



**Southern California Association of
Marine Invertebrate Taxonomists**

3720 Stephen White Drive
San Pedro, California 90731

March, 1994

Vol. 12, No. 10 & 11

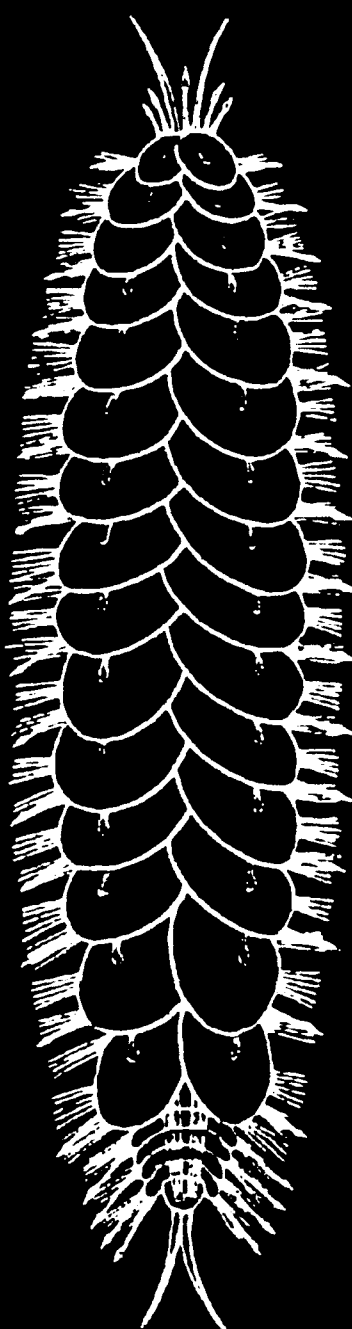
NEXT MEETING: Polynoidae

GUEST SPEAKER: Eugene Ruff, Ruff Systematics, Solana Beach,
CA

DATE: April 11, 1994

TIME: 9:30am-3:00pm

LOCATION: City of San Diego Marine Biology Laboratory,
San Diego, CA (map is included)



APRIL 11

The meeting in April will be on Polynoidae from the MMS Taxonomic Atlas of the Benthic Fauna of the Santa Maria Basin and Western Santa Barbara Channel. Please bring any specimens you need to have identified. The workshop will be lead by Gene Ruff and will be held at the City of San Diego's Marine Biology Laboratory, San Diego, CA.

Harmothoe imbricata: Light's Manual Third Edition; edited by
Ralph I. Smith and James T. Carlton

FUNDS FOR THIS PUBLICATION PROVIDED, IN PART, BY THE ARCO FOUNDATION, CHEVRON USA, AND
TEXACO INC.

SCAMIT Newsletter is not deemed to be a valid publication for formal taxonomic purposes.

MINUTES FROM MEETINGS ON FEBRUARY 28 & MARCH 14

The Southern California Academy of Sciences will be having their 1994 Annual Meeting, May 6-7 at the University of California, Irvine.

The X International Symposium on Marine Biology will be in Ensenada, Baja California, Mexico on June 13-17, 1994. The symposium will focus on topics related to: fisheries, marine ecology and resource management. Included in this newsletter is a letter from Dr. D. Reish and a copy of the registration form.

The Fifth International Polychaete Conference will be held at Qingdao, China in July 2-7, 1995. Information and a reply form have been included in this newsletter.

The Western Society of Malacologist meeting will be in June 26-30, 1994 at the Santa Barbara Museum of Natural History (SBMNH).

Larry Lovell suggested that Dr. Kirk Fitzhugh might need help moving the Allan Hancock Foundation polychaete collection to the Los Angeles County Museum of Natural History. Larry is thinking about organizing a Saturday SCAMIT moving party.

Preliminary results indicate that the slate of officers on the ballot will be elected to their positions for the upcoming year. They will assume their duties at the May meeting.

Don Cadien informed attending members that the Third California Island Symposium publication is available. If anyone is interested in a copy please contact the SBMNH. He also proposed for the upcoming EMAP project that there be information exchange and problem solving meetings for species encountered during this project. Don suggested meeting more than once a month to maximize the information interchange.

Two new publications were announced at the meeting:

Watling, L. 1991. Revision of the Cumacean Family Leuconidae. *Journal of Crustacean Biology*, 11(4): 569-582.

Kuck, H.G. and J.W. Martin. 1994. Redescription, Description for the Male, and New Distribution Records for the Homolid Crab *Paromola faxoni* (Schmitt) in the Eastern Pacific Ocean. *Journal of Crustacean Biology*, 14(1): 177-187.

Ron Velarde announced that the Master Species List is complete and everyone who is a SCAMIT member will receive a copy. The list will be updated on a yearly basis and non-members can receive a copy by contacting Ann Dalkey at:

Hyperion Treatment Plant
12000 Vista del Mar
Playa del Rey, CA 90293
tel. (310) 648-5611

CUMACEAN WORKSHOP FEBRUARY 28

Les Watling started the meeting by announcing that the final draft of the Cumaceans from the MMS Taxonomic Atlas of the Benthic Fauna of the Santa Maria Basin and Western Santa Barbara Channel is due to Jim Blake by the end of March. The rough draft is available to SCAMIT members. If anyone would like a copy contact Diane O'Donohue at City of San Diego, Marine Biology Lab MS-45A, 4077 N. Harbor Drive, San Diego, CA 92101 tel. (619) 692-4901. Most of the specimens were from deeper water and Les has been using scanning Electron Microscopy to photograph sections of specimens along with whole mounts. He has been successful with the larger more robust, i.e. calcified, animals. The more fragile animals had a tendency to collapse or peel during the prep. Les is looking for more suitable prep agents. On the following page is a list of names currently used by SCAMIT and appropriate manuscript names (note: these names are still in prep.).

The only other foreseeable change is that *Hemilamprops californica* Zimmer, 1936 has been changed to *H. californicus*.

MOLLUSCA WORKSHOP MARCH 14

Paul Scott started the meeting by discussing the Taxonomic Atlas of the Benthic Fauna of the Santa Maria Basin and Western Santa Barbara Channel. The standing order form for the atlas is included in this newsletter and depending on the production cost the price for each volume will vary from \$20 to \$50. The first volume is out and the second volume (sponges) will be available sometime in May.

The morning was spent examining *Parvilucina* and discussing Carole S. Hickman's article The Genus *Parvilucina* in the Eastern Pacific: Making Evolutionary Sense of a Chemosymbiotic Species Complex from *The Veliger*, Jan. 3, 1994, vol. 37(1), 43-61. Paul presented information about *P. tenuisculpta* Carpenter, 1864 vs *P. approximata* (Dall, 1901). He suggested looking at a suite of characters. *P. tenuisculpta* has shallow, narrow lunules in both valves, beaks low and hinge line slightly curved. Whereas, *P. approximata* has moderate depth and width lunules in both valves, beaks prominent and hinge line strongly curved. He will put something together for the next newsletter and suggested that everybody take a critical look at their *Parvilucina*'s and see if there are two different forms.

