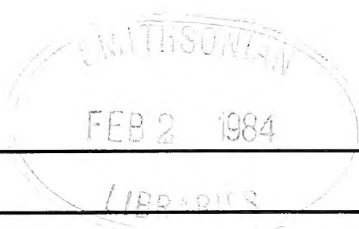


OPISTHOBRANCH



Chromodoris marginata Pease, 1860
Photo by Jeff Hamann
Heron Island, Australia
35mm Specimen, 3m depth
January, 1979

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The "Opisthobranch" is open to articles and notes on any aspect of malacology — or related marine life. Scientific articles submitted for publication are subject to review by one or more persons in addition to the

editor. Suggested changes will be coordinated with the author prior to publication. Articles should be addressed to the Editor, 505 E. Pasadena Ave., Phoenix, AZ 85012. No material submitted will be returned unless it is accompanied by return postage and mailing envelope.

Articles sent for publication in the "Opisthobranch" may include color or black and white illustrations. Either 35mm color transparencies and/or prints may be sent in although the slides are preferred. Minor notes may appear within 30 days of submission. Material requiring editorial board review will probably take a minimum of 60 days for publication.

Editor's comments within sections of the "Opisthobranch" will normally be within square brackets.

The "Opisthobranch" is published monthly by Steven J. Long & Sally Bennett, 505 E. Pasadena, Phoenix, AZ 85012-1518 telephone 602-274-3615 (message recorder) or 602-265-4584. Subscription rates are \$15.00 per calendar year for individual subscriptions or \$30.00 per year for all institutional subscriptions. Add \$5.00 per year for first class mail or \$10.00 per year for air mail postage. Second or third class mail is not recommended for foreign subscriptions. The "Opisthobranch" is issued in 12 numbers each year.

PREFACE TO VOLUME SIXTEEN OF THE "OPISTHOBRANCH"

by

R. Tucker Abbott

No science or hobby can flourish without good communications. Sharing information, news and knowledge is the life-blood of a strong community of fellow malacologists. The "Opisthobranch", spearheaded by Steven Long and Sally Bennett, intends to fill that vital role. We join thousands of other well-wishers in supporting and subscribing to this new and expanded effort. Professionals and amateurs will find a common bond in this new publication, for their goals and hopes are essentially the same — an ever increasing interest in the study, protection and appreciation of mollusks.

— R. Tucker Abbott
American Malacologists, Inc.
Melbourne, Florida

EDITOR'S NOTES

This issue begins the sixteenth year of publication for the "Opisthobranch," and brings several changes to format, audience, and style. I hope that you will all assist me by telling me both what you like and what you don't like about the new "Opisthobranch."

Thanks to Dave Mulliner, Tom Rice, R. Tucker Abbott, Dave Behrens, Hans Bertsch, Michael Ghiselin, Nellie B. Eales, Jeff Hamann, J. Sherman Bleakney, Kikutarô Baba, Kathe Jensen, R. C. Willan, T. E. Thompson, Malcolm Edmunds, Heike Wägele, Eveline Marcus, Ken Boss, Casto L. Fernández Ovies, Joandoméneç Ros, Antonio Perrone, and others who have recently sent information for the "Opisthobranch".

Please send me your current telephone numbers (both home and office) so that I may contact you. Note if they are private numbers. Please also send me addresses for anyone you believe would be interested in the "Opisthobranch." I will be pleased to mail them a free sample issue.

INFORMATION WANTED

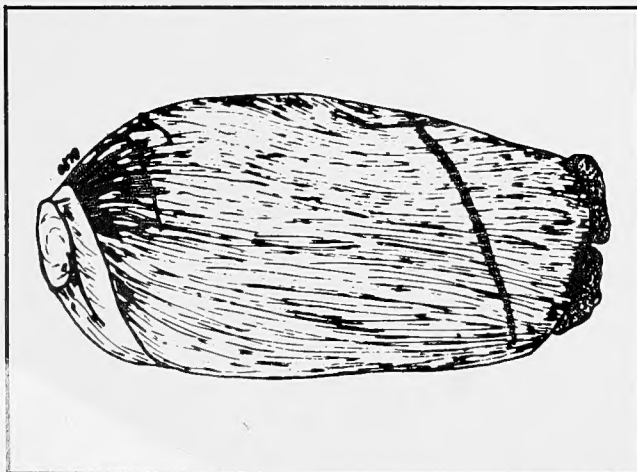
From Casto L. Fernández-Ovies (Covadonga, 3 10; Salinas, Asturias; Spain): "I am currently working on the anatomy and systematics of the sacoglossans from the Spanish coasts, but, I am mainly interested in the reproductive and developmental biology of the Gastropoda. I should be very grateful if whoever is studying these subjects could communicate with me about them."

From Alan Kuzirian (Department of Health & Human Services, Laboratory of Biophysics; Marine Biological Laboratory; Woods Hole, MA 02543): "Did you find any information on that ?PhD/MS thesis dealing with the cerata of *Hermisenda* and *Aeolidia*? I have gotten involved with a disease problem in *Hermisenda* and that reference would be very useful. I'm also going to contact Larry Harris and, if he can give me the information, I'll pass it along to you. Secondly, in the latest ON [15(6)] concerning the taxonomic listing of the Opisthobranchia, could you tell me what source you used? [Keen

Gosliner, Taylor & Sohl, Franc, etc.] I am finally going to finish my paper on the Coryphellidae and because of Terry Gosliner's paper subjugating everything under the Flabellinidae, it will be a major paper (in length and I hope, scope!). I will also cover the family Paracoryphellidae of Miller. The genus that catches my attention is *Rioselleolis* Ortea, 1979. [Please send Alan the citation] When I finish my paper, I will send you an abbreviated transcript of my changes along with the evidence and my reasons, if you are interested." [Of course I'm interested]

From Heike Wägele (Fachbereich 7; Universität Oldenburg; Postfach 2503; 2900 Oldenburg; Federal Republic Germany): "I am working on Antarctic nudibranchs, collected during the maiden voyage of the 'Polarstern' in 1983. Is there anybody, who recently (last 10 years) worked on Antarctic or Subantarctic opisthobranchs, or has material which she/he doesn't need anymore? I am interested in every kind of information or paper on this subject."

From Jeff Hamann (8242 Valley High, Lakeside, CA 92040): "I found a pair of Chromodorids in the Florida Keys in June that I can't identify. Would you ask our readers if they can? 55mm pale brown base color with a heavily ruffled notum. The notum is edged in yellow with a dirty red inner ring both only about 1mm wide. The branchia is comprised to two connected spirals with the anus in the middle (between the spirals). The rhinophores are white with four longitudinal red lines at the quarter-points."



Cylindrobulla sp.

Drawing by

Casto L. Fernández Ovies

PERSONAL NOTES

Jeff Hamann is in the Dominican Republic area around the Turks and Caicos Islands diving for about 30 days. He will return to San Diego about 20 January, 1984.

From Eveline Marcus (Caixa Postal 6994; Sao Paulo, Brazil 01501): "I hope to come to California next time [1984] . . . My news for the "Opisthobranch" is that two papers are issued and being sent to you: 'Tritoniidae of w. Atlantic' and 'Polyclad from Oysters in California', in Bolm. Dep. Zool. USP, 6 and 7, and proofs were read for Pleurobranchaeidae, in collaboration with Terry Gosliner, for the South African Museum. A paper on the remaining Notaspidea is going to press in vol. 8, USP [University of Saõ Paulo]. During the trip I saw Claude Poizat, Luise Schmekel, Terry Gosliner, and several other friends. No collecting, too short of time. Now I have to do some Tardigrades and freshwater Bryozoa, but already specimens of opisthobranchs are piling up for classification."

From Kathe Jensen (Zoologisk Museum; Universitetsparken 15; DK2100 København; Denmark): ". . . I am very happy to announce that I am finally getting paid for my work again. I just got [October, 1983] a 7-month appointment at the Zoological Museum here in Copenhagen to work with some of the late Dr. Henning Lemche's unfinished material of Ascoglossa, and possibly other non-nudibranchiate opisthobranchs. Hanne Just is still working on the Nudibranchia."

From Hans Bertsch (4444 W. Pt. Loma Blvd. #83, San Diego, CA 92107): "My job hunt continues. Right now I'm dissecting Antarctic opisthobranchs; have several new species of tritonids from the Gulf of California and Ensenada; have several works in press and more in line. This weekend [Nov. 83] I'm going to Bahía de los Angeles for several days of diving with faculty and students of Ciencias Marinas. I will be diving at Cabo San Lucas between 10 and 30 January, 1984."

From Dr. R. C. Willan (University of Queensland, Department of Zoology, St. Lucia, Brisbane, Australia 4067): "Very pleased to receive my June issue of Opisthobranch Newsletter and to see the Systematic List of the Opisthobranchia that it contains. It's an excellent start. Though I see quite a number of 'hornets nests' amongst the taxa! Still if you stick to the stated policy of accepting the most recently published taxonomic changes as accurate, not too many malacologists should get upset. To this end I have included a list of corrections and additions (mostly for Notaspidea).

Recent visits to northern New South Wales have proved productive for opisthobranchs. Diving off Byron Bay, I found *Micromelo guamensis*, *Bulla lineata*, *Bulla angasi*, *Favorinus turiganus*, *Hexabranchus sanguineus*, *Aphelodoris varia*, *Cadlinella ornatissima*, *Miramira magnifica*, *Dendrodoris guttata*, *Pteraeolidia ianthina*, *Chromodoris splendida* and *Tylodina corticalis* (how's that for a mixture of temperate and tropical species!) and collecting intertidally at Iluka has produced *Aeolidiella indica*, *Favorinus japonicus*, *Austraolis*

ornata, *Cratena lineata*, *Plocamopherus imperialis*, *Chromodoris nariei*, *Pleurobranchus peroni* and, of particular note, a live adult *Hydatina physis* that was being eaten by an octopus."

From Wes Farmer (11061 Lea Terrace Drive, Santee, CA 92071): "We plan a trip to Baja California the week prior to Christmas and hope to explore the low tides in the Gulf of California. I have been making nudibranch models for a few customers and made a few Opah fish . . ." Wes married Barbara Speth recently.

Steve Long and Sally Bennett travelled to England between 21 December, 1983, and 4 January, 1984. Steve and Sally spent a day visiting Dr. T. E. Thompson at the University of Bristol. Dr. Thompson's "Biology of Opisthobranch Molluscs, Volume II" is due to be published during 1984. He has now finished most of his work on British opisthobranchs and will be concentrating on the animals of the Mediterranean Sea. On another day, Steve travelled to Preston and visited with Dr. Malcolm Edmunds and his wife, Janet at their home in Goosnargh.

Dr. Kikutarô Baba (Shigigaoka 35, Minami 11-jo; Sango-cho, Ikoma-gun; Nara-ken, Japan 636): "I have been well. During the early part of August I joined with the Takaoka Biological Club for a collecting activity in the Japan Sea just north to Tsuruga Bay. Recently I finished a final MS of a paper and submitted it to "The Veliger": Supplementary information on the morphology of *Phestilla melanobranchia* Bergh, 1870 from Seto, Kii, Middle Japan (Nudibranchia: Aeolidacea: Ter-gipedidae)."

From Sandra Millen (The University of British Columbia, 6270 University Boulevard, Department of Zoology, Vancouver, B.C., Canada V6T 2A9): "We are all going to the Yucatan for Christmas where hope to do some diving (SCUBA) and snorkeling. Last time I didn't see a single 'branch' - maybe I'll have better luck this time."

Tom Rice says that the next issue of "Of Sea and Shore" magazine should be in the mail before the end of January, 1984.

☆ ☆ ☆ ☆ ☆

EDITOR'S NOTES

I need help from all malacological group secretaries. I will be happy to put notices of meetings and shell shows in the issues of the "Opisthobranch." The information must reach me prior to the first day of the month the meeting will be held. Actually, for maximum use, the information should be here one month before the meeting month to allow time for printing and distribution of the information.

I would appreciate line drawings of living mollusks for the cover of each issue of the "Opisthobranch." Original artwork can be almost any size but will be reduced to about 2" x 2" for publication. Please be certain to include the full scientific name of the animal along with the author and date the name was published.

CLASSIFIED ADVERTISING

Wanted to buy: books, journals, photographs, papers, etc. relating to malacology. Also interested in shell cabinets, letters, collecting records, notes, photographs, and drawings by malacologists. I have duplicates of many books and papers. Please send notes on items wanted to me. Write to Steven J. Long, 505 E. Pasadena Avenue, Phoenix, AZ 85012-1518 listing materials and prices wanted.



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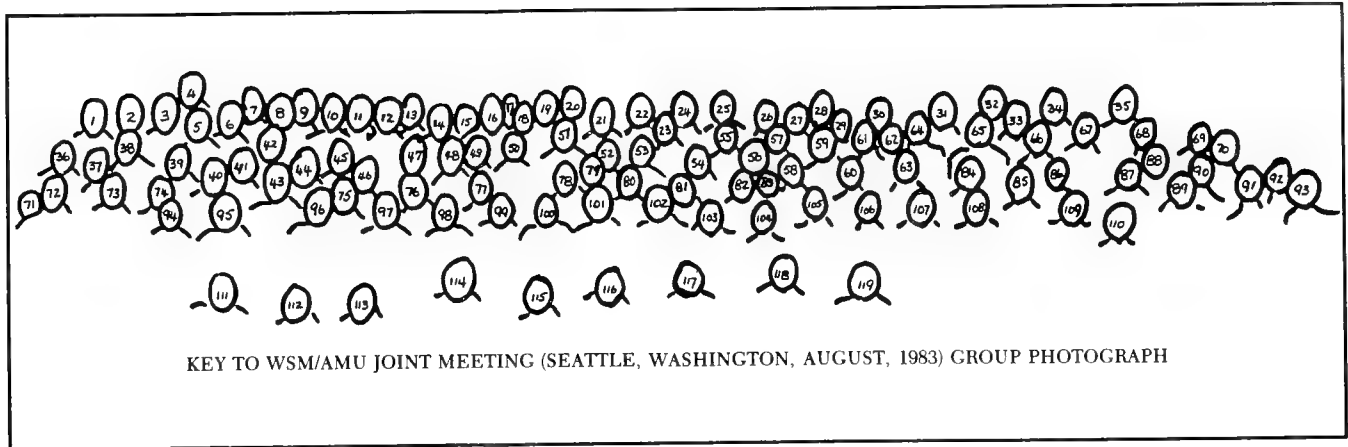
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KEY TO WSM/AMU JOINT MEETING (SEATTLE, WASHINGTON, AUGUST, 1983) GROUP PHOTOGRAPH

1. Arthur J. Cain 2. 3. 4. 5. 6. William Emerson 7. Matthew James 8. 9. Joe Houbrick 10. 11. 12. F.G. Hochberg 13.
 Jerry Landye 14. 15. James McLean 16. Harold D. Murray 17. Herb Young 18. 19. Sally Bennett 20. Stuart Lillico 21. 22. 23. Don Shasky
 24. 25. 26. 27. Paul Scott 28. Richard E. Petit 29. 30. 31. 32. 33. Hollis Q. Boone 34. Barry Roth 35. George Kennedy 36.
 Rose Burch 37. Donald Moore 38. Margaret Mulliner 39. 40. 41. Elsie Messing 42. 43. 44. 45. 46. 47. 48. 49.
 Margaret Tesky 50. 51. George M. Davis 52. 53. Thomas A. Burch 54. 55. Walter Miller 56. 57. 58. H. Wayne Holliman 59.
 60. David K. Mulliner 61. 62. 63. Patrick LaFollette 64. 65. 66. 67. David Lindberg 68. 69. 70. Eugene Coan 71. Beatrice L.
 Burch 72. 73. Mrs. Donald Moore 74. 75. Edith Abbott 76. Twila Bratcher 77. 78. Elsie Marshall 79. 80. 81. 82. Audrey Holliman
 83. 84. Liz Petit 85. Joseph Rosewater 86. M. Patricia Morse 87. 88. 89. Geerat J. Vermeij 90. Terrence Gosliner 91. 92. Judith Terry Smith
 93. Clyde Roper 94. Vida Kenk 95. 96. Constance Boone 97. Bert Draper 98. Billee Dilworth 99. Sandra Gardner 100. Walter Moore 101. 102.
 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. Myra Taylor 113. Melbourne R. Carriker 114. Robert Robertson 115.
 Alan J. Kohn 116. Paul E. Jennewein 117. 118. William Bledsoe 119.

Note: Our apologies for missing many of the names in the photograph. No list was taken at the meeting. If you write us with names and numbers for unidentified attendees within the next few days, we will list them in the next issue of the "Opisthobranch."



BOOKS & PAPERS

From Kathe Jensen: "I would...recommend the small pamphlet by Dr. Tom Gascoigne: 'Fine Dissection of Ascoglossans.' Published by the author in conjunction with the Conchological Society of Great Britain and Ireland. Copies are obtainable directly from the author: T. Gascoigne, 16A York Grove, London, SE 15, 2NY, England, at the price of 1 pound Sterling. Please note that remittances must be in British pounds, because bank charges for currency exchange are so high. The pamphlet is 31 pages of detailed explanations of the author's magnificent techniques for dissecting minute specimens of Ascoglossa - and how to avoid common pitfalls. (This is perhaps the most important information for someone who already has some experience with dissections). The pamphlet includes 11 text-figures illustrating in detail the different anatomical features mentioned in the book. The author explains a number of different methods for preservation and staining, and also for making radular mounts, etc., all accompanied by the author's own experiences with these techniques. Altogether a highly recommendable book for anyone wishing to study the internal anatomy of small, soft-bodied animals."

A few student copies of the Mollusca Section of *The Synopsis and Classification of Living Organisms* which include sections of Comments and Additional Notes: Classification of Mollusca (pp. 1092-1096); the main body of text (Mollusca, pp. 945-1166); and an Index (pp. 1-27) are available from the Department of Mollusks for \$10.00 which covers reproduction, postage, and handling. Payment in U.S. currency (postal money order, check, or cash) should be directed to: Dept. of Mollusks, Museum of Comparative Zoology, Harvard University, Cambridge, MA 02138 U.S.A.

From Kathe Jensen: "Here's the information on John Orr's 'Hong Kong Nudibranchs': Orr, John, 1981. Hong Kong Nudibranchs. Published by the Urban Council, Hong Kong, 82pp. Price H.K. \$17. The book may be obtained directly from the Urban Council, Hong Kong. You may have to add a postage and handling charge. I bought it when I was there in April. The book contains color-photographs of about 50 nudibranch species, with short descriptions of key characters and distribution. Also, there is a brief introduction on classification, anatomy and biology of nudibranchs with schematic drawings explaining the various anatomical terms. This is all very helpful to the amateur collector, and the color-photography section may also be used successfully by professional malacologists. The recent workshop in malacology, in which I participated, showed that the Hong Kong area has considerably more species than mentioned in the book, but since nothing else is available for field identification, the book can definitely be recommended." [Dave Behrens (P.G. & E. Bioassay Lab., P.O. Box 117, Avila Beach, CA 93424) has a few copies for sale for \$6.00 each including postage and handling.]

READER FORUM

From Kathe Jensen: "The reason I haven't commented on the systematic list is that I wanted to include all my comments at one time, but I'm afraid that some of them need a little more 'homework' than I anticipated. I have enclosed a copy of the Ascoglossa page with a few additions. (Family Oxyroidae Fischer, 1883; Stiligeridae Iredale & O'Donoghue, 1923; Subgenus *Ercolania* Trinehese, 1872 (after *Stiliger*)). The problem of synonymy of *Stiliger* and *Ercolania* is not finally solved, and I am currently preparing a manuscript (on my Hong Kong materia), in which I try to list all characters which are common to the species of *Ercolania*, and I feel convinced that they are separate genera. For now, I think it would be appropriate to at least mention *Ercolania* as a subgenus of *Stiliger*, because the sabot-shaped teeth clearly distinguishes them from the type species of *Stiliger*, *S. ornatus* (see Baba & Hamatani, 1970) and other species presently referred to *Stiliger*."

Another problem is whether the Platyhedylacea should be included in the Ascoglossa. There are certainly similarities. However, it is extremely difficult for me to accept a group of apparently dioecious animals (or is it still only 1 species?) in a group of otherwise hermaphroditic animals. Also, the anatomy of the digestive system (according to the original description) seems to be completely different from that of other Ascoglossa. However, I have not yet had access to all the papers on *Platyhedyle*, nor have I seen the animal, so I won't say for sure that it is not an Ascoglossa. Wara (1979) seemed to suggest that it might not be dioecious after all, but Dr. Wara also stated that the pleural ganglia were separate from the cerebral ones, which is also very hard to accept in an ascoglossan — how could they have 'reappeared' after the loss of the shell? I would greatly appreciate some comments from people who have actually seen and worked with *Platyhedyle*."

From Nellie B. Eales: "I am sending some remarks on the classification of the Opisthobranchs. You may use it as you wish, but I should like to see a print of the classification of the Aplysiomorpha, to include the list of obsolete names. In your list, p. 29 *Cymbulia* Péron & Lesueur not Sesueur."

From Kenneth J. Boss (Museum of Comparative Zoology, Department of Mollusks, Harvard University, Cambridge, MA 02138): "I did have fun with your list of opisthobranchs in the June newsletter and I have some residual questions: Did you purposely omit the authors and dates of some families (e.g. all of the Dendronotacea, the Stiligeridae, etc?) [I put in all of the authors and dates which I could find. Please send any corrections and additions which you have.] Did you mean to treat *Actinocyclus* as a runcinoid and why; I have it related to *Hallaxa* (I see you do too). [I am removing it from runcinoid area.] Are you publishing *Gigantonotum*? or *Pleurobranchomorpha*? [I have removed *Gigantonotum* see Willan below. I don't have any justification to include *Pleurobranchomorpha* please send if

available.] How can a family name date from before the publication of the genus? (Polybranchiidae H. A. Adams 1854 and *Polybranchia* Pease 1860.) [Help. Do you consider *Notobryon* and *Crosslandia* synonyms of *Scyllaea*? [*Crosslandia* is a good genus; Help on *Notobryon*.] Why place the doridids in the Polyceratacea? [Help. What is *Percunas* (spelling and who named it) in the didoridids? [I don't know] Do you mean to have *Thorunna* in the platydoridids or is it a chromadoridid? [Help. Where can I get a description of the Conualeviidae? [I don't think you can — Subfamily Conualevinae is described in Collier & Farmer 1964 Citation #488; I have removed Conualeviidae from the Systematic List.] Anyway your list was a great help and I

shall incorporate it in my revision of molluscan families.

From Michael T. Ghiselin (Department of Invertebrate Zoology and Paleontology, California Academy of Sciences, Golden Gate Park, San Francisco, CA 94118): "For the next revision of your systematic list of the Opisthobranchia I recommend moving the Akeridae from the Philinacea to the Anaspidea. That *Akera* is a primitive seahare has long been recognized, even by those who want to treat it as a cephalaspidean. There is no evidence that the Akeridae are related more closely to the Philinacea than they are to other groups of cephalaspideans. Indeed they are probably closer to sacoglossans and the Diaphanacea."

CURRENT EVENTS

A meeting of the Conchological Society of Great Britain and Ireland was held on 19 November, 1983, in the British Museum (Natural History). The topic was "Tropical Opisthobranchs."

A meeting of the Linnean Society was held on 19 January, 1984, in Burlington House, Piccadilly, London. The title was "Marine Biology of the Aegean Sea."

The Western Society of Naturalists 64th annual meeting was held at Simon Fraser University, Burnaby, B.C., Canada, December 27-30, 1983. Numerous papers were presented on mollusks and other organisms. Membership in the society of \$3.00/year for students and \$5.00/year for others. For details contact: Prof. David H. Montgomery, WSN Secretary, Department of Biological Sciences, California Polytechnic State University, San Luis Obispo, California 93407. Telephone (805) 546-2446.

