

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

Volume 11 — The Crustacea Part 2

The Isopoda, Cumacea and Tanaidacea



SANTA BARBARA MUSEUM OF NATURAL HISTORY

Santa Barbara, California

Research Published in this Volume was Supported by

**U.S. Department of the Interior
Minerals Management Service
Pacific OCS Region**

770 Paseo Camarillo
Camarillo, California 93010

Under
Contract No. 14-35-0001-30484

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

VOLUME 11

The Crustacea Part 2
The Isopoda, Cumacea and Tanaidacea

Edited by

James A. Blake
and
Paul H. Scott



SANTA BARBARA MUSEUM OF NATURAL HISTORY

Santa Barbara, California

QL
164
.662
1994
v.11

NATURAL HISTORY MUSEUM
OF LOS ANGELES COUNTY
library

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

Volume 11

The Crustacea Part 2 – The Isopoda, Cumacea and Tanaidacea

©1997

Santa Barbara Museum of Natural History

2559 Puesta del Sol Road

Santa Barbara, California 93105-2936

Original Date of Publication: **20 May 1997**

All rights reserved.

This book may not be reproduced in whole or in part
for any purpose whatever, without written permission from the publisher
(Santa Barbara Museum of Natural History).

Printed and bound by Alternative Graphics, Goleta, California

Production editor, Adele Smith

Layout by Marie Murphy

Cover photograph by Ron McPeak: An undescribed species of Idoteidae from central California. Photograph digitally
enhanced by Marie Murphy and Paul Scott.

Library of Congress Cataloging in Publication Data

Library of Congress Catalog Card Number 94-68651

ISBN 0-936494-16-6 (Volume 11)

ISBN 0-936494-21-2 (14 Volume Set)

Table of Contents

1.0 THE ORDER ISOPODA	1
1.1 INTRODUCTION TO THE MARINE ISOPODA	1
Introduction	1
Summary of Isopod Research in Northeast Pacific Region	2
General Isopod Anatomy	2
Glossary of Technical Terms	5
Phyletic Key to the Suborders of Isopod (Adults)	7
1.2 DESCRIPTIONS OF THE SPECIES OF THE SUBORDERS ANTHURIDEA, EPICARIDEA, FLABELLIFERA, GNATHIIDEA, AND VALVIFERA	9
Suborder Anthuridea	10
Key to the Families of Anthuridea	10
Family Anthuridae Leach, 1814	10
Key to the Genera of Anthuridae	11
<i>Amakusanthura californiensis</i> (Schultz, 1964)	13
<i>Cyathura munda</i> Menzies, 1951	13
<i>Haliophasma geminatum</i> Menzies and Barnard, 1959	15
Family Hyssuridae Wägele, 1981	18
<i>Kupellonura</i> sp. A	19
Family Paranthuridae Menzies and Glynn, 1968	21
<i>Paranthura elegans</i> Menzies, 1951	22
Suborder Epicaridea	22
Family Bopyridae Rafinesque, 1815	24
<i>Munidion pleuroncodis</i> Markham, 1975	25
Suborder Flabellifera	28
Key to the Families of Flabellifera	28
Family Aegidae Dana, 1853	30
Key to California Species of <i>Rocinela</i>	30
<i>Rocinela angustata</i> Richardson, 1904	31
Family Cirolanidae Dana, 1853	33
<i>Metacirolana joanneae</i> (Schultz, 1966)	34
Family Serolidae Leach, 1814	34
<i>Serolis carinata</i> Lockington, 1877	36
Family Tridentellidae Bruce, 1984	36
<i>Tridentella glutacantha</i> Delaney and Brusca, 1985	38
Suborder Gnathiidea	41
Key to the California Species of <i>Gnathia</i>	42
<i>Gnathia crenulatifrons</i> Monod, 1926	43
<i>Gnathia productatridens</i> Menzies and Barnard, 1959	43
<i>Gnathia sanctaecrucis</i> Schultz, 1972	43
<i>Gnathia tridens</i> Menzies and Barnard, 1959	47

Suborder Valvifera	47
Key to the California Families of Valvifera	47
Family Arcturidae G.O. Sars, 1897	50
<i>Idarcturus allelomorphus</i> Menzies and Barnard, 1959	50
Family Idoteidae Fabricius, 1798	53
Key to the Genera of Idoteidae	53
<i>Idotea (Idotea) rufescens</i> Fee, 1926	54
Key to Species of <i>Synidotea</i>	54
<i>Synidotea calcarea</i> Schultz, 1966	56
<i>Synidotea media</i> Iverson, 1972	56
1.3 THE SUBORDER ASELOTA	59
Introduction	59
General Morphology	60
Collection and Preservation	60
Laboratory Methods	61
Glossary and Terminology	61
Key to the Families of the Asellota and the Species	62
Description of Asellotan Species	68
Family Stenetriidae Hansen, 1905	68
<i>Stenetrium</i> sp. A	69
Family Munnidae Sars, 1897	71
<i>Munna</i> sp. A	71
Family Paramunnidae Vanhöffen, 1914	73
<i>Munnogonium cf. tillerae</i> (Menzies and Barnard, 1959)	73
<i>Pleurogonium</i> G.O.Sars, 1883	76
<i>Pleurogonium californiense</i> Menzies, 1951	76
<i>Pleurogonium</i> sp. A	78
Family Janiridae Sars, 1897	80
<i>Janiralata</i> sp. A	80
<i>Janiralata</i> sp. B	82
<i>Janiralata</i> sp. C	84
<i>Janiralata</i> sp. D (cf. <i>rajata</i>)	86
Family Joeropsididae Nordenstam, 1933	86
<i>Joeropsis concava</i> (Schultz, 1966)	88
<i>Joeropsis</i> sp. A	90
Family Munnopsidae Sars, 1869	90
<i>Eurycope californiensis</i> Schultz, 1966	92
<i>Belonectes</i> sp. A	94
<i>Ilyarachna acarina</i> Menzies and Barnard, 1959	96
<i>Munnopsurus</i> sp. A	98
<i>Munnopsurus</i> sp. B	100
Family Nannoniscidae Hansen, 1916	102
<i>Nannonisconus latipleonus</i> Schultz, 1966	102
Family Desmosomatidae Sars, 1897	104
<i>Momedossa symmetrica</i> (Schultz, 1966)	104
<i>Desmosoma</i> sp. A	106
<i>Prochelator</i> sp. A	108
Literature Cited	110

2. CUMACEA	121
Introduction	121
Cumacean Morphology	121
Classification	127
Key to the Families of Cumacea	128
Family Diastylidae	128
Key to the Diastylidae	128
<i>Diastylis sentosa</i> Watling and McCann, new species	130
<i>Diastylis crenellata</i> Watling and McCann, new species	131
<i>Diastylis quadriplicata</i> Watling and McCann, new species	133
<i>Diastylis santamariensis</i> Watling and McCann, new species	135
<i>Diastylis californica</i> Zimmer, 1936	135
<i>Diastylis pellucida</i> Hart, 1930	138
<i>Leptostylis calva</i> Watling and McCann, new species	139
<i>Leptostylis abditis</i> Watling and McCann, new species	140
Family Lampropidae	142
<i>Hemilamprops californicus</i> Zimmer, 1936	142
Family Leuconidae	144
Key to the Leuconidae	144
<i>Alloeoleucon santamariensis</i> Watling and McCann, new species ..	145
<i>Leucon (Diaphonoleucon) declivis</i> Watling and McCann, new species ..	147
<i>Leucon (Crymoleucon) bishopi</i> Bacescu, 1988	149
<i>Leucon (Leucon) falcicosta</i> Watling and McCann, new species	151
<i>Leucon (Leucon) armatus</i> Given, 1961	151
<i>Leucon (Leucon) magnadentata</i> Given, 1961	153
<i>Eudorella pacifica</i> Hart, 1930	155
<i>Eudorella redacticruris</i> Watling and McCann, new species	156
<i>Eudorella truncatula</i> Bate, 1856	156
<i>Eudorellopsis longirostris</i> Given, 1961	159
Family Nannastacidae	159
Key to the Nannastacidae	160
<i>Campylaspis canaliculata</i> Zimmer, 1936	161
<i>Campylaspis rufa</i> Hart, 1930	163
<i>Campylaspis rubromaculata</i> Lie, 1971	164
<i>Campylaspis maculinodulosa</i> Watling and McCann, new species .	164
<i>Campylaspis hartae</i> Lie, 1969	167
<i>Campylaspis blakei</i> Watling and McCann, new species	168
<i>Campylaspis biplicata</i> Watling and McCann, new species	170
<i>Procampylaspis caenosa</i> Watling and McCann, new species	172
<i>Cumella (Cumella) morion</i> Watling and McCann, new species	174
<i>Cumella (Cumella) californica</i> Watling and McCann, new species	175
Acknowledgements	176
Literature Cited	177
Attachment I	179
Attachment II	180

3. THE TANAIIDACEA	181
Introduction	181
Taxonomic History	181
External Morphology	182
Internal Anatomy	195
Development	195
Ecology and Biology	196
Zoogeographic Distribution	196
Depth Distribution	197
Materials and Methods	197
Abbreviations Used in Keys and Figures	198
Glossary	199
List of Species	202
Key to Families	203
Key to Genera and Species of Tanaidacea	204
Descriptions of Species	207
Suborder Apseudomorpha Sieg, 1980	207
Family Apseudidae Leach, 1814	207
<i>Carpoapseudes caraspinosus</i> Dojiri and Sieg, new species	207
Suborder Tanaidomorpha Sieg, 1980	210
Family Tanaidae Dana, 1849	210
<i>Zeuxo maledivensis</i> Sieg, 1980	210
Family Leptocheliidae Lang, 1973	213
<i>Leptochelia dubia</i> (Krøyer, 1842)	213
Family Paratanaidae Lang, 1949	218
<i>Paratanais intermedius</i> Dojiri and Sieg, new species	218
Family Anarthruridae Lang, 1971	220
<i>Siphonolabrum californiensis</i> Dojiri and Sieg, new species	220
<i>Paraleptognathia cf. gracilis</i> (Krøyer, 1842)	224
<i>Paraleptognathia bisetulosa</i> Dojiri and Sieg, new species	226
<i>Scoloura phillipsi</i> Sieg and Dojiri, 1991	228
<i>Chauliopleona dentata</i> Dojiri and Sieg, new species	231
<i>Araphura breviaria</i> Dojiri and Sieg, new species	234
<i>Araphura cuspirostris</i> Dojiri and Sieg, new species	236
<i>Tanaella propinquus</i> Dojiri and Sieg, new species	239
Genus <i>incertae sedis</i> , Male species 1	242
Genus <i>incertae sedis</i> , Male species 2	242
Genus <i>incertae sedis</i> , Male species 3	245
<i>Leptognathia cf. breviremis</i> (Lilljeborg, 1864)	247
<i>Tanaopsis cadieni</i> Sieg and Dojiri, 1991	249
Family Typhlotanaidae Sieg, 1984	253
<i>Typhlotanais williamsae</i> Dojiri and Sieg, new species	253
<i>Typhlotanais crassus</i> Dojiri and Sieg, new species	256
Family Pseudotanaidae Sieg, 1973	258
<i>Pseudotanais makrothrix</i> Dojiri and Sieg, new species	258
<i>Pseudotanais californiensis</i> Dojiri and Sieg, new species	260
Literature Cited	265
APPENDIX	269
INDEX	275

Acknowledgments

This study was funded by the Pacific Outer Continental Shelf Region of the U.S. Department of the Interior, Minerals Management Service, Washington, D.C., under Contract No. 14-35-0001-30484. We deeply appreciate the continual support and patience of the staff at the Santa Barbara Museum of Natural History, as well as Fred Piltz and Frank Manago of the Minerals Management Service, Pacific OCS Region, without whom this series would not have been possible.

List of Acronyms

BRA	Refers to a station designation from the MMS Phase I Reconnaissance: Benthic Rocky, transect A/B.
BRC	Refers to a station designation from the MMS Phase I Reconnaissance: Benthic Rocky, transect C/D.
CAS	California Academy of Sciences, Department of Invertebrate Zoology, San Francisco, California, USA.
LACM	Natural History Museum of Los Angeles County, Los Angeles, California, USA.
MMS	United States Minerals Management Service.
SCAMIT	Southern California Association of Marine Invertebrate Taxonomists.
SBMNH	Santa Barbara Museum of Natural History, Santa Barbara, California, USA.
SDNHM	San Diego Natural History Museum, San Diego, California, USA.
USNM	United States National Museum. A historical designation for the National Museum of Natural History (NMNH), Smithsonian Institution, Washington, D.C., USA.

2. CUMACEA

by

Les Watling¹ and Linda D. McCann²

Introduction

Cumaceans are small crustaceans, generally ranging in size from 1 mm to 1 cm; however, a few species, such as *Diastylis goodsiri*, may be 3 cm or more in length. The Order Cumacea currently contains more than 1200 species worldwide. This is a sizable increase over the 770 species listed by Jones (1969). Of these, and including those described herein, 49 species are known from the Pacific coast of the United States. Many of the habitats where cumaceans are likely to be found, such as estuaries, shallow embayments, beaches, tidal flats, and the inner continental shelf, have not yet had their cumacean fauna documented. In contrast, the far less diverse cumacean fauna of the northeastern United States is completely known (Watling 1979).

Cumaceans are malacostracans, considered by many to be an order in the Superorder Peracarida, but considered by Watling (1983) and Schram (1986) to be a member of the Superorder Brachycarida. They are distinguished by the following combination of features: the carapace covers the first three or four, or rarely six, thoracic somites; the anterior margin of the carapace is extended in front of the head as pseudorostral lobes; the telson may be present, reduced, or incorporated into the last abdominal somite (pleonite); the eyes are confluent dorsally in all but a very few genera; the second antennae lack an exopod; and pleopods are absent in females (with the exception of one deep-sea species) and often reduced in number or absent in males (Fig 2.1).

Cumacean Morphology

The cumacean body is externally divided into carapace, thorax, and abdominal regions (Fig. 2.2). The carapace covers three, four, or rarely six, thoracic somites. Externally the body can then be seen to be divided into three regions, the carapace, the pereon (reduced thorax), and the abdomen or pleon. The pereon usually consists of five body somites, but fewer may be visible depending on the extent of the carapace. The abdomen always contains six body somites, of which pleonite 5 is usually the longest. An articulated telson may or may not be present terminally.

The carapace is expanded ventrally and laterally to form a branchial chamber. Each side of the carapace is produced anteriorly in the form of pseudorostral lobes which meet, but are not fused, in front of the head, forming a pseudorostrum (Fig. 2.2). Reaching to the end of, or projecting beyond, the pseudorostrum are the tips of the branchial epipods of the first maxilliped, which together form the branchial siphon, or exhalant canal, for the respiratory current. The pseudorostrum may be directed anteriorly at various angles, or be completely reflexed such that the branchial opening is dorsal. The lower margin of the pseudorostrum is incised to form a notch for the first antenna. Below this notch the carapace bears an anteroventral corner, which may be broadly rounded or produced into one or more teeth. Laterally and dorsally, the carapace may

¹Department of Oceanography and Darling Marine Center, University of Maine, Walpole, Maine 04573.

²Smithsonian Environmental Research Center, P.O. Box 28, Edgewater, Maryland 21037.

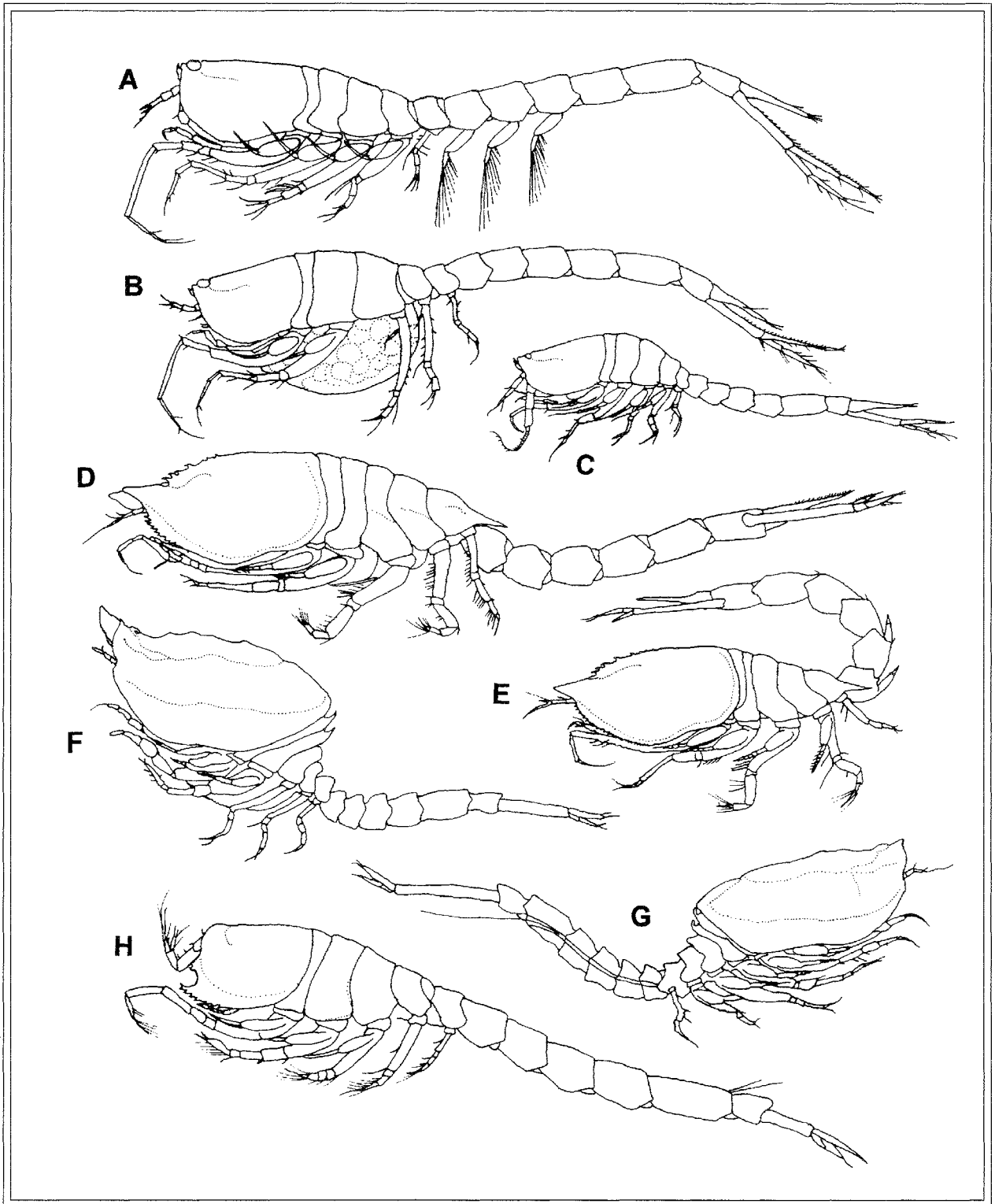


Figure 2.1. Representative cumaceans from various families likely to be encountered in the Santa Maria Basin Region: A, Lampropidae, mature male with elongate antenna 2; B, Lampropidae, female with eggs in brood pouch; C, Lampropidae, mature male with grasping antenna 2; D, Diastylidae, subadult female; E, Diastylidae, subadult male; F, Nannastacidae, subadult female; G, Nannastacidae, mature male; H, Leuconidae, subadult female.