The afternoon was spent discussing the Family Eulimidae. Included in this newsletter is a handout entitled A Generic Revision of the Family Eulimidae (Gastropoda, Prosobranchia) by Anders Waren. In the handout, the Genus *Strombiformis* needs to be changed to *Eulima*. It was also determined that *Rhamphidonta* sp. A [Cadien, 1993] is *R. santarosae* (Dall, 1916).

FUTURE MEETINGS

The meeting on May 9 will be on Biological Illustrations with Dr. Jodi Martin leading the workshop. It will be held in the Times Mirror Room at the Los Angeles Natural History Museum, Los Angeles, CA.

The date and topic(s) for the June meeting have yet to be determined.

SCAMIT

Diastylis sp. A and D. sp. D (male)
Diastylis sp. B
Leptostylis sp. A
Leptostylis villosa
Leucon sp. H
Leucon sp. A
Epileucon sp. A
Campylaspis sp. P (male)
Campylaspis sp. E
Procampylaspis sp. A
Cumella sp. A

Manuscript names

D. serratocostata Watling & McCann, n. sp.
D. santamariensis Watling & McCann, n. sp.
L. calva Watling & McCann, n. sp.
L. abditis Watling & McCann, n. sp.
L. (Diaphonoleucon) declivis Watling & McCann, n. sp.
L. (Leucon) falcicosta Watling & McCann, n. sp.
Leucon (Crymoleucon) bishopi Bacescu, 1988
C. maculinodulosa Watling & McCann, n. sp.
C. blakei Watling & McCann, n. sp.
P. caenosa Watling & McCann, n. sp.
C. (Cumella) californica Watling & McCann, n. sp.

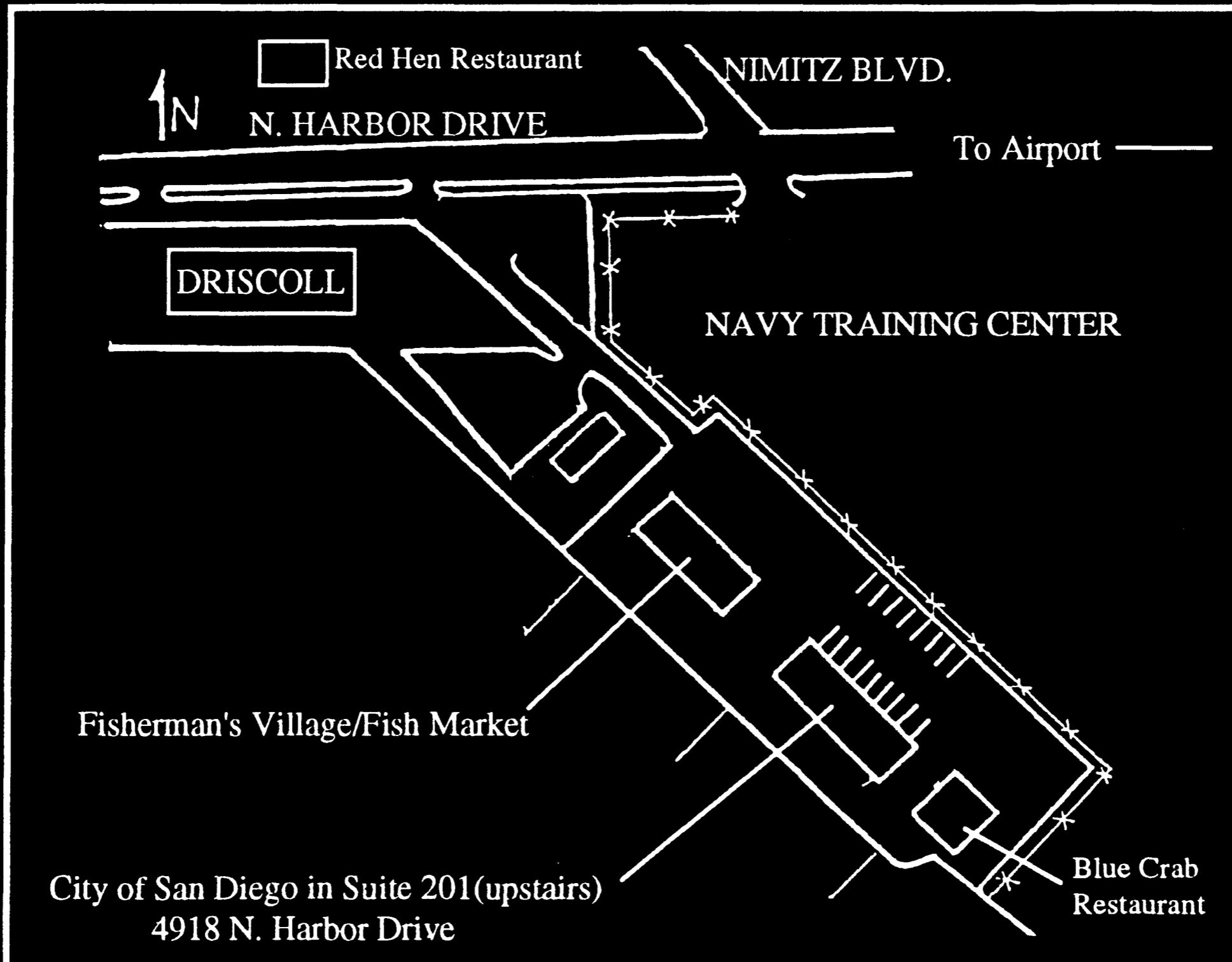
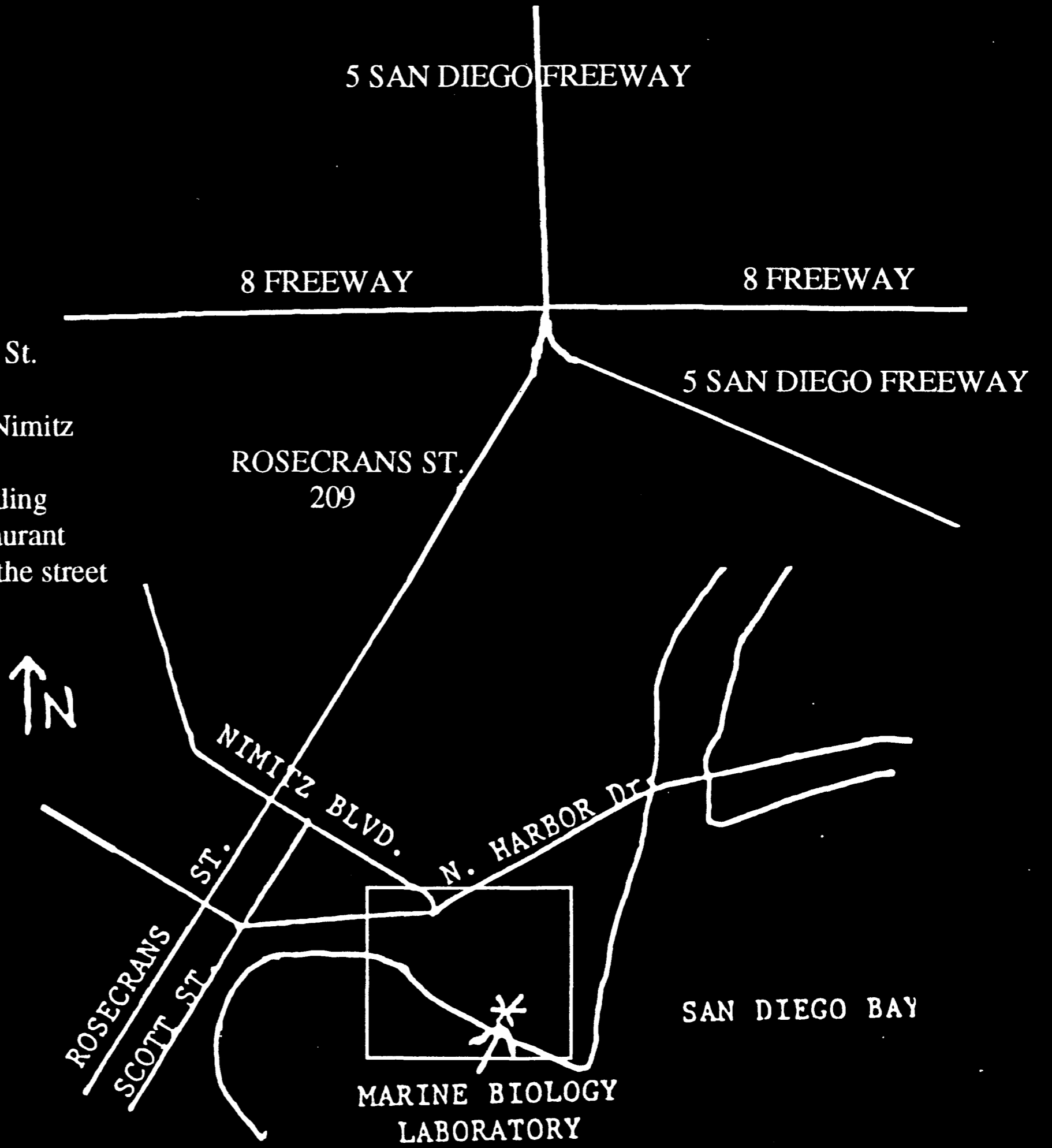
SCAMIT OFFICERS:

If you need any other information concerning SCAMIT please feel free to contact any of the officers.

President	Ron Velarde	(619)692-4903
Vice-President	Larry Lovell	(619)945-1608
Secretary	Diane O'Donohue	(619)692-4901
Treasurer	Ann Dalkey	(310)648-5611

CITY OF SAN DIEGO'S MARINE BIOLOGY LABORATORY

From North, take 5 South to Rosecrans St.
(209)
Turn left on N. Harbor Dr. (light after Nimitz
Blvd.)
The entrance will be after Driscoll building
(America III), look for Blue Crab Restaurant
sign; the Red Hen Restaurant is across the street



**TAXONOMIC ATLAS
OF THE BENTHIC FAUNA OF THE
SANTA MARIA BASIN AND
WESTERN SANTA BARBARA CHANNEL**

Standing Order Form

Name _____

Institution _____

Mailing Address _____

Phone number and fax number _____

Email address _____

I wish to have a standing order for the Taxonomic Atlas of the Santa Maria Basin and Santa Barbara Channel published by the Santa Barbara Museum of Natural History. I understand volumes will be sent to me as they are produced, and I will receive a 10% discount off the list price. All invoices will be paid within 30 days of receipt of the volume. If the publication is deemed unsatisfactory, it may be returned at no cost.

Signature _____ Date _____

Please return to:

Paul Scott
Santa Barbara Museum of Natural History
2559 Puesta del Sol Road
Santa Barbara, CA 93105
fax 805-569-3170



See ... for Announcements

CALIFORNIA STATE UNIVERSITY, LONG BEACH

DEPARTMENT OF BIOLOGY
(310) 985-4806

February 21, 1993

To: Marine Biologists

From: Donald J. Reish *Lon*

Re: X International Marine Biology Symposium

The tenth International Marine Biology Symposium will be held in Ensenada, Baja California, June 13-17, 1994. This symposium is co-sponsored by the Universidad Autónoma de Baja California, Universidad Autónoma de Baja California de Baja California Sur Southern California Marine Institute [the new name for Oceans Study Institute]. This symposium has been a very successful association with the universities of Baja California. The symposium will be held in the convention center of Ensenada which was the former Hotel Riviera del Pacifico.

Abstracts are due March 31, 1994 to Lon McClanaham on Terminal Island or they can be given to me. Lon and I will be going to Ensenada to make the final arrangements after March 31. Abstracts must be typed on a specific form which will then be photocopied. Arrangements are being made to publish submitted papers in Ciencias Marinas subject to peer review. I have a few of the forms as well as hotel information. Additional forms are available from Lon.

Funds have been made available to support five graduate students to attend and present a paper or poster. Each student will receive \$200.00; they must have the written support of a faculty member as well as presenting a paper or poster.

For further information consult Lon or me.



ENSENADA, B.C., DECEMBER 16, 1993.

for announcement

X INTERNATIONAL MARINE BIOLOGY SIMPOSIUM

Dear Congress Member:

The present is with the aim to send you a greating and let you know about the services and rates that "HOTEL CORONA" offers you as a head office of the Congress, that going to be the 13 thru the 17 of June 1994.

The Corona Hotel has been built thinking in your safety and comfort taken the most advance systems of security, prevent any catastrophe. The Hotel is located near to the see across from the Convention Center (Riviera del Pacifico Ex-Hotel).

The Hotel have 93 rooms with the following services:

- COMPLETED CARPETED
- PURIFIED DRINKING WATER
- POOL
- RESTAURANT
- PANORAMIC BALCONIES
- ELEVATORS
- GUARD
- SAFE BOX
- AIR CONDITIONER/HEATING
- PHONE
- PRIVATE PARKING LOT
- SATELLITE T.V.
- LOBBY BAR/LIVE MUSIC/GAMES ROOM

The four floors of the Hotel let see and enjoy the best view of the City and Harbor of Ensenada.

RATES:

SINGLE ROOM	1 KING bed/1 Person	\$38 DLLS + TAX
DOUBLE ROOM	2 QUEEN beds/2 People	\$38 DLLS + TAX
TRIPLE ROOM	2 QUEEN beds/3 People	\$43 DLLS + TAX

We offer you a Welcome Party in a Pool Area from 8 to 10 P.M. with typical drinks of our land. (Margaritas, Clamatos, Beers & tequilas).

Also we provide you with our Restaurant Menu, wich contain prices for Breakfast, Lunch & Dinner.

RESERVATIONS POLICY: Must be made two weeks prior arrival and prepaid one week before; in case of cancellation it must be 72 Hrs. prior arrival, if not one night of no show, will be charge to your deposit or to the credit card that is holding the reservation.

Thank you for thinking in us, its our commitment that our guest have a pleasant stay.