NOTES FROM HANS BERTSCH

The Inside-Out Clam: *Chlamydoconcha*
(See photo back page)

To most of us, the word clam evokes images of oysters in bays, giant *Tridacna* in the Indo-Pacific, or intertidal banks of *Mytilus*. However, along the coast of California occurs a rare snow white clam that at first glance looks like an opisthobranch gastropod. No shell is covering the animal; the shell is completely internal. A sea slug clam is bizarre out of context, but it is actually the biological result of several correlated evolutionary trends within the family Galeommatidae.

Chlamydoconcha orcutti Dall, 1884, was originally named based on specimens that Charles R. Orcutt collected in Mission Bay, San Diego. Although its original habitat has been altered by land fill, housing developments, and flood control projects, *Chlamydoconcha* can still be found in the bay. I have found this clam under the rocks of the man-made jetty lining the modern entrance of Mission Bay. Additional collecting records are mainly in central and southern California and Baja California. The species apparently prefers under-rock situations in areas with detritus-rich mud or sand bottom.

The morphology and biology of the animal are intriguing. Brian Morton has recently published the first detailed description of living *Chlamydoconcha orcutti*. He indicates that a complete description of the species must ultimately include descriptions of three distinct forms. A pelagic larva stage has not been reported. The large adult "female" form is the best known. Living inside "her" body is a dwarf male.

Externally the adult animal has an elongate oval appearance. At the anterior end is a cowl-like inhalant siphon curving over the flexible, extensible foot. An exhalant siphon is posterior. Covering the dorsal surface are numerous small ducts. They are secretory tubules which presumably exude repugnatory defensive chemicals.

The adult shell is completely internal because the middle mantle fold has grown up and over the animal's body, completely enclosing the shell. It is thin, narrow and elongate. The valves are aligned horizontally, and cannot close together. Because of unequal growth, the anterior portion is over three times as long as the part posterior to the small ligament. Maximum length of the adult shell is 10 mm, about one-half the total length of the animal's body.

In the space formed by the mantle reflected over the shell is found the dwarf male. Less than 1 mm, the endosymbiont can be divided into three sections. A bivalve shell with large prodossoconchs caps the animal. Below the shells, the massive testis fills nearly the entire transparent visceral mass (almost half the animal's body). Projecting ventrally are a foot and a many-branched byssal thread. The small male has no gills nor labial palps. It is dependent on its host female to provide it with food. There is a small pore that connects to the outside from where the male attaches to the female's shell. Muscular pumping by the female exchanges water in the space surrounding the male. Suspended material in this fluid provides food for the male.

The dwarf male fertilizes the much larger female. The fertilized eggs are then incubated in the female's

ctenidia. Morton has suggested that the small male eventually matures into an adult, and that this species manifests protandric sequential hermaphroditism.

Between the cowl of the inhalant siphon and the pore that opens into the dwarf male's home between the shell and the reflected mantle is a curious multi-papillar structure. The round object contains over a hundred papillae, all of which can send out a homing signal for the dwarf male to follow to his new abode inside her body.

Brian Morton's excellent anatomical study shows that *Chlamydoconcha* is a representative of the family Galeommatidae Gray, 1840. Within this leptonacean family, there is a series of evolutionary changes: reduction of shell, bending of the middle mantle fold over the shell and its assumption of the defensive role, protandric hermaphroditism, brooding of eggs in the

gills, and brooding of a dwarf male. These trends culminate in the morphology and biology of *Chlamydoconcha orcutti*. They are fascinating adaptations to ensure reproduction within a sparse population.

Because *Chlamydoconcha* is a rare mollusk, it is recommended that specimens not be collected. This California endemic is still extant despite massive habitat loss. Those of us who know mollusks have a great responsibility to conserve them.

ADDITIONAL READING

MORTON, BRIAN 1981* The biology and functional morphology of *Chlamydoconcha orcutti* with a discussion on the taxonomic status of Chlamydoconchacea (Mollusca: Bivalvia). *J. Zool., London*, 195:81-121.



Chlamydoconcha orcutti Dall, 1884 Photo by David Mulliner Pyramid Cove, San Clementi Island, California Under rocks, sand, 13m depth November, 1970, 12mm shell

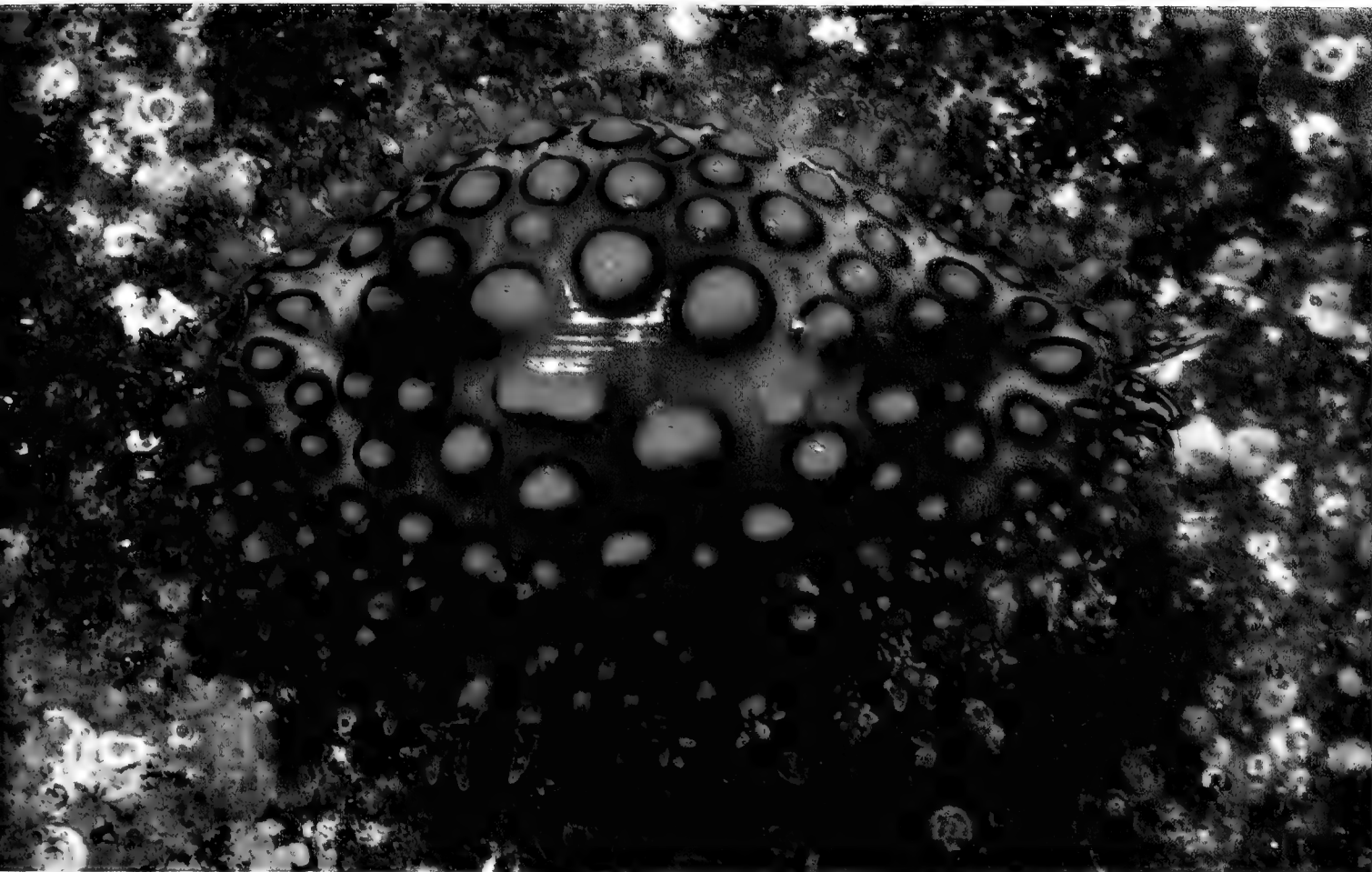


Figure 1. *Jenneria pustulata* (Lightfoot, 1786). Bahía de Los Angeles, Baja California, Mexico. Shell found under rocks at 8 m

depth on reef south of Smith Island. 22 mm specimen. Photo by Dave Mulliner, 1978. (See article inside cover).

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| Dr. Kerry B. Clark | |

The **Opisthobranch** is open to articles and notes on any aspect of malacology — or related marine life. The **Opisthobranch** was formerly known as the **Opisthobranch Newsletter**. 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.

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Notes from Hans Bertsch

Jenneria pustulata, the Pustulate "Cowrie."

Figure 1. Front cover photograph by David K. Mulliner.

A most distinctively-marked mollusk occurs throughout nearly the entire length of the tropical eastern Pacific faunal province. Although commonly called a cowrie, it is not a true cowrie. This cypracean is a member of the family Ovulidae Fleming, 1822, subfamily Eocypraeinae Schilder, 1927. It has been found from the northern extremes of the Gulf of California to Ecuador. Often, it is in or near masses of stony corals, its prey item.

The shell of *Jenneria pustulata* (Lightfoot, 1786) is gray-brown (figure 1). The dorsal surface of the adult is covered with brilliant orange pustules, each of which is surrounded basally by a dark chocolate colored ring. The mantle of the living animal has a salt-and-pepper appearance, and bears many dendritic papillae. The underside of the shell is gray; white apertural teeth radiate to the margins. As with most cypraceans, there is an ontogenetic change in the shell. The orange pustules are not laid down until near maturity. They are not formed simultaneously, but gradually fill up the surface of the shell during its change from the swollen bulloid juvenile to the adult. Thiele (figure 2) illustrated the radula; there are strong cusps on the lateral teeth, and the two outer marginals end distally with thin, narrow, pectinate elongations.

The breeding habits of aquaria specimens of *Jenneria* have been described by D'Asaro. The female cleans the site she has selected for oviposition. Then an egg capsule is passed from the oviduct, kneaded by the propodial muscles, and then applied to the substrate with an adhesive secreted by glandular cells.

The egg mass is oval shaped (about 30 mm in maximum length), and contains 14 to over 200 egg capsules (figure 3). The egg capsules are shaped like inflated triangles and measure 2.3 mm in length and 1.7 mm in width. Each egg capsule (or ootheca) contains about 65-100 embryos. An entire egg mass can contain between 1,200 and 21,000 individual embryos. Hatching takes place in about 2 weeks and results in long-term planktotrophic veligers.

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ADDITIONAL READING

- D'ASARO, CHARLES 1969. The egg capsules of *Jenneria pustulata* (Lightfoot, 1786) with notes on spawning in the laboratory. *The Veliger* 11(3):182-184.
- GIBSON-SMITH, J. 1974. On two new members of the family Ovulidae (Mollusca: Gastropoda) from the Cantaure formation, Venezuela. *Boletín Informativo Asociación Venezolana de Geología, Minería y Petróleo* 17(4-6):87-96.
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Figure 2. Half row of radula of *Jenneria pustulata*. (From Thiele).

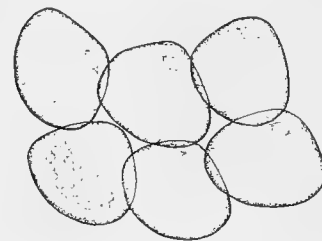


Figure 3. Egg capsules of *Jenneria pustulata*. Dorsal view of six capsules; one capsule contains embryos; the escape apertures of all capsules are visible. (From D'Asaro)

Dr. Hans W. Bertsch, 416 W. San Ysidro Boulevard, K-229, San Ysidro, CA 92073

OPISTHOBRANCH

A MONTHLY PUBLICATION ON MOLLUSKS AND MARINE LIFE

\$2.50 February 1984

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Figure 1. *Jenneria pustulata* (Lightfoot, 1786). Bahía de Los Angeles, Baja California, Mexico. Shell found under rocks at 8 m depth on reef south of Smith Island. 22 mm specimen. Photo by Dave Mulliner, 1978. (See article inside cover).

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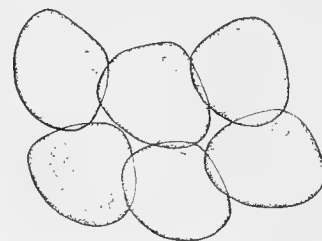


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Dr. Hans W. Bertsch, 416 W. San Ysidro Boulevard, K-229, San Ysidro, CA 92073

Editor's Notes

The response to our first color issue has been very gratifying. We hope this issue is even better. The **Opisthobran**ch is a full range malacological publication. We will cover popular and scientific material for land, freshwater, fossil, and marine mollusks. Any other group of animals or plant which interacts with any mollusk will also be considered (e.g., birds which eat mollusks). The size of the publication will grow as material and advertisers increase. At the minimum, 24 pages per quarter with 12 in full color is a bargain. Postage and color are the two major expenses for a monthly publication.

We need "popular" articles on malacology. Please take the time to write notes and articles for the **Opisthobran**ch. We will be happy to provide editorial assistance and suggestions if you like — but write! Your contributions are valuable.

Thanks to the Western Society of Malacologists and the American Malacological Union for allowing us to use the group photo. We hope that the result was pleasing to all.

Information Exchange

From **Dr. Clyde F. E. Roper** Two Zoologist positions for a malacologist (preferably in opisthobranchs, bivalves or pulmonates) and a stony coral specialist. These are posted government service positions which close by 15

Thanks to R. Tucker Abbott, Manuel Ballesteros Vasquez, Dave Behrens, John Bernard, Hans Bertsch, Jack Brookshire, Kerry Clark, Norma Dullas, N. B. Eales, Michael Ghiselin, Terry Gosliner, Jeff Hamann, Myra Keen, Alex Kerstich, Mary Larson, Stuart Lillico, Ian Loch, Jim McLean, Donna Fagan, Dave Mulliner, Tim Pearce, Dick and Liz Petit, Tom Rice, I. S. Roginskaya, Clyde Roper, Don Shasky, Kay Vaught, R. C. Willan, and others who have provided information and help for this issue. Thanks also to Valley Typesetting, Whitten Printers, and especially, Perry Wilson who all conspired to put together a great January issue in very short time with very little direction.

This issue has small changes in type and layout. Let us know what you think. We will probably use this standard unless we hear numerous complaints. All of the columns are written by Steve Long unless otherwise noted on the masthead or on article titles. We would like to find people interested in writing monthly columns. Please contact us.

Everyone who writes to the **Opisthobran**ch should be aware that the letter or excerpts from it may appear in the publication. If any portion of the letter is not for publication, please mark "Not for publication."

April, 1984. Call the Department of Invertebrate Zoology at (202) 357-2030 for further information or write to: Smithsonian Institution, Office of Personnel Administration, 900 Jefferson Dr., S.W., Room 1410, Washington, DC 20560, Attention: MPA-84-200-F.

Classified Advertising

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

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STEVEN J. LONG Wanted to buy: books, periodicals, pamphlets, letters, equipment, storage cabinets, etc. relating to malacology. I have duplicates of many books and papers along with special index lists for opisthobranchs and malacology. Copies of Kay Vaught's "An outline of classification of living shelled marine mollusks" 93 pages are available at \$10.00 each + \$1.00 postage and handling. Arizona residents add appropriate sales tax. Please write 505 E. Pasadena Ave., Phoenix, AZ 85012.

Miscellanea

This column will be a catch-all for all "Who, what, where, how, why and, when" information. For example we will include: shell identification questions and answers; collecting methods; definitions; identification keys; tide calendars; computer cataloging; shell cleaning; and tips on photographing shells. We will also feature biographical sketches of naturalists associated with malacology. We aim to assist shell collectors at all levels and will develop a regular column in any area where sufficient interest is shown and a column editor is found — any volunteers?

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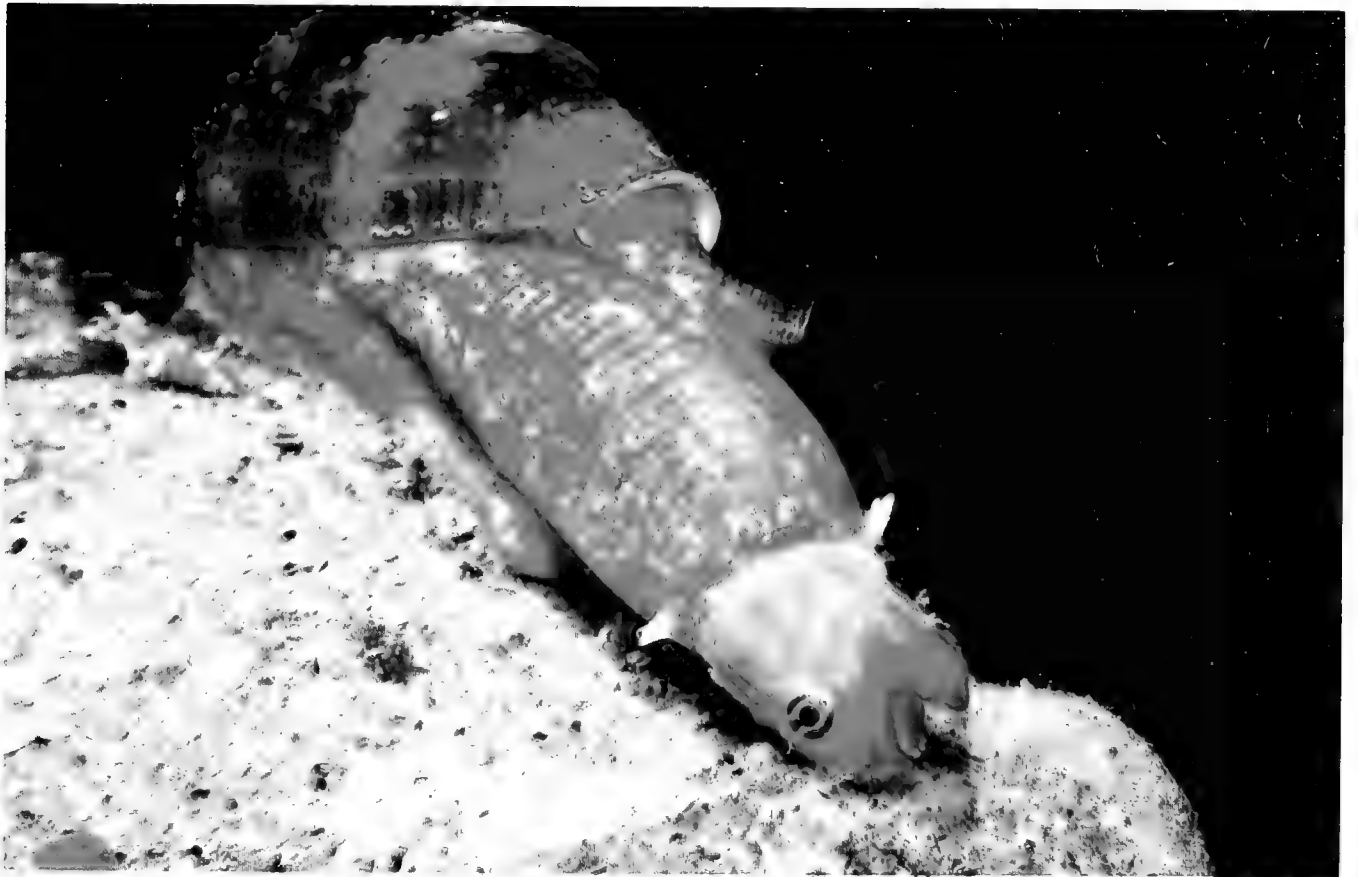
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Conus purpurascens Sowerby, 1833 ex Broderip, MS. Guaymas, Mexico. Proboscis extended, about to sting goby (*Elacatinys punctioulatus*). Photo by Alex Kerstitch.



Conus purpurascens. Guaymas, Mexico. Proboscis extended and goby almost inside — note eye stalks. Photo by Alex Kerstitch.

Killer Cone by ALEX KERSTITCH

(See photos at Left)

Known to malacologists as toxoglossan (meaning venom tongue), cones are equipped with a formidable apparatus for stinging and capturing prey. A venom-filled arrow, known as the radular tooth, is fired into the body of its prey from an elastic tube or proboscis.

Here, the purple cone, *Conus purpurascens* Sowerby, 1833 *ex* Broderip, MS, stalks, captures and devours a small goby. Paralyzed by the cone's neurotoxic venom, the small fish is ingested into the distended buccal cavity or mouth. Digestion may take as long as twenty hours. Finally, a neat mucous package is disgorged, filled with indigestible material. Piscivorous cones feed only on fishes and are potentially dangerous to man. Several species have been responsible for human fatalities.

ADDITIONAL READING

KEEN, A. MYRA 1971. Sea shells of tropical west America; marine mollusks from Baja California to Peru, 2nd ed. Stanford Univ. Press, Stanford, Calif. xiv + 1064 pp.; illust. (1 Sept. 1971)

KERSTITCH, ALEX 1979. The piscivorous cone (*Conus purpurascens*). *Shell Collector*, 1(2):56-57; 2 photos.

WALLS, JERRY G. 1978. Cone Shells, a Synopsis of the Living Conidae. T.F.H. Publications, Inc. Ltd., Singapore, 1011 pp.; illust.

Alex Kerstitch, Department of Biology, University of Arizona, Tucson, AZ 85720

One Way to Start a Shell Collection

by NORMA DULLAS

How does an individual get involved in shell collecting and where does it lead? Obviously, the answers are numerous. In my case the seed, so to speak, was planted about the age of seven while beachcombing during a summer vacation. My home, at that time, was in a mountainous region in Arizona so the beach was paradise to me. Love at first sight was my reaction to the little clam and scallop shells I gathered. That initial collection was lost somewhere along the years, and the interests of adolescence, then a career and marriage responsibilities filled the time.

The seed, however, sprouted into life several summers back while sight-seeing along old Coast Highway 1 in northern California. We stopped for lunch at a cafe adjacent to commercial oyster beds where a pile of rough-textured shells caught my attention. I liked their irregular shapes and nacreous linings. The owner told me to help myself. Next it was abalones from a stack beside a seafood market. After that I noticed shells everywhere: in baskets beside cash registers, in museums and aquaria, campground stores, roadside stands — everywhere but the beaches. (How little I knew!) By the time I had returned to Arizona with my bag of treasures I was addicted to shell collecting.

The joy of any hobby or collection is the individual's perception and development of that activity. It can be simple or complex — whichever gives the most satisfaction. By nature I am a person who enjoys detail and I was not content to place my shells upon a shelf as mere decoration and leave it at that. Looking over the group I realized I knew very little about shells, not even their names. Reference books were a necessity and poring through them brought the molluscan world into perspective for me. I began to collect systematically and set goals. Although I am an "armchair" collector depending upon dealers as a source for shells, I look forward to a self-collecting expedition as one of my goals.

My collection grew and so did the requirements to keep it organized: individual identification slips, data file card for each specimen, log book, numbering system, and a cabinet (designed and constructed by my husband). Future plans include cross-reference files which will group specimens by geographical areas and by source.

All this labor was fulfilling, but the best was yet to come. Through a chain of circumstances, I discovered the Southwestern Malacological Society, a shell club in Phoenix with approximately fifty members. Membership opened the door to new friendships, educational and entertaining programs, field trips, auctions and even a library. I became involved in the club's operation by first serving as display chairwoman. At present I serve as secretary with the responsibility for taking minutes, preparing and mailing the monthly newsletter and meeting notice. I never imagined that picking up shells in my youth would eventually lead to these activities!

Membership in SWMS revealed a new dimension of shell collecting to me. The amateur shell collectors make valuable contributions to the science of malacology. Many of these fine people have careers and occupations totally unrelated to this science. Through years of collecting on site, observing, and studying, they have become authorities. They share their discoveries, their knowledge and experience through editing and publishing newsletters, books, articles, and magazines. They assist museums with research, classification, identification, displays and collections. They present programs to students, shell clubs and other community groups. These are just a few examples, and they are inspirational.