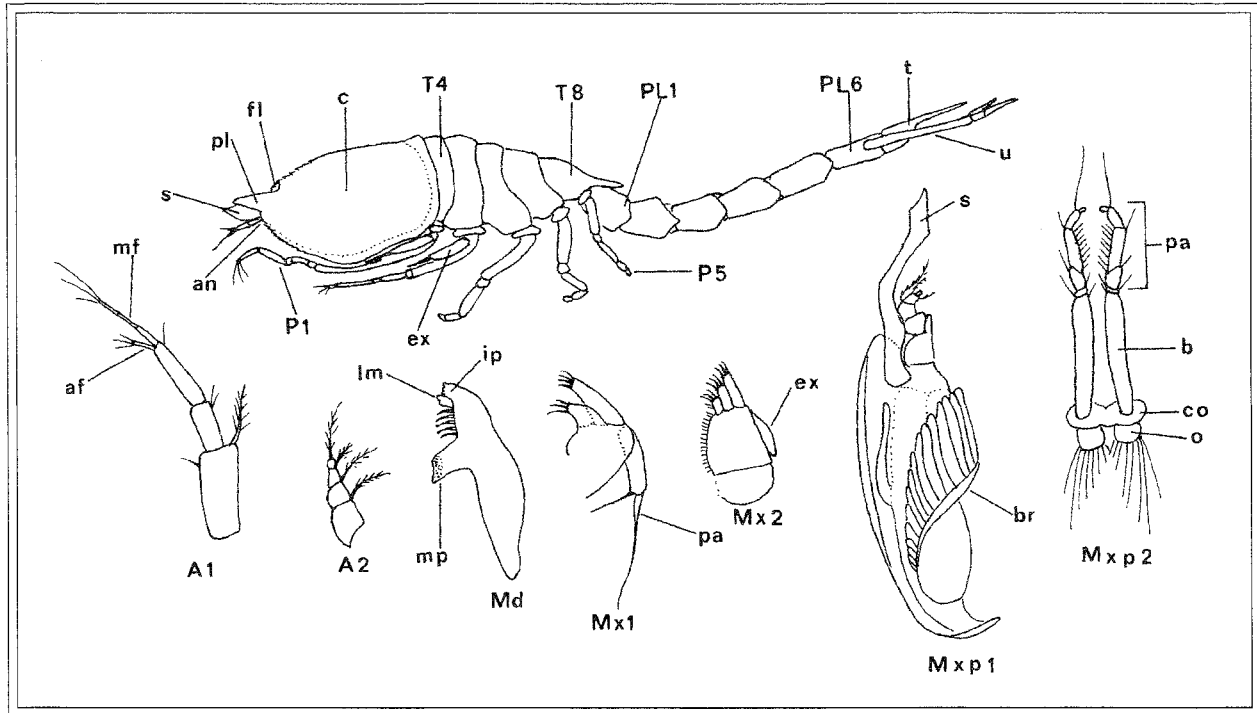


Figure 2.2. Side view of the cumacean body with details of the seven anterior head and thoracic appendages. A1, antenna 1; A2, antenna 2; Md, mandible; Mx1, maxilla 1 (maxillule); Mx2, maxilla 2 (maxilla); Mxp1, maxilliped 1; Mxp2, maxilliped 2; P1, pereopod 1; P5, pereopod 5; PL1, pleonite 1; PL6, pleonite 6; T4, thoracic somite 4 (=pereonite 1); T8, thoracic somite 8 (=pereonite 5); af, accessory flagellum; an, antennal notch; b, basis; br, branchial apparatus; c, carapace; co, coxa; ex, exopod; fl, frontal lobe; ip, incisor process; lm, lacinia mobilis; mf, main flagellum; mp, molar process; o, oostegite; pa, palp; pl, pseudorostrum; s, siphon; t, telson; u, uropod (from Watling, 1979).

be ornamented with tubercles, spines, ridges, or any combination of these. The side of the carapace may be depressed to form a sulcus (Fig. 2.1F, G). The ventral margin may be smooth or produced into a series of teeth or serrations. In males, the ventral margin is extended some additional distance ventrally to house the enlarged peduncle of antenna 2 (Fig. 2.1E).

Behind the pseudorostrum is the anterior-most part of the head, known as the frontal lobe (Fig. 2.2). The anterior part of the frontal lobe contains the eyelobe, which may be present even when eyes are absent. In some cases, especially in deep-sea species, the eyelobe may range in shape from extremely elongate to being completely absent. The frontal lobe ranges in shape from triangular to broadly rounded. It houses the brain and optic ganglia (when eyes are present) and provides the point of attachment for the first and second antennae. As in all crustaceans the head bears five pairs of appendages, viz., the first and second pairs of antennae, mandibles, and first and second pairs of maxillae.

The first antenna (Fig. 2.2, 2.3A,B) consists of a three-articulate peduncle, the distal-most of which bears two rami, a main flagellum of 2 to 6 articles, and an accessory flagellum (when present) of 1 to 4 articles. In several families, the accessory flagellum consists of a single article ranging in size from minute to nearly as long as the main flagellum. Occasionally, both flagellae are very small and their exact structure is difficult to determine using light microscopy. The main flagellum is often festooned with long sensory setae, especially in males of the genus *Leptostylis* (Fig. 2.3D).

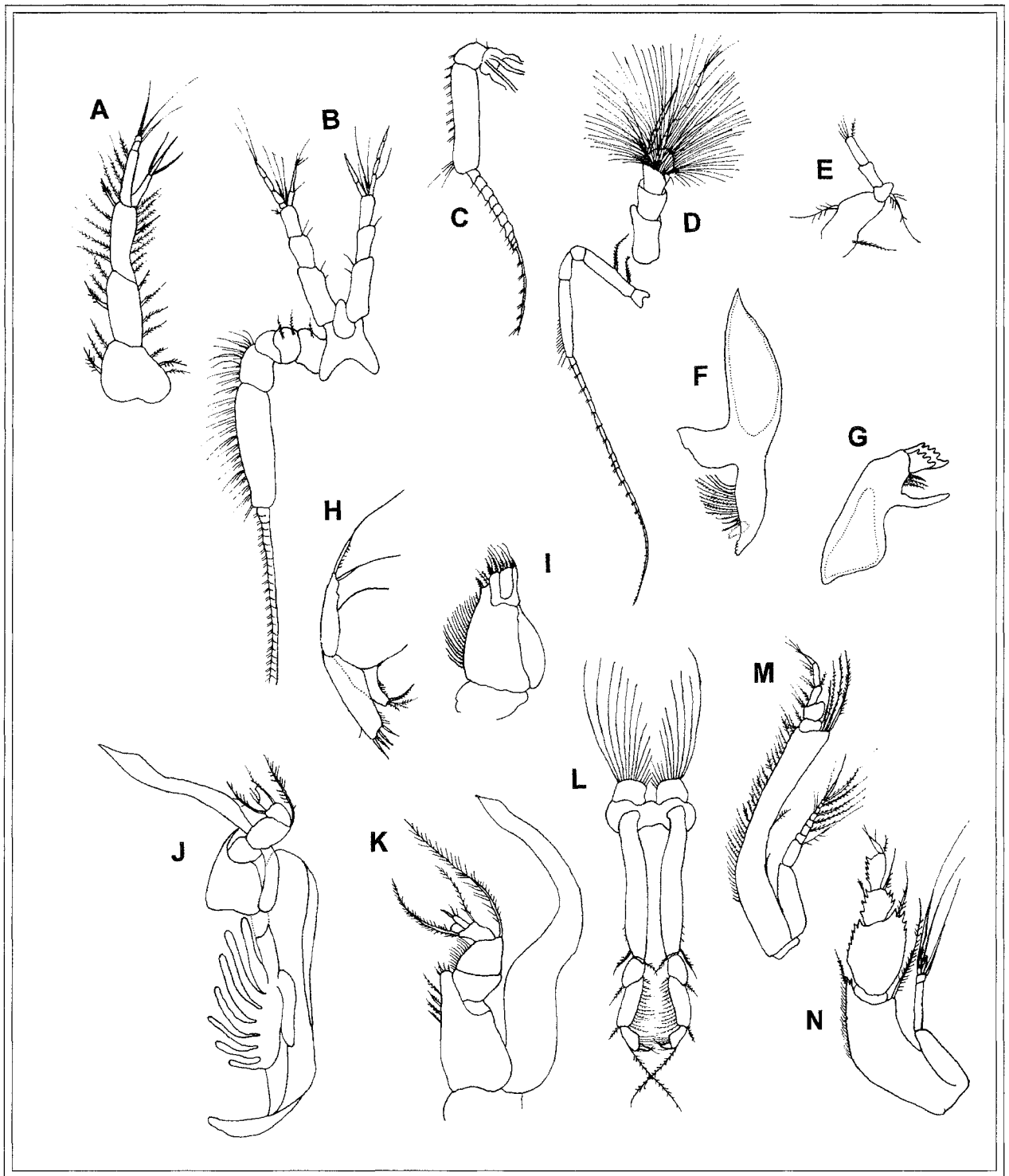


Figure 2.3.

Detailed views of selected cumacean head and anterior thoracic appendages. A, antenna 1 from female Leuconidae; B, antennae 1 and 2 from mature male Diastylidae (note enlarged peduncle article 5 and large setal brush on antenna 2); C, antenna 2 modified for grasping, from male of Lampropidae; D, antennae 1 and 2 from mature male of *Leptostylis* (note enlarged antenna 1 and setal brush on peduncle article 3); E, antenna 2 of female Diastylidae; F, mandible typical of most families; G, mandible from *Campylaspis*; H, a typical maxilla 1; I, a typical maxilla 2; J, maxilliped 1 with details of gill lobules from *Eudorella*; K, endopod of maxilliped 1; L, maxilliped 2 of *Diastylis*; M, maxilliped 3 of *Diastylis*; N, maxilliped 3 of *Campylaspis*.

The second antenna (Fig. 2.2) is generally rudimentary in the female (Fig. 2.3E) but may consist of as many as five articles. In the male, the structure of the second antenna changes with age and its final form is determined by the use to which it is going to be put. In the most typical form it consists of a five-articulate peduncle bearing a very long multi-articulate flagellum, peduncle articles four and five bear a strong brush of sensory setae, and peduncle article five is much longer than article four (Fig. 2.3B). In the immature male, the setal brush and elongate flagellum are not present; instead the second antenna is shaped like an elongate club. There are various modifications to this pattern, most of which appear to be related to the antenna functioning as a grasping device (Fig. 2.3C). In this case, the antenna is shortened, the setal brush is lost or reduced, and the smaller number of flagellar articles bear specialized setae on their anterior margin. Little is known about the sensory functions of the setae arming the second antenna, so the exact uses of this appendage cannot be predicted from its structure.

The mouth field is defined by the upper lip (labrum), paired mandibles, lower lip (labium), and paired first and second maxillae. In contrast to other small crustaceans, such as the amphipods, the upper and lower lip are of no taxonomic significance in cumaceans.

The cumacean mandible is a simple structure (Fig. 2. 2). In its basic form it consists of an elongate mandible body, a columnar molar process, an incisor process, and a row of setae with distal lacinia mobilis between the molar and incisor (Fig. 2. 3F). A palp is never present. The paired mandibles are connected by a transverse mandibular tendon to which the mandibular adductor and abductor muscles are anchored. Those mandibles having the elongate body are referred to as “boat-shaped.” In some families the mandibular body is reduced, with that portion dorsal to the molar being lost. In this case, the mandible is referred to as truncate. Cumacean mandibles usually have strongly columnar molars, used for crushing the material to be ingested. The Nannastacidae genus, *Campylaspis*, and allies have a recurved, stylet-like molar thought to be an aid to predation on foraminifers (Fig. 2.3G). Very few examinations of food habits have been made for cumaceans; consequently strong relationships between the structure of the molar and food sources cannot yet be made.

The first maxilla (maxillule) consists of a three-articulate protopod, the first and third articles of which bear terminally setose lobes (endites) (Fig. 2.2, 2.3H). There is a backwardly-directed palp of one article which bears either one or two setae. The palp extends into the anterior part of the branchial chamber, but its exact role is unknown.

The second maxilla (maxillula) consists of a three-articulate protopod, of which only the third is produced into an endite (Fig. 2.2, 2.3I). On the outer side of the appendage is a thin, flattened plate, considered to be the reduced exopod.

In cumaceans, the carapace generally covers the three most anterior thoracic somites. Only the first of these is thought to be fused with (or incorporated into) the head. However, the appendages of all three somites are modified and are termed maxillipeds. As with most crustacean thoracic legs, in cumaceans the basic form consists of a coxa immediately adjacent to the body, the basis, and five articles making up the endopod. The coxa may bear an epipod of varying size and the basis an exopod of no more than two articles (in those forms where the exopod bears long swimming setae, the second article is multi-annulate, not multi-articulate, as can be seen by examining the musculature). The basis is often elongated, with the exopod attached proximally and the endopod distally. The endopod is the most developed part of the limb and its articles are named ischium, merus, carpus, propodus, and dactylus, in consecutive order distally.

The first maxilliped, which is, in fact, the first thoracic appendage, is very highly modified (Fig. 2.2, 2.3J,K). The epipod is elaborated into a large branchial structure. Its posterior portion is composed of branchial lobules (gills) on a supporting lappet and its anterior part is extended to form, with its pair, the branchial siphon. The endopod normally comprises five articles and extends forward to aid in the manipulation of food near the mouth.

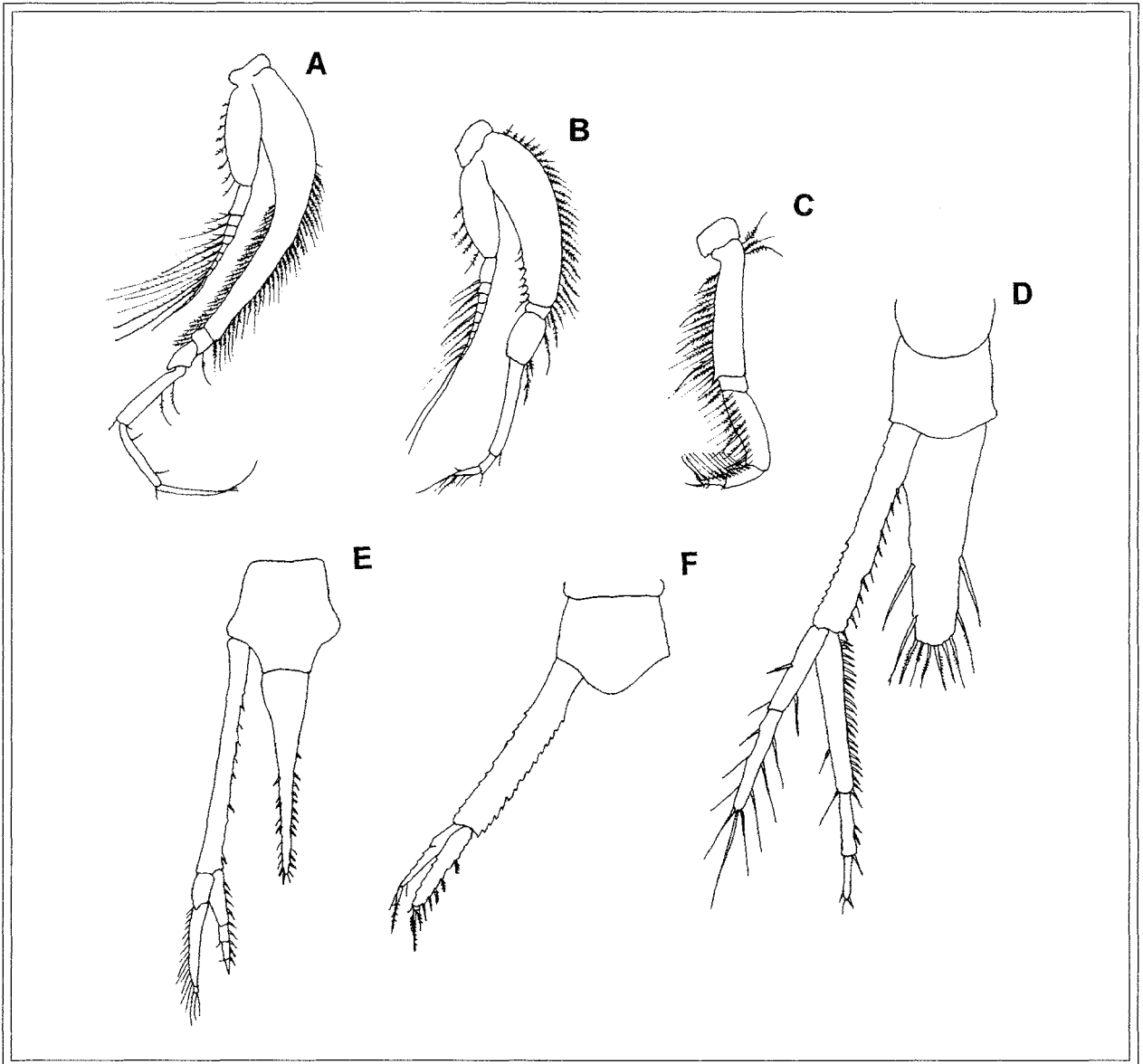


Figure 2.4. Detailed views of pereopods, uropods, and telons. A, pereopod 1 from Diastylidae; B, pereopod 2 from Diastylidae; C, pereopod 3 from Diastylidae; D, uropod and telson from Lampropidae; E, uropod and telson from Diastylidae; F, uropod from Nannastacidae (telson fused to pleonite 6).