VERY TRULY YOURS,


JOSE JORGE GALVAN LASSARD
GENERAL MANAGER


LILIA E. NAVA ROMERO
RESERVATIONS

Fifth
**INTERNATIONAL
POLYCHAETE
CONFERENCE**

2-7 JULY, 1995

Qingdao
PEOPLE'S REPUBLIC OF CHINA



Dear Colleague,

You are cordially invited to participate in the Fifth International Polychaete Conference to be held from 2-7 July 1995 in Qingdao, China. The Fifth International Polychaete Conference is sponsored by the International Polychaete Association (IPA) and the organizing committee of the Fourth International Polychaete Conference and is hosted by Chinese Society of Oceanography; Qingdao Association for Science and Technology; The Department of Biology, The Hong Kong University of Science and Technology; and The Marine Ecology and Polychaete Laboratory of the First Institute of Oceanography, State Oceanic Administration.

The conference will include plenary sessions, oral presentation of research papers, and display of the posters. In addition, field trips to various parts of the Yellow Sea will be organized during the session.

We welcome all polychaete experts who may like to present papers or posters, but we also welcome non-experts who are friends of polychaetes and who may only want to come to meet with world polychaete scholars and enjoy the surrounding of Qingdao. All participants are regarded as formal delegates and share the privilege of all activities of the conference.

Qingdao is a lovely port city; it is surrounded by miles of beautiful coast and fishing villages; the nearby Laoshan Mountain is a famous scenic resort. The first bathing beach at Huiquan Cove is one of the best bathing beaches in China and is characterized by a gentle slope and fine sand. The brand of Tsingdao Beer which is made with the Laoshan mineral water enjoys a worldwide fame. Qingdao is also the major base of oceanographic research with about half of all marine research institutions in China.

Attendees are urged to spend an extra week visiting the magnificent sights of China: The Great Wall, Forbidden City, the Summer Palace, Ming Tombs, Tiananmen Square etc. in Beijing; the Museum of terra cotta Army of the Emperor Qin ShiHuang in Xian; the lovely West Lake in Hangzhou; the beautiful mountains and waters in Guilin; and the beautiful port cities of Haikou and Sanya of Hainan Island in the South China Sea.

Organizing Committee of
The Fifth International Polychaete Conference

CHAIRPERSON OF THE INTERNATIONAL ASSOCIATION OF POLYCHAETES

Dr. Pat Hutchings

ORGANIZING COMMITTEE OF THE FIFTH INTERNATIONAL POLYCHAETE CONFERENCE

Co-Convenor:

Prof. B. L. Wu

- First Institute of Oceanography, SOA, China

Prof. F. S. Chia

- The Hong Kong University of Science and Technology,
Hong Kong

Secretary General:

Dr. P. Y. Qian

- The Hong Kong University of Science and Technology,
Hong Kong

ADVISORY COMMITTEE OF THE FIFTH INTERNATIONAL POLYCHAETE CONFERENCE

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Hutchings, Pat.

- Australian Museum, Sydney, Australia

Kung, Shain-dow

- Pro-vice-chancellor for Academic Affairs, The Hong Kong University of Science and Technology, Hong Kong

Reish, D. J.

- Department of Biology, California State University,
Long Beach, California, USA

Shi, J. S.

- Vice Chairman of the Standing Committee of Qingdao Municipal People's Congress, PRC

Tseng, C. K.

- Honorary Director, Institute of Oceanography,
Academia Sinica, Qingdao, PRC

Yan, H. M.

- Minister, State Oceanic Administration, PRC

DEADLINES

July 1994

Second Circular will be sent only to those who have requested it on the reply form included with the First Circular.

1 December 1994

Booking for post-conference excursions

1 February 1995

Submission of abstracts

1 May 1995

Notification of acceptance for oral or poster presentation

2 July 1995

Submission of manuscripts for review and publication

REGISTRATION FEES

US\$200 before 30 November 1994

US\$250 after 01 December 1994

50% discount of the registration fee for students & accompanying persons.

Registration fee includes all conference materials, proceeding programme, reception, tea & coffee breaks, and mid-conference tours.

SYMPOSIUM VENUE

All conference sessions will be held in the Yi-Fu Academic Hall at the Ocean University of Qingdao. The Academic Hall, completed only a year ago, was furnished with the latest conference facilities and funded with a generous donation of Hong Kong Film enterpriser Yi-Fu Shaw.

CONFERENCE PROGRAMME

English will be the official language for the entire conference and no translation facilities will be available. Details of scientific program, registration and abstract forms will be provided in the Second Circular.

ACCOMMODATION

Dormitories at modest rates at both the Ocean University of Qingdao and the First Institute of Oceanography are available for students and delegates. A variety of restaurants, major hotels and shops are within walking distance to the Yi-Fu Academic Hall.

Some close by Hotels:

Hui-Quan Hotel: US\$110/night

Huanghai Hotel: US\$80/night

Badaguan Hotel: US\$85/night

All hotel rooms are provided with two beds, telephones, TV set and washrooms; and can be shared by two persons.

MID- AND POST-CONFERENCE EXCURSIONS

The following tours are being planned but subject to change. The number of participants is limited. More detailed information and post-conference tour cost will be given in the Second Circular.

a. Mid-conference tours (no charges to delegates)

Two mid-conference tours will be organized. All will take a whole day and lunch will be provided.

1. Laoshan Mountain (Beijiu Shui and Xiaqing Gong) and city tour.
2. Polychaete collection around the local coast area (intertidal zone, rocky shores and sand beaches).

b. Post-conference tours (Non-Scientific)

1. Qingdao - Shanghai - Hangzhou - Guilin. 8 days
2. Qingdao - Shanghai - Hangzhou - Shanghai. 5 days
3. Qingdao - Beijing. 3 days
4. Qingdao - Xian - Beijing. 5 days
5. Qingdao - Xiamen - Haikou - Sanya. 7 days



TRAVEL

There are several Domestic and International airlines connected Qingdao directly to Beijing, Shanghai, Guilin, Xian, Haikou, Sanya, Hong Kong, Seoul.

REPLY FORM AND SECOND CIRCULAR

To receive the second circular, you must complete the enclosed reply form and returned it to the address indicated on the Form as soon as possible. The Second Circular will include abstract form for oral or poster presentation.