Where will my collecting lead me? I don't know yet — I'm still on my way.

Norma Dullas, 13231 North 65th Drive, Glendale, AZ 85304

Current Events

This section of the **Opisthobranch** will include news of clubs and organizations, especially shell shows, club meeting dates, club programs, and conventions. Special symposiums and meetings for malacology and associated fields will be included as space permits.

The **SOUTHWESTERN MALACOLOGICAL SOCIETY**, meets at the United Methodist Church, 1601 W. Indian School Road, Phoenix, Arizona. The meetings are held the third Wednesday of each month, September through May at 7:30pm. For information about the club and its activities contact Norma Dullas, Secretary, c/o 3846 E. Highland, Phoenix, Arizona, 85018. Programs are presented monthly. Bert Draper of Los Angeles, California, presented the January program on the "Marine Molluscan Taxonomy for the Eastern Pacific, Made Easy." His color slides of the shells were beautiful. As an extra added attraction he showed some fascinating photos of live *Caecum* taken under a microscope. The February's program is "Shelling on the Great Barrier Reef," by Gene Everson of Fort Lauderdale, Florida. The March program will be presented by Roy Poorman of Westminster, California. His program; "El Niño en El Golfo" will discuss the effect of El Niño on the fauna of the Gulf of California.

The **CONCHOLOGISTS OF AMERICA [COA]** 12th annual convention will be at the Don CeSar Beach Resort, St. Petersburg Beach, Florida, June 27-30, 1984. This year's meeting will be hosted by the St. Petersburg Shell Club. Convention activities include slide and movie presentations on travel, collecting, and cleaning shells. There will be shell displays, a local collecting trip, and both silent and verbal auctions. Many international shell dealers will attend with specimen shells for sale. Guest speaker at the banquet will be Robert J. L. Wagner, Senior Editor of *Wagner and Abbott's Standard Catalog of Shells* and *Van Nostrand's Catalog of Shells*. For further information please contact COA Convention Chairman; Donald J. Young, 11975 Third Street East, Treasure Island, Florida 33706.

Personal Notes

From **James H. McLean** Congratulations on the first issue of the **Opisthobranch**. I wish you success with it . . .

From **Myra Keen** Thank you very much for the colorful **Opisthobranch Newsletter**, vol. 16, no. 1. If I were continuing my line of work in Mollusca, this would sorely tempt me to re-subscribe to it. However, due to failing health, I am moving by the end of this month to a retirement home in Santa Rosa. I have turned over my malacological library to Dr. Eugene Coan because I will not have space in my small apartment for such materials. I am not losing interest in Mollusca as such, but I expect in future to confine my efforts to editorial work.

I advise you, therefore, to remove my name from your mailing list and to send any inquiries you might have to Dr. Coan, whose address you doubtless have in the AMU and WSM directories.

The **AMERICAN MALACOLOGICAL UNION** 50th annual meeting will be at the Holiday Inn, Norfolk, Virginia, U.S.A., July 22-27, 1984. The meeting will be sponsored by the National Capital and Philadelphia Shell Clubs. Two International symposia are planned: The Physiological Ecology of Freshwater Mollusks honoring Dr. W.D. Russell-Hunter, organized by Dr. A.J. Burky, and Dr. R.F. McMahon; and the Larval Ecology of Mollusks, organized by Dr. M. Vecchione. Two workshops will be held: Veligers organized by Dr. J.B. Taylor; and: The Mollusk Fauna of Virginia and the Carolinas, organized by Dr. R.T. Abbott. Also planned are invited lectures on diverse topics by some outstanding malacologists. There will be contributed papers, posters, slide shows, field trips, an identification clinic, non-commercial and commercial exhibits, an auction, receptions, and a banquet. For further information contact: Dr. Robert Robertson, AMU President, Dept. Malacology, Academy of Natural Sciences, Nineteenth and the Parkway, Philadelphia, PA 19103 U.S.A. (215) 229-1131.

The **WESTERN SOCIETY OF MALACOLOGISTS'** 17th annual meeting will be held at University of California, Santa Cruz, California, August 16-19, 1984. Emphasis of this year's meeting will be on the Natural History of Marine Mollusks of the Eastern Pacific Ocean. In addition to the regular program of contributed papers, several special symposia are planned, including ones on Nudibranchs, Parasitic Mollusks, and Paleocology of Fossil Mollusks. For further information, please contact WSM Secretary; Dr. Fred G. Hochberg, Department of Invertebrate Zoology, Museum of Natural History, 2559 Puesta del Sol Road, Santa Barbara, CA 93105, U.S.A.

From **Stuart Lillico** [Editor of the **Hawaiian Shell News**] The Hawaiian Malacological Society is just emerging from a traumatic ten weeks of converting to a computerized membership list, mailing label and record keeping system. If we survive 1984, we'll be on our way to victory! In the meantime, our mailing schedule is a shambles.

Thanks also for reproducing the AMU group photograph in this issue of the **Opisthobranch** newsletter. I had not seen it and have enjoyed examining it.

From **Stuart Lillico** I am much impressed by the "new" **Opisthobranch**. Good luck with it!

From **Manuel Ballesteros** I am working on the opisthobranch fauna (principally nudibranchs and ascoglossans) of the Mediterranean coasts of Spain (peninsular and Balearic Islands). In addition to faunistic studies I am doing some anatomical studies (general anatomy, radula and labial cuticle) with SEM.

From **R. Tucker Abbott** Congratulations on a very splendid new format. It certainly looks like a very professional job . . . I now have Robertson's and also a Cernohorsky manuscript to edit for the next two numbers of *Monograph of Marine Mollusca*. Also must get to writing on my *Compendium of Land Shells* (3000 photos are now finished — do you know where I can get some good color shots of live Western species?)

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Haliotis assimilis Dall, 1978. Point Loma, California. Abalone found attached to the bottom of turnable rock at 12 m depth in kelp beds 1 km offshore, feeding on broken kelp. 110 mm juvenile specimen. Photo taken underwater with Nikonos camera by Dave Mulliner, 1980.

Current Addresses

Dr. R. Tucker Abbott, P.O. Box 2255, Melbourne, FL 32901

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

Donald B. Cadien, 1006 37th Street, San Pedro, CA 90831

Dr. Kerry B. Clark, Department of Biological Sciences, Florida Institute of Technology, 150 West University Boulevard, Melbourne, FL 32901

Dr. Eugene V. Coan, 891 San Jude Avenue, Palo Alto, CA 94306

Dr. Michael T. Ghiselin, Department of Invertebrate Zoology & Paleontology, California Academy of Sciences, Golden Gate Park, San Francisco, CA 94118

Dr. Terrence Gosliner, Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, DC 20560. [until about April, 1984]

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

Stuart Lillico, Hawaiian Malacological Society, P.O. Box 10391, Honolulu, HI 96816

Ian Loch, Department of Malacology, Australian Museum, P.O. Box A-285, Sydney 2000, Australia

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

Dr. T.E. Thompson, University of Bristol, Department of Zoology, Woodland Road, Bristol BS8 1UG, England



*Tambja
abdere*

Opisthobranch sculpture embeddings, 60 species, life-like in color and shape, also made to order.

SEA-SLUG GASTROPODS, 157 species-Panama to Alaska, 177 pages, illustrated, \$10. Hand colored copy for \$46. A good reference.

Wesley M. Farmer
11061 Lea Terrace Dr.
Santee, CA 92071
(619) 448-8697

Current Events

This section of the **Opisthobranch** will include news of clubs and organizations, especially shell shows, club meeting dates, club programs, and conventions. Special symposiums and meetings for malacology and associated fields will be included as space permits.

The **SOUTHWESTERN MALACOLOGICAL SOCIETY**, meets at the United Methodist Church, 1601 W. Indian School Road, Phoenix, Arizona. The meetings are held the third Wednesday of each month, September through May at 7:30pm. For information about the club and it's activities contact Norma Dullas, Secretary, c/o 3846 E. Highland, Phoenix, Arizona, 85018. Programs are presented monthly. Bert Draper of Los Angeles, California, presented the January program on the "Marine Molluscan Taxonomy for the Eastern Pacific, Made Easy." His color slides of the shells were beautiful. As an extra added attraction he showed some fascinating photos of live *Caecum* taken under a microscope. The February's program is "Shelling on the Great Barrier Reef," by Gene Everson of Fort Lauderdale, Florida. The March program will be presented by Roy Poorman of Westminster, California. His program; "El Niño en El Golfo" will discuss the effect of El Niño on the fauna of the Gulf of California.

The **CONCHOLOGISTS OF AMERICA [COA]** 12th annual convention will be at the Don CeSar Beach Resort, St. Petersburg Beach, Florida, June 27-30, 1984. This year's meeting will be hosted by the St. Petersburg Shell Club. Convention activities include slide and movie presentations on travel, collecting, and cleaning shells. There will be shell displays, a local collecting trip, and both silent and verbal auctions. Many international shell dealers will attend with specimen shells for sale. Guest speaker at the banquet will be Robert J. L. Wagner, Senior Editor of *Wagner and Abbott's Standard Catalog of Shells* and *VanNostrand's Catalog of Shells*. For further information, please contact COA Convention Chairman; Donald J. Young, 11975 Third Street East, Treasure Island, Florida 33706.

The **AMERICAN MALACOLOGICAL UNION** 50th annual meeting will be at the Holiday Inn, Norfolk, Virginia, U.S.A., July 22-27, 1984. The meeting will be sponsored by the National Capital and Philadelphia Shell Clubs. Two International symposia are planned: The Physiological Ecology of Freshwater Mollusks honoring Dr. W.D. Russell-Hunter, organized by Dr. A.J. Burky, and Dr. R.F. McMahon; and the Larval Ecology of Mollusks, organized by Dr. M. Vecchione. Two workshops will be held: Veligers organized by Dr. J.B. Taylor and; The Mollusk Fauna of Virginia and the Carolinas, organized by R.T. Abbott. Also invited lectures on diverse topics by some outstanding malacologists. There will be contributed papers, posters, slide shows, field trips, an identification clinic, non-commercial and commercial exhibits, an auction, receptions, and a banquet. For further information contact: Dr. Robert Robertson, AMU President, Dept. Malacology, Academy of Natural Sciences, Nineteenth and the Parkway, Philadelphia, PA 19103 U.S.A. (215) 229-1131.

The **WESTERN SOCIETY OF MALOCOLOGISTS'** 17th annual meeting will be held at University of California, Santa Cruz, California, August 16-19, 1984. Emphasis of this year's meeting will be on the Natural History of Marine Mollusks of the Eastern Pacific Ocean. In addition to the regular program of contributed papers, several special symposia are planned, including ones on Nudibranchs, Parasitic Mollusks, and Paleocology of Fossil Mollusks. For further information, please contact WSM Secretary; Dr. Fred G. Hochberg, Department of Invertebrate Zoology, Museum of Natural History, 2559 Puesta del Sol Road, Santa Barbara, CA 93105, U.S.A.

From **Stuart Lillico** [Editor of the **Hawaiian Shell News**] The Hawaiian Malacological Society is just emerging from a traumatic ten weeks of converting to a computerized membership list, mailing label and record keeping system. If we survive 1984, we'll be on our way to victory! In the meantime, our mailing schedule is a shambles.

Personal Notes

From **James H. McLean** Congratulations on the first issue of the **Opisthobranch**. I wish you success with it . . .

From **Myra Keen** Thank you very much for the colorful **Opisthobranch Newsletter**, vol. 16, no. 1. If I were continuing my line of work in Mollusca, this would sorely tempt me to re-subscribe to it. However, due to failing health, I am moving by the end of this month to a retirement home in Santa Rosa. I have turned over my malacological library to Dr. Eugene Coan, because I will not have space in my small apartment for such materials. I am not losing interest in Mollusca as such, but I expect in future to confine my efforts to editorial work.

I advise you, therefore, to remove my name from your mailing list and to send any inquiries you might have to Dr. Coan, whose address you doubtless have in the AMU and WSM directories.

Thanks also for reproducing the AMU group photograph in this issue of the **Opisthobranch** newsletter. I had not seen it and have enjoyed examining it.

From **Stuart Lillico** I am much impressed by the "new" **Opisthobranch**. Good luck with it!

From **Manuel Ballesteros** I am working on the opisthobranch fauna (principally nudibranchs and ascoglossans) of the Mediterranean coasts of Spain (peninsular and Balearic Islands). In addition to faunistic studies I am doing some anatomical studies (general anatomy, radula and labial cuticle) with SEM.

From **R. Tucker Abbott** Congratulations on a very splendid new format. It certainly looks like a very professional job . . . I now have Robertson's and also a Cernohorsky manuscript to edit for the next two numbers of *Monograph of Marine Mollusca*. Also must get to writing on my *Compendium of Land Shells* (3000 photos are now finished — do you know where I can get some good color shots of live land, Western species?)

Classification Notes

Outline of the Classification of Living Mollusca

Kay C. Vaught, 8646 E. Paraiso Drive, Scottsdale, AZ 85255

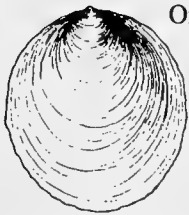
The taxonomy and systematics of the Phylum Mollusca have changed recently with the increasing use of biological criteria. This column will present an update to "An Outline of Classification of Living Shelled Marine Mollusks." The outline was published privately in 1980 and is available through the **Opisthobranch** [\$10.00 plus postage, and tax, if applicable].

The systematic arrangement follows that of more recent authors as well as established standard works and subsequent issues will proceed through all taxons to subgenus level. Synonyms and authorities are not included here.

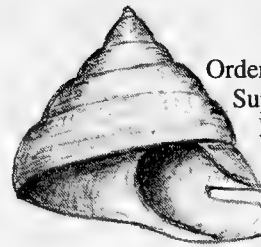
Limited access to literature may have caused recent changes to be missed in this list. It is hoped that with exposure to more knowledgeable readers, the list may be augmented and corrected. The original listing will be much more accurate if readers will send data on upcoming groups to me. Any assistance will be appreciated and acknowledged. Corrections (with their justifications) will normally appear in the **READER FORUM** section of subsequent issues.

PHYLUM MOLLUSCA
Class MONOPLACOPHORA

Order TRYBLIDIODEA
Superfamily TRYBLIDIACEA
Family TRYBLIDIIDAE
Subfamily Neopilininae
Neopilina Lemche, 1957
Vema Clark & Menzies, 1959



TRYBLIDIIDAE
(*Neopilina*)
from Yonge & Thompson



PLEUROTOMARIIDAE
(*Petrochus*)
Kay Vaught drawing



SCISSURELLIDAE
(*Scissurella*)
from Yonge & Thompson



HALIOTIDAE (*Haliotis*)
Kay Vaught drawing

Class GASTROPODA
Subclass PROSOBRANCHIA

Order ARCHAEOGASTROPODA
Superfamily PLEUROTOMARIACEA
Family PLEUROTOMARIIDAE
Entemnotrochus Fischer, 1885
Mikadotrochus Lindholm, 1927
Petrochus Fischer, 1885

Family SCISSURELLIDAE
Scissurella Orbigny, 1824
Anatoma Woodward, 1859
Scissurona Iredale, 1927
Sinezona Finlay, 1927
Sukashitrochus Habe & Kosuge, 1964
Woodwardia Crosse & Fischer, 1861

Family HALIOTIDAE
Haliotis Linnaeus, 1758
Euhaliotis Wenz, 1938
Eurotis Habe & Kosuge, 1964
Exohaliotis Cotton & Godfrey, 1933
Marinaurus Iredale, 1927
Norodotis Habe & Kosuge, 1964
Notohaliotis Cotton & Godfrey, 1933
Ovinotis Cotton, 1943
Padollus Montfort, 1810
Paua Fleming, 1952
Sanhaliotis Iredale, 1952
Schismotis Gray, 1856
Sulculus H.&A. Adams, 1854
Usahaliotis Habe & Kosuge, 1964

Thanks to Dick and Liz Petit and to Tim Pearce for the many additions to the WSM/AMU group photo name list we printed last issue. If some of you will come up with the ten-odd missing names this month, we will reprint the key with the entire list in the March issue. For now we will list only names not on the January list. Our apologies for the "ghost" numbered 83. We can't figure out where we came up with that one. Please do not hesitate to correct us if any of these names are wrong.

- 4. Peter Hoover
- 5. Alan Kabat
- 11. Ray Hixon
- 14. Jim Quinn
- 18. Tom Pulley
- 21. Bill Lyons
- 22. Hugh Porter
- 26. Raymond Neck
- 29. Harold Harry
- 31. John Jenkinson
- 32. William Pratt
- 39. Sally Walker
- 40. Walter Lowry
- 42. Art Bogan

- 43. Dorothea Franzen
- 45. Bowie Kotrla
- 46. Jane Topping
- 47. Juliette Compitello
- 50. Jane Deisler
- 52. Mrs. William Lyons
- 54. Donna Turgeon
- 56. Fred Thompson
- 57. Dick Reeder
- 61. Timothy Pearce
- 62. Mrs. Harold Harry
- 64. Robert Prezant
- 65. Lyle Walsh
- 68. Dave Giblanski
- 72. Louise Kraemer
- 74. Mrs. Ginne Jennewein
- 79. Elaine Hoagland
- 80. ? Lucille Taylor
- 81. Noorulah Babrazkai
- 83. Does not exist
- 87. Ron Toll
- 91. Mike Sweeney
- 95. Mrs. Walter Lowry
- 101. Mrs. Welty
- 102. Stephen Welty
- 103. Dorothy Beetle
- 104. Charlotte Gorbunoff
- 105. Alex Gorbunoff
- 106. Mrs. Rios
- 109. Mary Rosewater
- 110. Mrs. Ron Toll
- 119. E. deC. Rios

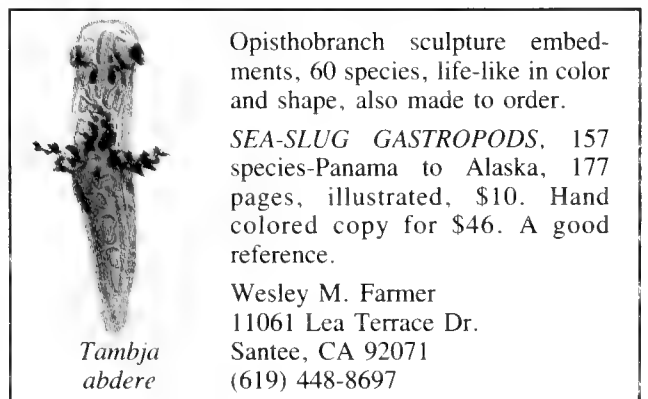


Tambja eliora (Marcus & Marcus, 1967). Bahía de Los Angeles, Baja California, Mexico. Found intertidally. 30 mm specimen. Photo by Jeff Hamann, April 1981.

Note on *Tambja eliora*
by WESLEY M. FARMER

Tambja eliora (Marcus & Marcus, 1967) was originally classified as a *Nembrotha*. This nudibranch swims by bending its body rather rapidly from side to side to escape from its predator, *Roboastra tigris* Farmer, 1978.

The main population of *Tambja* is found in the Gulf of California. It attains a length of 50 mm, has 5 to 7 unipinnate gills and 22 leaves in each rhinophore. The radular formula is 15(5-4.1.1.1.4-5) or 15 rows of teeth with a central tooth surrounded by two different appearing forms of teeth and 4 or 5 marginal plates. [ed. for the original description and radular drawing see Marcus & Marcus, 1967, pages 194-196]



Tambja
abdere

Opisthobranch sculpture embedments, 60 species, life-like in color and shape, also made to order.

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OPISTHOBRANCH

A MONTHLY PUBLICATION ON MOLLUSKS AND MARINE LIFE

Volume 16, Number 3
Page 17

MARCH, 1984
\$2.50

A very rare Gulf of California species,
Pterynotus (Purpurellus) pinniger
(Broderip, 1833), coveted by *Murex*
collectors. Guaymas (San Carlos), Sonora,
Mexico, 25m depth. This may be the first
photo published showing the live animal.
(See Alex Kerstitch article inside)

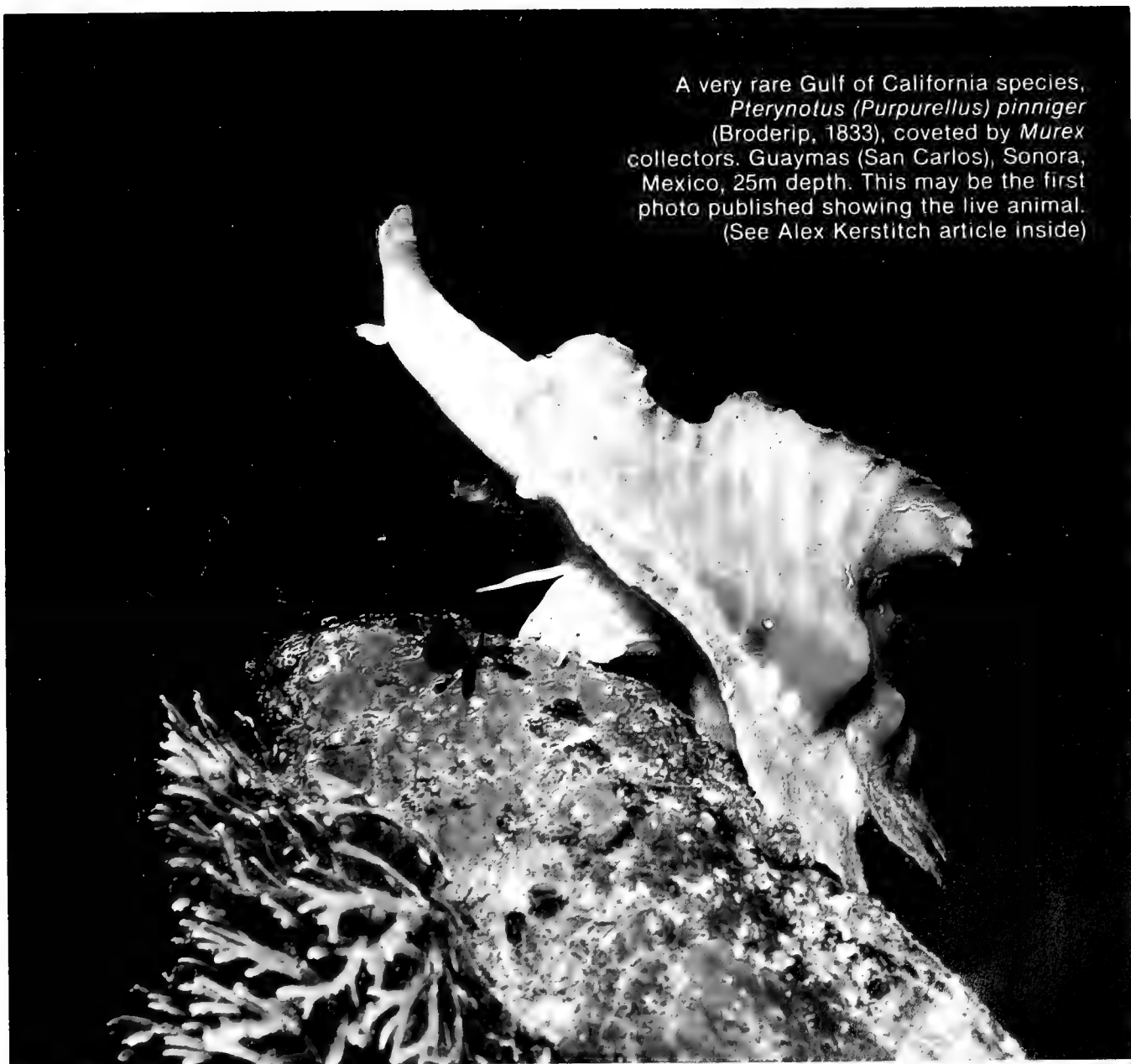


Photo by Alex Kerstitch



Sally Bennett

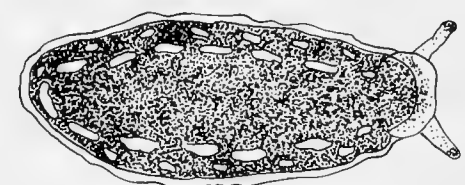
Information Exchange

From Sally Bennett [505 East Pasadena, Phoenix, AZ 85012] Please send me information on Tyrian purple dye from *Murex* and photos of *Murex (Bolinus) brandaris* and *Murex (Phyllonotus) trunculus* for an article I am doing on the subject. Material and/or photos will be acknowledged if published.