The endopod of the second maxilliped is more elongate than in the previous appendage (Fig. 2.2, Fig. 2.3L). The epipod and exopod are both absent. In mature females a small pair of posteriorly-directed oostegites may be present.

The third maxilliped is even more leg-like than the second maxilliped (Fig. 2.3M,N). It consists of an elongate basis and five-articulate endopod, and often possesses an exopod. The shape of this appendage ranges from very elongate to broad and operculate. Whether truly opercular or not, the third maxilliped usually covers the ventral aspect of the mouth field.

Pereopod 1 is the first true ambulatory appendage, but is, in fact the fourth thoracic appendage (Fig. 2.4A). Its structure is much the same as for the third maxilliped, but the endopod is generally more elongate. An exopod is usually present. The remaining pereopods decrease in length and robustness posteriorly (Fig. 2.4B, C); exopods may or may not be present on pereopods 2 to 4. An exopod is never present on pereopod 5.

The appendages of abdominal somites 1 to 5 are known as pleopods, and are present (with a single exception in a deep-sea species) only in males. Depending on the family, there may be one to five pairs of pleopods, or they may be absent altogether.

The last pair of abdominal appendages are the uropods. They consist of a uniarticulate peduncle bearing two rami, the endopod and exopod (Fig. 2.4D-F). The exopod is always two-articulate, but the endopod may consist of one to three articles.

The cumacean body terminates with a telson, on the ventral side of which is located the anus and anal valves. In the Bodotriidae, Leuconidae, and Nannastacidae, the telson is very short and is fused to the sixth pleonite (Fig. 2.4F). Freely articulated telsons of varying length can be found in the other families (Fig. 2.4D,E).

Classification

Family Bodotriidae	Family Lampropidae*
Subfamily Bodotriinae*	Family Pseudocumatidae
Subfamily Vaunthompsoniinae	Family Diastylidae*
Subfamily Mancocuminae	Family Gynodiastylidae
Family Leuconidae*	Family Ceratocumatidae
Family Nannastacidae*	

The Order Cumacea is divided into 8 families. Those families and subfamilies dealt with in this atlas are marked with an asterisk.

Attachment I is a list of names that have changed between the original identifications as part of the MMS studies, and the present treatment.

Key to the Families of Cumacea with Species in the Santa Maria Basin Region

- 1A. With freely articulated telson 2
- 1B. Without freely articulated telson 3

- 2A. Telson with 0 or 2 terminal setae Diastylidae
- 2B. Telson with 3 or more terminal setae Lampropidae

- 3A. Uropod endopod uniarticulate Nannastacidae
- 3B. Uropod endopod 2-articulate 4

- 4A. Male with 0 or 2 pairs of pleopods, females with exopods on pereopods 1 to 3 Leuconidae
- 4B. Male with 5 pairs of pleopods; females with exopods only on pereopod 1 or on pereopods 1-4
..... Bodotriidae

Family Diastylidae

Diagnosis (as emended by Day, 1980). Mandible normally boat-shaped but rarely truncate. First maxilliped branchial filament with numerous leaflets. Exopods present on maxilliped 3 (except in *Paradiastylis*), and in females on pereopods 1 and 2, absent or rudimentary on pereopods 3 and 4, in males present on pereopods 1-4. Telson variable, usually large, often with long post-anal part, sometimes short and poorly armed, usually with 1 pair of terminal setae, occasionally with none. Uropods usually long and slender, endopod with 1-3 articles. Male antenna 2 with long flagellum, reaching at least to posterior margin of thorax. Males with 2 pairs of pleopods; no outer process on inner ramus.

Remarks. The Diastylidae are a family of predominantly cold-water favoring cumaceans. On a global basis, by far the greatest number of species are found at latitudes exceeding 30°N and S (Day, 1980). From Point Conception northwards to British Columbia (the Oregonian Province), 12 species are known to date. Most of these were described, or redescribed, by Calman (1912) and Zimmer (1926, 1936, 1943), with single additional species added by Hart (1930) and Lie (1971). In contrast, more than 40 species of diastylids are known from the North Atlantic, suggesting that the fauna from the boreal eastern Pacific is vastly under-represented. The present study has produced an additional 12 new species with sufficient material to provide adequate diagnoses, and another 7 probable new species represented by single specimens.

Key to the Diastylidae from the Santa Maria Basin Region

- 1A. Telson elongate, with 1 pair of lateral setae; male antenna 1 with club-shaped article 3 bearing many sensory setae *Leptostylis* 2
- 1B. Telson short, with 2 or more pairs of lateral setae; male antenna 1 elongate, with sensory setae on distal articles *Diastylis* 3
- 2A. Uropod exopod and endopod subequal in length *Leptostylis calva*
- 2B. Uropod exopod reaching only halfway along endopod terminal article *Leptostylis abditis*
- 3A. Carapace with spines, but no ridges 4
- 3B. Carapace with ridges, but no spines 5
- 4A. Carapace with 4 horizontal rows of spines; pereonite 1 not completely visible in lateral view
..... *Diastylis sentosa*
- 4B. Carapace with 1 row of horizontal spines; pereonite 1 completely visible in lateral view
..... *Diastylis paraspinulosa* Zimmer (not in text)
- 5A. Carapace with serrate or crenellate ridges *Diastylis crenellata*
- 5B. Carapace ridges smooth, not serrate 6
- 6A. Carapace with 2 oblique lateral ridges *Diastylis pellucida*
- 6B. Carapace with more than 2 lateral ridges 7
- 7A. Carapace with 3 lateral ridges, the area in front of the dorsal-most ridge slightly depressed; telson not reaching end of uropod peduncle *Diastylis californica*
- 7B. Carapace with 4 distinct lateral ridges and no horizontal ridges; telson reaching end of uropod peduncle
Diastylis quadriplicata
- 7C. Carapace with 4 oblique ridges of different lengths and a few horizontal ridges; telson not reaching to end of uropod peduncle *Diastylis santamariensis*

Genus *Diastylis* Say, 1818

Type Species. *Cuma rathkei* (Krøyer, 1841).

Diagnosis (after Sars, 1900 and Day, 1980). Carapace large, tumid, often armed with spiniform projections, sometimes also with lateral folds or ridges, but never with dorsal crest. Male antenna 1 article 3 not expanded distally, with sensory setae distally. Male antenna 2 flagellum extends to end of or beyond pleon. Third and fourth pereonites not coalesced. Basis of pereopods not widened in male and pereopods 2 and 3 not widely separated in ovigerous female. Pereopods 3 and 4 with rudimentary exopods or exopods absent in female. Male with 2 pairs of pleopods. Post-anal part of telson longer than pre-anal part. Uropod endopod 2- or 3-articulate.

Remarks. This is the oldest of all cumacean genera. It is represented in all cold and cold temperate seas of the world. Including those described below, 8 species are known from the Oregonian Province. A complete list can be found in Attachment II.

***Diastylis sentosa* Watling and McCann, new species**

Figure 2.5

Material Examined. Santa Maria Basin, Phase I stations 66, 201 m and 70, 200 m, 10 Nov 1983, and the following Phase II stations: Cruise 1-1, Nov 1986, Stas. R-2 (2), R-5 (4); Cruise 1-2, Jan 1987, Stas. R-2 (5), R-5 (31), PJ-1 (2); Cruise 1-3, May 1987, Stas. R-2 (7), R-5 (17); Cruise 2-3, Oct 1987, Stas. R-2 (2), R-5 (2), R-6 (1); Cruise 2-4, Jan 1988, Stas. R-2 (1), R-5 (33), R-6 (1), PJ-1 (3); Cruise 2-5, May 1988, Stas. R-2 (1), R-5 (15), PJ-1 (1); Cruise 3-1, Sep 1988, Stas. R-5 (2), PJ-1 (1); Cruise 3-4, May 1989, Stas. R-2 (2), R-4 (1), R-5 (23), R-6 (17), PJ-1 (2).

Description. Adult female and immature male, 6.5 mm. Carapace 2 times length of thoracic somites, posterior two-thirds broadly rounded, lobes separated dorsally by mid-dorsal furrow; ornamentation of thorn-like spines arranged in 4 rows running approximately horizontally and a fifth row paralleling posterior carapace margin; amongst large spines many short spines scattered over carapace; dorsolateral spine row continues anteriorly onto dorsolateral margin of pseudorostral lobes; eyelobe broad, bearing 2 spines; ventral margin serrate throughout length. Pereonite 1 not visible ventrally; with group of spines dorsolaterally. Pereonites 2-5 with pair of large dorsolateral spines; spines may also be present on lateral and ventral margins. Pleonites with lateral spines; pleonite 5 with lateral spines terminally and additional pair midway along segment length. Pereopod 1 elongate, extending well beyond pseudorostral lobes. Telson extending slightly beyond uropod peduncles; post-anal part about equal in length to pre-anal part; lateral margins with 3-6 setae. Uropod peduncle with few setae on medial margin; rami subequal in length; endopod of 2 subequal articles, with strong setae equally spaced along medial margin, terminal seta partially fused to distal article; exopod with 3 terminal setae, lateral margin with 3-5 evenly spaced setae. Adult male, 7.0 mm. Similar to female but carapace spines less pronounced, anterolateral corner below eyelobe with twin anteriorly directed spines. Pereonite 5 posteriorly produced, with 1 or 2 spines.

Remarks. This species belongs to a small group of northern and Arctic species characterized by the presence of a spiny carapace: *D. paraspinulosa* Zimmer, *D. spinulosa* Heller, *D. echinata* Bate, and *D. ornata* Lomakina. Of these, only *D. paraspinulosa*, originally described from the Bering Sea, has been recorded from Californian waters (Zimmer, 1943). *Diastylis sentosa* differs from *D. paraspinulosa* most noticeably in the following features: pereonite 1 is not completely visible in lateral view, there are at least four horizontal and one vertical row of spines on the carapace, and the telson bears only 4-5 pairs of lateral setae. It is quite likely that *D. paraspinulosa* has been mis-identified from southern California waters or has been only occasionally carried into these waters by the California Current. None of the specimens collected during this study are *D. paraspinulosa*.

Type Locality and Type Specimens. California, Santa Maria Basin, off Purisima Point, Sta. R-5 34°42.69'N, 120°50.83'W, 154 m, holotype USNM 273595, paratypes USNM 273596 and LACM 95-84.1.

Etymology. From Latin, *sentus*, = thorny, referring to the shape and arrangement of the spines on the carapace.

Distribution. Known from the Santa Maria Basin region to off Pt.Loma, San Diego; depth range, 92-410 m.

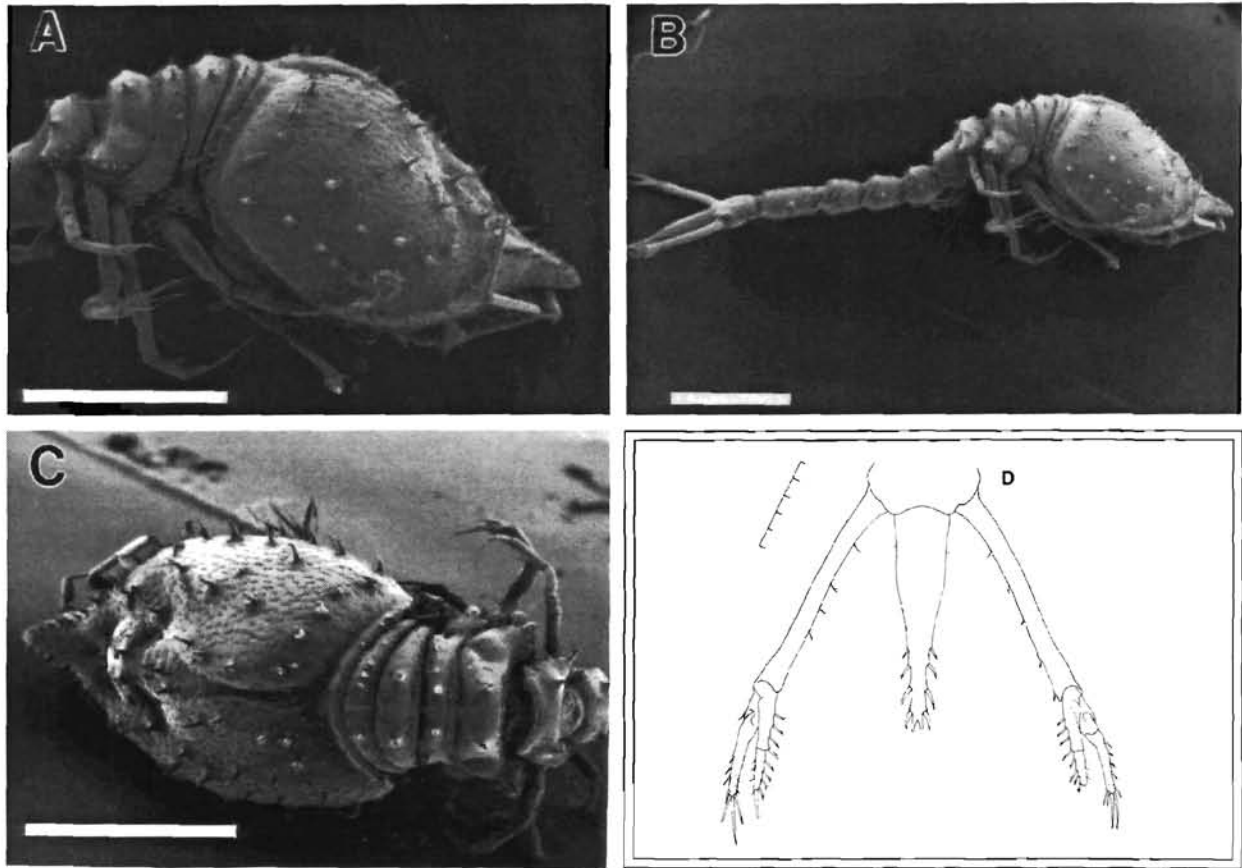


Figure 2.5. *Diastylis sentosa* Watling and McCann, new species. Female: A, carapace and pereonites, lateral view; B, body, lateral view; C, carapace and pereonites, dorsal view; D, telson and uropods. Scale, A-C = 1 mm, D = 0.5 mm.

***Diastylis crenellata* Watling and McCann, new species**

Figure 2.6

Material Examined. Santa Maria Basin, Phase II, Cruise 1-1, Nov 1986, Stas. R-1 (3), R-4 (43), R-5 (21), PJ-1 (7); Cruise 1-2, Jan 1987, Stas. R-4 (7), R-5 (39), PJ-1 (2); Cruise 1-3, May 1987, Stas. R-2 (1), R-4 (22), R-5 (29), R-8 (1), PJ-1 (21); Cruise 2-3, Oct 1987, Stas. R-1 (2), R-2 (3), R-4 (13), R-5 (36), R-9 (1), PJ-1 (10); Cruise 2-4 Jan 1988, Stas. R-1 (4), R-4 (11), R-5 (47), R-8 (3), PJ-1 (26); Cruise 2-5, May 1988, Stas. R-1 (3), R-2 (4), R-4 (44), R-5 (14), R-8 (4), R-9 (1), PJ-1 (14); Cruise 3-1, Oct 1988, Stas. R-1 (5), R-4 (61), R-5 (48), PJ-1 (21); Cruise 3-4, May 1989, Stas. R-1 (13), R-4 (51), R-5 (18), R-8 (29), PJ-1 (24).