CONTACT PERSON

Prof. B. L. Wu

Marine Ecology and Polychaete Laboratory

First Institute of Oceanography, State Oceanic Administration

3A Hongdaozi Road, Qingdao, People's Republic of China

Tel. 86-0532-2866810

Fax. 86-0532-2879562

FIFTH INTERNATIONAL POLYCHAETE CONFERENCE

2-7 JULY 1995

REPLY FORM

FAMILY NAME: _____ GIVEN NAMES: _____

TITLE(DR/PROF/ETC): _____

AFFILIATION: _____

ADDRESS: _____

TEL: _____ FAX: _____ E-MAIL: _____

(PLEASE CIRCLE AS APPROPRIATE)

- 1 I wish to attend the conference. Please send me more information when available
- 2 I wish to participate in the mid conference excursion
- 3 I wish to participate in the post-conference excursion
- 4 I intend to submit a paper entitled _____

for **Oral presentation / poster display**

- 5 I wish to stay in: Hui-Quan, Huanghai, or Badaguan Hotel (Check one)
- 6 I wish to stay in the dormitories

PLEASE RETURN THE COMPLETED FORM TO:

Prof. B. L. Wu
Marine Ecology and Polychaete Laboratory
First Institute of Oceanography,
State Oceanic Administration
3A Hongdaozi Road, Qingdao
P. R. China

A GENERIC REVISION OF THE FAMILY EULIMIDAE

(GASTROPODA, PROSOBRANCHIA)

ANDERS WARÉN

*Department of Zoology, University of Göteborg
Box 25059, S-40031 Göteborg, Sweden*

SUPPLEMENT 13
THE JOURNAL OF MOLLUSCAN STUDIES
1983

DEFINITION OF THE FAMILY EULIMIDAE

It is impossible to give a brief definition of a group that is so variable and incompletely known as the family Eulimidae. A family is a unit based on a number of genera which are more related to each other than to other genera and every new genus tends to strain the limits. I have therefore restricted myself to giving a number of details partly shared by the genera known to me. The alphabetical list of the genera shows the variation of the family more completely.

Shell. Usually present. Colourless or brownish yellowish with brownish or yellowish markings. Often there are one or several scars from earlier positions of the outer lip (similar scars may also be found in Aclididae and Rissoinidae). The shape of the shell is most variable. Siphonal canal absent.

Larval shell. Brownish or colourless. In species with planktotrophic development it consists of 2.5-4 whorls and is rather slender.

There is no sculpture except in a few species which have extremely faint axial lines. It does not show any sinusigera characteristics.

Operculum. An operculum is present in all species with a solid shell, but is often lacking in species which are constantly attached to the host and have an inflated or less solid shell. Sometimes it has pegs, folds or other reinforcements.

Tentacles. Usually present. They are round, flat, or are fused to form a fold. Sometimes they are lacking. Eyes are usually present and situated basally, under the skin in the centre of each tentacle.

Radula. Present in *Hemiliostraca*, *Niso*, *Eulimostraca*, *Eulima* and some other genera. Ptenoglossate.

Proboscis. Present in all except a few of the most highly reduced endoparasites. Acrembolic.

Alimentary canal. Salivary glands present in some species. Oesophagus usually passing through the nerve ring anteroventrally in the body cavity. Stomach present in *Eulima*, but usually the oesophagus is gradually transformed into the midgut gland. Rectum often present.

Pallial oviduct. Open.

Penis. Present except in the most highly modified endoparasites. Seminal groove open.

Foot. Usually present, often with flaps which may cover the base of the shell. Propodium (mentum) well developed.

Way of life. Always parasitic, more or less permanently attached to the host (with two exceptions echinoderms), by the snout or proboscis.

I have earlier used the name Eulimidae to denote these gastropods without discussing whether they should be regarded as a family or a higher taxon. Previous authors have distinguished between a number of taxa, a list of which is given below. These range from subfamily to suborder. As I will show later, these groups can all be derived from the basic eulimid organization shown by *Eulima*, *Niso*, and *Melanella*. Therefore I have preferred to keep them in one family, Eulimidae. I have not made any attempts to divide Eulimidae into subfamilies.

Suprageneric names used for species here included in Eulimidae.

Eulimidae H. & A. Adams, 1853

Styliferidae H. & A. Adams, 1853

Entoconchidae Gill, 1871

Parasita Fischer, 1883 (Suborder)

Cochlosolenia Voigt, 1888 (Suborder)

Cochlosyringia Voigt, 1888 (Suborder)

Melanellidae Bartsch, 1917

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Styliferidae H. & A. Adams, 1853

Entoconchidae Gill, 1871

Parasita Fischer, 1883 (Suborder)

Cochlosolenia Voigt, 1888 (Suborder)

Cochlosyringia Voigt, 1888 (Suborder)

Melanellidae Bartsch, 1917

Enteroxenini Schwanwitsch, 1917

Pelseneeridae Rosén, 1910

Asterophilidae Thiele, 1925b

Thycinae Thiele, 1931

Paedophoropodidae Ivanov, 1933

Enteroxenidae Heding & Mandahl-Barth, 1938

Melanellacea Cotton, 1959

The systematic position of Eulimidae also has to be decided upon. Thiele (1931) placed the family, together with Aclididae and Pyramidellidae in Aglossa. The family Pyramidellidae has since been transferred to the opisthobranchs (Fretter & Graham, 1949). Not very much is known about the acclidids (cf. Sars, 1878, and Thiele, 1931), but the few facts available (ptenoglossate radula, presence of mentum, long proboscis, a pair of jaws carrying teeth on their edges) agree as well with epitoniids as with eulimids, except a supposed absence of a penis in Aclididae (A.W. pers. obs), a difference from eulimids. The genus *Thaleia* Warén, 1979(e) is similar to Eulimidae in many aspects, but has a very different radula and the organization of the alimentary canal is poorly known.

The ptenoglossate radula is shared with the epitoniids and some architectonicids, but these families differ in the organization of the alimentary canal, and lack a penis and mentum. The epitoniids have a hypobranchial gland secreting a purple dye and the architectonicids have a heterostrophic larval shell.

Also the family Trochaclididae (with a single known species) has a ptenoglossate radula, but has neither proboscis nor jaws and a trochiform shell and multispiral operculum.

No other gastropods show any similarities to the eulimids, except in non-specific characters, such as shell shape (several smooth Rissoinidae).

Therefore I regard the eulimids as a superfamily, containing a single family Eulimidae. The name Melanellacea was introduced by Cotton (1959) to include Melelanellidae and Stiliferidae and has to be changed to Eulimoidea.

TAXONOMICAL CONCEPTS IN EULIMIDAE

Generic level. The present concept of genus and subgenus in taxonomy is based on personal weighting of differences and similarities between species. Species which resemble each other very much are placed in the same subgenus and similar subgenera are brought together in genera. Numerous attempts have been made to

use numerical methods to arrange the species of certain groups in a hierarchy or to express relationships between them. Such methods are valuable, under the presumption that the evolutionary rate of morphological changes has been approximately uniform in the group and through time (Colless, 1970). I find it unrealistic to assume that the evolution of the eulimids has proceeded with an approximately uniform rate, but believe that speciation and radiation have been faster when certain levels of organization have been achieved and that the present opulence of species at certain levels and the scarcity or absence at others reflect this.

The morphological variation within the eulimids is at least as great as among the remaining prosobranchs. All organ-systems of prosobranchs are present in the primitive species and most may be lacking in others. Thus it becomes more difficult to discern relationships between groups.

Another additional difficulty is the present, scanty knowledge about the family. As it will be emphasized (cf. p. 5), it can be assumed that only a small part of the total number of genera and species is known.

Therefore, I have preferred not to use subgenera, but instead I have used very restricted genera. Probably several of them can be united as subgenera in the future, when more species are known and intermediate forms make a continuum of what now is seen as scattered groups. This way of working reduces the probability of classifying unrelated species together and is more easy to correct, than an exaggeration in the other direction.