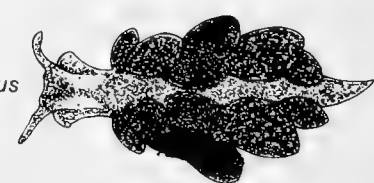


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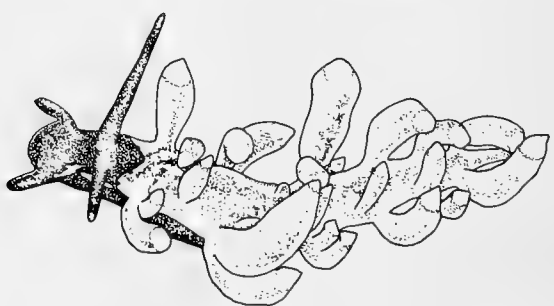




Bosellia sp. Mellieha Bay, Isle of Malta.
 This is a new species of *Bosellia*, described as *Bosellia* sp. because the dissection of the genital system was not satisfactory. The radula, II x O.I.O is similar to that of *Bosellia mimetica* (Trinchese, 1890).



Stiliger vesciculosus
 (DESHAYES, 1864)



Eubranchius sp. Baja, California. Drawing by B.W. Behrens.

Editorial Review Board

- | | |
|-------------------|---------------------|
| R. Tucker Abbott | David W. Behrens |
| Hans W. Bertsch | Donald B. Cadien |
| Kerry B. Clark | Eugene V. Coan |
| Malcolm Edmunds | Michael T. Ghiselin |
| Terrence Gosliner | James R. Lance |
| T. E. Thompson | |

EDITORIAL STAFF

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|---------------------------|----------------|
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| Assistant Editor | Sally Bennett |
| Contributing Editor | Hans Bertsch |

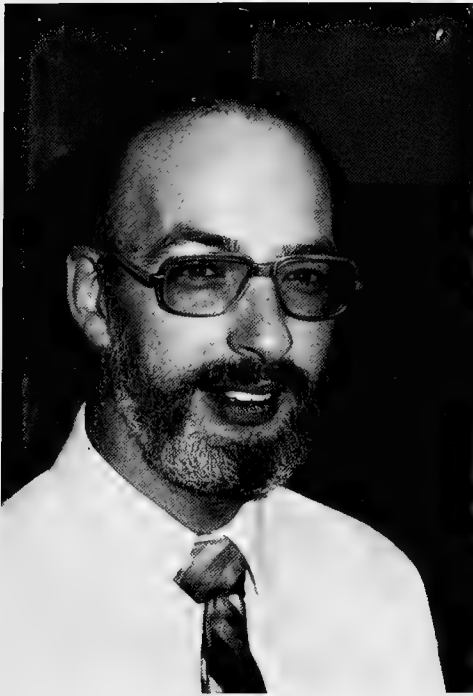
Monthly Features

- | | |
|-------------------------------|---------------|
| 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. The **Opisthobranch** was formerly known as the **Opisthobranch Newsletter**. 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.



EDITOR'S NOTES:

Please note that the **Opisthobran** is a **monthly** publication. If you don't see your special interests in this issue -- try the next issue which will arrive in thirty days. You should see at least a dozen different subjects each quarter.

The first day of each month is the deadline for material for the following month. Articles requiring review will require at least two additional weeks. Photos submitted for publication in the **Opisthobran** should be accompanied by an article of at least 250 words in length. The article should give all data relative to size, collecting locality, date collected, current systematic position (correct name, author and date) and some natural history notes.

We will be happy to provide suggestions and assistance. Send all of your notes, photos and a rough draft of your article. We will help you (or find someone to help you) put it together into an article. Please check your data carefully and if you doubt any of it, let us know in advance so that we may verify your data. We need to receive more material earlier so that we can get proper proof-reading and editing done.

We are settling into the columns a bit more with each issue, and it seems appropriate to discuss our directions here.

Personal Notes contains impromptu comments picked from letters received by the editors. Most of these relate to travels, current researches and "personal" happenings of our readers. They are never subject to editorial board review and therefore, should be considered "personal communication" if referenced in print (e.g., citing the collection of a species mention in this column).

Reader Forum contains more specific information on a subject and frequently takes a stand proposing or opposing an idea or published matter. Again, these are not subject to editorial review. The basis for your acceptance or rejection of the subject should be the author's previous works and his justification of the argument he is making. Differing viewpoints, if they exist, normally appear within the next issue or two of the **Opisthobran**. This "forum" is simply that, a forum for the discussion of ideas and does not require the same level of research and justification that would be found in a pure scientific article.

* * * * *

In R.C. Willan's note, **Opisthobran** 16(1):3, fifth line from the bottom, the typographical error of *Miramira* appears. The name is *Miamira* Bergh, 1875. Also, on page 6 of the same issue, Dr. Wawra is correct, **not** Wara. Thanks to Eveline Marcus for both of these corrections.

* * * * *

Many people are investigating personal computers for use with their malacological studies. Perhaps someone will volunteer to coordinate a column on the subject. I have some experience, but would like to see someone else take the job. I know several of you are far more experienced than I. Any volunteers? Perhaps the first step would be a general article on the subject to see what interest and comments are generated.

* * * * *

I made a serious mistake in Kay Vaught's column (February). In attempting to find two additional figures at the last minute, I grabbed the wrong one for *Scissurella*. My apologies to Kay. The correct figure is included this month.

* * * * *

Thanks to Elsie Marshall, Alan Kohn, Alan Kabat, Helen DuShane and Tim Pearce who have recently helped with the key to the WSM / AMU group photo. We are down to four missing names (Numbers 24, 25, 30, and 59). Please take another look at your **Opisthobran** January issue and send us the names or even suggestions as to where the people came from (college, town, field of study).

* * * * *

The publication date of the January issue was January 20, 1984. The February issue was February 24, 1984. These dates may be used for purposes of priority.

Articles of at least 500 words length published in the **Opisthobran** may be paid. You have your choice of the current volume of the **Opisthobran**, the 1985 volume of the **Opisthobran**, any one back volume of the **Opisthobran Newsletter**, or \$10.00 cash. Indicate which form of payment you prefer at the time you submit the article. You will be paid or notified of credit for 1985 volume within 30 days after publication of your article.

Thanks to Norma Dullas for help with preparations for the March issue. Thanks to Gene Coan for editorial assistance with the March issue.

— Steve Long

Note on *Haliotis*

By DAVID K. MULLINER

Abalone, Ormer or Ear shells are found along rocky shores in crevices or on the undersides of rocks. The worldwide family consists of 3 genera and approximately 100 species. The greatest concentrations, both in numbers of species and individuals are off the coasts of Australia, Japan and western North America.

Haliotids first appeared in the fossil record during the Cretaceous period. The fossil Miocene species described from California are closely related to our present living species. *Haliotis koliki* Hertlein, 1937, compares with *H. assimilis* Dall, 1878 (threaded abalone). *H. lasia* Woodring, 1932, resembles *H. fulgens* Philippi, 1845 (green abalone) and *H. elsmereensis* Vokes, 1935 is closely related to *H. rufescens* Swainson, 1822 (red abalone).

Abalone were first mentioned in history by Aristotle in the 4th century B.C. where he refers to the perforations as outlets. The oldest recorded abalone fishery was conducted by the Japanese in 425 A.D. They collected "awabi"

for pearls and food by free diving to depths as great as 20 m.

The shells of *Haliotis*, Linné, 1758 are spiral, flattened, cup shaped with a low spire. The body whorl constitutes most of the shell. A curved row of holes, either flush to the surface or raised, are along the left margin, those near the edge being open. These holes are exits for the water that enters under the shell and passes over the gills, supplying them with oxygen. The exterior of the shells are colored black, red, orange or brown according to the species. The interior is iridescent and often multicolored. For a good description of individual California species see Cox, 1960.

The sexes are separate in abalone. The single gonad lies just under the mantle and foot in the recess on the right side of the shell. It is large, horn shaped and attached to the kidney. The sexes can be identified by the color of the gonad; cream color in the male and dark green in the female. Spawning takes place during the sum-

Haliotis assimilis Dall, 1878 [Family HALIOTIDAE]. Point Loma, California. Abalone found attached to the bottom of turnable rock at 12 m depth in kelp beds 1 km offshore, feeding on broken kelp. 110 mm juvenile specimen. Photo taken underwater with a Nikonos camera by Dave Mulliner, 1980. Black & white photos also taken by Dave.



mer and early fall and is related to warm water temperatures. The male sends out millions of sperm in puffs through the shell holes, making the water white. The female then jets eggs into the water in puffs. The fertilized eggs develop into planktotrophic trochophore larvae. The planktonic stage lasts from one to two weeks. The young animals are light sensitive and therefore settle on the underside of rocks.

The juvenile abalone feed on coralline algae for the first one or two years. The diet then changes to macroalgae. Leighton, 1959, reported that giant kelp, *Macrocystis pyrifera* (Linné) gave *H. cracherodii* Leach, 1814 (black abalone) the characteristic dark blue color of the adult. The same kelp produced a dull, brick-red color in the red abalone and a dull green to reddish brown color in the pink abalone. Abalone feed with a long, wide, rasping radula. They trap drifting blades of kelp with their muscular foot and pin them to the rocks while they feed.

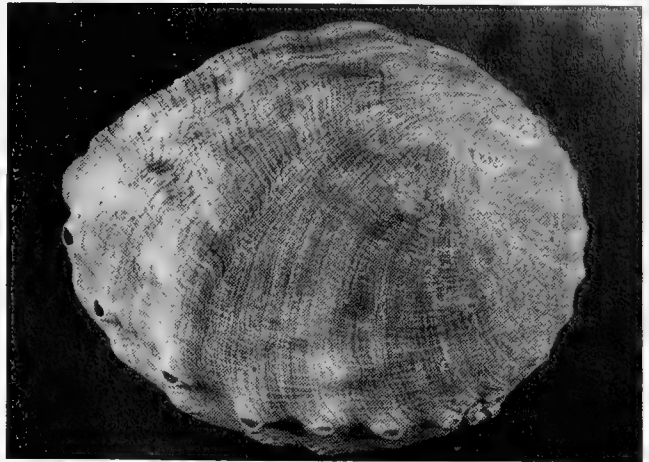
The Sea Otter is the main predator on the abalone from Monterey northward. They either pull the abalone from the rocks or break a hole in the top of the shell with a rock. The only abalone that exist in Sea Otter territory are deep in crevices (Cox, 1962). Other predators on abalone are sea stars, octopus, Sheepshead fish and large crabs.

Betaeus harfordi Kingsley, 1878, a purple shrimp is the commensal that lives in the mantle cavity of all species of California abalone. The shrimp gains a protective home but no benefits are evident for the host.

The habitats of the California abalone are separated by depth, probably associated with the water temperatures required for spawning by different species. Where overlapping populations of different species occur some hybridization takes place (Owen, 1971). *H. cracherodii* is found on rocks intertidally to depths of 6.5 m. *H. fulgens* lives on rocks from low tide to 8 m. *H. corrugata* is found on rocks from 6.5 m to 26.5 m. *H. assimilis* lives on rocks from 23 m to 32 m; this is the least common species found in California (Cox, 1960).

Because of overfishing, the abalone stocks are depleted in all areas. In some regions not even a breeding stock is left. Attempts are now being made to establish colonies in overfished areas by planting hatchery grown juveniles. Some hatchery workers contend that hatchery grown animals are more susceptible to predation than native stock. Perhaps the Japanese method of mariculture would be a better answer to supplying the commercial market with this most delicious sea food.

Editor's Note: *Haliotis walallensis* Stearns, 1899 (flat abalone) is not figured here although it is a California abalone.



Haliotis rufescens Swainson, 1822 (red abalone) dorsal view



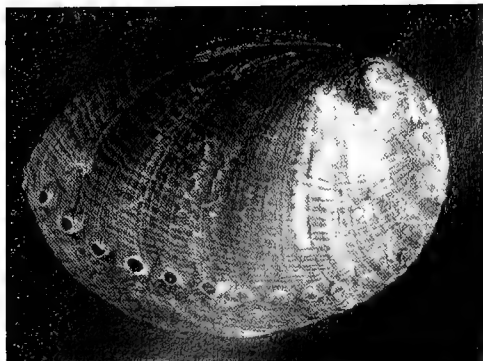
Haliotis rufescens Swainson, 1822 (red abalone) ventral view

REFERENCES AND ADDITIONAL READING

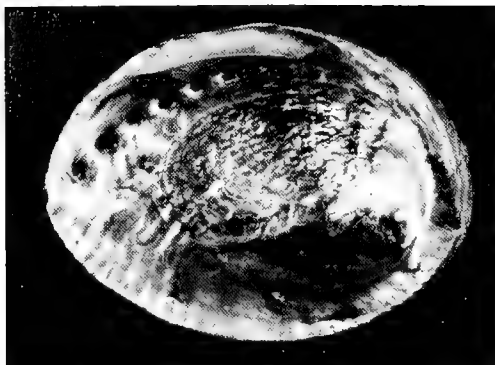
- COX, KEITH W. October, 1960. Review of the Abalone in California. California Fish and Game, 46(4): 386-405.
 COX, KEITH W. 1962. California Abalones, Family Haliotidae. The Resources Agency of California. Department of Fish and Game. Fish Bulletin, no. 118, p. 7-37.
 LEIGHTON, D.L. 1959. Diet and its Relation to Growth in the Black Abalone *Haliotis cracherodii*, Leach. Univ. Calif. Los Angeles, Masters Thesis, 61 pp.

Haliotis assimilis Dall, 1878 [Family HALIOTIDAE]. Point Loma, California. Abalone found attached to the bottom of turnable rock at 12 m depth in kelp beds 1 km offshore, feeding on broken kelp. 110 mm juvenile specimen. Photo taken underwater with a Nikonos camera by Dave Mulliner, 1980. Black & white photos also taken by Dave.

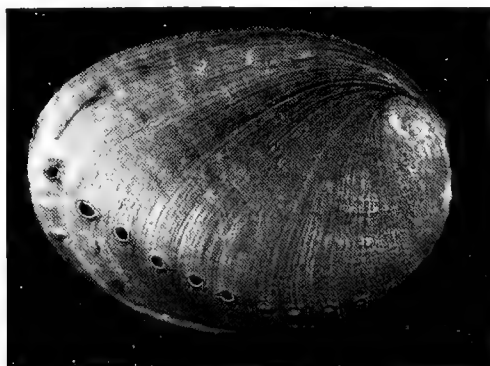
David K. Mulliner, 5283 Vickie Drive, San Diego, CA 92109.



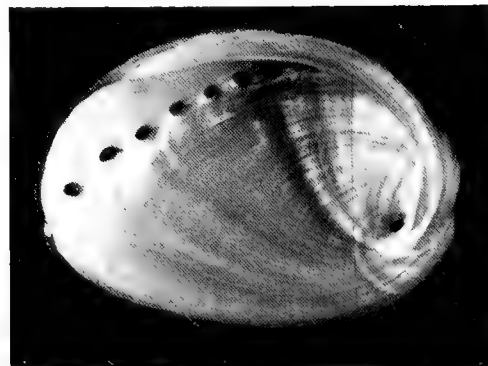
Haliotis fulgens Philippi, 1845 (green abalone)
dorsal view



Haliotis fulgens Philippi, 1845 (green abalone)
ventral view



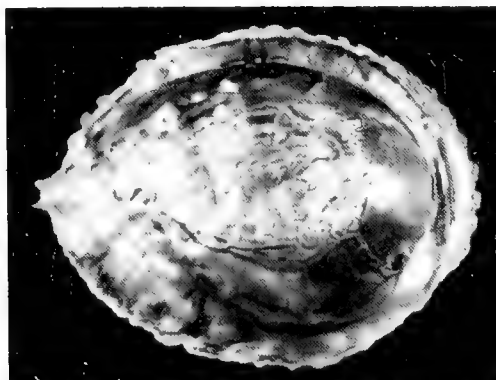
Haliotis cracherodii Leach, 1814 (black abalone)
dorsal view



Haliotis cracherodii Leach, 1814 (black abalone)
ventral view



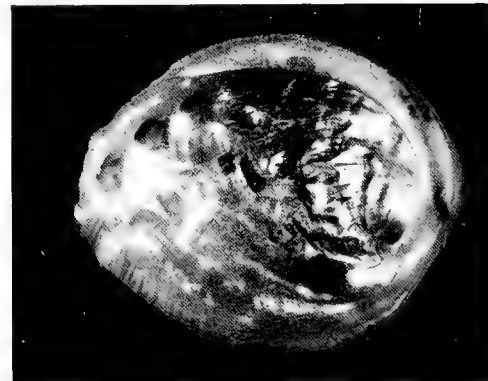
Haliotis corrugata Wood, 1828 (pink abalone)
dorsal view



Haliotis corrugata Wood, 1828 (pink abalone)
ventral view



Haliotis sorenseni Bartsch, 1940 (white abalone)
dorsal view



Haliotis sorenseni Bartsch, 1940 (white abalone)
ventral view

Classification Notes

**Outline of the Classification of Living Mollusca,
Part 2.** by Kay C. Vaught

[Editor's note: Kay has provided a drawing for the SCISSURELLIDAE to replace the one which I included, in error, last month. The correct drawing appears below along with the family's taxons. The taxons were correct last month.

Kay will be including the synonyms (indented and enclosed by parenthesis) throughout the remainder of the list. Generic taxons are all upper case italics. This list continues from 16(2):15 (February, 1984). All drawings by Kay Vaught unless otherwise noted.]

Order ARCHAEOGASTROPODA

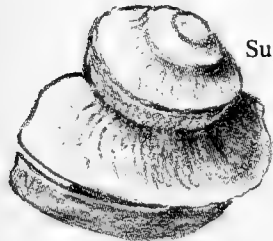
Superfamily PLEUROTOMARIACEA

Family PLEUROTOMARIIDAE

Family SCISSURELLIDAE

- SCISSURELLA Orbigny, 1824
- Anatoma* Woodward, 1859
- Scissurona* Iredale, 1927
- SINEZONA Finlay, 1927
- SUKASHITROCHUS Habe & Kosuge, 1964
- WOODWARDIA Crosse & Fischer, 1861

Family HALIOTIDAE



Scissurella (1-2 mm)

Superfamily FISSURELLACEA

Family FISSURELLIDAE

Subfamily EMARGINULINAE

- EMARGINULA Lamarck, 1801
- ?*Capuliformis*
- Semperia* Crosse, 1867
- Subzeidora* Iredale, 1924
- CLYPIDINA Gray, 1847
- EMARGINELLA Pilsbry, 1891
- HEMITOMA Swainson, 1840
- (*Submarginula* Gray, 1847)
- Montfortia* Recluz, 1843
- Montfortista* Iredale, 1929
- LAEVIEMARGINULA Habe, 1953
- NESTA H. Adams, 1870 (?)
- Laevinesta* Pilsbry & McGinty, 1952



Emarginula (13 mm)

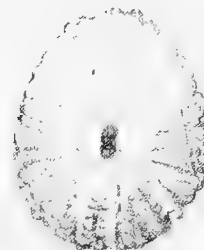


Diodora (20 mm)

- Zidora* Fischer, 1885)
- Subfamily DIODORINAE
- DIODORA Gray, 1821
- Austroglyphus* Cotton & Godfrey, 1934
- Elegidion* Iredale, 1924
- Fissuridea* Swainson, 1840
- MEGATEBENNIS Pilsbry, 1890
- MEGATHURA Pilsbry, 1890
- Macrochisma* Dall, 1915
- STROMBOLI Berry, 1953

Subfamily FISSURELLINAE

- FISSURELLA Bruguière, 1789
- Balboaina* Pérez-Farfante, 1943
- Carcellesia* Pérez-Farfante, 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, 1839
- (*Papillaea* Krauss, 1848)
- INCISURA Hedley, 1904
- LEUROLEPAS McLean, 1970
- LUCAPINA Sowerby, 1835
- LUCAPINELLA Pilsbry, 1890
- MACROCHISMA Sowerby, 1839
- Dolichochisma* Iredale, 1940
- Forolepas* Iredale, 1940
- MONODILEPAS Finlay, 1927
- MONTFORTULA Iredale, 1915
- MONTFORTULANA Habe, 1961



Fisurella (25 mm)

- NOTOMELLA Cotton, 1959
- PUNCTURELLA Lowe, 1827
- (*Cremoria* Leach, 1852;
- Rimulanax* Iredale, 1924;
- Sipho* Brown, 1827;
- Vacerra* Iredale, 1924)
- Cranopsis* A. Adams, 1863
- Fissurisepta* Seguenza, 1863
- Kira* Habe, 1951
- Rixa* Iredale, 1924
- Vacerrana* Iredale, 1958
- RIMULA DeFrance, 1827
- (*Rimularia* Fischer, 1834)
- SCUTUS Montfort, 1810
- (*Aviscutum* Iredale, 1940;
- Parmophorus* Blaineville;
- Scutum* Sowerby, 1841)
- Nannoscutum* Iredale, 1937
- TUGALIA Gray, 1843
- Parmophoridae* Wenz, 1938
- TUGALINA Habe, 1953
- ZEIDORA A. Adams, 1850
- (*Crepimarginula* Seguenza, 1880;
- Legrande* Beddome, 1833;



Puncturella (15 mm)



Note: Our apologies for missing many of the names with the color photograph in the January issue. Thanks to Dick & Liz Petit, Alan Kabat, Alan Kohn, Elsie Marshall, Tim Pearce, Carol Skoglund and Helen DuShane.