Description. Adult female and immature male, 2.5 mm. Carapace twice length of pereonites 1-5; posterior margin extended strongly laterally to cover pereonites 1 and 2 ventrally; with three major serrate ridges, anteriormost originates middorsally behind frontal lobe, crosses onto pseudorostrum, eventually joining anterior horizontal extension of posterior ridge, latter originates dorsolaterally near anterior ridge, extends posteriorly, then descends laterally in wide sweeping arc toward anterior, ending near antennal angle, third ridge runs ventrally from anterior extension of posterior ridge to ventral margin; region of carapace behind posterior ridge covered with dirt and debris, creating roughened look; eyelobe and frontal lobe each with pair of small spines; ventral margin finely toothed. Pereonites 1-5 without spines; pereonite 5 with subacute

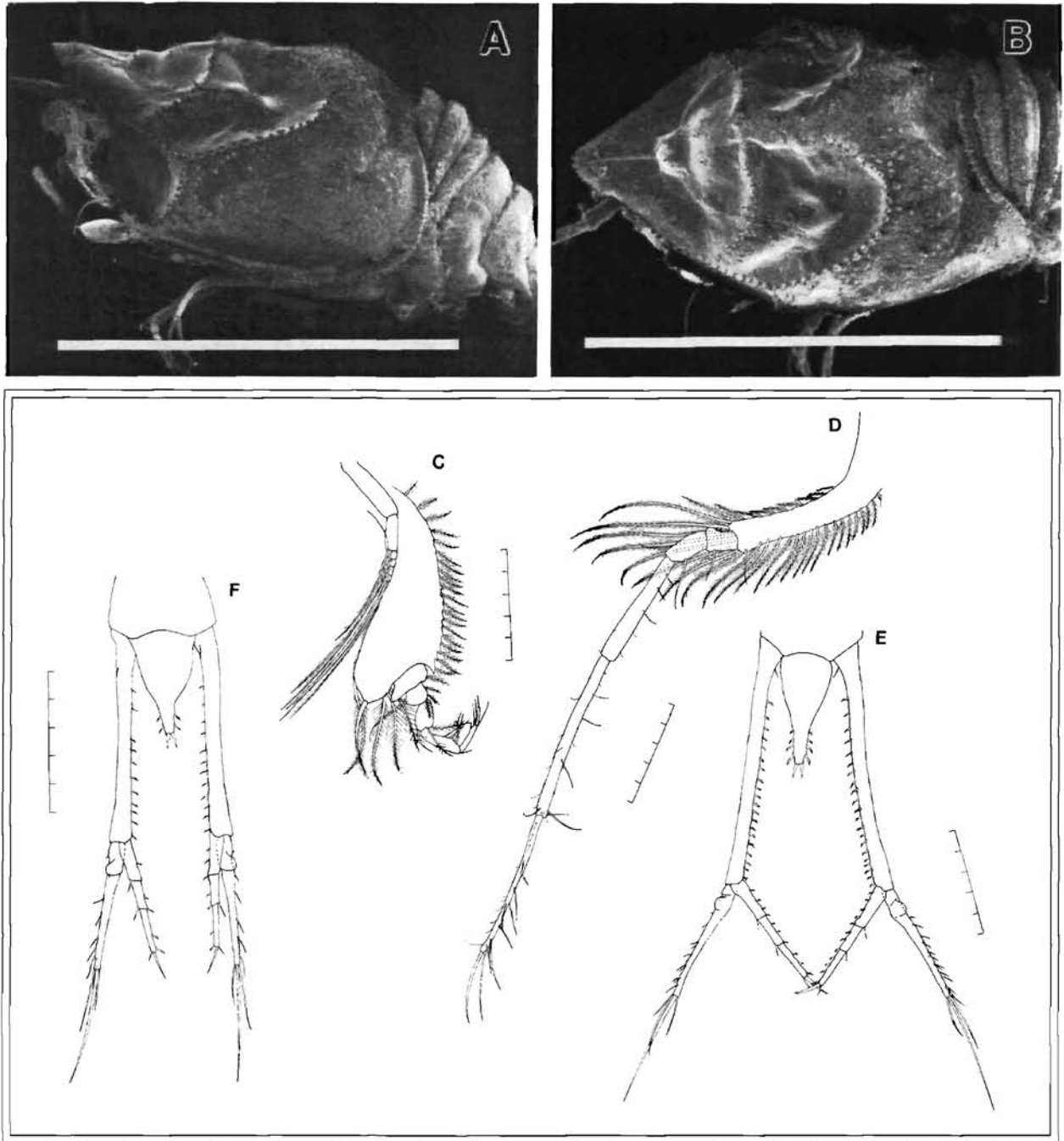


Figure 2.6. *Diastylis crenellata* Watling and McCann, new species. Female: A, carapace and pereonites, lateral view; B, same, dorsal view; C, maxilliped 3; D, pereopod 1; E, telson and uropods. Juvenile: F, telson and uropods. Scale, A,B = 1 mm, C-F = 0.5 mm.

posterior corners. Maxilliped 3 basis distal margin exceptionally broad, forming opercular-like cover to mouth field; distal margin with few long, very finely plumose setae; medial margin with thick row of short plumose setae; endopod articles small, together less than half length of basis. Pereopod 1 long and slender; basis slender, heavily armed with finely plumose setae; articles 6 and 7 subequal in length, together equal in length to rest of limb, with covering of simple setae throughout. Telson short, about 1.5 times length of pleonite 6; post-anal part slightly shorter than pre-anal part; lateral margins with 3-5 setae. Uropod peduncles more than twice length of telson; inner margins lined with closely spaced setae; exopod longer than endopod, outer margin with many short setae, armed terminally with 4 setae; endopod of 3 articles, subequal in length, with continuation of setal part from peduncle on inner margin, distal article armed terminally with single strong seta.

Remarks. This species is very close to *D. californica* Zimmer, but differs from it in the following features: while the ridge pattern is deceptively similar, *D. californica* does not have a ridge crossing the frontal lobe, the ridges are not serrate, and the posterior margin of the carapace covers pereonites 1 and 2 laterally whereas in *D. californica* it extends over only part of pereonite 1. The juveniles of this species have only a single pair of lateral telson setae, located subterminally, and have been identified in early benthic surveys from this region as *Leptostylis* sp. E. A second pair of lateral setae does not appear on the telson until at least the third juvenile stage.

Type Locality and Type Specimens. California, Santa Maria Basin, off Purisima Point, Sta. R-5 34°42.69'N, 120°50.83'W, 154 m, holotype USNM 273591, paratypes USNM 273592 and LACM 95-82.1.

Etymology. From Latin, *crenellus*, = embrasure, battlement, referring to the notches found at the top of the battlement, the pattern of which is seen on the carapace ridges.

Distribution. Known from the Santa Maria Basin region to off Pt. Loma, San Diego, depth range, 47-160 m, one record at 410 m.

Diastylis quadriplicata Watling and McCann, new species

Figure 2.7

Material Examined. Off Point Arguello Phase I station 071, 306 m; off Point Conception, 075, 293 m.

Description. Adult female and immature male, 4.5 mm. Carapace about half again as long as pereonites 1-5; pseudorostrum broadly triangular; major ornamentation consists of 4 folds or ridges, three of which are parallel and run dorsoventrally from vicinity of paired dorsolateral ridges; fourth dorsoventral ridge originates at junction of pseudorostral lobe with carapace; eyelobe small, without spines. Pereonite 1 nearly completely covered by posterior carapace margin. Pereonites 1-5 dorsal surfaces free of spines; posterior corner of pereonite 5 broadly triangular. Pereopod 1 articles 5-7 subequal in length. Telson very slightly shorter than uropod peduncles; post-anal part slightly longer than pre-anal part; lateral margins with 5-8 setae. Uropod peduncle about 20% longer than rami; endopod slightly longer than exopod, 3-articulate, basal article longer than distal, armed terminally with a single seta; exopod with two setae on medial margin, outer margin with several setae, armed terminally with 3 setae. Mature male unknown.

Remarks. This species belongs to a group of diastylids found predominantly in the northern cold waters of the Atlantic and Pacific, with some connection through the low Arctic. These species all have a series of parallel dorsoventral ridges on the carapace. The northern Atlantic species, *D. scorpioides* (Lepechin), *D. edwardsi* (Krøyer) and *D. lepechini* Zimmer, all have four ridges running the full dorsoventral distance and have serrate ridges on the frontal lobe and pseudorostrum. Four multi-ridged species are thus far known from the colder Pacific waters: *D. bidentata* Calman, *D. dalli* Calman, *D. alaskensis* Calman, and *D. pellucida* Hart. *Diastylis alaskensis* has six ridges that run nearly vertically dorsoventral rather than obliquely

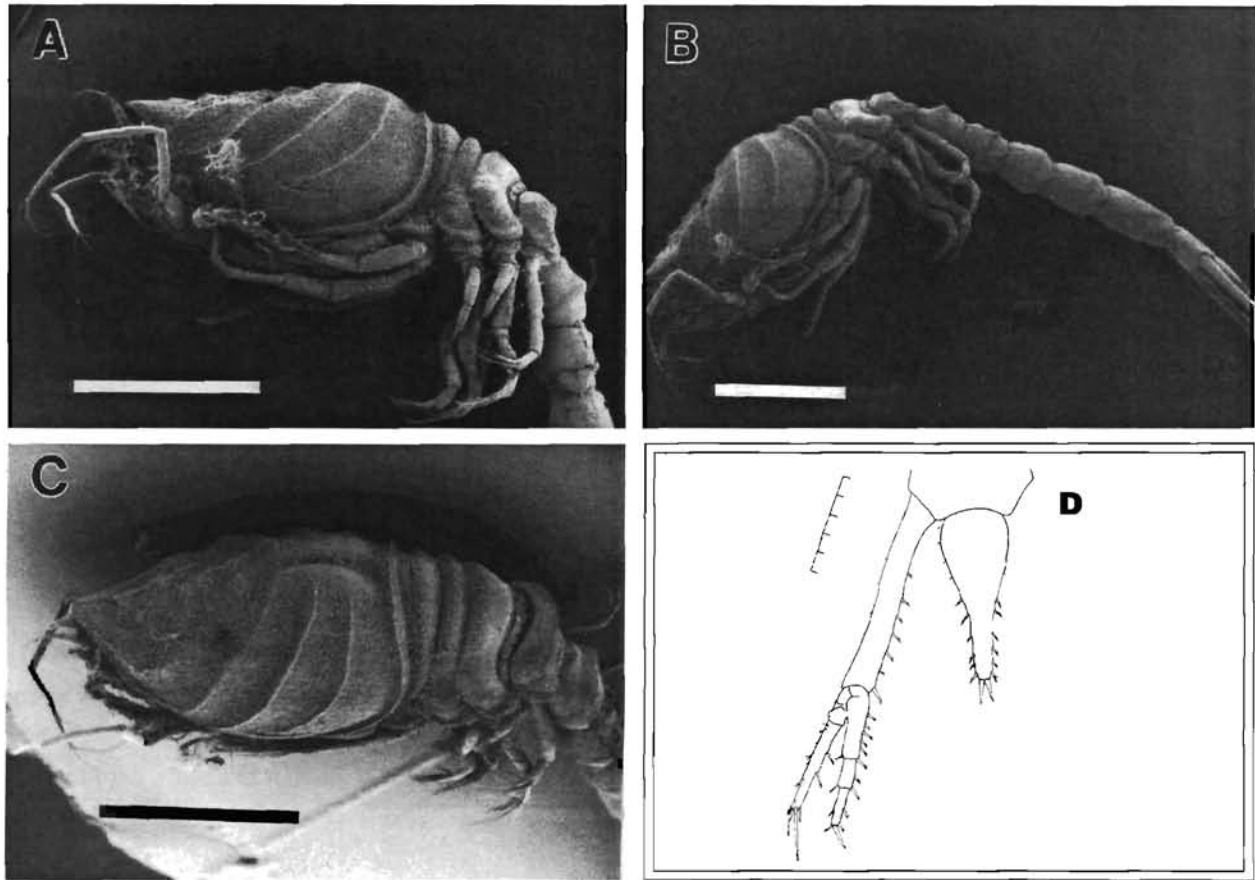


Figure 2.7. *Diastylis quadriplicata* Watling and McCann, new species. Subadult male: A, carapace and pereonites, lateral view; B, body, lateral view; C, carapace and pereonites, dorsal view; D, telson and uropod. Scale, A-C = 1 mm, D = 0.5 mm.

as in this species. Also, in *D. alaskensis* the telson is much shorter than the uropod peduncles. In *D. bidentata* and *D. dalli*, the carapace folds are oblique and the telson is more nearly equal in length to the uropod peduncle; however, in these two species the basal article of the uropod endopod is longer than the two distal articles combined, which is clearly not the case in *D. quadriplicata*.

Type Locality and Type Specimens. California, Santa Barbara Co., off Pt. Arguello, Sta. 71, 34°29.04'N, 120°44.01'W, 306 m, holotype USNM 273593, paratypes USNM 273594 and LACM 95-83.1.

Etymology. From Latin, *quadros* = four, and *plicatus* = fold or ridge, referring to the four ridges ornamenting the carapace.

Distribution. Known only from the Santa Maria Basin Region, approximately 290-310 m.

Diastylis santamariensis Watling and McCann, new species

Figure 2.8

Material Examined. Santa Maria Basin, Phase II, Cruise 1-1, Nov 1986, Sta. R-5 (4), PJ-1 (1); Cruise 1-2, Jan 1987, Sta. R-5 (3); Cruise 1-3, May 1987, Stas. R-4 (3), R-5 (3), R-8 (22); Cruise 2-3, Oct 1987, Stas. R-2 (2), R-5 (5), PJ-1 (3); Cruise 2-4, Jan 1988, Stas. R-1 (3), R-5 (5), PJ-1 (1); Cruise 2-5, May 1988, Stas. R-5 (1), R-8 (4); Cruise 3-1, Oct 1988, Stas. R-1 (2), R-4 (3), R-5 (2), PJ-1 (3); Cruise 3-4, May 1989, Stas. R-1 (39), R-4 (2), R-5 (16), R-8 (1).

Description. Adult female and subadult male. Carapace twice length of pereonites 1-5; surface with general overall wrinkled look; with 4 dorsoventral ridges, the two posteriormost originating dorsally at dorsolateral ridge and running to ventral margin, anteriormost extending across frontal lobe but not reaching ventral margin, behind that a short ridge extending from pseudorostral cut toward but not reaching ventral margin; eyelobe smooth and globular, lenses not visible in SEM view. Pereonite 1 concealed ventrally in subadult male but not in young female. Pereonite 5 posterior corner bluntly rounded. Telson pre-anal part shorter than pleonite 6, post-anal part longer than pre-anal, with 4-5 setae on lateral margins. Uropod peduncle slightly longer than telson; endopod longer than exopod, 3 articles of endopod subequal in length, distal article with single terminal seta; exopod with several setae on outer margin, armed with 3 setae terminally.

Remarks. On the basis of its carapace ornamentation, this species is closely allied to *D. alaskensis* Calman and *D. paralaskensis* Vassilenko and Tzareva. *Diastylis santamariensis* has fewer dorsoventral ridges than either of the other two. In addition, its telson is more nearly equal in length to the uropod peduncles (versus much shorter in both *D. alaskensis* and *D. paralaskensis*) and the basal uropod endopod article is not much longer than either of the distal two articles (versus much longer in *D. alaskensis*).

Type Locality and Type Specimens. California, Santa Maria Basin, off Point Sal, Sta. PJ-3 34°56.26'N, 120°49.58'W, 138 m, holotype USNM 273589, paratypes USNM 273590 and LACM 95-81.1.

Etymology. Name derived from sample locations in the Santa Maria Basin region.

Distribution. Known from the Santa Maria Basin region, depth range, 90-161 m., and Puget Sound, Washington, as shallow as 10 m.

Diastylis californica Zimmer, 1936

Figure 2.9

Material Examined. Off Point Conception, Phase I, Sta. 079, 98 m.S.

Description. Adult size, female 9 mm, male 12 mm. Carapace with elevated ridges or keels, lateral ridges terminating in paired elevated teeth, 1 pair dorsolaterally above and behind frontal lobe and 1 pair to side of frontal lobe; from dorsal tooth ridge runs posteriorly then ventrally meeting ventrally-directed ridge originating at lateral tooth. Antenna 1 very slender, peduncle article 2 reaching end of pseudorostrum, peduncle article 3 equal in length to first 2 articles. Maxilliped 3 basis broadly expanded, upturned somewhat laterally, and forming opercular-like covering of mouth field. Uropod peduncle more than twice length of telson; endopod 3-articulate, all articles subequal in length; exopod longer than endopod.

Remarks. This species is very distinct with respect to carapace sculpturing. The species to which it is most closely related is *Diastylis crenellata* sp. n., described above. While the latter is a species of the Oregonian Province, *D. californica* is probably restricted to the shelf of the San Diego Province, reaching its northern limit in the immediate vicinity of Point Conception.

Type Locality and Type Specimens. Between Balboa and Corona Del Mar, California, holotype USNM no. 71440.

Distribution. Off Southern California, San Diego to Point Conception, 19 - 127 m.