As I have based my generic concept on relative characteristics, viz. resemblance between a number of species, compared with the remaining species of the family, it has been impossible to affix a "generic value" to certain details. Some characteristics, however, are almost invariably constant in a genus. (1) Host group. The species of a genus are usually restricted to a single class of echinoderms. Exceptions are *Vitreolina* and perhaps *Niso*. (2) Sexual strategy.

Relationships within the Eulimidae. Earlier authors have constructed more or less elaborate evolutionary schemes, based on a few genera, to show the relationships of the families here included in the Eulimidae (e.g. Vaney, 1913; Ivanov, 1952; Grusov, 1965). Grusov reduced the number of families to one, while Lützen in various papers has mentioned Stiliferidae, Pel-

seneeridae, Paedophoropodidae, and Entoconchidae. I here point out the problems connected with such arrangements, and arrange some genera, which I consider related, into groups.

When previous workers have outlined the systematics of the family they have used exclusively morphological similarities and differences, and only infrequently have they considered the possibility of convergence. Neither have they been aware of the high plasticity of the morphology of the eulimids. I give some examples to show this.

Presence or absence of a pseudopallium has been used to group the species. The pseudopallium is a collar-shaped enlargement of the snout, first described in *Stilifer* where it forms a sac-like wrapping covering all the shell, except the apical part. In one species of the genus, *S. astericola*, it is absent in the male phase which lives as an ectoparasite. A pseudopallium is present also in several other genera, e.g. in the male of *Stilapex montrouzeri* which lives under the shell of the female, in *Megadenus* spp. and in *Vitreobalcis holdsworthi*, where it protects the snail from the pedicellariae of the host (Warén 1980b). The presence of a pseudopallium is always associated with a more intimate relation with the host and therefore I suppose that the pseudopallia of different groups of eulimids, have evolved independently, probably to reduce defensive activities of the host. (A parallel to this is presumably the pedal flaps of *Pelseneeria*, *Pulicicochlia* and *Robillardia*.) I have therefore not paid as much attention to the pseudopallium as earlier authors.

Some authors have paid much attention to sexual strategy, when grouping the species into families. I later discuss the variation of sexual strategies in the eulimids and try to show that these are very much subject to selective pressure by predation. The presumed primitive protandric hermaphroditism in the family and the small changes necessary for a change from one strategy to another have made me doubt this characteristic for separating larger groups.

The proboscis is also highly variable, even within a genus (e.g. *Apicalia* (Warén, 1979c) and *Peasistilifer* (Hoskin, pers. comm.)), which might be expected, as it is directly connected with food uptake. High variability also occurs in other parts of the digestive system and the foot. Some other details in the anatomy, such as excretory system and circulatory system are too poorly known to be evaluated at present. This is also the case with the spermatozoa, which are known to vary even between the few species in

which they are known (Heding & Mandahl-Barth, 1938, Ivanov, 1949b).

One characteristic that has not been used earlier is the host specificity. I have emphasized earlier (p. 1) and discuss later (p. 19) that most eulimid genera show a high degree of group specificity in their choice of host. The only exception is found in the little modified genus *Vitreolina*. Therefore, I assume that the early eulimid genera had a low host-specificity. Certain species became more and more specialized and more firmly associated with certain hosts. They gave rise to new genera, that evolved parallel to their hosts and in response to other selective forces such as predation and conditions for the larvae.

In Tables 1-5 I have arranged all eulimid genera by host group. Each table comprises the parasites of one echinoderm class. At a first glance the contents of a table seem very heterogeneous, with genera representing all degrees of specialization. At a closer examination, however, it will be found that no genus is more similar to genera of other groups, than to certain genera in its own group. It will also be found that in several occasions a genus seems to be a more specialized form of another genus of its own group, as for example the following: *Paramegadenus* → (development of pseudopallium) → *Stilifer* → (loss of shell and coiling of the visceral sac) → *Asterophila*. *Megadenus* → (enlargement of pseudopallium) → *Gasterosiphon* → (reduction of proboscis and visceral sac) → *Diacolax*, *Entocolax*, *Entoconcha* → (total reduction or extroversion of alimentary canal) → *Thyonicola*, *Enteroxenos*. *Sabinella* → (development of snout, reduction of foot) → *Echineulima*. *Trochostilifer* and *Robillardia* have in common the oddly-shaped male shell and the strongly-developed pedal fold and may share an ancestor.

I do not believe that evolution has gone straight or directly as in the sequences above, but I find it likely that the genera of a sequence represent offspring of the same evolutionary branch. Other genera of the same host group may or may not represent other evolutionary branches.

Because of poor knowledge, it is still more difficult and hazardous to give any scheme for the evolution of the more unmodified eulimids, and I prefer to leave it. The attempts above, however, will support my opinion that all eulimids can be included in a single family, even though there exist vast morphological differences.

NUMBER OF SPECIES OF EULIMIDAE

There have been described about 1250 species of the groups here included in Eulimidae. About 425 of these names are based on fossil species. There have been described about 150 species from the North Atlantic, from the Caribbean and Mediterranean areas and northwards. A revision that I am working on presently has proved that these names are based on about 110 species, but the fauna of the area includes at least 260 species. The fauna of other areas is much less well known. From South America for example, only a dozen species have been described. Therefore, it can be assumed, although many of the described species are probably synonyms, that the total number of species will by far exceed the number of described species. The large number of species is not surprising when one considers the number of potential hosts (echinoderms about 6000 species). Although many eulimids are not host-specific, there are many echinoderms that are parasitized by several species of Eulimidae.

PALEONTOLOGICAL ASPECTS

Several species of *Eulima* have been described from the Triassic and Jurassic periods. I have examined the descriptions of these and find it hard to support their position in Eulimidae. Cossmann (1921) also arrived at the same conclusion. Sohl (1964), D'Orbigny (1842) and Holzapfel (1888) have in their treatments of the Cretaceous faunas listed typical eulimids. From this time, however, the eulimids are very poorly represented, both in number of species and specimens. In Paleocene faunas eulimids begin to become more common and in the Eocene Faunas they are represented by numerous genera (cf. Cossmann & Pissarro, 1904-06; Palmer, 1937). It is difficult to identify the old fossil genera with Recent ones, but there seems to be no doubts that most of the early tertiary species placed in *Niso* by von Koenen (1891), Cossmann & Pissarro (1904), Palmer (1937) and other authors really do belong here. I have examined Eocene specimens and I am not able to separate them from modern species. Cossmann (1921) and Cossmann & Peyrot (1918) gave the earliest appearance of *Niso* as late Cretaceous. Cossmann (1921) also gave this early date for *Eulima* (by him called *Subularia*). The original descriptions of e.g. *Eulima clara* Wade, 1926 and *Niso melanoides* (Leymerie, 1842) fit these genera rather well. I have not been able to identify any other modern genera from deposits older than middle Eocene.

SHELL

The shell of most primitive eulimids is straight, conical, with flat whorls, a polished surface and a high spire. Many species have a more or less coloured shell, marked with brownish bands or spots on a colour-less or yellowish background. These colour patterns are usually specific for the species, but fade in empty shells. I have, however, seen them in Eocene specimens.