1. Arthur J. Cain
2. Claude Morris
3. A. R. Palmer
4. Peter Hoover
5. Alan Kabat
6. William Emerson
7. Matthew James
8. Daryl Foote
9. Joe Houbrick
10. Dennis Willows
11. Ray Hixon
12. F. G. Hochberg
13. Jerry Landye
14. Jim Quinn
15. James McLean
16. Harold D. Murray
17. Herb Young
18. Tom Pulley
19. Sally Bennett
20. Stuart Lillico
21. Bill Lyons
22. Hugh Porter
23. Don Shasky
- 24.
- 25.
26. Raymond Neck
27. Paul Scott
28. Richard E. Petit
29. Harold Harry
- 30.
31. John Jenkinson
32. William Pratt
33. Hollis Q. Boone
34. Barry Roth
35. George Kennedy
36. Rose Burch
37. Donald Moore
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41. Elsie Messing
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43. Dorothea Franzen
44. Leslie Newman
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46. Jane Topping
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51. George M. Davis
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73. Mrs. Donald Moore
74. Mrs. Ginne Jennewein
75. Edith Abbott
76. Twila Bratcher
77. Patti Lounsbury
78. Elsie Marshall
79. K. Elaine Hoagland

80. ? Lucille Taylor
81. Noorulah Babrazkai
82. Audrey Holliman
83. Does Not Exist
84. Liz Petit
85. Joseph Rosewater
86. M. Patricia Morse
87. Ron Toll
88. Jennifer Plummer
89. Geerat J. Vermeij
90. Terrance Gosliner
91. Mike Sweeney
92. Judith Terry Smith
93. Clyde Roper
94. Vida Kenk
95. Mrs. Walter Lowrey
96. Constance Boone
97. Bert Draper
98. Billee Dillworth
99. Sandra Gardner
100. Walter Moore
101. Elaine Welty
102. Stephen Welty
103. Dorothy Beetle
104. Charlotte Gorbunoff
105. Alex Gorbunoff
106. Mrs. Rios





KEY TO WSM / AMU JOINT MEETING (SEATTLE, WASHINGTON, AUGUST, 1983) GROUP PHOTOGRAPH (See color photo **Opisthobran** 16(1): 4-5, January, 1984)

107. Helen Lillico
 108. Rose Killam
 109. Mary Rosewater
 110. Mrs. Ron Toll

111. Fred Sorenson
 112. Myra Taylor
 113. Melbourne R. Carriker
 114. Robert Robertson

115. Alan J. Kohn
 116. Paul E. Jennewein
 117. George D. Buckley
 118. William Bledsoe
 119. E. deC. Rios

Reader Forum

Notes on Cephalaspideans The drawing of *Cylindrobulla* sp. on pg. 2 [Opisthobranch 16(1)] reminds me of the following:

1. In 1976 Eveline Marcus [No. 9748 Stud. Neotrop. Fauna, 11:6] lumped *Ascobula ulla* from Brazil and *A. californica* into *A. japonica* (Hamatani, 1971). Hamatani had used *Cylindrobulla* for *japonica* and *californica*. [No. 5156 HAMATANI, I. 1971. Publ. Seto Mar. Biol. Lab., 19(2/3): 111-117. Hamatani lists Gulf of California, as the locality for *C. californica*.]

2. I have never seen Hamatani's paper so I don't know what range he had for *A. japonica*. [No. 6451 HAMATANI, I. 1969. Publ. Seto. Mar. Biol. Lab., 17(3):171. Hamatani lists Cape Shionomisaki, Kii, Middle Japan, as the only locality.]

I collected a single specimen of this in about 1 m of water from under a dead coral, at Pte. Opeha, Avera, Raiatea, French Polynesia December 30, 1982. If Dr. Marcus is correct in her synonymy, this little beast has quite a range. [Dr. Donald R. Shasky, 834 W. Highland Ave., Redlands, CA 92373]

Use of family names with articles & photos May I suggest an innovation which would be a real boon to collectors who think in families rather than in genera? When a shell is the subject of any article, would you please mention its family? It would really help no end with our homework. Thanks! [ed. - I think this is great and will include them when possible.] [Mary Larson]

Notes on the Classification of Opisthobranchs The classification follows the usual lines in this large and varied subclass. These notes will be confined to the first seven orders, up to and including the Sacoglossa (= Ascoglossa), but excluding the Nudibranchia. The excellent little sketches of nudibranchs [in the **Opisthobranch Newsletter**] are most valuable for adult recognition, but this order is so large that it requires the attention of a specialist. The enormous number of genera suggests that stricter control should be exercised in the nomenclature of new species. How many of these for example, are based on one specimen, one juvenile, or even one colour variety? How many are later found to be stages or variations of known species, proving that external appearance is not enough for founding a species, and that the whole animal, its life and habitats as well as its anatomical features, should be considered?

Among the first eight orders, the omission of one order might be noticed. The Pyramidellomorpha, a small semi-extinct group, contains the parasitic *Pyramidella* and *Odostomia*. (Reference - FRETTER & GRAHAM [?1949], J. Mar. Biol. Assoc. U.K. 28: pp. 493-532). [ed. - Most recent authors do **not** agree that the pyramidellids belong with the opisthobranchs. No one appears to want to claim them.]

It is time that the order Aplysiomorpha (= Anaspidea) is properly classified and that it is cleared of false names applied to it by systematists. Several of these, notably Vayssière, Pruvot-Fol and Eveline Marcus have attemp-

ted this without success. It is true that the order contains odd species pronounced evolutionary trends, such as the *Aplysia* form, the gradual loss of shell, and the increase in pappularity of the smooth skin, which separate its members from those of other orders.

Order APLYSIOMORPHA

- Superfamily Aplysiacea
- Family Aplysiidae
- Subfamily Aplysiinae
 - Symphonota* H. & A. Adams, 1854
 - Aplysia* Linnaeus, 1767
- Subfamily Dolabellinae
 - Dolabella* Lamarck, 1801
- Subfamily Dolabriferinae
 - Dolabrifera* Gray, 1847
 - Petalifera* Gray, 1847
 - Phyllaplysia* Fischer, 1872
- Subfamily Notarchinae
 - Notarchus* Cuvier, 1817
- Subfamily Stylochininae
 - Stylocheilus* Gould, 1852
- Subfamily Bursatellinae
 - Bursatella* Blainville, 1817

These last three subfamilies have sometimes been grouped as Notarchidae.

The genus *Aplysia* contains many species, which have been subdivided as follows:

- Aplysia* (*Pruvotaplysia*) Engel, 1936
- A. p. parvula* Gülding in Mörch, 1863
- A. p. punctata* Cuvier, 1863
- Aplysia* (*Neaplysia*) Cooper, 1863
- Aplysia* (*Varria*) Eales, 1960 - about 24 species
- Aplysia* (*Aplysia*) Linnaeus, 1767
- A. a. depilans* Gmelin, 1791 - type species of the genus
- A. a. cedrosensis* Bartsch & Rehder, 1939
- A. a. dura* Eales, 1960
- A. a. juliana* Quoy & Gaimard, 1832
- A. a. nigra* d'Orbigny, 1837
- A. a. vaccaria* Winkler, 1955
- Aplysia* (*Phycophila*) A. Adams, 1861
- A. p. euchlora* Adams in M.E. Gray, 1850

Suppression of incorrect names:

Tullia Applied to the sub-family Aplysiinae (Pruvot-Fol, 1933) for *A. depilans*, but *depilans* is the type species for family Aplysiidae therefore *Tullia* is obsolete. See *Tethys* below.

Paraplysia Pilsbry, 1895. Obsolete because this species was named *Symphonota* H. & A. Adams, 1834.

Tethys Linnaeus, 1758 duplicated by a nudibranch. *Aplysia* Linnaeus, 1767 is accepted as the generic name. See Opinion 200, 1954 International Commission on Zoological Nomenclature. Type species *Aplysia* (*Aplysia*) *depilans* Gmelin, 1791.

Placobranchus A. Adams, 1861 is *Aplysia* (*Phycophila*) *euchlora* Gray, 1850. [not same as *Placobranchus*, an Ascoglossan].

Aclesia Adams, 1854 is *Aplysia* (*Phycophila*) *euchlora*. *Aplysiella* P. Fischer, 1872 is *Petalifera* Gray, 1847.

Barnardaclesia Eales & Engel, 1935 is a variety of *Bursatella* Blainville, 1817 with other varieties according to William Macnae (personal communication).

These seven genera (*Tullia*, *Paraplysia*, *Tethys*, *Placobranchus*, *Aclesia*, *Aplysiella* & *Barnardaclesia*) are obsolete. [N.B. Eales, Littledown, Colliers Lane, Kingswood, Henley on Thames, Rotherfield Greys 250, Oxon RG9 5LT, England]

Corrections and Additions to the Systematic List of Opisthobranchiata

1. Akeridae Pilsbry, 1893 and *Akera* Müller, 1776 belong in the order Anaspidea. References - MORTON, J.E. 1972. The Form and Functioning of Pallial Organs in the Opisthobranch *Akera bullata* with a Discussion of the Nature of the Gill in Notaspidea and Other Tectibranchs. The Veliger **14**(4) pp. 337-349. BRACE, R.E. 1977. Shell Attachment and Associated Musculature in the Notaspidea and Anaspidea (Gastropoda : Opisthobranchia). Transactions of the Zoological Society of London **34** p. 36.

2. The suborder Pleurobranchacea (of the Notaspidea) contains only one family - Pleurobranchidae. Reference - WILLAN, R. 1983. New Zealand Side-Gilled Sea Slugs (Opisthobranchia : Notaspidea : Pleurobranchidae). Malacologia **23**(2) p.226.

3. *Koonsia* Verrill, 1882 is a junior synonym of *Pleurobranchaea*. Reference - WILLAN, R. 1977. A review of *Pleurobranchella* Thiele, 1925 (Opisthobranchia : Pleurobranchaeinae). Journal of Conchology **29**(3) pp. 152-153.

4. *Gigantonotum* Guang-Yu & Si, 1965 is a junior synonym of *Pleurobranchella*. Reference - WILLAN, R. 1977. As above, p. 151.

5. *Euselenops* Pilsbry, 1896 is a thoroughly distinctive pleurobranch genus that seems to have been forgotten or accidentally missed from the list. Reference - WILLAN, R. 1983. As above, p. 226.

6. The correct author and date of *Pleurobranchaea* is Meckel in Leue, 1813. Reference - WILLAN, R. 1983. As above, p. 254.

7. *Osceanius* and *Susania* are both junior synonyms of *Pleurobranchus*. References - THOMPSON, T.E. 1970. Eastern Australian Pleurobranchomorpha (Gastropoda, Opisthobranchia). Journal of Zoology, London **160**: p. 179. BABA, K. & I. HAMATANI 1971. Description of *Pleurobranchus semperi* (Vassière, 1896 from Osaka Bay, Middle Japan. The Veliger **13**(4): pp. 326-327.

8. *Roya* is a basommatophoran pulmonate and not an opisthobranch. (It is a junior synonym of *Williamia* Monterosato). Reference - MARSHALL, B.A. 1981. The Genus *Williamia* in the Western Pacific. New Zealand Journal of Zoology **8**: p. 488.

9. Heterodorididae Verrill & Emerton in Verrill, 1882, is now considered as a subfamily of Arminidae. Reference - WILLAN, R. 1981. A New Abyssal Nudibranch from New Zealand. New Zealand Journal of Zoology **8**: pp. 329, 330. [Dr. R.C. Willan, Department of Zoology, University of Queensland, St. Lucia, Brisbane, Australia 4067]

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Personal Notes

From **Ian Loch** [Department of Malacology, Australian Museum, P.O. Box A-285, Sydney 2000, Australia] In October, 1983, I went on a dive trip which included the Swain Reefs at the southern end of the Great Barrier Reef, and Saumarez and Wreck Reefs in the Coral Sea beyond the Swains. Bad weather, long travelling distances, and a head cold, which stopped diving for several days, led to a fairly small return for opisthobranchs. The couple of days in the Swains yielded seven pairs, including *Gymnodoris aurita* (Gould) and *Phyllodesmium hyalinum*, five days at Saumarez Reef 14 species including a bright blue and red *Elysia*, and five days at Wreck Reef only nine species, including a specimen of the white *Bornella* with red tips which I mentioned previously from North Queensland.

The water around these Coral Sea reefs is very clear, but the fauna is considerably poorer than the main Barrier Reef. Bill Rudman, Geoff Avern and I are going to Tasmania in February to collect. A bit of a change from tropical reef waters. Best wishes with the new **Opisthobranch**.

* * * * *

From **Dave Mulliner** [5283 Vickie Drive, San Diego, California 92109] Here is the data I promised you for the slides [for the **Opisthobranch**]. I had to dig through old, old files to find this info.

Your publication is great. Gale [Sphon] and I went to Gonzaga Bay, Baja California in February. Gale collected for the Los Angeles County Museum. We sure enjoyed the trip. The drive was through beautiful, unspoiled wilderness. The bay is large and is protected by Willard Island, which we walked to on low tides. The water goes out almost as far as it does at Cholla Bay. Shore collecting and diving produced very few species. I hope to get a list together within the next few days for the **Opisthobranch**.

* * * * *

From **Stephanie Prince** [24242 Via Aquara, Laguna Niguel, CA 92677] I have been collecting shells for fifteen years from all over the world. Recently, I sent 122 different West Coast species (437 total shells) to the Museum of Natural History, Naturalist Center, Smithsonian Institution, Washington D.C. I have a large and small shell display in the Marine Institute, Dana Point, and a descriptive catalog of some local shells. (They have an educational program daily for school children K-12 & college.) I also worked in the Institute several years ago as a volunteer.

I have sent two articles for your consideration to include in your magazine; hope you can use them and that I can help in a small way.

* * * * *

From **Dave Behrens** [PG & E, Bioassay Lab., P.O. Box 117, Avila Beach, California 93424] Fantastic! Keep up the good work. Hope to be able to send you some stuff soon.

* * * * *

From **Hans Bertsch** [4444 W. Pt. Loma Blvd. #83, San Diego, CA 92107] When you write to me, please use the

address listed here. I am trying to close out the San Ysidro box.

* * * * *

From **Mary R. Larson** [Rancho Paso Park, Space 134; Theater Drive, Paso Robles, CA 93446] As soon as we can sell this mobile home, we are moving to Oregon. So, hopefully you will soon have a change of address. Hope to be able to get to Santa Cruz this August. I don't do much active collecting, but I'm working over my grunge and wearing out my inadequate reference books.

* * * * *

From **I.S. Roginskaya** May I send you my sincere wishes for happiness and success throughout the new year 1984! Again, I especially thank you for sending me the **Opisthobranch**. So many interesting opisthobranch news items; so many new friends - colleagues! It was a nice idea of yours to collect pictures of opisthobranch researchers [O.N. 15(8)]. I shall wait impatiently for the appearance of this set of photos, as I have almost no idea how you all look (except my dear friend Eveline Marcus and Dr. H.R. Haefelfinger, whose photo was published in **Palette II**.) Sorry, but as photography is my hobby, I have no decent pictures of myself, but I shall go to the photo-atelier and will send you a fitting one. P.S. In **Opisthobranch Newsletter**, October, 1983, the last address in the address list was that of L.A. Zenkevich. Very sorry, but Prof. Zenkevich died more than ten years ago! I was his student at Moscow University, and now (for 16 years) am working in his laboratory.

* * * * *

From **Michael T. Ghiselin** [Department of Invertebrate Zoology and Paleontology, California Academy of Sciences, Golden Gate Park, San Francisco, California 94118] A group of us from the Academy, including Terry Gosliner, have just returned from a three-week trip to the southern part of Baja California. We were joined by Hans Bertsch and a couple of Mexican students from Enseñada. We have six or seven species of opisthobranchs new to science, plus some interesting distributional records. This is envisioned as the first part of a series of expeditions to that part of the world. I suspect all of you will be getting more details from Terry and Hans.

* * * * *

From **Wesley M. Farmer** The **Opisthobranch** looks great - good luck with its future and further growth. That trip to Baja [California]: We went to Puertocitos for a couple of warm days and collected two species of branches. From there, to Punta Banda via Enseñada and collected a few more species on the west coast of Baja. At San Quintin Bay saw some oysters 11 inches long and 5 inches wide. One of the nudibranchs was a 43 mile southward extension of the currently published range.

* * * * *

From **David Denning** [Field Trip Coordinator, Bamfield Marine Station, Bamfield, B.C., Canada VOR 1B0] This fall I will be travelling to Australia, intending to spend 2 or 3 months at various Great Barrier Reef Islands including Lizard and Heron Island. I would appreciate hearing about other opisthobranch "hot spots" and about any scientific marine biology expeditions I might be able to join.

The Predatory *Murex*

by Alex Kerstitch

The sculptured shell of *Murex* snails (or muricids) makes this group distinctive among gastropods. Generally, but not always, muricids are adorned with intricate networks of spines, frills and fronds in various degrees of development. The ecological significance of the shell sculpture is not fully understood.

The animal of all muricids secretes a toxic substance which turns deep purple when exposed to light and oxygen. Early Phoenicians utilized some of the mucus to manufacture a permanent dye widely used throughout the Mediterranean. The *Murex* species which produced the best dye was *M. (Bolinus) brandaris* (Linné, 1758), a common species which became the main source of purple dye for centuries.

Several marine biotoxicologists have suggested that *M. brandaris* should not be eaten by humans even if the danger of poisoning is slight. Laboratory experiments have indicated that extracts of muricin toxin taken from the hypobranchial gland of *M. brandaris* caused paralysis and death when injected into cold-blooded animals such as frogs and fishes.

In 1900 an outbreak of *M. brandaris* poisoning occurred in the Gulf of Trieste affecting over 40 people seriously and resulting in 5 deaths. In spite of the toxic mucus present in *M. brandaris* the animal is eaten in large quantities by people throughout Europe.

All muricids are carnivorous predators feeding mostly on other mollusks (a few on barnacles). In some areas of the world they are serious pests, invading oyster and scallop beds.

The feeding mechanism of most muricids consists of specialized radular teeth modified for drilling. When a prey such as a clam or oyster has been located, the *Murex* secures itself to its victim and begins to drill a hole through the shell. The boring mechanism has been studied in several species of *Murex* and it appears that a substance is secreted by the drilling organ which softens the shell material to aid penetration. The entire boring operation may last several days. When completed, the muricid draws its feeding apparatus or proboscis inside the hole and consumes the soft parts.

Another method of muricid predation, as featured in Figure 1, involves the utilization of the muricid's (*Phyllonotus erythrostomus* (Swainson, 1831)) powerful foot as leverage to pry open the valves of an *Argopecten circularis* (Sowerby, 1835) shell. Once opened, the animal is consumed in approximately 5 hours.

Muricids are also subject to predation. A number of larger fishes, such as sharks and rays are known to prey on *Murex*. Additionally, hermit crabs have been reported to remove the muricid from its shell and consume it. Figure 2 shows a hermit crab using its powerful claw to apply pressure to the animal until it is slowly

pulled out. The hermit then occupies the empty *Murex* shell. Although this predatory behavior

has been reported, this photo is perhaps the first example of this phenomenon.

References and Additional Reading:

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- Alex Kerstitch, 5436 East Bellevue Ave., Tucson, AZ 85712



Figure 1. *Phyllonotus erythrostomus* (Swainson, 1831) [Family MURICIDAE] feeding on a scallop, *Argopecten circularis* (Sowerby, 1835) [Family PECTINIDAE], and is joined by a smaller *Murex*, *M. recurvirostris* Broderip, 1833. The proboscis of the latter is clearly seen extended inside the scallop. Guayamas, Sonora, Mexico. Photo by Alex Kerstitch.



Figure 2. The gulf of California pink *Murex*, *Phyllonotus erythrostomus*, being preyed upon by a hermit crab, *Petrochirus californiensis* Bruguière. This may be the first photo record of this preying behavior. Photo by Alex Kerstitch.



Tambja abdere

Opisthobranch sculpture embedments, 60 species, life-like in color and shape, also made to order.

SEA-SLUG GASTROPODS, 157 species-Panama to Alaska, 177 pages, illustrated, \$10. Hand colored copy for \$46. A good reference.

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Current Events

The CONCHOLOGICAL CLUB OF SOUTHERN CALIFORNIA meets at the Los Angeles County Museum of Natural History, 900 Exposition Blvd., Los Angeles, California, on the first Monday of each month at 7:30 p.m. Dues are \$5.00 per single membership. For further information, write Kirstie Kaiser 19545 Sherman Way #62, Reseda, CA 91335.

The CONCHOLOGICAL SOCIETY OF GREAT BRITAIN AND IRELAND meets at the British Museum (Natural History) Cromwell Road, London SW7, England. On every third Saturday (October to May) at 2:30 p.m. Meetings include lectures, readings of scientific papers and exhibits by members of the society. Dues are 10 pounds sterling per annum plus one pound joining fee. Four newsletters and 2 parts of a journal are published each year. For further information write c/o 49, Highfield Hill, Upper Norwood; London, S.E. 19 3PT.

The V CONGRESSO NATIONAL DE MALACOLOGIA (Fifth annual Congress of Malacology,) Vigo (Pontevedra) (Spain) will be sponsored by the SOCIEDAD ESPAÑOLA DE MALACOLOGIA at the Museo Nacional de Ciencias Naturales; Paseo de la Castella, 80; Madrid-6 Spain, 6th to 9th September 1984. Dues are \$25.00 U.S. per year. This includes the club journal IBERUS by surface mail.

The MONTEREY PENINSULA SHELL CLUB meets at the Allen Knight Maritime Museum, 550 Calle Principal, Monterey, California, on the third Tuesday of each month at 7:30 p.m. Programs and local collecting trips are planned monthly. Anyone interested in the club may contact Donna Fagan, secretary, 4158 El Bosque Drive, Pebble Beach, CA 93953.

The SAN DIEGO SHELL CLUB meets at the Casa Del Prado (Across from the Natural History Museum) Room 104, Balboa Park, San Diego, on the third Thursday of each month at 7:30 p.m. Programs are presented monthly. Dues are single members: \$7.00; Family membership: \$8.00; overseas (surface mail) \$10.00. Dues include the club newsletter THE FESTIVUS published monthly except December. For further information, write San Diego Shell Club Inc., c/o 3883 Mt. Blackburn Ave., San Diego, CA 92111.

GLOSSARY

ascoglossans see sacoglossans

branchiae gills, respiratory organs for breathing the oxygen dissolved in water, as those of crustaceans and mollusks. [Arnold, 1965]

dioecious having the male and female organs present in different individuals, as in the majority of bivalves; opposed to monoecious

dorsal in bivalves, at or toward the hinge. [Keen, 1971] the back edge of a bivalve, in the region of the hinge; the back of gastropod remote from the aperture; the conical surface of a limpet. [Arnold, 1965] on the back or upper surface. [McDonald & Nybakken, 1980]

dorsum the back opposite the aperture of a gastropod. [Arnold, 1965]

notum dorsal surface in certain opisthobranchs. [Keen, 1971]

opisthobranch mollusks having evolved from pro-sobranch ancestors and possessing the following combination of characters: reduced shell and operculum, hermaphrodite genital apparatus, mantle cavity organs shifted toward the rear of the body. [Thompson, 1976]

radula a rasping organ in the mouth area of gastropods, comprised of serial rows of flexible teeth. [Keen, 1971]

rhinophore sensory tentacle located on the head or anterior end of the dorsum of a nudibranch. [McDonald & Nybakken, 1980]

sacoglossans gastropod mollusks resembling nudibranchs but distinguished from them by their adaptations for a herbivorous diet; nudibranchs are all carnivorous. [Thompson, 1976]

taxon, pl. **taxa** any unit or level in classification, such as a class, superfamily, genus, subspecies, etc. [Keen, 1971]

taxonomy the laws or principles of the systematic classification of organisms or of the morphological facts. [Arnold, 1965]

Miscellanea

Help! shell club secretaries and program chairpersons out there. I need club information. I am setting up a monthly calendar of events of interest to our readers. In conjunction with this, I would like to include a "Have program, will travel section." As a former program chairperson of the Southwestern Malacological Society, I know how difficult it is to find good programs. Please send me names of people with programs who are willing and able to travel. I am also compiling a list of sources for films on malacology and associated marine life. Please send me any suggestions on how the **Opisthobranch** may be more helpful to you.

A New Record of a Rare Species --
Tritonia septemtrionalis (Baba, 1937). by
 IRINA S. ROGINSKAYA

A new record of a rare species -- *Tritonia septemtrionalis* (Baba, 1937), is described from the Sea of Okhotsk. Recently, I was happy to recognize this species in the material from Avatcha Bay (Pacific Coast of Kamchatka). Seven well preserved specimens of *T. septemtrionalis* (the largest measured 90 mm in length, the smallest one -- only 28 mm) were fished from the depth of 5-12 m (by V. Oshurkov). The radula of the smallest specimen (l=28 mm) contained 41 series of teeth (the maximum number of lateral teeth - 62 (62.1.1.1.62). The radula of the 54 mm specimen had only 15-13 lateral teeth in the old worn rows. Color is uniformly yellowish in alcohol. I was told the living specimens demonstrated a bright rosy color. Here are two median teeth of the radula of the 28 mm specimen. [figs. 1 & 2].