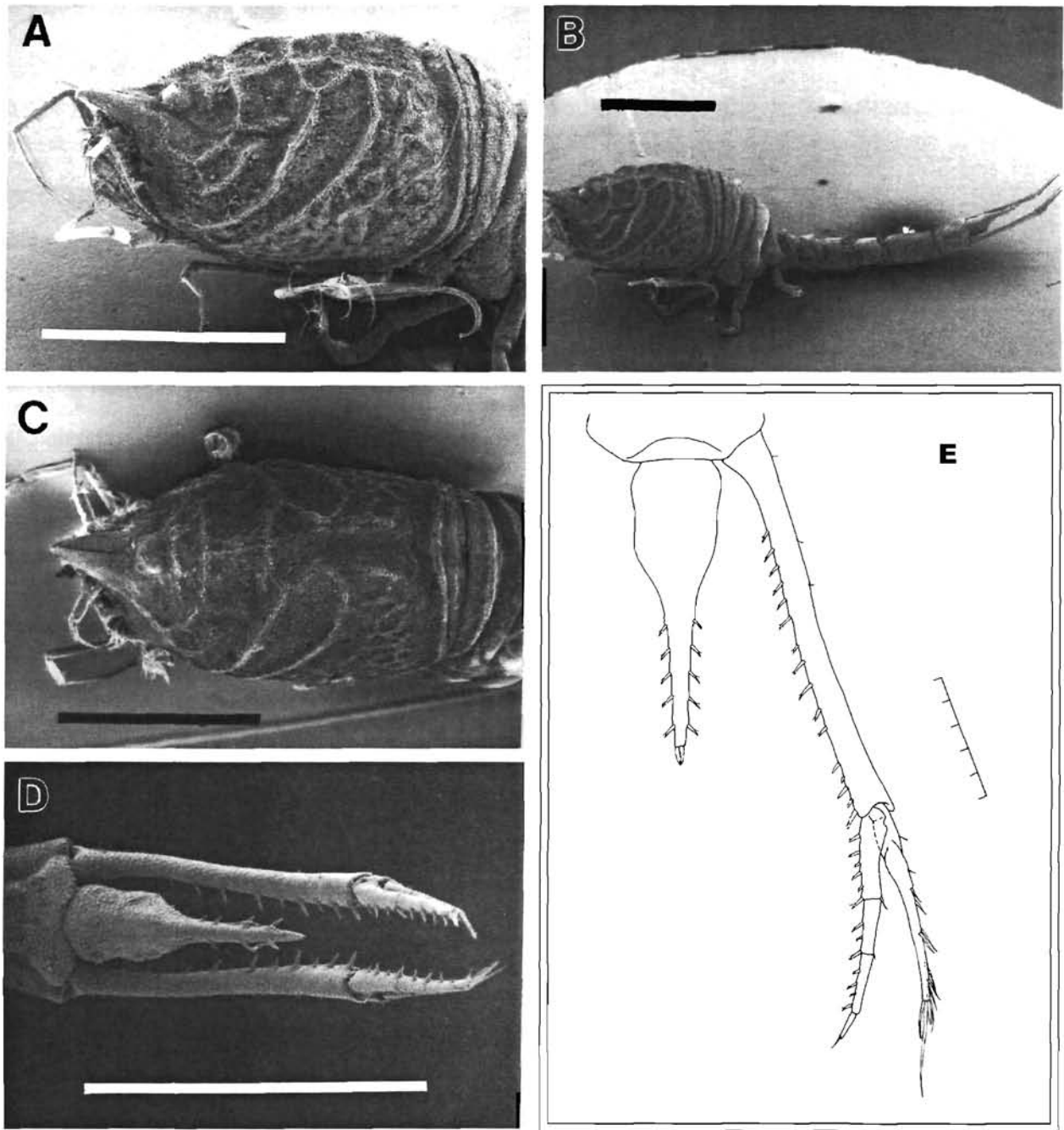


Figure 2.8. *Diastylis santamariensis* Watling and McCann, new species. Female: A, carapace, lateral view; B, body, lateral view; C, carapace and pereonites 1-2, dorsal view; D, E, telson and uropods. Scale, A-D = 1 mm, E = 0.5 mm.

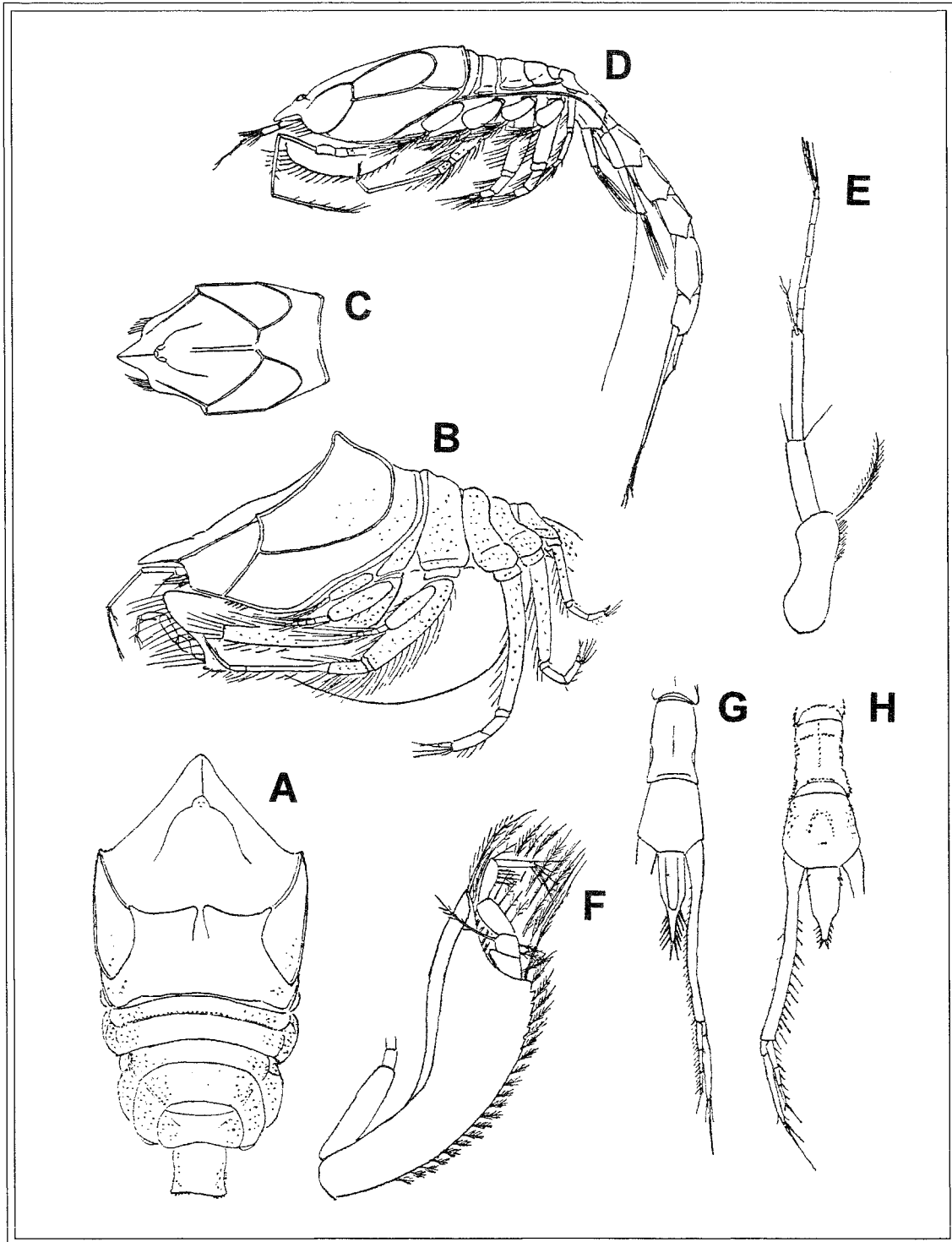


Figure 2.9. *Diastylis californica* Zimmer 1936. Female: A, carapace and pereonites, dorsal view; B, same, lateral view; E, antenna 1; F, maxilliped 3; H, telson and uropods. Juvenile: C, carapace, dorsal view. Male: D, body, lateral view; G, telson and uropod. From Zimmer (1936); no scale provided.

Diastylis pellucida Hart, 1930

Figure 2.10

Material Examined. Cruise 1-1 (November, 1986), Sta. R-2 (81), R-3 (2), R-5 (1), PJ-1 (9); Cruise 1-2 (January, 1987), Sta. R-2 (43), R-3 (3), R-5 (1), R-6 (3), R-9 (2), PJ-1 (20); Cruise 1-3 (May, 1987), Sta. R-2 (61), R-3 (20), R-5 (2), R-6 (4), R-9 (10), PJ-1 (1); Cruise 2-3 (October, 1987), R-1 (1), R-2 (14), R-6 (1), R-9 (11); Cruise 2-4 (January, 1988), Sta. R-2 (89), R-3 (5), R-5 (6), R-9 (10), PJ-1 (16); Cruise 2-5 (May, 1988), Sta. R-2 (42), R-3 (2), R-5 (1), R-6 (7), R-8 (2), R-9 (27); Cruise 3-1 (October, 1988), Sta. R-2 (5), R-3 (2), R-5 (1), R-6 (3), R-9 (8), PJ-1 (1); Cruise 3-4 (May, 1989), Sta. R-2 (24), R-3 (9), R-4 (1), R-5 (3), R-6 (7), R-9 (66), PJ-1 (5).

Description. Adult size, female 8 mm, male 9 mm. Carapace longer than free pereonites; surface smooth except for two oblique, minutely crenulate ridges running from mid dorsal ridge to ventral margin; a third very slight circumcinct ridge occurs posterior to frontal lobe. Pereonite 1 visible ventrally; pereonite 5 posterior corners subacute. Antenna 1 peduncle article 2 extending near to end of pseudorostrum. Telson slightly more than half length of uropod peduncle; lateral margin with 5-8 setae. Uropod exopod longer than 3-articulate endopod.

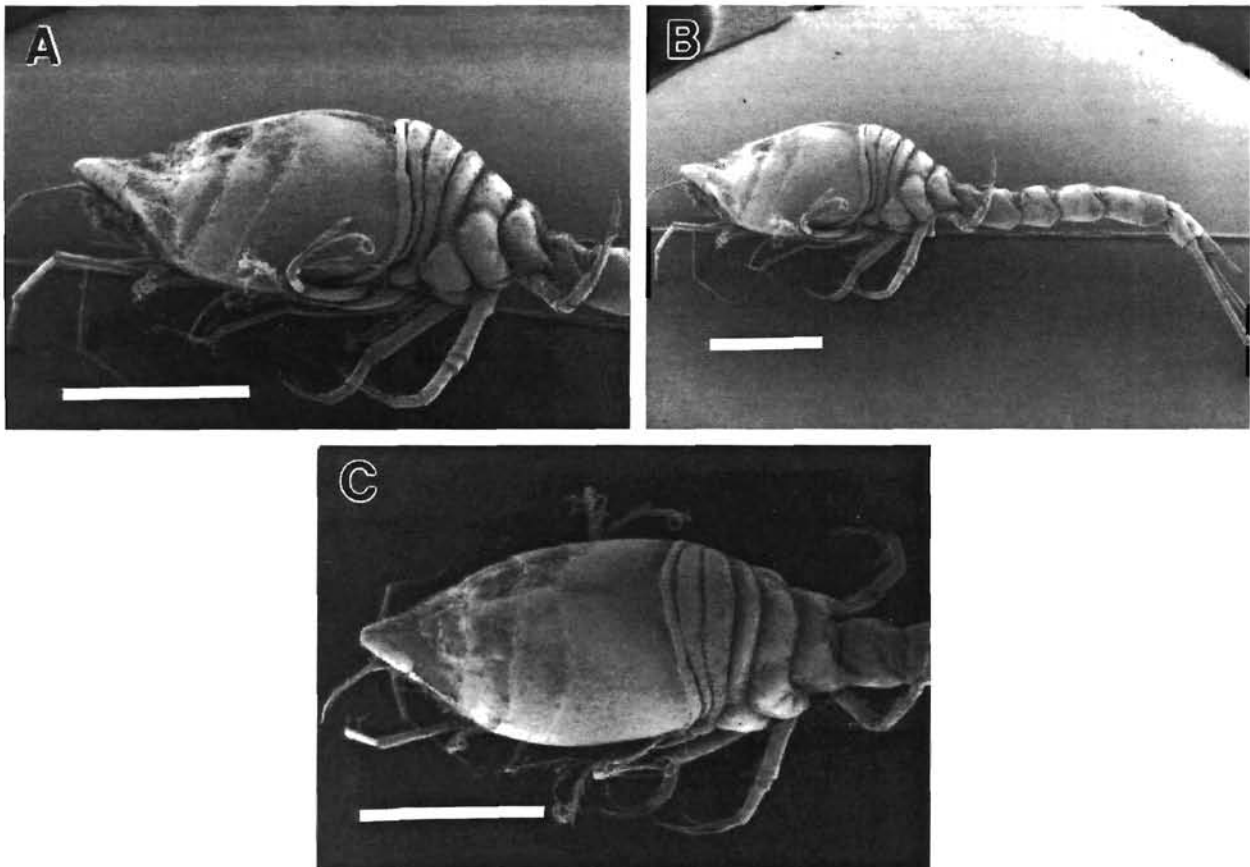


Figure 2.10. *Diastylis pellucida*, Hart 1930. Male: A, carapace and pereonites, lateral view; B, body, lateral view; C, carapace and pereonites, dorsal view. Scale = 1 mm.

Remarks. This species is the only diastylid in this region with just two lateral oblique ridges. It also has a relatively thin integument, so the ridges in newly moulted individuals are not readily visible except in transmitted light.

Type Locality and Type Specimens. Deep Cove, Vancouver Island, British Columbia, 120 m. Type in British Columbia Provincial Museum. Holotypes on slides are in very bad condition.

Distribution. Southern California to British Columbia, Canada (Oregonian Province), 50 - 410 m.

Genus *Leptostylis* G. O. Sars, 1869

Type Species. *Diastylis longimana* Sars, 1865.

Diagnosis. (modified from Day, 1980) Carapace usually tumescent posteriorly. Pereonites 3 and 4 may be coalesced or not; fifth pereonite not produced posteriorly. Male antenna 1 with club-shaped article 3, with dense array of sensory setae distally. Male antenna 2 not extending beyond pereonite 5. Basis of pereopods in male not widened and pereopods 2 and 3 not widely separated in ovigerous female. Pereopods 3 and 4 with rudimentary exopods or exopods absent in female, fully developed in male. Male with 2 pairs of pleopods. Post-anal part of telson shorter than pre-anal; with single pair of lateral setae sub-terminally. Uropod endopod 3-articulate.

Remarks. The short telson and form of the male antenna 1 characterize this genus. It is widespread throughout the colder waters of the world's oceans but not as diverse as *Diastylis*. One species, *Leptostylis villosa*, has previously been recorded from the Oregonian Province, but it is likely this record is in error, at least from Puget Sound south.

Leptostylis calva Watling and McCann, new species

Figure 2.11

Material Examined. Santa Maria Basin, Cruise 1-1 (November, 1986), Sta. R-1 (64); Cruise 1-2 (January, 1987), Sta. R-1 (90); Cruise 2-3 (October, 1987), Sta. R-8 (49); Cruise 2-5 (May, 1988), Sta. R-1 (89), R-4 (56), R-8 (82); Cruise 3-1 (October, 1988), Sta. R-1 (39), R-4 (40), R-5 (4), R-8 (30); Cruise 3-4 (May, 1989), Sta. R-1 (64), R-8 (54).

Description. Adult size, 2.5 mm. Carapace slightly swollen posteriorly; triangular in dorsal view; very slight ridge present lateral to frontal lobe; surface of carapace smooth, with few setae; posterolateral margins extended posteriorly partially covering pereonite 1. Pereonites 1 and 2 of normal width dorsally but narrowed ventrolaterally; pereonites 3 and 4 coalesced dorsally. Pereopods 3 and 4 with rudimentary exopods in female. Telson about half as long as uropod peduncles in male and female; with single pair of subterminal lateral setae. Female uropod peduncle setose along distal two-thirds of medial margin; rami subequal; endopod articles subequal; male uropods similar but more elongate.

Remarks. This species is unusual in the extent to which the carapace extends posterolaterally. It is very similar to the following species, *L. abditis*, being most easily distinguished from the latter by its subequal uropod rami.

Type Locality and Type specimens. California, Santa Maria Basin, off Point San Luis, Sta. R-1 35°05.83'N, 120°49.16'W, 91 m, holotype USNM 273587, paratypes USNM 273588 and LACM 95-80.1.

Etymology. From Latin, *calvus*, = bald, bare, indicating the lack of setae on the carapace.

Distribution. Known so far only from the Santa Maria Basin region, primarily at depths near 90 m. It is probably an abundant member of the shallow shelf fauna.