Presence or absence of colour has sometimes been used to distinguish genera (Laseron, 1955), but I have observed several cases where species with coloured and colour-less shells belong to the same genus, judging from anatomical characters.

The shell is usually rather solid, more so than in most mesogastropods of comparable size and shape. The suture is very shallow and marked by a less transparent spiral band which constitutes that part of the whorl which is in contact with the preceding whorl. In many species the suture is so indistinct, that the lower part of the spiral band is more conspicuous than the real suture.

Bartsch (1917) used the term "false suture" for this line and I have adopted his use.

In most eulimids the surface of the shell looks smooth at the first glance, but when examined with a stereomicroscope and good illumination there can often be seen extremely fine spiral and/or axial striae. These are especially distinct when the light is reflected by the shell. This is not a real sculpture. SEM examination of some species with such a striation, proved that the surface was completely smooth, even at high magnification. Therefore I suppose that this striation is a refractive phenomenon, caused by the crystalline structure of the calcium carbonate. It is, however, a good taxonomical characteristic, on the species level.

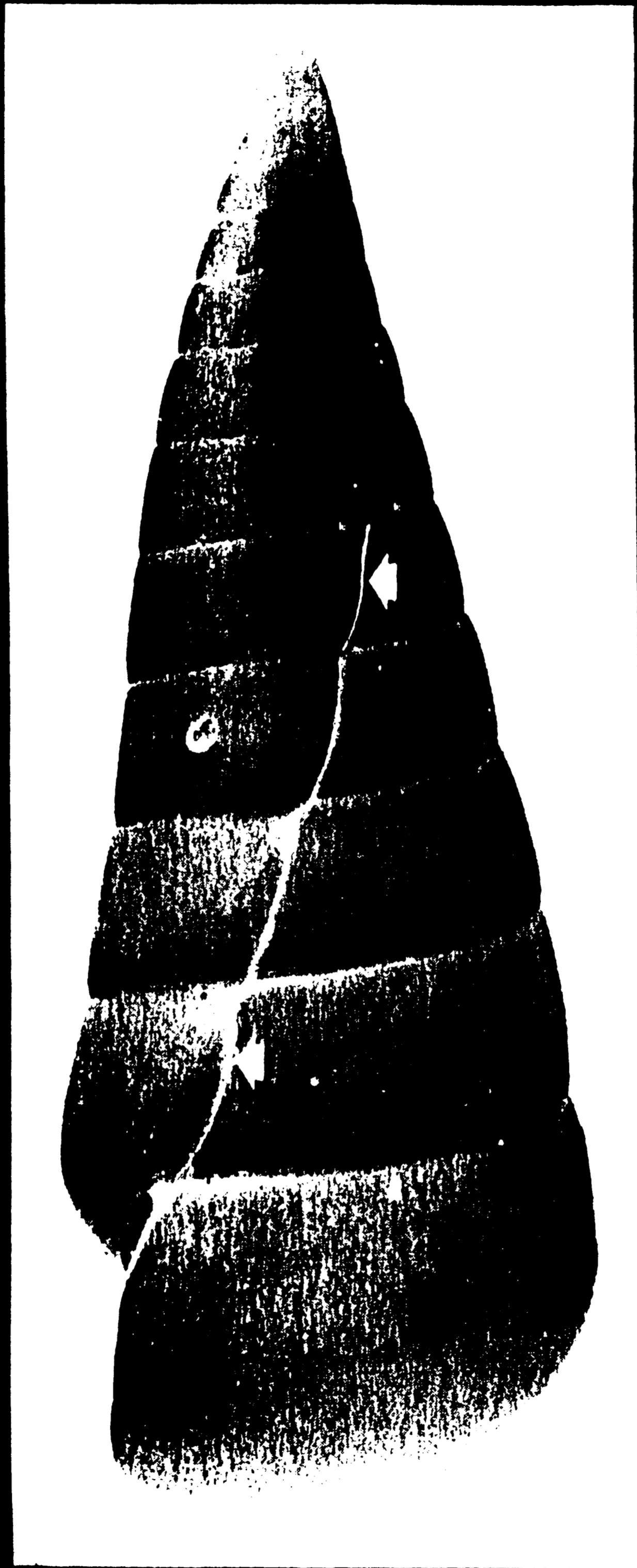


Fig. 22. *Melanella martini* (A. Adams in Sowerby, 1855), from Taiwan. Height 43 mm. Incremental scars placed in a line (marked by arrows).

In some eulimids, especially *Niso*, but also scattered among the slender species of other genera, there is a sculpture of regularly spaced, sharp, distinct, raised axial lines. These lines run almost straight, from suture to suture. They are never present in species with inflated shells, and they should not be confused with incremental lines, which usually run parallel to the outer lip. In some species there is also a normal sculpture.

Almost all eulimids have scars from earlier positions of the outer lip. These are formed by the growth pattern typical for eulimids: they grow rapidly 0.3-1 whorl and then they stay at that size for a considerable time. During this standstill in growth, the outer lip is thickened and when it starts growing again, there is left a scar marking the position and the shape of the old lip. These scars appear very regularly in some species, in others the intervals are variable.

In *Melanella martini* (A. Adams, 1855) some specimens have the scars in a perfect line, exactly one whorl from each other, while others have them scattered (cf. Fig. 22).

In some species with strongly-expanded apertures, e.g. *Oceanida* and *Auriculigerina*, these scars are very strong and may form varices or processes.

One detail of taxonomic importance in many genera is the profile of the outer lip (seen from the side). In some species it is projecting (in relation to the part immediately below) at the suture, in others it is retracted and in some more or less perpendicular.

Two genera have an umbilicus, *Niso* and *Microstilifer*. The umbilicus in *Niso* is broad and deep and penetrates the shell up to the larval shell in many species. These species also have a strong basal keel. In other species of this genus the umbilicus is more narrow and the base rounded, and some lack it completely.

In those species which anatomically may be regarded as more modified, the shell is usually less solid and more inflated. When scars are present, they usually represent a change in sex. Many of the odd genera such as *Bacula*, *Concavibalcis*, *Amamibalcis* etc. are still known from empty shells only, and it is not possible to say to what extent the oddness of the shells corresponds with deviations in the anatomy.

Family EULIMIDAE

Whorls flattened, suture not indented. The key is to genera.

- 1. Shell not conspicuously glossy; suture evident.....*Cythnia*
Shell polished; suture mostly indistinct..... 2
- 2. Apex mucronate, with minute pointed tip..... 3
Apex evenly tapering..... 5
- 3. Outline globose*Stilifer*
Outline ovate to conic..... 4
- 4. Spire bluntly rounded, outline ovate.....*Hypermastus*
Spire cylindrical, outline conic.....*Mucronalia*
- 5. Base umbilicate *Niso*
Base not umbilicate..... 6
- 6. Outline ovate*Turveria*
Outline conic to slenderly tapering..... 7
- 7. Periphery with a keel.....*Scalenostoma*
Periphery rounded, not keeled..... 8
- 8. Slender, many-whorled; aperture elongate.....*Eulima*
Blunt, relatively few-whorled; aperture short..... 9
- 9. Whorls inflated*Sabinella*
Whorls flat-sided 10
- 10. Inner lip smoothly appressed to body whorl.....*Balcis*
Inner lip slightly elevated from body whorl.....*Eulimostraca*

now Melanella

Key to Californian and Panamic genera (ex Keen, 1971)

Genus *Melanella* Bowdich, 1822

Shell elongate, white, with an oily, glossy surface. Whorls numerous, slightly convex. Apex sometimes bent to one side. Not umbilicated. *Eulima* Risso, 1826, is a synonym. Type: *dufresnii* Bowdich, 1822 (is *arcuata* Sowerby?). There are many named forms in this group, and their speciation is in need of revision. Some are parasites of holothurians, starfish and sea urchins.