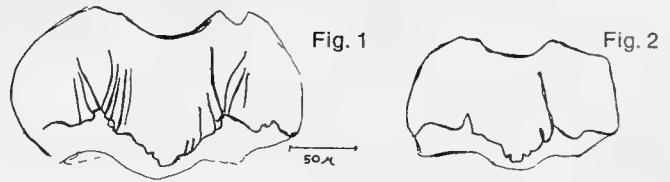


Figure 1. 14th tooth from the old end. I.S. Roginskaya drawing
 Figure 2. 2nd tooth from the old end. I.S. Roginskaya drawing

BABA, K. Nov. 1937. *Duvaucelia septemtrionalis* nov. sp., a Nudibranchiate Mollusc from the Sea of Okhotsk. Zool. Mag. Japan, 49(11): 391-392; 1 text fig. [Japanese, English summary]

[Editor: McDonald, 1983 considers *T. septemtrionalis* a junior synonym of *T. diomedea* Bergh, 1894. See pages 220-221. MCDONALD, GARY 1983. A Review of the Nudibranchs of California Coast. Malacologia 24(1 & 2): 114-276].

Dr. 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

Notes from Hans Bertsch -

Hawaii's Checkered Cowrie.
 (See back page photo)

The checkered cowrie has made its home in the Hawaiian Islands for over a million years. *Cypraea tessellata* Swainson, 1822, has been a true Hawaiian endemic throughout its evolutionary history: it has not expanded its distribution beyond this island chain. Except for some records from nearby Johnston Island, it has been found only along the length of the Hawaiian Islands, from Kure Island to the Big Island of Hawaii. Pleistocene fossils have been found on Molokai and Oahu.

This rare shell is unmistakable. Wide golden brown or tan bands alternate with narrower white bands across the inflated hump of its dorsal surface. Each side has two prominent chocolate brown checkerboard square markings. Below these blotches are found a row of smaller and fainter brown markings broken up by white splotches. The aperture is very narrow, and is bordered by numerous fine teeth. Adult specimens are about 35 mm in length, 25 mm wide, and about 20 mm high. Specimens reaching 50 mm in length have been recorded.

The mantle of the living animal is equally distinctive. It is a light cream color, partly transparent. When the mantle is extended out over the shell, the color pattern of the shell can still be seen through this thin covering veil. There are no papillae on the mantle (see Figures 4 and 5).

Not much is known about the biology of this species. They seem to hide out near coral reefs or under dead coral heads. Some collectors break apart corals to try to find them. This is illogical, since they destroy the natural habitats where these animals could grow.

Specimens of *Cypraea tessellata* have been dredged from 100 meters, although they are most common between about 10 to 20 m depth. I have seen the cowrie in 13 m on a night dive at Pupukea (on the north shore of Oahu), and in 24 m at Makua (southwestern side of Oahu).

Burgess (1970, *The Living Cowries*) reported that the egg mass of *Cypraea tessellata* consists of "about 100 pointed, brown, 1.5 x 5.5 mm egg capsules." A pair of cowries were found in association with the egg mass, with the brooding female sitting on top of the eggs. A description of the veliger has not yet been published.

To my knowledge, Figure 1 is the first published illustration of the juvenile shell. This photograph shows the stages of metamorphosis from the bulloid juvenile to the adult. The middle shell demonstrates that basal thickening, covering the whorls with a callus, and depositing of the coloration around the perimeter of the shell occur first. The final process in this sequence is the laying down of the distinctive pair of large brown squares on each side of the shell.

In August, 1977, my colleague Scott Johnson collected a very rare specimen with a unique color aberration. Illustrated in Figures 2 and 3, the body whorl side (not the outer lip side) had only one square blotch instead of the typical pair.

There is much information still to be discovered about the rare *Cypraea tessellata*. In situ observations by scuba divers (documented by data taking on underwater plastic slates and by close-up photography) are necessary to answer such questions as what they eat, when they breed, and their larval biology. Because of their limited distribution, I suspect that they probably have lecithotrophic larvae with a very short planktonic life span.

Figure 1: Growth series of juvenile, intermediate and adult shells. Figures 2 and 3: Shells with typical coloration (2 large dark brown squares on each side) and aberrant pattern (just one square on one side). Figures 4 and 5: Living *Cypraea tesselata* with mantle expanded, covering the shell. Photos by Hans Bertsch.

Cypraea tesselata

[Family CYPRAEIDAE]

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

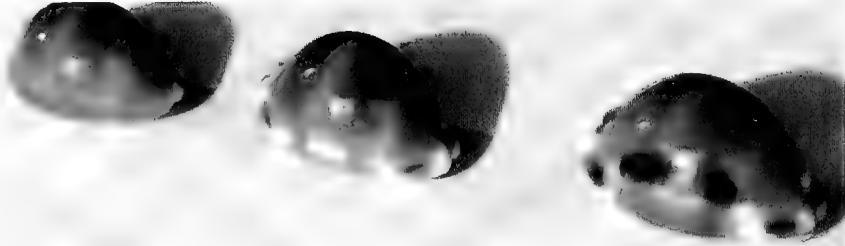


Figure 1



Figure 2

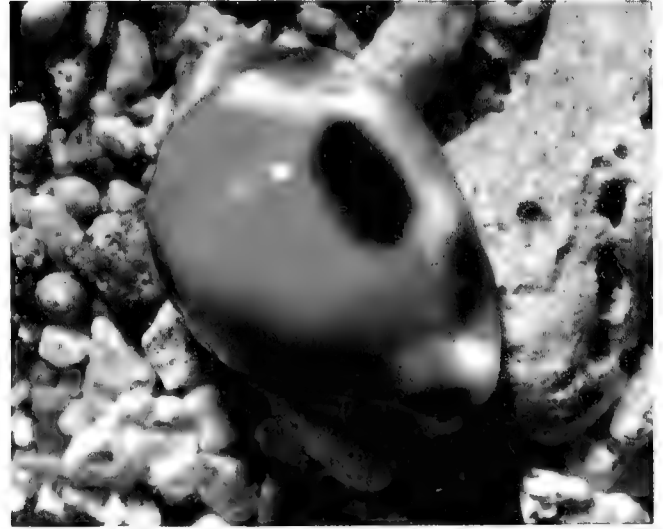


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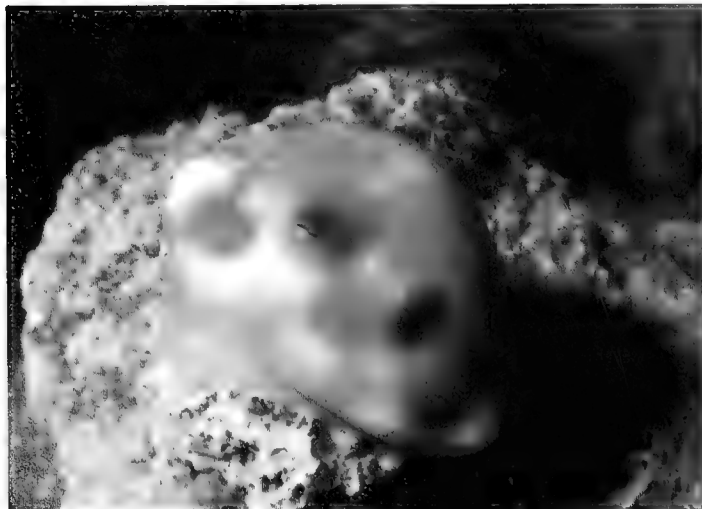


Figure 4

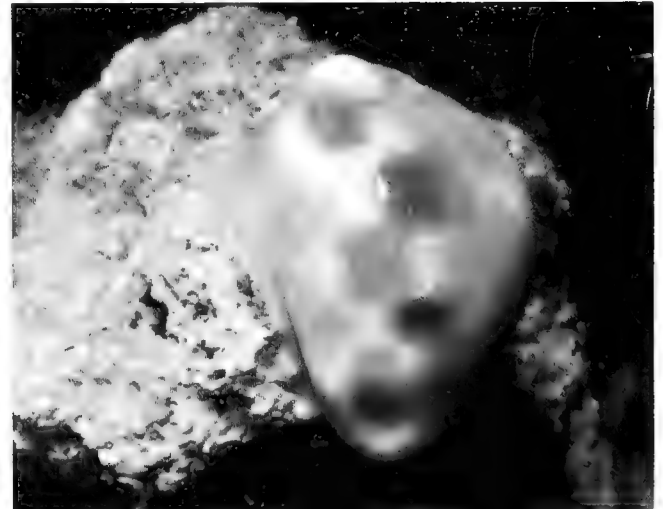


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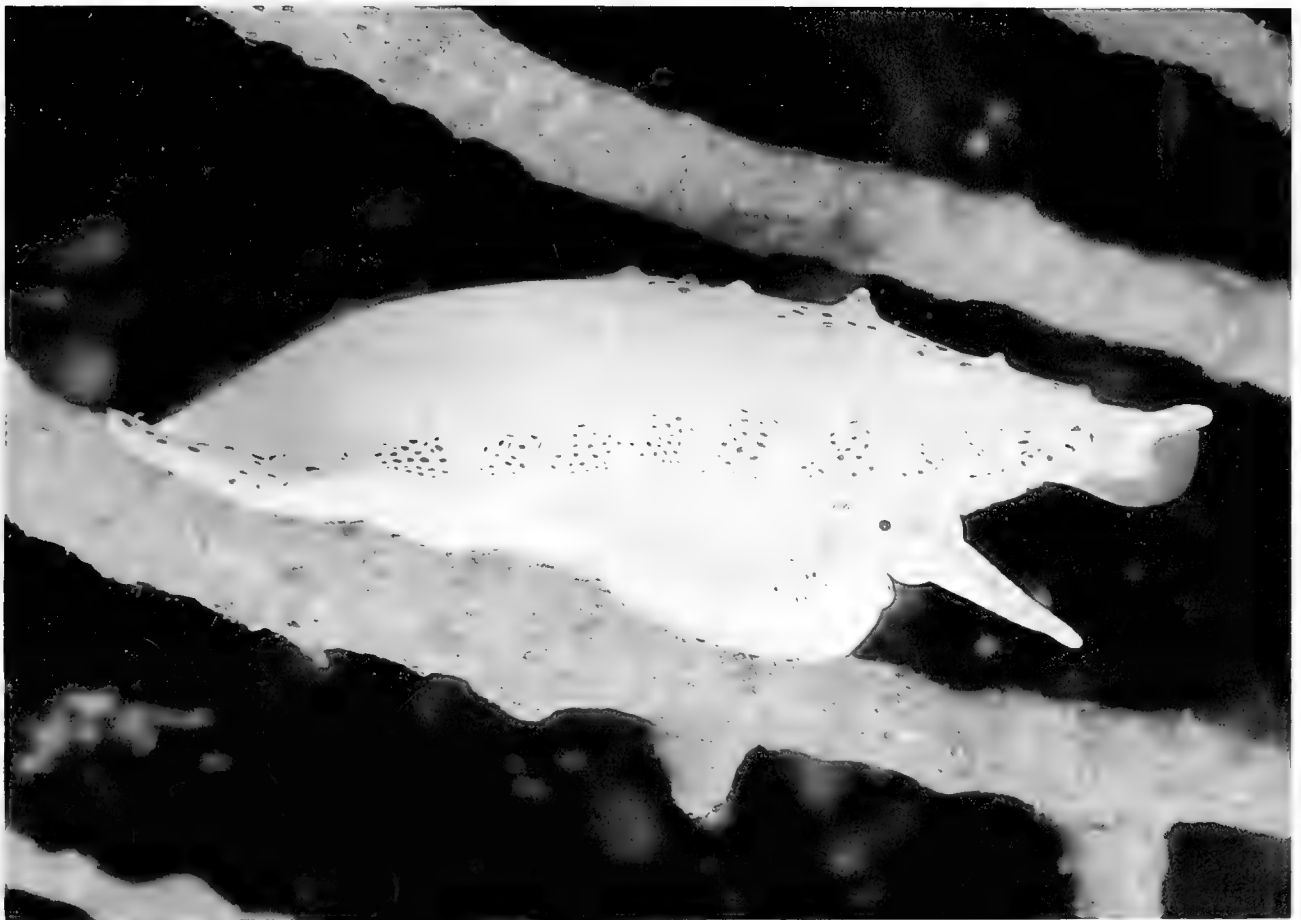
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OPISTHOBRANCH

A MONTHLY PUBLICATION ON MOLLUSKS AND MARINE LIFE

APRIL, 1984
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Volume 16, Number 4
Page 33



Simnia aequalis on gorgonian, shallow water, Playa Alicia, Baja California, shell 13 mm, 1970.
Photo by David Mulliner

Simnia

by David K. Mulliner

Simnia, Risso 1826 is a member of the family Ovulidae which has been distinct from cowries for approximately 80 million years. Four species from the Eastern Pacific are recognized in Keen 1971. She noted that this is a conservative classification and that several taxonomic problems have yet to be resolved.

Simnia feeds on the coelenterates, gorgonians - sea fans and sea whips. Unlike other carnivores in the mollusc's group, *Simnia* has only a short snout which expands distally around the mouth. This expansion covers the contracted polyps of the gorgonian. The polyps are bitten off with strong jaw plates aided by the median and lateral teeth of the radula. The radula is used primarily to brush the tissue with a sweeping motion into the food channel of the buccal cavity.

Faye Howard, a California collector, observed specimens of *Simnia* in Mexico. They are not confined to a single host colony (prey) but can move about. They can leave the host and drift to the surface of the water where they attach to the surface film and drift with the current. They then detach and drift down to the bottom. This is repeated until a new colony is found, Keen 1971. The author has observed this in the Gulf of California where animals were found on contrasting colors of gorgonians. It is usually accepted that the *Simnia* takes on the same color in its shell as the gorgonian on which it feeds.

Simnia lays its eggs in a circular single layer on the

host colony. The several hundred eggs hatch as free swimming veligers with a long planktonic stage. The veligers have a 4-lobed velum in contrast to the more usual 2-lobed velum of most molluscan veligers. The shell of the juvenile crawling stage has a form similar to a small *Strombus* with a spire external and a flared lip. As the shell develops the youngest turn grows so as to conceal all those that have gone before. This growth method is known as convolute. The adult *Simnia* shells are long, slender and thin with a straight aperture notched at each end. The outer lip thickens with age.

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David K. Mulliner, 5283 Vickie Drive, San Diego, California 92109

Front cover photograph. *Simnia aequalis* Sowerby, 1832, the shell is smoothly oval, tapering at both ends. The dorsum is usually smooth but may be finely striate centrally, with transverse ridges or grooves toward the ends of the shell. The color varies from white to lavender-rose or orange usually matching very closely the color of the gorgonian on which it lives.

Publication Notes

This section of the **Opisthobranch** will contain book reviews and other notes on recent publications as space permits. Please address review copies and reprints of publications to the Editor. English translations of foreign language citations are surrounded by square brackets.

GHILAROV, M.S. 1983. [Appropriation of functioning organelles of food organisms by phytophagous and predatory opisthobranch molluscs as a specific category of food utilization.] *Journal of General Biology*, **44** (5): 614-620.

HERTZ, CAROLE M. January 10, 1984. Illustrations of the Types Named By S. Stillman Berry in his "Leaflets in Malacology" *The FESTIVUS*, Volume XV, Supplement, pp. 1,42; Figs. 1, 92; Tbl. 1. [Available from San Diego Shell Club, Inc., c/o 3883 Mt. Blackburn Ave., San Diego,

California 92111. \$5.88 postpaid.]

IBERUS *Revista de la Sociedad Española de Malacología* 1983. **3**: 1-111.

INTERNATIONAL WILDLIFE January-February, 1984. **14** (1): 1-48. [Gary McDonald nudibranch article]

KEPPEL BAY TIDINGS December, 1983 - January, 1984. **22** (5): 1-8.

LEVANTINA June, 1983. (44): 510-525.

LEVANTINA August, 1983. (45): 526-534.

LEVANTINA October, 1983. (46): 534-542.

OF SEA AND SHORE 1984. Volume **13** (2): 51-94.

THE NAUTILUS January 30, 1984. **98** (1): 1-54.

WILLAN, RICHARD C. & NEVILLE COLEMAN 1984. *Nudibranchs of Australia*. Australasian Marine Photographic Index, 103 Caringbah Road, Caringbah, N.S.W. 2229 Australia. Price Australian \$15.00 plus \$3.00 postage and packing. [Not certain whether this has been published yet. Will review after we see a copy.]

Editor's Notes

by Steven J. Long

Several readers have requested the resumption of the "Publication Notes" section of the Opisthobran-

* * * * *

I am also looking for someone to survey Russian, Chinese and other eastern countries' biological literature for malacological information.

The March issue of the Opisthobran- ch is history. I have been improving the quality of each issue and waiting for the world to take notice.

* * * * *

I would like to print a thorough index to the Opisthobran- ch Newsletter volumes 1-15 sometime this year.

* * * * *

Thanks to the many readers who have contributed to this issue. Special thanks to R. Tucker Abbott, James R. Lance and Jack Brookshire for suggestions on layout of the Opisthobran- ch pages.

* * * * *

The publication date of the March issue was March 28, 1984.

* * * * *

The Opisthobran- ch accepts worldwide shell dealers' advertising in good faith, assuming that they will deal fairly with their customers.

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Notes from Hans Bertsch Hans Bertsch
Classification Notes Kay C. Vaught

The Opisthobran- ch is open to articles and notes on any aspect of malacology -- or related marine life. The Opisthobran- ch was formerly known as the Opisthobran- ch Newsletter.

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.

The Opisthobran- ch 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).

Beginner's Luck

by Malcolm Edmunds

I first saw living sea-slugs on an undergraduate field course at Millport on the island of Little Cumbrae, Scotland, in 1959. During the first week of the course we made the usual studies of rocky and sandy shores, trawling, dredging and plankton towing, and in the second week we were encouraged to undertake a small project of our own choosing. Having seen one or two eolids, I decided to study the food preferences of sea-slugs. The weather was unusually warm for mid-September, and clambering over the pier supports at low tide looking for *Tubularia*, sponges and bryozoans was quite fun, and the sea-slugs were the most colorful, graceful and altogether most fascinating creatures I had ever seen. *Facelina bostoniensis*, *Aeolidia papillosa*, *Favorinus branchialis* and *Polycera quadrilineata* were all there. I also found a strange eolid that was not in the local sea-slug bible, Alder and Hancock's superb monograph. It had three bulbs on each rhinophore, and it appeared to be a new species.

I asked one or two malacologists about this animal and was told it was probably an aberrant form of *Favorinus branchialis*, so I simply noted that this must be a very variable species, and later I referred to it in a discussion on Atlantic species of *Favorinus* (Edmunds, 1964). Some years later, Lemche and Thompson (1974) published their description of a new species, *Favorinus blianus*, which has three bulbs on its rhinophores. It immediately became obvious that my old Millport animal was this new species, and that *F. branchialis* was not actually a particularly variable species after all (Edmunds and Marcus, 1977).

Meanwhile I had completed my degree in Zoology at Oxford and was given the opportunity to undertake research. I had no idea if I would enjoy research or if I might find it tedious, so I decided to work on sea-slugs because however dull the work might be, at least I should derive satisfaction and inspiration from their grace and beauty! Oxford is a long way from the sea, so my work took me to Plymouth from time to time to collect fresh material. My very first visit in October 1960 was particularly fortunate. An old rope hung down from the breakwater. We hauled this up and found it coated with sponges and sea squirts, and among these were two of the most glorious orange polycerids with ultramarine blue spots. I knew at once that this was new to Britain, and I had hopes that it might be new to science. Back at the laboratory, D.P. Wilson looked in on my work and I showed him my prize specimens (D.P., as he was always affectionately known, was the foremost photographer of marine animals in the 1950's and his illustrations adorn many

books of this period). To my dismay he said, "Oh, yes, that's like the one Mr. Foster found while diving in the summer." But he proved to be a most generous colleague and offered me his specimen if I wished to write anything up on the animals. Well, I had the good luck, so now came the bad. I carefully left my two valuable animals in a jar with plenty of sea squirts and associated animals under a tap of running sea water so that they would get plenty of oxygen, but next morning the smaller specimen had gone. It had probably crawled up onto the water surface and been carried away with the overflow and down the drain. And D.P.'s first animal had fared almost as badly. Because it was large it took a long time to narcotise, and on the Saturday morning when he was ready to go home for lunch it was still not relaxed. So he asked his technician to get him a small jar of formalin, and he took the animal home together with the formalin. Later that day he transferred it from the magnesium chloride-sea water mixture to the formalin for preservation, and then forgot about it. Unfortunately the jar contained distilled water, and when next examined the unique specimen was beginning to decay. The specimen was no use to me for examination of soft parts, but its radula and jaws were still in good condition, so it was of some use after all.

It transpired that the animal was *Greilada elegans*, now also known as *Polycera elegans*. It had been found only three times before, and all three records were from the Mediterranean. The result of this experience was that I was able to publish a short paper on the animal and so get my doctoral thesis to an early and promising start (Edmunds, 1961).



FIGURE 1. *Favorinus blianus* Lemche & Thompson, 1974.



FIGURE 2. *Polycera elegans* (Bergh, 1894)

Watercolors by Malcolm Edmunds

My early luck continued the following year when I was fortunate enough to get a travel award to work in Jamaica for six months. Most of the sea-slugs that I found had been recently described by Ernst and Eveline Marcus, but I found several new species as well, including one in a narrow channel in the mangroves near Port Royal. Collecting here proved almost as intriguing for the team filming James Bond in 'Dr No' as their antics did for me. From the algal debris that I collected and left to stand in bowls of sea water crawled some curious 2 mm long creatures with two shells; bivalved gastropods. These remarkable animals had first been found alive in Japan less than three years earlier, and they had since turned up in Hawaii, Australia and California, but this was the first Atlantic record. In the next few weeks I collected over 100 of these strange sacoglossans, and although only marginally relevant to my thesis I was able to prepare a description of the new species, *Berthelinia caribbea* (Edmunds, 1963).

Of course there is more to finding rare and unusual specimens than good luck, but in the early stages of ones study a slice of good fortune helps to build up interest and enthusiasm; it certainly did for me.

Dr. Malcolm Edmunds, Preston Polytechnic, Division of Biology, School of Sciences, Corporation Street, Preston PR 1 2TQ, England.