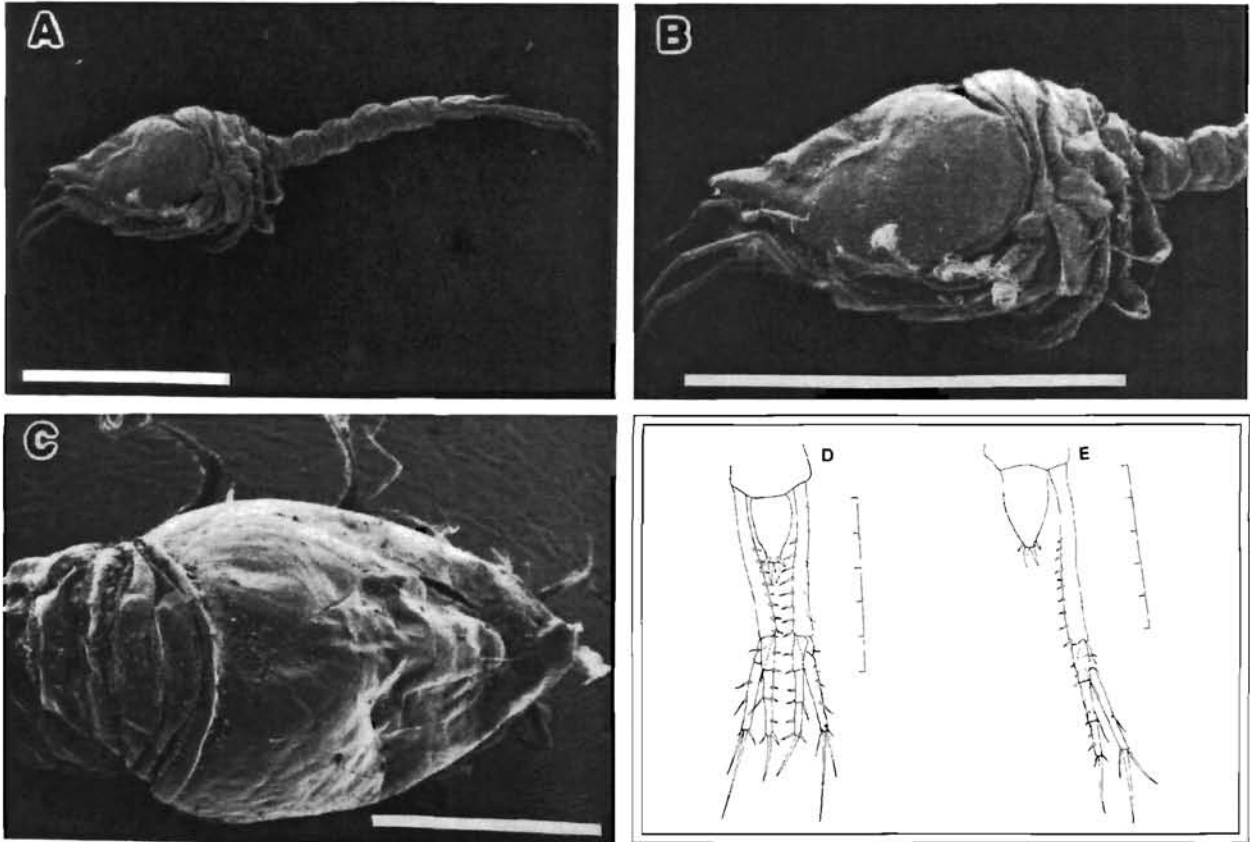


Figure 2.11. *Leptostylis calva* Watling and McCann, new species. Female: A, body, lateral view; B, carapace and pereonites, lateral view; C, same, dorsal view; D, telson and uropods. Male: E, telson and uropods. Scale, A-C = 1 mm, D,E = 0.5 mm.

Leptostylis abditis Watling and McCann, new species

Figure 2.12

Material Examined. Santa Maria Basin, Phase II, Cruise 1-1 (November, 1986), Sta. R-5 (25); Cruise 1-2 (January, 1987), Sta. R-5 (13); Cruise 2-3 (October, 1987), Sta. R-5 (14), PJ-1 (18); Cruise 2-4 (February, 1988), Sta. PJ-1 (6); Cruise 2-5 (May, 1988), Sta. R-3 (1), R-4 (2), R-5 (6), PJ-1 (1); Cruise 3-1 (October, 1988), Sta. PJ-1 (1); Cruise 3-4 (May, 1989), Sta. R-1 (1), R-4 (6), R-5 (18), PJ-1 (15).

Description. Adult size, 3.5 mm. Carapace swollen posteriorly into tumescent lobes; anteroventral margin below antennal sinus with coarse serrations; surface of carapace smooth, with few setae; posterolateral margins extended posteriorly to cover pereonite 1 laterally. Pereonites 1 and 2 of normal width dorsally but narrowed ventrolaterally; pereonites 3 and 4 weakly coalesced dorsally. Pereopods 3 and 4 without rudimentary exopods in female. Telson less than half length of uropod peduncle. Uropod exopod shorter than endopod, reaching just beyond end of endopod second article; endopod terminal article longer than second. Male uropod similar but more elongate.

Remarks. This species is superficially similar to *L. calva*, especially in general aspects of the carapace and body shape. However, the unequal rami of the uropods and the lack of rudimentary exopods on pereopods 3 and 4 of the female serve to readily distinguish it from *L. calva*.

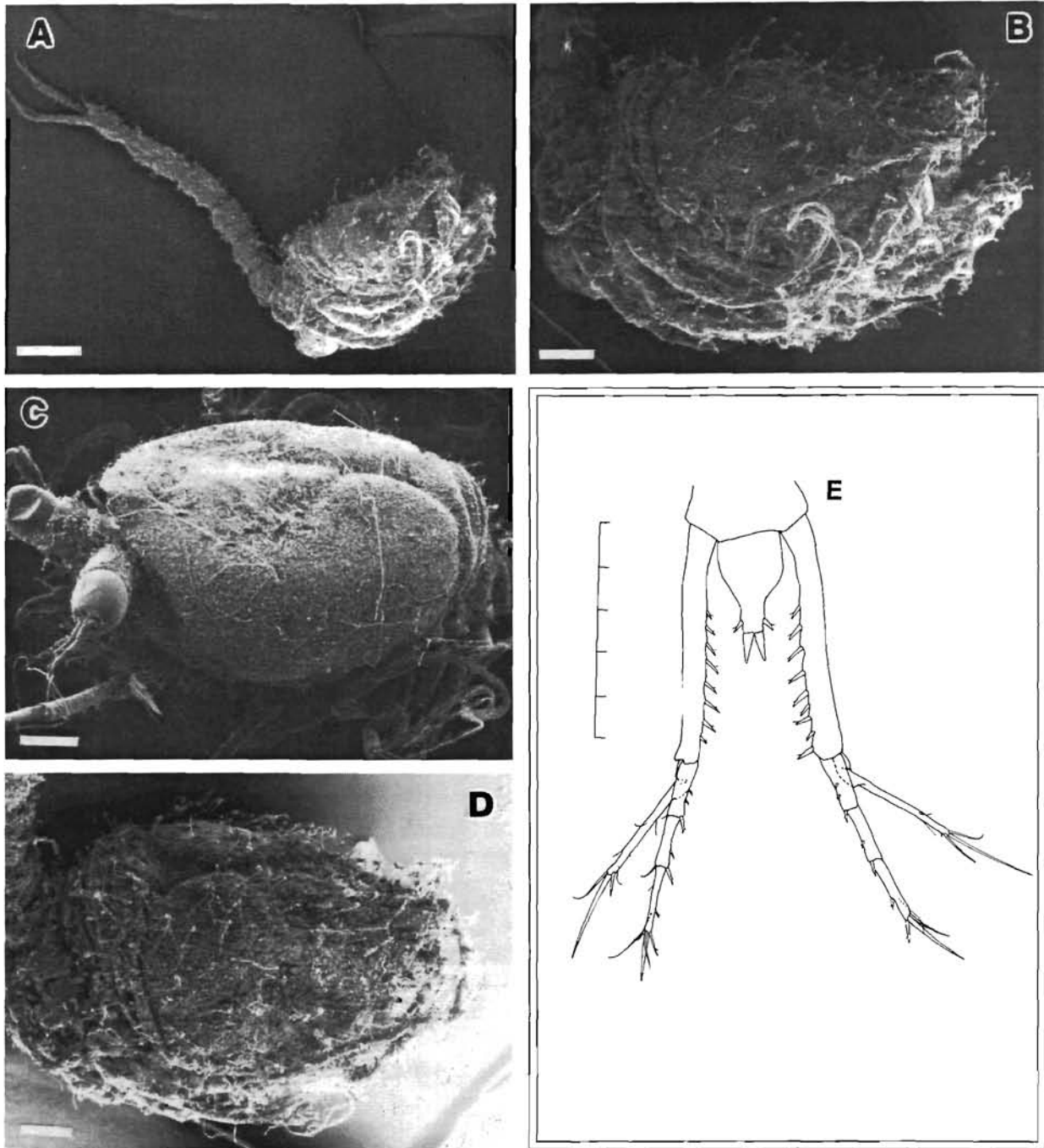


Figure 2.12. *Leptostylis abditis* Watling and McCann, new species. Female: A, body, lateral view; B, carapace and anterior pereonites, lateral view; D, carapace and pereonites, dorsal view; E, telson and uropods. Male: C, carapace and antenna 1, dorsal view. Scale, A = 0.5 mm, B-D = 0.2 mm, E = 0.5 mm.

Type Locality and Type Specimens. California, Santa Maria Basin, off Purisima Point, Sta. R-5 34°42.69'N, 120°50.83'W, 154 m, holotype USNM 273585, paratypes USNM 273586 and LACM 95-79.1.

Etymology. From Latin, *abditus* = hidden, concealed, referring to the initial difficulty in separating this species from *L. calva*.

Distribution. A somewhat rare species of shelf and slope, known from the Santa Maria Basin region, primarily at depths of 145-410 m., to off Pt. Loma, San Diego as shallow as 47m.

Family Lampropidae

Diagnosis (from Day, 1978). Mandibles naviculoid. Maxilla 1 palp absent or bearing 1 or 2 setae. Exopods present on maxilliped 3 and pereopod 1 in both sexes; in female present or rudimentary on pereopods 2-4 or absent from all three; in male exopods present on pereopods 2-4. Pleopods absent or 1-3 pairs in male, with outer process on inner ramus. Telson moderate to large, with post-anal part longer than pre-anal, with 3 to 8 terminal and subterminal setae.

Remarks. Lampropids are most easily distinguished on the basis of possessing at least three terminal setae on the telson. The family presently comprises 10 genera and is well represented in the cold waters of the world's oceans, from shallow depths to the abyss. The taxonomic history of this family has been quite clear, with the exception of Stebbing's (1912) division of the group into five families on the basis of male pleopod number. Given (1964) followed Stebbing's example and created the family Mesolampropidae for species where the male possessed two pairs of pleopods. This arrangement of the lampropids has not been followed by any other workers and is not accepted here.

Genus *Hemilamprops* Sars, 1883

Type Species. *Vaunthompsonia rosea* Norman, 1863.

Diagnosis (From Day, 1978). Carapace not strongly dorsoventrally flattened. Eye present or absent. Pseudorostrum short. Antenna 1 flagella well developed. Maxilla 1 palp with 2 terminal setae. Exopods on pereopods 3 and 4 rudimentary in female. Male with 3 pairs of pleopods. Telson usually with 3 terminal and often 2 subterminal setae.

Remarks. *Hemilamprops* Sars, *Mesolamprops* Given, and *Lamprops* Sars are very closely related genera. The only definitive method of distinguishing these genera at the present time is on the basis of the number of pleopod pairs in the male, viz., *Hemilamprops* has three, *Mesolamprops* has two, and *Lamprops* none.

Hemilamprops californicus Zimmer, 1936

Figure 2.13

Hemilamprops (?) *californica* Zimmer, 1936.

Lampropoides californicus, Harada, 1959.

Hemilamprops californiensis, Lie, 1969 (*lapsus calami*).

Material Examined. Santa Maria Basin, Phase II, Cruise 1-1 (November, 1986), Sta. R-1 (1); Cruise 1-2 (January, 1987), Sta. R-1 (3), R-4 (23), R-8 (61); Cruise 1-3 (May, 1987), Sta. R-1 (2), R-3 (43), R-4 (4), R-8 (111); Cruise 2-3 (October, 1987), Sta. R-1 (1), R-8 (18); Cruise 2-4 (February, 1988), Sta. R-4 (15), R-8 (3); Cruise 2-5 (May, 1988), Sta. R-4 (1), R-8 (4); Cruise 3-1 (October, 1988), Sta. R-1 (24), R-4 (8), R-8 (33); Cruise 3-4 (May, 1989), Sta. R-4 (7), R-8 (12).

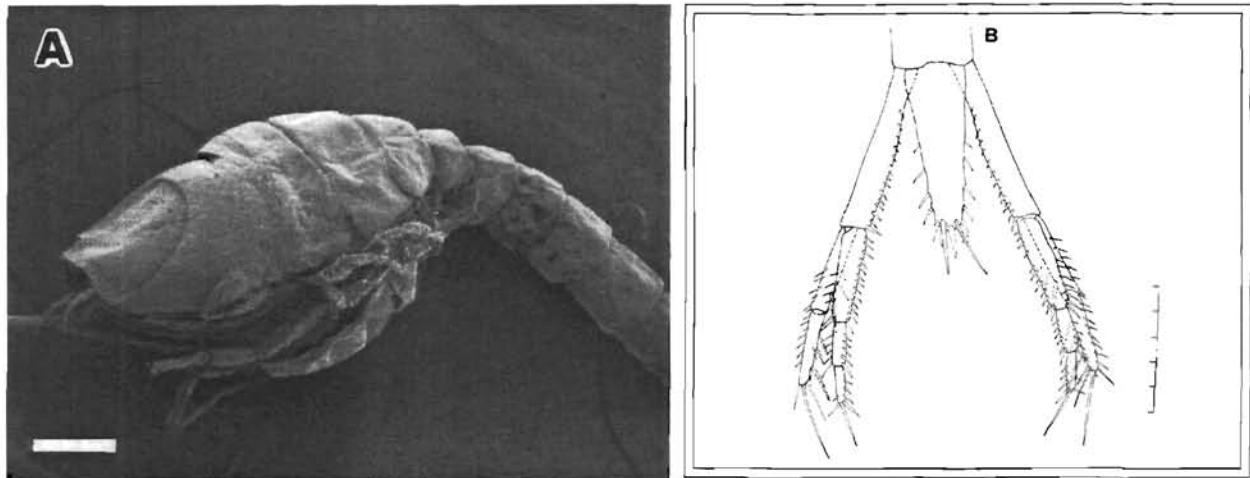


Figure 2.13. *Hemilamprops californicus* Zimmer 1936. Female: A, carapace and pereonites, lateral view; B, telson and uropods. Scale, A = 1 mm, B = 0.5 mm.

Description. Adult size, female, 5.5 to 8 mm, male 6 mm. Carapace as long as first 4 pereonites; broadly truncate anteriorly; with single ridge running from pseudorostral margin upward and backward to median carina on frontal lobe; ocular lobe distinct, large, with 7 lenses; pseudorostral lobes extend only short distance in front of ocular lobe. All 5 pereonites visible in lateral view; pereonites 2 and 3 subequal in length. Telson as long as uropod peduncles, with 3 apical and 2 dorsal subapical setae. Uropod endopod longer than exopod, proximal article longer than distal 2 combined, distal article the shortest; exopod reaching to midpoint of endopod distal article, 2 articles subequal in length, external margin with heavier setae than on inner margin.

Remarks. Zimmer did not have a male in his collection when he described the species, but assigned it questionably to *Hemilamprops* on the basis of general features. Given (1964) noted that the specimens he identified as *H. californicus* had three pairs of pleopods, as did the specimens identified as this species by Harada (1959) and Gamô (1962). Harada (1959) created the new genus *Lampropoides* to accommodate several new species wherein the male possessed three pairs of pleopods and a recurved fold on the carapace. He included Zimmer's *Hemilamprops* (?) *californica* in this new genus. Gamô (1962) dismissed the genus as not being sufficiently distinguishable from *Hemilamprops*. Currently, the closely related genera *Hemilamprops*, *Lamprops*, and *Mesolamprops* are defined on the basis of the number of pleopods present on the male. Therefore, on the basis of male pleopod number, this species belongs in the genus *Hemilamprops*. However, Gladfelter (1975) described a new species, *Mesolamprops dillonensis*, in which the male possessed two pairs of pleopods, but the female is virtually indistinguishable from *H. californicus*. In the material at hand, there is also a male with two pairs of pleopods accompanying two ovigerous females that also fit well the description of *H. californicus*. There is thus a major problem in need of solution. Are there two closely related species assignable to two different genera (on the basis of male pleopod number), or is it possible for one species to have two male morphologies? Perhaps Harada's *Lampropoides* concept needs to be given a more thorough examination, and all species redefined on other characters. For the present time, this species will be left in the genus *Hemilamprops*, in order to avoid needless cluttering of the synonymy until the necessary studies are completed.

Type Locality and Type Specimens. Between Balboa and Corona Del Mar, California. Holotype USNM 71439.

Distribution. Puget Sound, Washington to Southern California, Japan, 13-60 m.

Family Leuconidae

Diagnosis (modified from Jones, 1963). Mandible truncate, molar usually present and columnar. Maxilla 1 palp bears single seta. Exopods present on maxilliped 3 and pereopods 1-3 (occasionally on pereopods 1-2) in both sexes, additional exopod on pereopod 4 on most males. Pleopods absent, rudimentary, or 2 pairs in male, without external process on inner ramus. Telson absent. Eye generally absent; if present may be either fully developed or rudimentary.

Remarks. The Leuconidae is one of the oldest cumacean families, having been established by Sars (1878). Until Watling's (1991a) revision, it had consisted of only eight genera, all but one of which were proposed by 1907. The latest revision expanded the family so that it now comprises 12 genera, and five subgenera in the genus *Leucon*. The present material adds one new genus, a new subgenus, and 4 new species.