Melanella micans (Carpenter, 1864) 1338
Carpenter's *Melanella*

Alaska to Baja California.

9 to 12 mm., rather straight, elongate, with about 15 flattened whorls. Parietal wall covered with a moderately thick glaze. Common; 1 to 30 fathoms.

(1339) The subspecies *borealis* Bartsch, 1917, occurring from Kodiak Island, Alaska, to Vancouver Island, British Columbia, is uniformly more slender. 12 whorls; length 11.3 mm.; width 3.3 mm.

Melanella rutila (Carpenter, 1864) 1340
Rutila Melanella

Vancouver Island to Baja California.

6 to 7 mm., straight, slender, polished. Periphery of the last whorl rounded, the base sloping in such a way as to lend the left outline a somewhat flattened appearance. Parietal wall with weak callus. Common; on starfish from 1 to 360 fathoms.



Other Pacific species:

1365 *Melanella* (*Balcis*) *montereyensis* (Trinidad to Monterey Bay), 5 mm.; *peninsularis* (1366) (San Diego to Magdalena Bay Baja California) 5 mm.; *lastra* (1367) (San Pedro to Magdalena Bay); *columbiana* (1368) (Baranoff Island, Alaska, to Departure Bay, British Columbia) 9.5 mm.; *comoxensis* (1369) (Comox Vancouver Island, British Columbia) 7 mm.; *macra* (1370) (Departure Bay to Seattle, Wash.) 7.5 mm.; *berryi* (1371) (Monterey Bay to Catalina Island, Calif.); *grippi* (1372) (San Pedro, Calif. to Point Abrejos, Baja Calif.) 8 mm.; *catalinensis* (1373) (San Rosa Island, Calif., to San Hipolito Point, Baja California) all Bartsch, 1917, *Proc. U.S. Nat. Mus.*, vol. 53.

1374 *Melanella* (*Balcis*) *thersites* Carpenter, 1864. Monterey California, to San Geronimo Island, Baja California. *M. bistorta* (Vanatta, 1899) and *M. lowei* (Vanatta, 1899) are synonyms.

1375 *Melanella* (*Melanella*) *randolphi* Vanatta, 1899. Alaskan Islands to Puget Sound. 7 mm.

1376 *Melanella compacta* Carpenter, 1864. San Pedro, California, to Point Abrejos, Baja California. 7 mm.

1377 *Melanella* (*Melanella*) *mexicana* Bartsch, 1917. Gulf of California to Acapulco, Mexico. 6.4 mm.

1378 *Melanella* (*Melanella*) *oldroydi* (San Pedro to Point Abrejos, Baja California) 9 mm.; *californica* (1379) (Catalina Island and San Martin, California); *hemphilli* (1380) (San Diego, California, to Point Abrejos, Baja California) 8.3 mm.; *tacomaensis* (1381) (Tacoma, Wash.) 5 mm., all Bartsch, 1917, *Proc. U.S. Nat. Mus.*, vol. 53.

1382 *Melanella* (*Sabinella* *Monterosata*, 1890) *bakeri* Bartsch 1917. San Diego, California. 2.7 mm.

1383 *Melanella ptilocrinicola* (Bartsch, 1907). Off British Columbia, 1,588 fms. 9.5 mm. Parasitic on the crinoid, *Ptilocrinus pinnatus*.

1384 *Melanella rosa* Willett, 1944. Off Redondo Beach, California, 125 fms. *Bull. So. Calif. Acad. Sci.*, vol. 43, p. 72.

1385 *Melanella* (*Balcis*) *titubans* (S. S. Berry, 1956). Anacapa Island, California, 46 to 58 fms. *Jour. Wash. Acad. Sci.*, vol. 46 p. 155.

1386 *Melanella* (*Balcis*) *delmontensis* (A. G. Smith and M. Gordon, 1948). Off Del Monte, California, 10 fms. *Proc. Calif. Acad. Sci.*, series 4, vol. 26, p. 219. 4.5 mm.

Genus *Strombiformis* Da Costa, 1778

Shell small, transparent, elongate, glossy, with an umbilical depression. Type: *glabra* (Da Costa, 1778). *Leiostraca*

H. and A. Adams, 1853, is a synonym. The genus name is masculine.

Strombiformis californicus Bartsch, 1917
Californian Melanella

1395

Catalina Island to San Diego, California.

11 mm., with 13 flat-sided whorls. Elongate, narrow, polished. Early whorls yellowish white, succeeding ones light-brown, marked with a dark-brown band at the periphery. A second band occurs a little below the middle of the whorl. Outer lip edged with brown. Pale-brown growth streaks present on whorls. Parietal wall callused. Uncommon; 14 to 60 fathoms.

Strombiformis almo Bartsch, 1917
Almo's Melanella

1396

Santa Rosa Island to San Diego, California.

7 mm., broadly elongate-conic, polished, whitish with a broad chestnut-brown band around the middle of the whorls. 10 whorls slightly convex. Uncommon; 53 to 113 fathoms on sandy mud bottom.

Genus *Niso* Risso, 1826

Shell flat-sided, acutely conic, with a glossy surface. Umbilicus deep. Outer lip simple. Operculum corneous, thin, transparent-tan. Type: *eburnea* (Risso, 1826), Pliocene of Italy. For a review of the Eastern Pacific species, see W. K. Emerson, 1965, *Amer. Mus. Novitates*, no. 2218.

Niso hipolitensis Bartsch, 1917
Hipolito Niso

1413

San Diego, California, to the Gulf of California.

3 mm., with 10 flat-sided whorls. Narrowly umbilicate. Apex yellowish white; base white with a broad median brown band. Anterior half of aperture white. Suture feebly impressed. Periphery of the last whorl angulated. Uncommon. See *Amer. Mus. Novitates*, no. 2218, figs. 9 and 10, by W. K. Emerson, 1965.

Other Pacific species:

1416 *Niso lomana* Bartsch, 1917. Santa Rosa Island to Point Loma, California.

Genus *Cythnia* Carpenter, 1864

Embedded in starfish. Similar to *Stilifer*, but the nuclear whorls are normal, not pupiform, and the operculum is multispiral. Type: *asteriaphila* Carpenter, 1857. *Cythna* is a misspelling. One United States species.

1427 *Cythnia albida* Carpenter, 1864. San Diego, southern California. Parasitic on starfishes.

1428 *Cythnia asteriaphila* Carpenter, 1864. Cape San Lucas, Baja California.