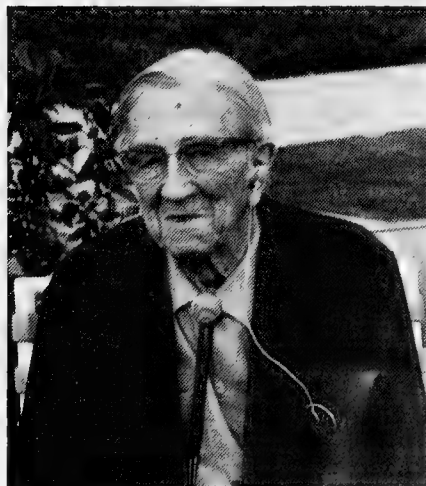
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IN MEMORIAM

S. Stillman Berry

born 16 March, 1887 Unity, Maine
died 9 April, 1984 Redlands, California



S. Stillman Berry
June 1982, Redlands, California
Photo by Steven J. Long

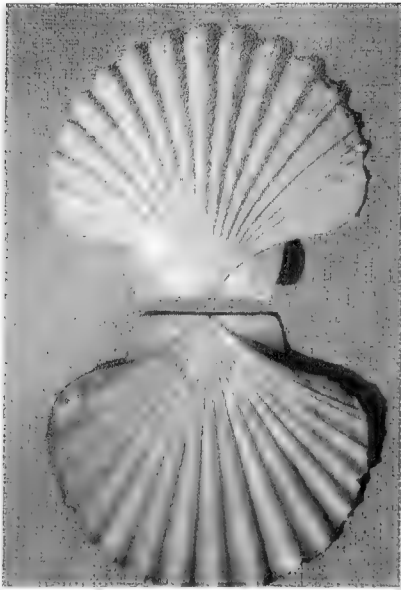


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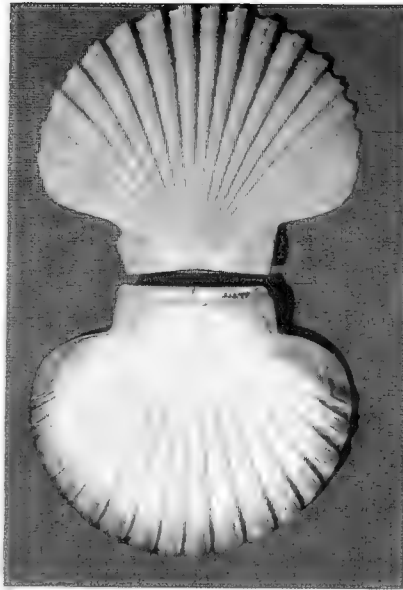


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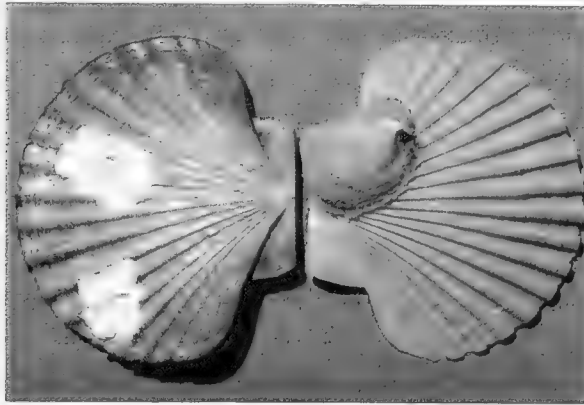


Figure 3.

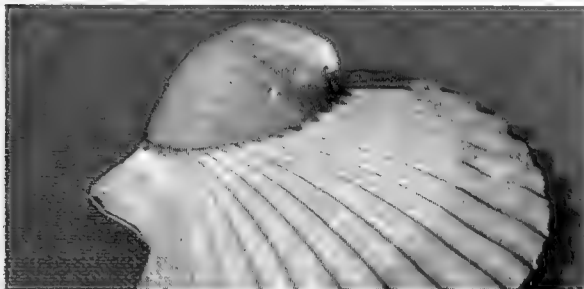


Figure 4.

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Figure explanations: *Pecten diegensis* and *Capulus californicus*; specimens in the San Diego Museum of Natural History collection; photography by Hans Bertsch. (Figures 1 and 2.) Valves of *Pecten*; the flat left valve is illustrated with both inner and outer surfaces. (Figure 3.) *Capulus* on the lower (right) valve of *Pecten*. (Figure 4.) Close-up of *Capulus* on the convex valve; note sharply pointed and curved apex. This is upside-down from the living orientation of these species.

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

Notes from Hans Bertsch**Just Living Together: *Pecten* and *Capulus***

Symbiosis is an interrelationship between two species. The word means "living with," and there are obviously many ways in which organisms live together. One popular method in the marine environment is for one species to live attached to another animal. If the relation is not one of parasitism, the guest is called the epizoite. Often times epizoites are

very restrictive in their choice of a host, settling on one (or just a few) species. Hence, the barnacle *Cryptolepas rachianecti* grows only on the California gray whale *Eschrichtius gibbosus*. However, species of the prosobranch *Crepidula* often occur on numerous different organisms and substrates.

An interesting epizoitic relationship occurs between two rare temperate Eastern Pacific species. *Capulus californicus* Dall, 1900, lives attached to the right valve of *Pecten diegensis* Dall, 1898. Both have known distributions that are rather restricted: The *Pecten* is

reported from Bodega Bay, California, to Cabo San Lucas, the tip of Baja California Sur, Mexico, and the *Capulus* is known from the Redondo Beach-San Pedro area (near Los Angeles) to San Diego, California, or to "Baja California." Additional precise records are needed from the Baja California region to better determine the distribution of this epizoite. Careful anatomical studies are also needed to establish the synonymy and validity of the three species of *Capulus* currently known from the eastern Pacific: *C. californicus*, *C. sericeus* Burch & Burch, 1961 (from Morro Colorado, Sonora, to Rio Sinaloa, Sinaloa, Mexico), and *C. ungaricoides* (Orbigny, 1841) (Peru).

Pecten diegensis is a rare, deep water species. Although scuba divers may at times encounter it below 20 m, it is usually dredged in depths down to 150 m. Specimens used by Clark in his studies on the growth of the *Pecten diegensis* shell were dredged from 50-60 m off Santa Catalina Island, California. The valves attain a diameter of 50-100 mm. Living specimens lie on their right valve. This lower valve is convex, with 22 to 23 ribs that usually have longitudinal ridging on their flattened tops; it is yellow-brown in coloration. The upper, left valve, is nearly flat, with 22 ribs; it is orange or red in color.

Several investigations have been conducted on the shell growth of *Pecten diegensis*. One studied the growing margin of the shell, illustrating how the mantle tissues precipitate mineral crystals into the old shell substrate. Another reported on the formation of daily growth lines by *Pecten diegensis*. The ridges that form the concentric sculpturing exhibit daily periodicity. Since ridges are not always laid down every day, G.R. Clark found that the maximum number of ridges gives a more accurate estimate of the animal's age and periodicity patterns than does an average line count. Daily growth lines of corals and bivalves have been used to determine year length in the geologic past. According to geophysical theory, the earth's rotation is slowing, which means that a year contained more days (but shorter) in the distant past than today. Hence, studies on how mollusks deposit shell material can give useful information for paleontological investigations.

The epizoite *Capulus californicus* lives on the lower (right) valve of *Pecten diegensis*. This gastropod grows to about 40 mm in length. The shell is ovalish, with an eccentric apex that curls tightly downwards. A thin, fuzzy, brownish periostracum covers the white shell; the interior of the shell is a shiny white. There are obvious spiral growth lines visible, and often times the lip of the shell takes on the corrugated texture of its host.

— TABLE 1 —

Occurrence of *Capulus californicus* on various sizes of *Pecten diegensis*.

| Size of <i>Pecten</i> | Number of <i>Pecten</i> | Number of <i>Capulus</i> or scar |
|-----------------------|-------------------------|----------------------------------|
| Less than 20mm | 26 | 0 |
| 24 mm | 1 | 0 |
| 26 mm | 2 | 0 |
| 54 mm | 1 | 1 |
| 72 mm | 1 | 1 |
| 77 mm | 2 | 1 |
| | | one with, one without |
| 80 mm | 1 | 1 |
| 85 mm | 2 | 1 |
| 86 mm | 1 | 1 |
| 87 mm | 1 | 1 |
| 88 mm | 1 | 0 |
| 89 mm | 1 | 1 |
| 93 mm | 1 | 1 |
| 97 mm | 1 | 1 |
| 100 mm | 4 | 8* |

*One *Pecten* had 5 *Capulus*; rest just one each.

To my knowledge, biological observations have not been made on *Capulus californicus*. The European species, *C. ungaricus*, is primarily a suspension feeder, positioning itself on the scallop so as to lie near the path of water entering the mantle cavity of the bivalve. It lives on asiphonate bivalves; a bivalve with a siphon would not offer a strong ingoing current of which the epizoite could take advantage. *Capulus* can also use its proboscis to take up pseudofeces from the bivalve. Since *Capulus californicus* sits astride the right valve near the 'ear' of the scallop, it probably has a similar feeding mechanism. The mouth of the scallop is quite close; most likely *C. californicus* avails itself of the inflowing current of *Pecten diegensis* to collect food particles.

An examination of specimens in the San Diego Museum of Natural History reveals an interesting relationship (Table 1). Apparently, the clam has to reach a certain size before it will be an acceptable host for *Capulus*. These data should not be used to determine incidence of *Capulus* on large *Pecten*, since the original collectors may have biased the sample to maintain those bivalves with its epizoite. *Capulus* leaves a distinct scar on the *Pecten* shell surface; so even if it has moved, fallen off, or been removed, one can still determine if a *Capulus* has been on a *Pecten* valve.

Although one often hears of prosobranch-bivalve relationships as predator-prey systems (such as the boring murexes that feed on bivalves), in this curious case of *Capulus* and *Pecten* we have two animals just living together. It seems that *Pecten* does most of the work in this live-on arrangement, since it provides 'bed and board' for *Capulus*: a space to settle and grow, and a water current from which food can be extracted.

Miscellanea

Thanks to Helen DuShane and Kate St. Jean for their helpful information on "Tyrean Purple."

Glossary

abalone (corruption of the Spanish aulon or aulone): an ear shaped, flattened; slightly spiral shell with a series of perforations; a sea ear (i.e., *Haliotis* called "abalone" in the U.S. Pacific Coast; "paua" in New Zealand; "Perlemoen" in Afrikaans; and "ormer" in French). [Arnold, 1965]

cowrie or cowry (Hindustani, kauri = a cowrie): the family CYPRAEDAE; moneycowries: *Cypraea moneta* Linnaeus, formally used as money in Africa and the South Seas. [Arnold, 1965]

muricate (Latin, murex = pointed stone): formed with sharp elevated points; having the surface covered with sharp points; *muricoid*: similar to the MURICIDAE. [Arnold, 1965]

pectinate (Latin, pecten = a comb a scallop): comb-like (e.g. *Pecten*, a pectinoid bivalve with radiating ribs); *pectunculate*: having a row of minute appendages; pectunculoid; *pectinations*: small sharp teeth on outer edges of insertion plates in chitons. [Arnold, 1965]

veliger (Low Latin, veliger = sail bearing): a larval mollusk in the stage where it has a ciliated swimming membrane or membranes; the bearer of a velum; free swimming young (e.g., *Littorina littorea* Linnaeus). [Arnold, 1965]

velum (Latin, velum = a veil): a thin membranous covering; *velated*: having a velum. [Arnold, 1965]

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Personal Notes

From **Eveline Marcus** [Caixa Postal 6994, São Paulo, Brazil 01051] I am looking forward to California in July and hope to see you though Arizona is not California. Terry Gosliner and I have a paper on the Pleurobranchaeidae out in *Ann. S. African Museum* 93: 1-52.

* * * * *

From **Kaniaulono B. Meyer** [7382 Commonwealth Drive, Cincinnati, Ohio 45224] WOW...the ON has sure come a long way, thanks to your persistence. The new format is really slick...congratulations!!

I guess I haven't communicated with you in some time. A year and a half ago I had a baby and 4 months later we bundled Ross up and took him with us to Australia for 8 months. We spent 4 months on Lizard Island in the warmth, sun, and ever present wind and because of him I didn't get in much diving but people would bring up 'branches for me to look at now and then. The last 4 months we were at the Australian Institute of Marine Science where Dave [Meyer] continued his work on crinoids. Australia and her people are great and we enjoyed our stay there immensely. It was just too bad I wasn't able to do any 'branch searching as I know there are some beauties out there. I did get to stop in to say "Hi" to Bill Rudman in Sydney and he is very active with his work.

So now I'm mostly being a mother and only working in the lab one day / week. Though I'm no longer active in the field I really do enjoy the **Opisthbranch** since it keeps me informed with what others are doing.

* * * * *

From **Dave Mulliner** [5283 Vickie Dr., San Diego, California 92109] Gale Sphon and myself went on a collecting trip to Gonzaga Bay in my camper from February 11 to 18 [1984]. These were the lowest tides of the year.

We collected on the mud flats in the bay on the north side of Willard Island and on the south side. We turned hundreds of rocks along the island. We dredged on the Gulf side of Willard Island and in the bay. In all, we collected during six low tides.

The collecting was very poor, although we could see no visible reason why. There is very little collecting being done here and the scarcity of people (one small fishing village) wouldn't over pollute the water.

Twenty three species of gastropods were collected with only five of them being in abundance. Four species of chitons with only a few specimens each. We collected a total of eleven opisthobranchs representing five species: *Hypselodoris ghiselini*, *Berthellina citrina*, *Spurilla chromosoma*, *Taringa aivica timia* & *Tridchiella diomedea*.

From **Kathe Jensen** [Research Associate, Zoologisk Museum, Universitetsparken 15, DK 2100 Copenhagen, Denmark] I was impressed by the look of **Opisthbranch** -- though the increase in subscription rates, especially overseas, also seems rather impressive. [ed. - if you really want to be impressed, count the postage on your copy of the March issue and multiply by 12 months (\$19.44/year to Japan)] I don't know if Hanne Just has the time to tell you, but she will be leaving the Museum to accompany her husband on a Sabbatical leave in Australia for one academic year.

I noticed that Kenneth Boss spotted one mistake in the Ascoglossa part of the systematic list, which I had missed [ON 15(3): 13], namely that the family Polybranchidae was attributed to H. & A. Adams, 1854. In fact, this family was not named until Pruvot-Fol, 1954. Thank you for pointing out the error.

I spent a miserably cold Christmas in Florida (the only consolation was that it was slightly colder in Denmark), then went to the American Society of Zoologists' meeting in Philadelphia to present my paper on the toxicity of *Mourgona germanineae*.

Other news: Malcolm Edmunds visited the Copenhagen Museum for a few days in connection with the final preparation for publication of Henning Lemche's water-color drawings of nudibranchs with Hanne Just's texts.

* * * * *

From **T.E. Thompson** [Zoology Department, University of Bristol, Bristol BS8 1UG, United Kingdom] All fixed to move in April to the Somerset countryside just outside Bristol. Big treat is summer in Naples, 1984, working on reproductive organs and development of *Umbraculum mediterranea*.

Just finished a big paper on opisthobranch biology in the Gulf of Patras (Greece) where a very rich fauna exists in the sediments offshore between 5 and 15 m depth. The paper reports on the ecology of 19 opisthobranch species, nearly all shelled forms, which came up in dredge samples carried out by Greek colleague Argyro Zeretis of University of Athens. This must be the richest area ever investigated, so far as shelled opisthobranchs are concerned. Can any of your readers surpass it? .

* * * * *

From **Sam Spaulding** [1167 Tyndall Street; Santa Ynez, California 93460] Do you have any word on the publication date of "Nudibranchs of Southern Africa" by Terrence Gosliner? [ed. - no word at all]

Lamellariids: Masters of Disguise

by David W. Behrens

An obscure taxonomic group, maybe, but its real obscurity hails from the animal's acute ability to deceive an observer's eye. Worldwide, members of the gastropod family Lamellariidae Orbigny, 1841 are quite abundant, although comprising only a dozen or so species. Taxonomically, confusion exists right down to the designation of the type species. The original specific designation *Lamellaria* proposed by Montagu in 1815 has even drawn protest due to its resemblance to the name of algal genus *Laminaria* which includes brown kelps.

Historically, the family has been studied with opisthobranchs due to their shell-less appearance and resemblance to certain dorid nudibranchs. Of specific ecological interest is their close resemblance to compound ascidians (tunicates) upon which they feed and live. An additional feature of ecological interest afforded this group of molluscs is their ability to secrete acid from their mantle tissue to fend off wanton predators.

My study of Lamellariids began in California where several species were accidentally collected with samples of encrusting tunicates. An attempt to identify the mantle covered moon-snail like gastropod met with confusion and frustration, and ultimately concluded in a review of the northeastern Pacific species (Behrens, 1980).

To me, the most fascinating characteristic shared by members of the family is the development of the mantle to cover the bulloid shell and successfully copy the morphology of their host tunicate substrate. Although a great deal of variation exists within each species, both in color and texture of the mantle, the ability of this group to mimic their host is phenomenal.

The ecological significance of such resemblance, whether for protection or whatever has received a great deal of discussion in the literature.

Herdman (1893) and Ankel (1935) reported an association between *Lamellaria perspicua* and the Atlantic ascidian *Didemnum candidum* (= *Leptoclinium maculatum*) which they considered as protective to the lamellariid. Thompson (1973, 1976) collected *Lamellaria* from southern Britain, none of which resembled an ascidian host, but instead resembled other substrata. He found *Lamellaria latens* which resembled the hard marine substratum upon which it was collected and *L. perspicua* which resembled an assemblage of barnacles. Of the latter, two specimens were collected at Helford, Cornwall, with branacle-

like markings on their dorsa. So life-like was the resemblance, a hand lens was required to show otherwise. This fascinating phenomenon is documented with color photographs in Yonge & Thompson (1976).

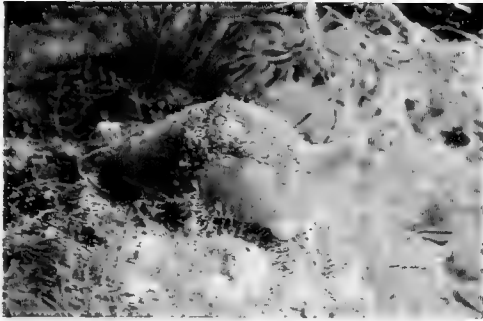
On the Pacific Coast at Corona del Mar, California, MacGinitie & MacGinitie (1949) report an unidentified yellow lamellariid feeding upon the yellow sponge, *Lissodendoryx noxiosa* and a brick-red lamellariid (*Marseniopsis sharonae*, their figure 200) feeding upon a sponge of the same color. At Puerto Peñasco, Sonora, Mexico, they report *Lamellaria orbiculata* (probably *L. diegoensis*) as occurring on the underside of rocks encrusted with either white sponge or white tunicate, which it closely resembles. Ghiselin (1964) discusses the morphological and behavioral relationships of the resemblance of *Marsenina stearnsii* (= *Lamellaria stearnsii*) to the compound ascidian, *Trididemnum opacum* (Ritter, 1907) upon which it lives. McCloskey (1973) concurs with Ghiselin that *Marsenina rhombica* (= *Lamellaria rhombica*) also resembles a tunicate colony, but occurs on other substrata as well. McCloskey collected his specimens on the solitary tunicate *Ascidia paratropa* (Huntsman, 1912).

Although I collected many animals on barren rock surfaces, my observations support the contention that all lamellariid species are, for the most part, tunicate-substrate specific. Of the genus *Lamellaria*, only *L. diegoensis* was observed in the field. Excluding the 8 animals collected on barren rock, 15 specimens were collected on *Aplidium* sp., *Cystodytes lobatus* (Ritter, 1900), *Eugyra* sp., *Polyclinum planum* (Ritter & Forsyth, 1917) and *Trididemnum opacum*. Two specimens found on *T. opacum* were highly cryptic, white animals marked similarly to *Marsenina stearnsii*. A single specimen found in beach wash algae on Isla Vista Beach, Santa Barbara County, California, was marked with two pink coralline algae-colored areas on a brown background; this observation is most likely incidental and inconclusive.

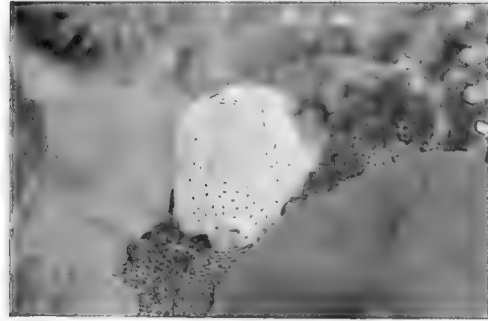
Seven individuals of *Lamellaria diegoensis* collected from a single salmon-colored colony of *Aplidium* near Isla Vista Beach, California, although cryptic, exhibited 7 separate color and texture phases. Marked typically, individuals included yellow, orange, brown, lavender and gray color regions.

I found *Marsenina stearnsii* to possess the very strict substrate specificity and resemblance reported by Ghiselin (1964). All specimens were collected on *Trididemnum opacum*, and were almost indistinguishable from the tunic of the host.

Marseniopsis sharonae was found only on *Botrylloides* sp., an orange, quiet-water species.



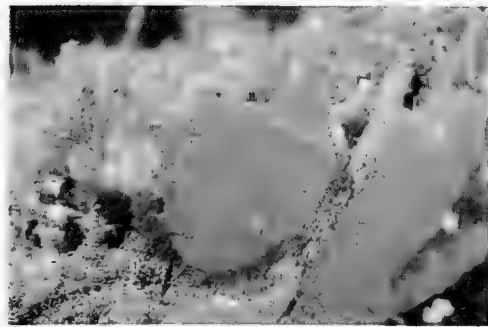
Lamellaria diegensis Dall, 1885 29 mm, 1978, barren rock, Diablo Cove.



Marsenina stearnsii (Dall, 1871) 18 mm, 10 m depth, San Luis, Obispo County, Calif.



Marsenina rhombica (Dall, 1871) 25 mm, November 1978, intertidal, Pt. Piedras Blancas.



Marseniopsis sharonae (Willet, 1939) 10 mm, Morro Bay.

Photos by David W. Behrens

Despite the wide color range of *M. sharonae*, it was often difficult to locate individuals sunken in the surface or in folds of this encrusting tunicate species.

One might ask, with such a sophisticated means of deceiving predators, why should a group need a secondary protection system? A remarkable backup defense does exist, however.

Some members of the Lamellariidae possess a predator deterrent in the form of acid secretions from glands in the mantle (Thompson 1960, 1969, 1976; Yonge & Thompson 1976). Thompson (1960) studied such secretions in *Lamellaria perspicua* from the Atlantic. This feature has not been investigated in any other Pacific species. Yonge & Thompson (op. cit.) presume that the acid secretion functions to dissuade a

(Continued on following page)



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sharp-sighted predator which has not been fooled by the snail's protective resemblance.

In the laboratory, I have observed the opisthobranchs *Triopha catalinae* (Cooper, 1963) and *Hermisenda crassicornis* (Eschscholtz, 1831) to retreat hastily from the contact with the mantle of *Marsenina rhombica*. This contact-retreat behavior was repeated several times by the same animal.

Another Pacific species of lamelliid shows no such deterrent, and in contrast, allows a variety of fouling organisms to attach to its mantle. This variance is curious and unexplainable. I noted epifaunal associations on *Marseniopsis sharonae* in Morro Bay, California. In 9 instances, I observed live barnacles, *Balanus* sp., attached to the living non-retractile mantle tissue of the host. The barnacles measured up to 1.5mm diameter. A minute hydroid, *Plumularia* sp., was found on 6 specimens. Like the barnacles, the hydroids were firmly attached to the mantle tissue.

The third species growing on mantle tissue was the scud, *Corophium* sp. These were found with their secreted mucous tubes attached to the mantles of 5 specimens.

Why would a molluscan group evolve two elaborate means of predator deterrence? Why, with such developments, hasn't it developed a greater number of species? Could reproductive success be an indication? What type of larval development does the group have: direct or indirect development? What is their fecundity (number of eggs per spawn)? Is species specific use of ascidian food the most efficient use of the limited resource? Does host resemblance outweigh species specific utilization?

Truly a fascinating group, the lamelliids offer both the conchologist and malacologist the challenge of a plethora of unanswered taxonomic and ecological questions.

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

Current Events

Call for talks, posters, abstracts and papers for the fiftieth annual meeting of THE AMERICAN MALACOLOGICAL UNION, July 22-27, 1984 at Norfolk Virginia. Applications must be made by May 31, 1984, to Dr. Robert Robertson, AMU President, Department of Malacology, Academy of Natural Sciences, Nineteenth and the Parkway, Philadelphia, PA 19103.

* * * * *

Pre-registration forms for the Twelfth annual convention of THE CONCHOLOGISTS OF AMERICA at St. Petersburg, Florida, are now available from, Donald J. Young, Convention Chairman, 11975 Third Street East, Treasure Island, FL 33706.