Key to the Leuconidae of the Santa Maria Basin Region

- 1A. Efferent orifice anterior or anterodorsal 2
- 1B. Efferent orifice distinctly dorsal, pseudorostral lappets bent posteriad and directed dorsally 6

- 2A. Male antenna 1 short, not reaching posterior margin of carapace; male without pleopods
 *Alloeoleucon santamariensis*
- 2B. Male antenna long, extending well past carapace posterior margin; male with 2 pairs of pleopods .
 *Leucon*..... 3

- 3A. Branchial siphon longer than pseudorostral lobes; male pleopods reduced (Subgenus *Diaphonoleucon*)
 *Leucon (D.) declivis*
- 3B. Branchial siphon normal, barely extending beyond pseudorostrum; male pleopods normal
 (Subgenus *Leucon*).... 4

- 4A. Carapace with forwardly curving ventrally directed lateral ridge *Leucon (L.) falcicosta*
- 4B. Sides of carapace without ridge 5

- 5A. Pseudorostral lobes short, bluntly truncate anteriorly *Leucon (L.) armatus*
- 5B. Pseudorostral lobes elongate, subacute anteriorly, slightly upturned
 *Leucon (L.) magnadentatus*

- 6A. Antenna 1 geniculate between peduncle articles 1 and 2; carapace with 2 lateral, strongly curving
 ridges..... *Eudorellopsis longirostris*
- 6B. Antenna 1 geniculate between peduncle articles 2 and 3; carapace without lateral ridges
 *Eudorella*..... 7

- 7A. Antenna 1 main flagellum with setae only at distal end; uropod peduncles with long marginal setae; pereopod 5 absent *Eudorella redacticruris*
- 7B. Antenna 1 main flagellum with setae along whole margin; pereopod 5 normal in male and female .
..... 8
- 8A. Uropod exopod reaching only to end of endopod basal article; carapace ventral margin bent, posterior section smooth, anterior section with serrations *Eudorella pacifica*
- 8B. Uropod exopod extending beyond end of endopod basal article; carapace ventral margin continuously curved, anterior section with fine serrations *Eudorella truncatula*

***Alloeoleucon*, new genus**

Type Species. *Alloeoleucon santamariensis* Watling and McCann, new species

Diagnosis. Pseudorostrum projecting anteriorly. Antenna 1 not geniculate. Male antenna 2 extending only to posterior margin of carapace; peduncle articles 4 and 5 without setal brush; flagellum not modified for grasping. Exopods on pereopods 1-3 in female and 1-4 in male. Pereopod 2 article 3 very short. Uropod endopod 2-articulate. Male without pleopods.

Remarks. This peculiar genus resembles *Hemileucon*, *Austroleucon*, *Heteroleucon*, and *Nippoleucon* in its lack of pleopods and shortened antenna 2 of the male. However, it differs from most of this group by having neither a strong setal brush on the antennal peduncle nor a flagellum modified for grasping. In this latter respect it is closest to *Heteroleucon*, but the latter is additionally modified in possessing exopods only on pereopods 1 and 2 in both sexes.

Etymology. From Greek, *alloios*, of another kind, different, + *leucon*, the stem genus, referring to the unusual collection of features characterizing this genus.

***Alloeoleucon santamariensis* Watling and McCann, new species**

Figure 2.14

Material Examined. Santa Maria Basin, Phase II, Cruise 1-1 (November, 1986), Sta. R-3 (12); Cruise 1-2 (January, 1987), R-3 (8), R-4 (4); Cruise 1-3 (May, 1987), R-3 (2), R-6 (1); Cruise 2-3 (October, 1987), R-3 (6); Cruise 2-4 (February, 1988), R-3 (4); Cruise 2-5 (May, 1988), R-3 (2); Cruise 3-1 (October, 1988), R-3 (2); Cruise 3-4 (May, 1989), R-3 (5), R-9 (1).

Description. Adult size, 2 mm, male and female. Carapace in both sexes slightly longer than pereonites; median carina sparsely, coarsely, serrate; pseudorostral lobes bluntly truncate; eyelobe not distinguishable from frontal lobe. Antenna 1 not geniculate; accessory flagellum minute. Male antenna 2, flagellum short, not extending beyond pereonites; peduncle articles 4 and 5 without brush of sensory setae, article 5 with 4 long proximal setae. Maxilliped 3 leg-like, distal articles slender, basis not strongly expanded distally, bearing only four setae. Pereopod 1 articles 5 and 6 subequal in length; basis armed with single, long, plumose seta distally. Pereopod 2 with short article 3. Uropod similar in male and female; endopod longer than exopod, 2-articulate, articles subequal in length; exopod with 1-2 subterminal setae on inner margin.

Type Locality and Type Specimens. California, Santa Maria Basin, off Point San Luis, Sta R-3, 35°05.30'N, 121°00.90'W, 409 m, holotype USNM 273583, paratypes USNM 273584 and LACM 95-78.1.

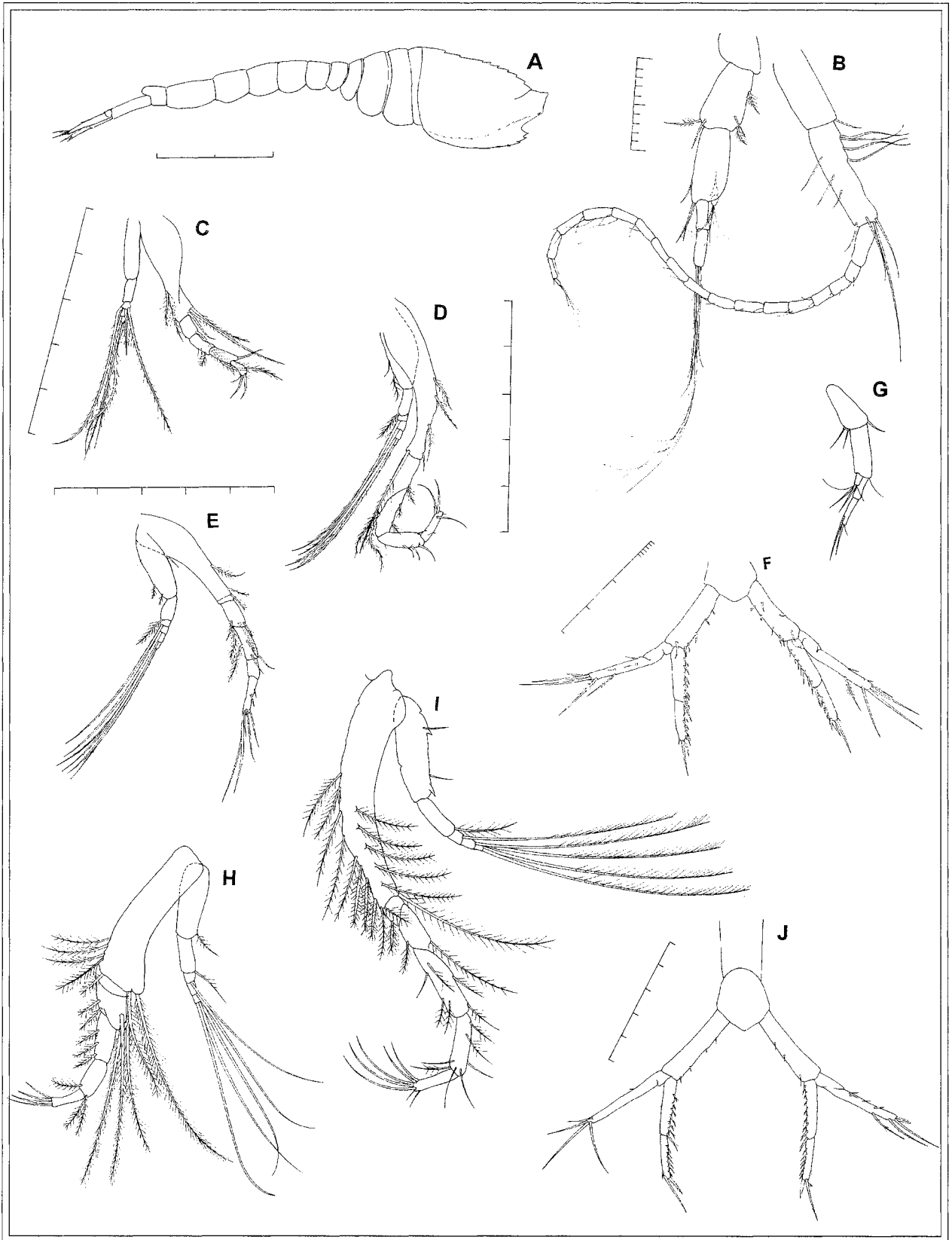


Figure 2.14. *Alloeoleucon santamariensis* Watling and McCann, new species. Male: A, body, lateral view; B, antennae 1 and 2; C, maxilliped 3; D, pereopod 1; E, pereopod 2; F, uropods. Female: G, antenna 1; H, maxilliped 3; I, pereopod 1; J, uropods. Scale, A, C-J = 0.5 mm, B = 0.1 mm.

Remarks. This is the smallest leuconid found in Californian waters. The species is readily distinguishable from the other leuconids found in the Santa Maria Basin area by the truncate pseudorostral lobes and the very similar appearance of the male and female.

Etymology. This species is named for its principal place of occurrence, the Santa Maria Basin of southern California.

Distribution. Known thus far only from the Santa Maria basin area, depth range, 409-410 m, with one record at 92 m.

Genus *Leucon* Krøyer, 1846

Type Species. *Cuma nasica* Krøyer, 1841.

Diagnosis (from Watling, 1991a). Pseudorostrum projecting anteriorly, usually slightly shorter in male; antenna 1 not geniculate; male antenna 2 with brush of setae on anterior margin of peduncle articles 4 and 5; male antenna 2 flagellum extending well along pleon; female with exopods on pereopods 1-3; male with exopods on pereopods 1-4; pereopod 2 article 3 very short or lacking; uropod endopod 2-articulate; male with 2 pairs of pleopods.

Remarks. This genus was subdivided by Watling (1991a) into 5 subgenera, using as criteria the relative length of the branchial siphon, the length of the antennule accessory flagellum, the presence of ventral hooks on pereonite 5, and the degree of fusion of the uropod endopod terminal seta. A new subgenus is described below which has a new combination of the above characters, but as well, shows extreme reduction of the pleopods in the male.

Diaphonoleucon, new subgenus

Type Species. *Leucon* (*Diaphonoleucon*) *declivis* Watling and McCann, new species

Diagnosis. Branchial siphon elongate, longer than pseudorostral lobes; antenna 1 accessory flagellum minute; pereonite 5 without ventral teeth; uropod endopod terminal seta not fused with distal article; pleopods of male reduced to short peduncle bearing nub-like rami.

Remarks. The combination of elongate branchial siphon and minute antennule accessory flagellum, is sufficient to distinguish this subgenus from the others recently established by Watling (1991a). The presence of reduced pleopods is not unique to this subgenus, having also been seen in *L. serrulirostris* Ledoyer, which was assigned to the subgenus *Crymoleucon* on the basis of its short branchial siphon and long antennule accessory flagellum.

Etymology. From Greek, *diaphonos*, dissonant + *leucon*, the stem genus, referring to the strongly different form of the male.

Leucon (*Diaphonoleucon*) *declivis* Watling and McCann, new species

Figure 2.15

Material Examined. Santa Maria Basin, Phase II. Cruise 1-1 (November, 1986), Sta. R-7 (5); Cruise 1-2 (January, 1987), R-7 (1); Cruise 1-3 (May, 1987), R-7 (8); Cruise 2-3 (October, 1987), R-7 (7); Cruise 2-4 (February, 1988), R-7 (2); Cruise 3-1 (October, 1988), R-7 (1); Cruise 3-4 (May, 1989), R-7 (10).

Description. Size of adult female, 9.0 mm, male, 9.5 mm. Carapace pseudorostral lobes upturned, about one-fifth total carapace length; dorsal crest serrate only along anterior half, serrations conspicuous on frontal lobe and on posterior extension of frontal lobe, often with middorsal gap; antennal notch narrow,

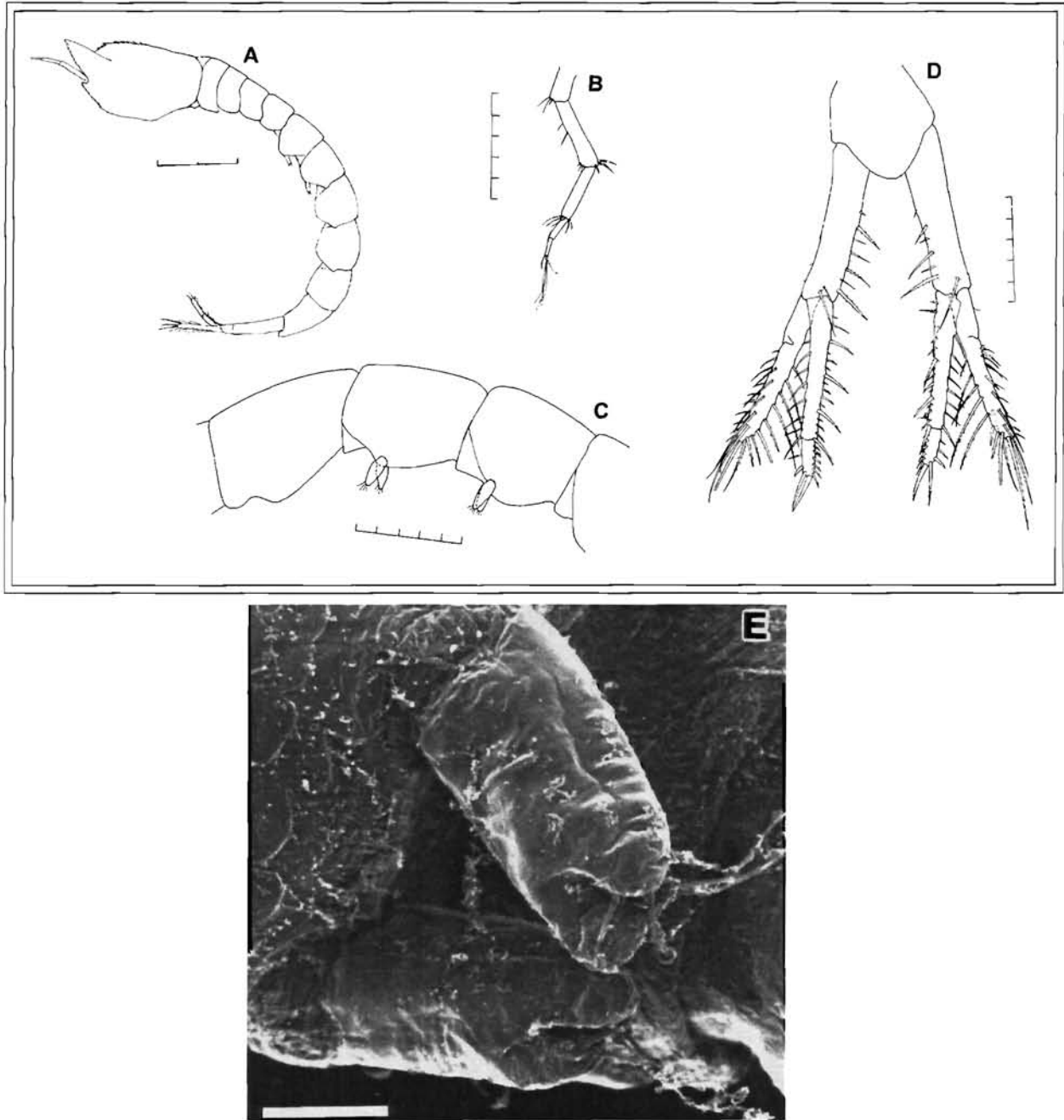


Figure 2.15. *Leucon (Diaphonoleucon) declivis* Watling and McCann, new species. Subadult male: A, body, lateral view; B, antenna 1; C, pleonites 1 and 2 with reduced pleopods; D, uropods; E, first pleopod pair. Scale, A = 1.0 mm, B-D = 0.5 mm, E = 50 μ m.

toothed along ventral margin of pseudorostral lobe; anteroventral corner acute. Branchial siphon much longer than pseudorostral lobes. Antennule elongate, thin, extending beyond end of pseudorostrum, accessory flagellum minute. Pereopod 1 article 5 longer than article 6. Pereopod 2 article 3 nearly as long as wide. Uropod rami longer than peduncle; endopod longer than exopod, distal article one-fourth length of basal article, both articles setose along both inner and outer margin; exopod strongly setose along both margins. Male pleopods reduced, 2 pairs, each consisting of shortened peduncles bearing nub-like ramal remnants. Antenna 2 of final male stage unknown, but sub-adult shows many compressed articles forming within old cuticle.

Remarks. This is one of the largest leuconid cumaceans known. It appears to be confined to the very soft, low oxygen mud habitat at the upper reaches of the oxygen minimum zone. None of the specimens collected were fully mature, so it is possible that the reduced pleopods of the male will eventually be found to develop small rami since there is an indication of a biramous condition which can be seen under the old cuticle of the one specimen that appears ready to undergo its final molt. There is no indication, however, that these pleopods will be fully formed as is the case in the genus generally.

Type Locality and Type Specimens. California, Santa Maria Basin, off Point Sal, Sta R-7, 34°52.90'N, 121°10.30'W, 565 m, holotype USNM 273581, paratypes USNM 273582 and LACM 95-77.1.

Etymology. From Latin, *declivis* = downhill, sloping, referring to the slope habitat in which this species lives.

Distribution. Known only from the deeper waters of the Santa Maria Basin, at least 565 m.

Subgenus *Crymoleucon* Watling, 1991a

Diagnosis. Branchial siphon normal; antenna 1 accessory flagellum extending at least to midlength of main flagellum first article; pereonite 5 without ventral teeth; uropod terminal seta not fused to distal article.

Remarks. Most of the species assigned to this subgenus are found in the deeper or colder polar waters of the world ocean. Otherwise, it is a rather heterogeneous assemblage of species united by the unusually large accessory flagellum.

Leucon (Crymoleucon) bishopi Bacescu, 1988

Figure 2.16

Epileucon pacifica Jones, 1969

Epileucon pacifica, Bishop, 1981

Leucon (Epileucon) bishopi Bacescu, 1988

Material Examined. Santa Maria Basin, Phase I, Sta. 63, (1); Phase II, Cruise 1-2 (January, 1987), Sta. R-7 (2); Cruise 1-3 (May, 1987), R-7 (2); Cruise 2-4 (February, 1988), R-7 (1); Cruise 3-1 (October, 1988), R-7 (2); Cruise 3-4 (May, 1989), R-7 (2).