Thanks to Casto L. Fernández-Ovies [Covadonga 3 19, Salinas Asturias, Spain], we have received some additional information on The V CONGRESSO NACIONAL DE MALACOLOGIA (Fifth Annual Congress of Malacology,) it will be at Vigo (Pontevedra) in north western Spain. From the 6th to the 9th, September 1984. For further information write; Comité Organizer, C/ Canovas del Castillo 22, or P.O. Box 975, Vigo (Pontevedra), Spain.

* * * * *

The ASSOCIATION CONCHYLILOGIQUE DE NOUVELLE CALÉDONIE [B.P. 146, Noumea. New Caledonia.] will hold their annual shell show 12-19 September, 1984, in the Noumea Town Hall.

Classification Notes

Outline of the Classification of Living Mollusca, Part 3. by Kay C. Vaught.

Superfamily PATELLACEA

Family PATELLIDAE

Subfamily PATELLINAE

PATELLA Linneus, 1758

- (*Costapatella* Pallary, 1914;
- Laevipatella* Pallary, 1914)
- Ancistromesis* Dall, 1871
- Cymbula* H. & A. Adams, 1854
- Olana* H. & A. Adams, 1854
- Patellastra* Monterosato, 1884
- Patellidea* Thiele, 1891
- Patellona* Thiele, 1891
- Patina* Gray, 1840 (?)
- Penepatella* Iredale, 1929
- Scutellastra* H. & A. Adams, 1854
- (*Patellanax* Iredale, 1924)

HELICON Montfort, 1810

- Ansates* Sowerby, 1839
- Patinastra* Thiele, 1891
- Rhodopetala* Dall, 1905

Subfamily NACELLINAE

NACELLA Schumacher, 1817

- Patinigera* Dall, 1905
- (*Patinella* Dall, 1871)

CELLANA H. Adams, 1869

- (*Granopatella* Pallary, 1941)
- (*Helcioniscus* Dall, 1871)

Family ACMAEIDAE

Subfamily ACMAEINAE

ACMAEA Escholtz, 1833

- Actinoleuca* Oliver, 1926
- Asteracmaea* Oliver, 1926
- Atalacmaea* Iredale, 1915
- Chiazacmaea* Oliver, 1926
- Conacmaea* Oliver, 1926
- Naccula* Iredale, 1924
- Nomaeopelta* Berry, 1958
- Notoacmaea* Iredale, 1915
- Parvacmaea* Iredale, 1915
- Patelloida* Quoy & Gaimard, 1834
- Radiacmaea* Iredale, 1915
- Subacmaea* Oliver, 1926
- Tectura* Gray, 1847
- (*Niveotectura* Habe, 1944)
- Thalassacmaea* Oliver, 1926

COLISELLA Dall, 1871

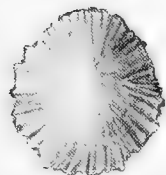
- Conoidacmaea* Habe, 1944
- Kikukozara* Habe, 1944

LOTTIA Gray, 1833

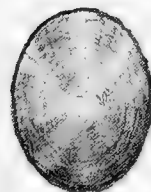
- (*Lecania* Carpenter, 1866;
- Tecturella* Carpenter, 1860)

POTAMACMAEA Piele, 1922

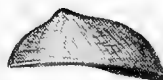
SCURRIA Gray, 1877



Patella
30-50 mm



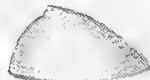
Acmaea
25 mm



Pectinodonta
(X3)



Cocculina
(8 mm)



Lepetella
(6 mm)

Subfamily PECTINODONTINAE

PECTINODONTA Dall, 1822

Family LEPETIDAE

LEPETA Gray, 1842

(*Cryptectenidia* Dall, 1918)

Cryptobranchia Middendorff, 1851

IOTHIA Gray, 1833 (Jothia)

MAORICRATER Dell, 1956

NOTOCRATER Finlay, 1927

PILIDIUM Forbes, 1849

PROPILDUM Forbes, 1849

(*Rostrisepta* Seguenza, 1866)

PUNCTOLEPETA Habe, 1958

Family BATHYSCIADIIDAE

BATHYSCIADIUM Dautzenberg &

Fischer, 1900

BATHYPELTA (?)

Superfamily COCCULINACEA

Family COCCULINIDAE

COCCULINA Dall, 1882

Coccopygia Dall, 1889

Dallia Jeffreys, 1882

Pseudococculina Schepman, 1908

Family LEPETELLIDAE

LEPETELLA Verrill, 1880

ADDISONIA Dall, 1882

COCCULINELLA Thiele, 1909

TECTICRATER Dell, 1956

TECTISUMEN Finlay, 1977

Note: Powell, 1979, places this after Neritacea.

Kay C. Vaught 8646 East Paraiso Drive, Scottsdale, Az. 85255

Information Exchange

From **Eveline Marcus** [Caixa Postal 6994,01051 Saõ Paulo, Brazil] I am struggling with the Umbraculacea, and have too little material. I need only West Atlantic *Umbraculum plicatum* and *Tylodina americana*.

From **Richard E. Petit** [P.O. Box 30, North Myrtle Beach, South Carolina 29582] For many years I have been working on a list of taxa in the Cancellariidae, and some of the references are still eluding me. If you can supply any of those on the attached list, it would be a great help. Am putting the list (about 1,800 nominal taxa) in my computer and hope to have it available by the end of the year. [Write to Dick for a copy of the list. -ed.]

Helen DuShane [15012 El Soneto Dr., Whittier, California 90605] is working on an article on the epitoniids of Panama Bay and the Perlas Islands comparing the epitoniids that Zetec, 1919 and Dall, 1918 found. She is having difficulty identifying the Actiniarians which are on the boulders at Panama. Anyone who can help with the Actiniarians should contact Helen.

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Living in Mud

by Sandra Millen & Sven Donaldson

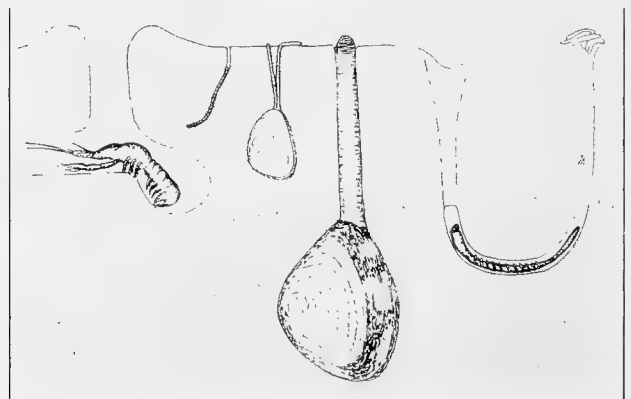
Because mud is basically obnoxious, gooey stuff, both boaters and biologists tend to avoid it. Marine organisms do just the opposite. Mud flats are, in fact, among the most productive areas in the local marine environment. Rivers carry a wealth of terrestrial organic matter mixed with clay and silt down to the sea. This rich brew drops out of suspension near river mouths or farther from shore in areas with little current action. On sloping bottoms, muddy deposits often form close to shore, because small particles adhere near the top of the slope, while larger ones tumble down in what constitutes a natural sieving action. Particles of silt range down to a few thousandths of an inch in diameter, while those of clay are even finer. The finer the particles, the more pronounced the tendency to retain water by capillary action and the greater the cohesiveness (i.e. gooeyness). Marine muds don't drain like beach sand. Every little depression in the surface of a mud flat becomes a shallow pool at low tide, a natural habitat for a myriad of small animals.

Organisms living in mud rarely have a problem with desiccation, but the same cohesive properties that enable soft sediments to retain water so successfully, also ensure that little water, and hence even less dissolved oxygen, will be exchanged. Just below the surface is a black layer below which there is simply no more oxygen. As most marine organisms need oxygen to survive, they cannot penetrate below this layer unless in contact with the surface through an open burrow. A few organisms can carry out anaerobic respiration, in particular the obscure and tiny gnathostomulids or "jaw mouths" and quite a variety of bacteria. Because marine mud is so rich in organic matter, anaerobic microbes thrive in the anoxic layers and produce hydrogen sulfide as a metabolic by-product. This is the chemical which causes flats to smell so terrible, especially if you disturb the surface layer. Hydrogen sulfide reacts with iron oxide to form iron sulfite compounds which give anoxic muds their characteristically black colour.

Animals living on mudflats have three options: occupy the muddy surface, protrude from within the mud, or tunnel through the mud. The most common good-sized mud flat dwellers, clams and worms, employ the second two strategies. Clams burrow beneath the mud and stick their long siphons up to the surface. Each clam has two siphons, although they are often fused together and appear as one. The incurrent siphon brings oxygenated water, suspended organic matter and plankton into the clam's body. The excurrent siphon carries away deoxygenated water and wastes.

The commonest clam on local mudflats is *Macoma inconspicua*. Its little white shells are lined with pink or yellow and rarely exceed an inch in length, but occur in great numbers just below the surface. By digging deeper, you can obtain two other *Macoma* species, the bent-nosed macoma and the polluted macoma, both from 3-to-4 in. in length. Both are edible, although very gritty and hard to clean. All macomas have separate, mobile incurrent siphons which they use like vacuum cleaners to slurp up detritus. In areas with a little gravel mixed in the sediment, delicious littleneck and butter clams thrive. During extra low tides, you can dig out the gigantic horse clam *Tresus capax*, if you have the stamina to follow its retreating siphon 2 to 3 feet down to the body. This interesting clam, 6-in. or more in length, has leathery pads at the tips of long fused siphons. These armoured tips are all that protrude from the mud, and probably protect the siphons from being nipped by fish or crabs. Frequently other organisms such as sponges, tunicates and algae settle on the siphon tips as though mistaking them for rocks.

Unlike clams, which burrow in mud, snails try to crawl across the surface. It is difficult to crawl on soft mud without sinking, and most mud-dwelling snails are content to plough along just below the surface with special siphons protruding like snorkels. The short, chunky *Nassarius* and the long-spined *Bratillaria* are common mud flat inhabitants of the ploughing variety. Other snails have thin, fragile, lightweight shells covered over by lateral extensions of the foot. Using this greatly-enlarged foot like a snowshoe, they crawl across the mud surface. The grey bubble shell *Haminoea* and the black *Melanochalamys* are examples of snails using this strategy. Both look more like blobs of jelly than conventional snails, because their shells are completely enveloped by soft tissue. All snails are most easily found if you first look for the irregular, wandering trail they leave behind in the mud. At low tide, the snail itself is usually buried in a small mound at the end of the trail.



A few mud-dwellers in their burrows. From left to right; mud shrimp, bloodworm polychaete, polluted macoma, horse clam, and lugworm.

The burrow entrances of two unusual crustaceans, ghost shrimp and mud shrimp, are frequently mistaken for clam holes. These elongated relatives of crabs dig elaborate sub-surface homes complete with side chambers and turn arounds. By fanning flaps on their abdomens they pump water through their burrows, bringing in oxygen and expelling wastes. Both species eat detritus, screening out fine particles with their modified legs. Their burrows can be recognized by volcano-like piles of mud at their entrances. Ghost shrimp live in mud-sand areas and are delicate pink, while mud shrimp are pale blue and green.

Also mistaken for clam holes are the burrows of polychaete sea worms. These worms are often extremely abundant; numbers can run into hundreds per cubic foot. Like earthworms, many thrust their way through the substrate eating detritus. Unlike earthworms, they have paddle-like legs to help them move. Some polychaetes eject mud as they tunnel and create permanent burrows. The lugworm forms a J-shape burrow close to the surface that can be readily recognized by the coil-shape castings piled near the entrance. To reach above the mud and catch suspended detritus, some polychaetes live in tubes they have constructed of mud and proteinaceous glue. These worms have modified heads resembling feather-dusters which they use to catch food. The tubes of *Eudistylia vancouveri*, a polychaete that is also found beneath docks and floats, are abundant in muddy areas.

Subtidally, a still greater variety of organisms inhabit the mud. The large sea cucumber *Parastichopus* mops the surface with its sticky tentacles. There are entire gardens of the burrowing sea anemone, *Pachycerianthus*, fat orange sea pens, and long white sea whips. Scuttling over the surface are two-spotted prawns, long-legged tanner crabs, and delicious Dungeness crabs. On deep mud bottoms are strange squat lobsters, burrowing heart urchins, and brittle

stars. The last-mentioned are active starfish with small bodies and snake-like, multi-jointed arms. At times they can become so dense as to form a solid mat of entangled bodies.

The flow of nutrient energy in a mudflat community spreads like a complex web beginning with the terrestrial organic materials that are swept down rivers to the sea. Suspended food particles are eaten by filter-feeders, mainly clams and worms. Settled food is engulfed by the sticky tentacles, siphons and proboscises of other worms and clams as well as sea cucumbers, snails and some crustaceans. Microbes attack some organic material and in turn become food themselves. Carnivorous worms and crabs stalk smaller invertebrate prey. The abundance of invertebrate life feeding directly or indirectly on this overflow of riches from *terra firma* is, in turn, a bountiful food source for the numerous fish which move over muddy areas.

At low tide, the teeming abundance of the mudflats becomes the favored foraging grounds for flocks of water birds. Migratory birds are especially dependent upon mud flats which conveniently reach their productive peak in the fall. Even in late autumn, after the land has become barren, the mudflats offer rich resources of clams and worms to sustain flocks on the move. Birdwatchers and hunters are keenly aware of the vast numbers of waterfowl that depend upon this resource. Unfortunately, most people regard mud flats as barren, smelly and unsightly areas that ought to be filled in and planted over. Instead we should protect these areas as valuable natural resources which we can manage and harvest like any other.

From Pacific Yachting, April, 1982
Sandra Millen, Department of Zoology, The University of British Columbia, 6270 University Boulevard, Vancouver, B.C., Canada V6T2A9

Errata

Two errors slipped by in a few of the copies of the March **Opisthobranch**, both in the "Reader Forum" section. In N.B. Eales' note (pg. 26, right-hand column) "It is true that the order contains odd species **devoid of definite affinities**, **but there are pro-nounced** evolutionary trends..." a partial sentence was lost. In R.C. Willan's note (pg. 27, item 7) *Oscantus* was given an "e" in error. My apologies to both authors. Kay Vaught caught me using "taxons" when I should have used "taxa." Helen DuShane noted my improper spelling in Wes Farmer's note on page 28; "Puertecitos" is the correct spelling.

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Casmaria vibexmexicana (Stearns, 1894)

by Helen DuShane

The genus *Casmaria* Adams and Adams, 1853 is represented by several varieties worldwide. Their systematic status, however, has been debated. The species are very similar in appearance but show some differences in shell and soft part morphology.

The islands of Panama Bay, Panama, with their calcareous substrate, form the ecological habitat for *Casmaria vibexmexicana* (Stearns, 1894). Live specimens were observed and collected from 1976 through 1981 living intertidally. (The Veliger 24(4): 336-338). This is the first report of the species being taken alive in numbers. This species feeds on the small epifaunal and burrowing echinoid sea biscuit, identified tentatively as *Lovenia cordiformis* A. Agassiz, 1872 and prefers a calcareous substrate.

Helen DuShane, Research Associate, Natural History Museum, 900 Exposition Blvd., Los Angeles, California 90007

Additional Reading

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- DUSHANE, HELEN 1982. Notes on Living *Casmaria vibexmexicana* (Stearns, 1894). The Veliger, 24 (4): 336-338.
- EMERSON, WILLIAM K. & WILLIAM E. OLD 1963a. Remarks on *Cassis* (*Casmaria*) *vibexmexicana*. The Nautilus 76(4): 143-145; pl. 10, 3 figs.
- EMERSON, WILLIAM K. & WILLIAM E. OLD 1963b. Results of the Puritan-American Museum of Natural History Expedition to Western Mexico. 19. The Recent Mollusks: Gastropods, Strombacea, Ton-nacea, and Cymatiacea. American Museum Novitates No. 2153, 38 pp., 28 figs.
- KEEN, A. MYRA 1971. Sea Shells of Tropical West America; Marine Mollusks from Baja California to Peru. Stanford University Press, Stanford, California, i-xiv + 1064 pp., ca 4000 figs., 22 color pls. (21 September 1971).



Casmaria vibexmexicana (Stearns, 1894). Isla Boyarena, Perlas Isles, Republic of Panama, April, 1981. Photo by Barbara Corner.

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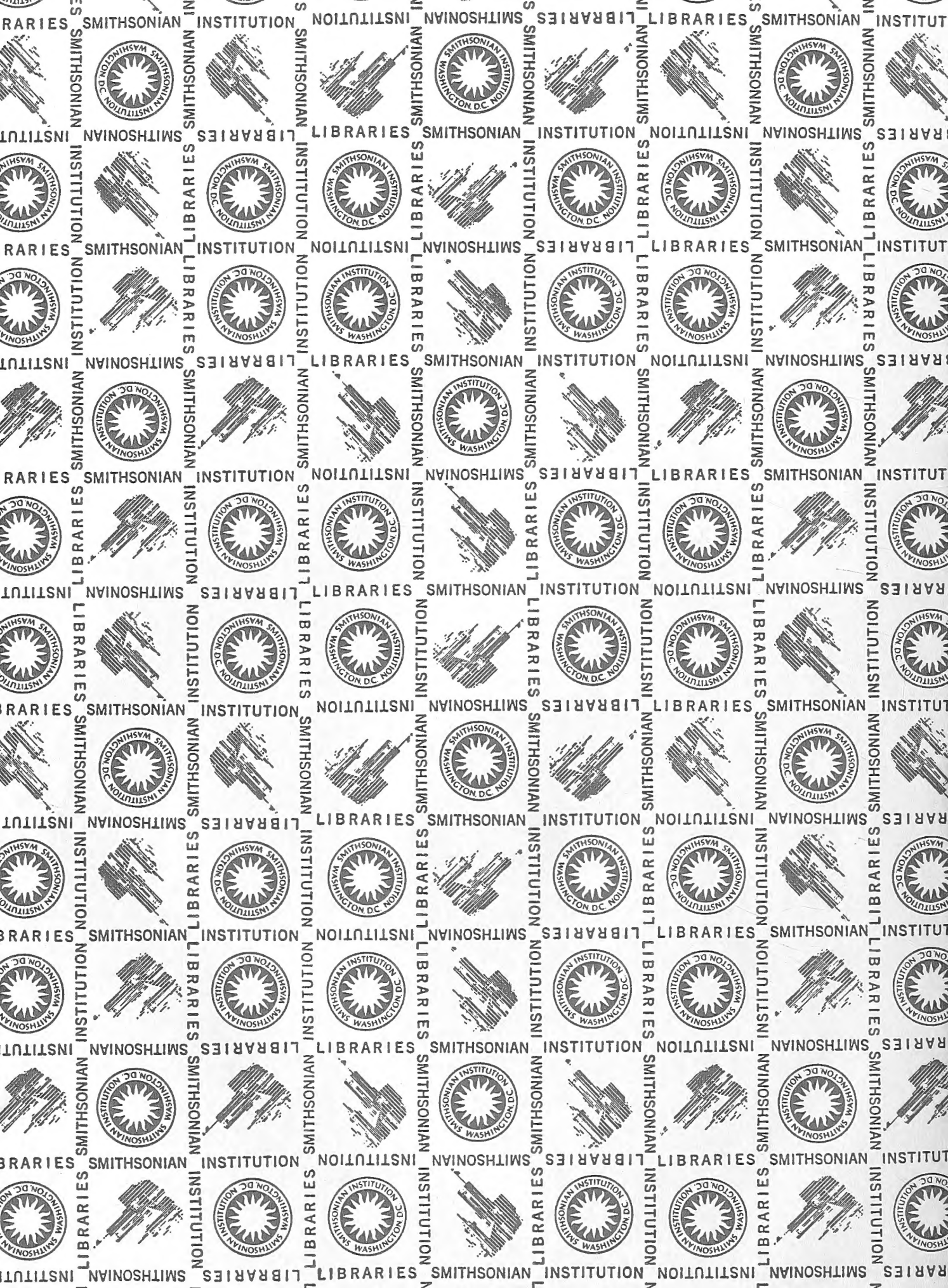
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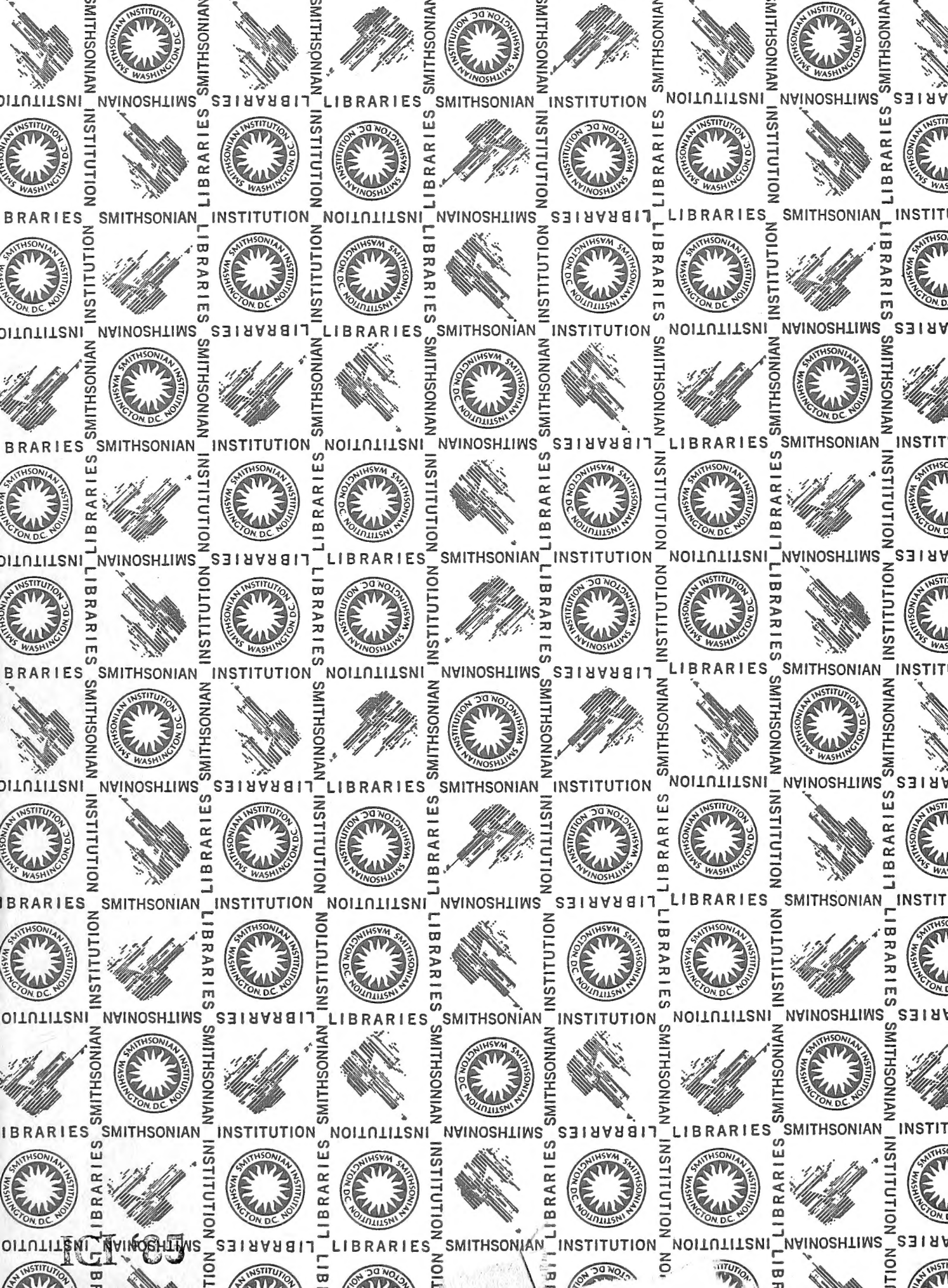
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