Description. Size of adult female, 6 mm. Carapace pseudorostral lobes directed anteriorly, less than one-fifth total carapace length; dorsal crest without serrations in female and male; anteroventral corner slightly projecting, with several teeth below antennal notch. Branchial siphon not projecting beyond end of pseudorostrum. Antenna 1 short, peduncle articles 2 and 3 subequal in length; accessory flagellum extending slightly beyond mid-length of main flagellum basal article. Pereopod 1 article 5 slightly shorter than article 6. Pereopod 2 article 3 shorter than wide. Uropod peduncle as long as endopod basal article; exopod basal article long, about half length of distal article; exopod extends at least to end of endopod basal article;

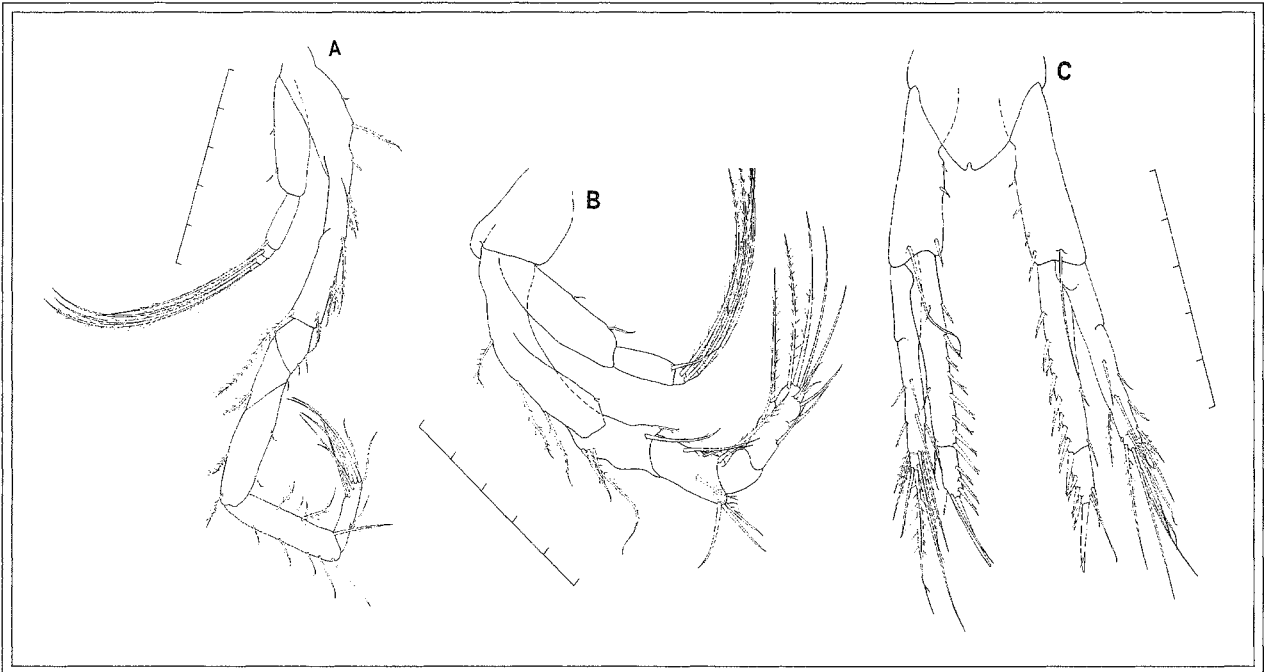


Figure 2.16. *Leucon (Crymoleucon) bishopi* Bacescu, 1988. Subadult male: A, pereopod 1; B, pereopod 2; C, uropods. Scale, A-C = 0.5 mm.

endopod armed medially with continuous series of narrowly spaced setae, 3 on distal article.

Remarks. This species was assigned to the genus *Epileucon* Jones, 1969, because it lacked serrations on the dorsal crest in the female. Bacescu (1988) and Watling (1991a) relegated *Epileucon* to subgeneric status because the constituent species could not be characterized by any feature other than the presence of ventral teeth on pereonite 5. Bishop (1981) noted that *E. pacifica* did not possess these ventral teeth and subsequently Bacescu (1988) moved *E. pacifica* into *Leucon (Epileucon)*. Since the species *L. pacifica* was an occupied name, Bacescu proposed *L. (E.) bishopi* for Jones' *E. pacifica*.

Type Locality and Type Specimens. Galathea station 745, 7° 15' N, 79° 25' W (Gulf of Panama), 915 m, T 5°C; holotype in British Museum.

Distribution. Previously known only from the type locality; the present specimens extend the range of the species to the north and further up the slope. *L. (C.) bishopi* seems to be characteristic of the upper reaches of sediments in contact with low oxygen content water.

Subgenus *Leucon* Krøyer, 1846

Diagnosis. Branchial siphon normal; antenna 1 accessory flagellum rudimentary; pereonite 5 without ventral teeth; uropod endopod terminal seta not fused to terminal article.

Remarks. This is the most wide-spread of the subgenera and embodies most of the northern Atlantic and sub-Arctic species included in the monograph of Sars (1900) from Norway.

Leucon (Leucon) falcicosta Watling and McCann, new species

Figure 2.17

Material Examined. Santa Maria Basin, Phase II. Cruise 1-1 (November, 1986), Sta. R-2 (18), R-4 (3), R-5 (3), R-6 (1), PJ-1 (77); Cruise 1-2 (January, 1987), R-1 (1), R-2 (15), R-5 (3), PJ-1 (19); Cruise 1-3 (May, 1987), R-1 (2), R-2 (52), R-4 (6), R-5 (9), R-8 (5), PJ-1 (41); Cruise 2-3 (October, 1987), R-1 (3), R-2 (15), R-8 (4), PJ-1 (29); Cruise 2-4 (February, 1988), R-2 (28), R-4 (14), R-5 (10), R-8 (3), PJ-1 (36); Cruise 2-5 (May, 1988), R-1 (4), R-2 (25), R-4 (8), R-5 (9), R-8 (9), PJ-1 (12); Cruise 3-1 (October, 1988), R-1 (4), R-2 (10), R-5 (4), R-8 (1), PJ-1 (14); Cruise 3-4 (May, 1989), R-1 (9), R-2 (14), R-4 (10), R-5 (10), R-8 (11), PJ-1 (52).

Description. Adult size, female and male, 3 mm. Carapace pseudorostral lobes subtriangular distally, less than one-fifth length of carapace; dorsal crest serrate anterior two-thirds, with approximately 15 serrations; with single anteriorly-directed curved ridge extending from posterior of dorsal serrations ventrally to region behind pseudorostral cut; antennal notch deep, anteroventral corner blunt. Antennule accessory flagellum nearly half length of basal article of main flagellum; peduncle third article 1.25 times length of article 2. Maxilliped basis distal margin not strongly extended laterally and bearing only 3 long plumose setae; ischium with additional long plumose seta. Pereopod 1 article 5 longer than article 6; exopod articles as long as basis. Pereopod 2 article 3 present, about half as long as wide; merus and carpus subequal in length. Uropod exopod slightly longer than endopod, inner margin armed with few (4-6), long, sparsely setulose setae; endopod distal article three-fourths length of basal article, inner margin of both articles armed with short, stiff setae.

Remarks. This species is superficially similar to *L. armatus* Given, but differs from the latter in the strength of the dorsolateral curved ridge, which is noticeable as a very sharp line in *L. falcicosta*, but only as a low, raised feature in *L. armatus*. The shape of the pseudorostral lobes and the uropod armature also differ in the two species. The only other species of *Leucon* possessing a curved ridge on the carapace is *L. (L.) kobjakovae* Lomakina, 1955. It differs from *L. (L.) falcicosta* by having a more blunt pseudorostrum in the male, fewer setae along the inner margin of the uropod, and simple rather than plumose setae on pereopods 1 and 2.

Type Locality and Type Specimens. California, Santa Maria Basin, off Point San Luis, Sta. R-1, 35°05.83'N, 120°49.16'W, 91 m, holotype USNM 273579, paratype USNM 273580 and LACM 95-76.1.

Etymology. From Latin, *falcis* = sickle, and *costa* = ridge, signifying the sickle-shaped nature of the dorsolateral ridge on the carapace.

Distribution. Known from the Santa Maria Basin region, 90-161 m (with a single record from 410 m), and off Pt. Loma, San Diego, from one specimen taken at 116 m.

Leucon (Leucon) armatus Given, 1961

Figure 2.18

Material Examined. California: Santa Maria Basin, Phase II, Sta. PJ-1.

Description. Adult size, female, 5.5 mm. Carapace pseudorostral lobes subquadrate distally; dorsomedian crest serrate nearly throughout entire length; dorsolateral depression extends from dorsomedian crest anteroventrally to just behind origin of pseudorostral lobe; slight dorsolateral depression also present posteriorly. Pereopod 1 article 5 longer than 6. Pereopod 2 article 3 absent. Uropod endopod stout and broadened, as long as or longer than exopod with dense array of setae along inner margin.

Remarks. This species is the only member of the genus *Leucon* present in California waters to have subquadrate pseudorostral lobes. As yet, an adult male has not been described, so the exact affinities of the species remain slightly in doubt.

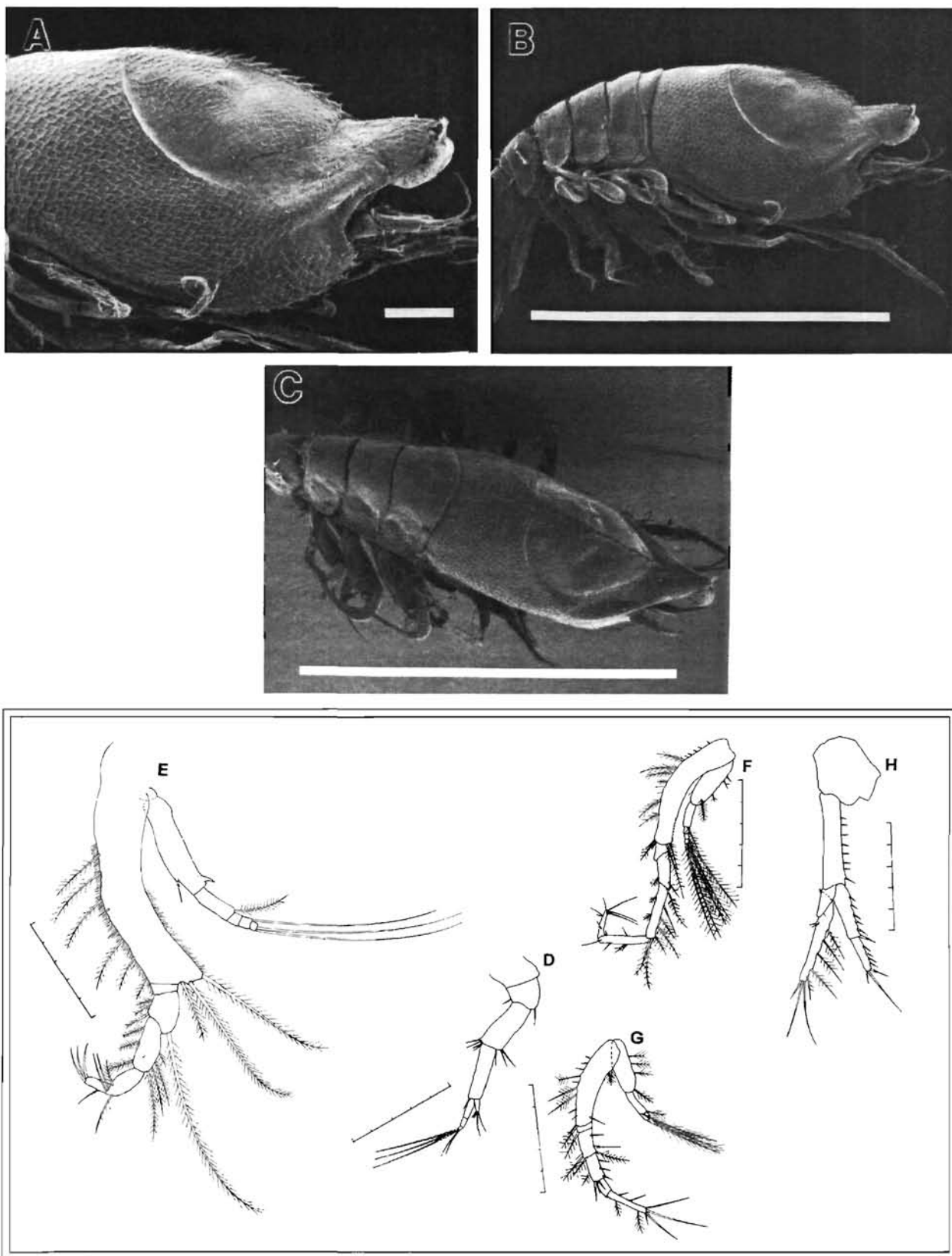


Figure 2.17. *Leucon (Leucon) falcicosta* Watling and McCann, new species. Male: A, carapace, lateral view; B, body, lateral view; C, carapace and pereonites, dorsal view. Female: D, antenna 1; E, maxilliped 3; F, pereopod 1; G, pereopod 2; H, uropod. Scale, A = 0.1 mm, B-C = 1 mm, D,E = 0.25 mm, F-H, 0.5 mm.

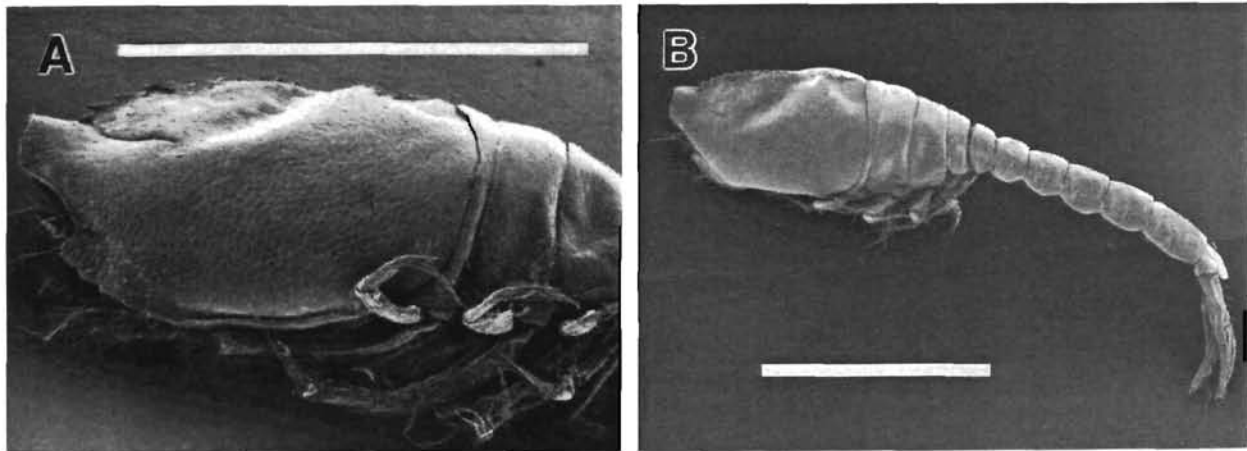


Figure 2.18. *Leucon (Leucon) armatus* Given, 1961. Female: A, carapace and pereonites 1-3, lateral view; B, body, lateral view. Scale = 1 mm.

Type Locality and Type Specimens. Velero IV sta. 4851-57, Mugu Canyon, 7.75 miles from Port Hueneme Light, 172 m; holotype AHF 5726, in Los Angeles County Museum.

Distribution. Southern California, in sandy silt, 145-187 m.

***Leucon (Leucon) magnadentata* Given, 1961**

Figure 2.19

Material Examined. Santa Maria Basin, Phase II. Cruise 1-1 (November, 1986), Sta. R-3 (87), R-6 (4); Cruise 1-2 (January, 1987), R-3 (66), R-5 (1), R-6 (1), R-9 (12); Cruise 1-3 (May, 1989), R-3 (135), R-6 (3), R-9 (23); Cruise 2-3 (October, 1987), R-3 (144), R-6 (2), R-9 (26); Cruise 2-4 (February, 1988), R-3 (118), R-6 (3), R-9 (26); Cruise 2-5 (May, 1988), R-3 (41), R-6 (1), R-9 (44); Cruise 3-1 (October, 1988), R-3 (137), R-6 (2), R-9 (20); Cruise 3-4 (May, 1989), R-3 (195), R-6 (11), R-9 (41).

Description. Size of adult female 5.5 mm, male 6.0 mm. Carapace longer than pereonites; pseudorostral lobes acute distally, slightly upturned; dorsomedian crest with 7-10 large serrations; anteroventral margin below antennal notch with large teeth. Pereopod 1 basis with large serrations; article 5 longer than article 6. Pereopod 2 article 3 absent. Uropod endopod 2-articulate, basal article the longer; endopod shorter than exopod. In mature male, carapace pseudorostral lobes more truncate than in female, serrations on dorsal crest reduced; pereonites 4 and 5 with exaggerated pleurites; uropod exopod and endopod with additional medial setae.

Remarks. Until this study, this species was known only from four specimens, all of which were juveniles. The species is distinguished by the very large serrations, both dorsally and ventrally, on the carapace of the juveniles and immature females and males.

Type Locality and Type Specimens. R/V *Velero IV* Sta. 5762-58, 8.6 miles 310.5° true from Point Loma light (near San Diego, California), 575 ft (208 m). Holotype AHF 585 (now in Los Angeles County Natural History Museum).

Distribution. Southern California including San Diego and southern part of Oregonian Provinces, 200-410 m.

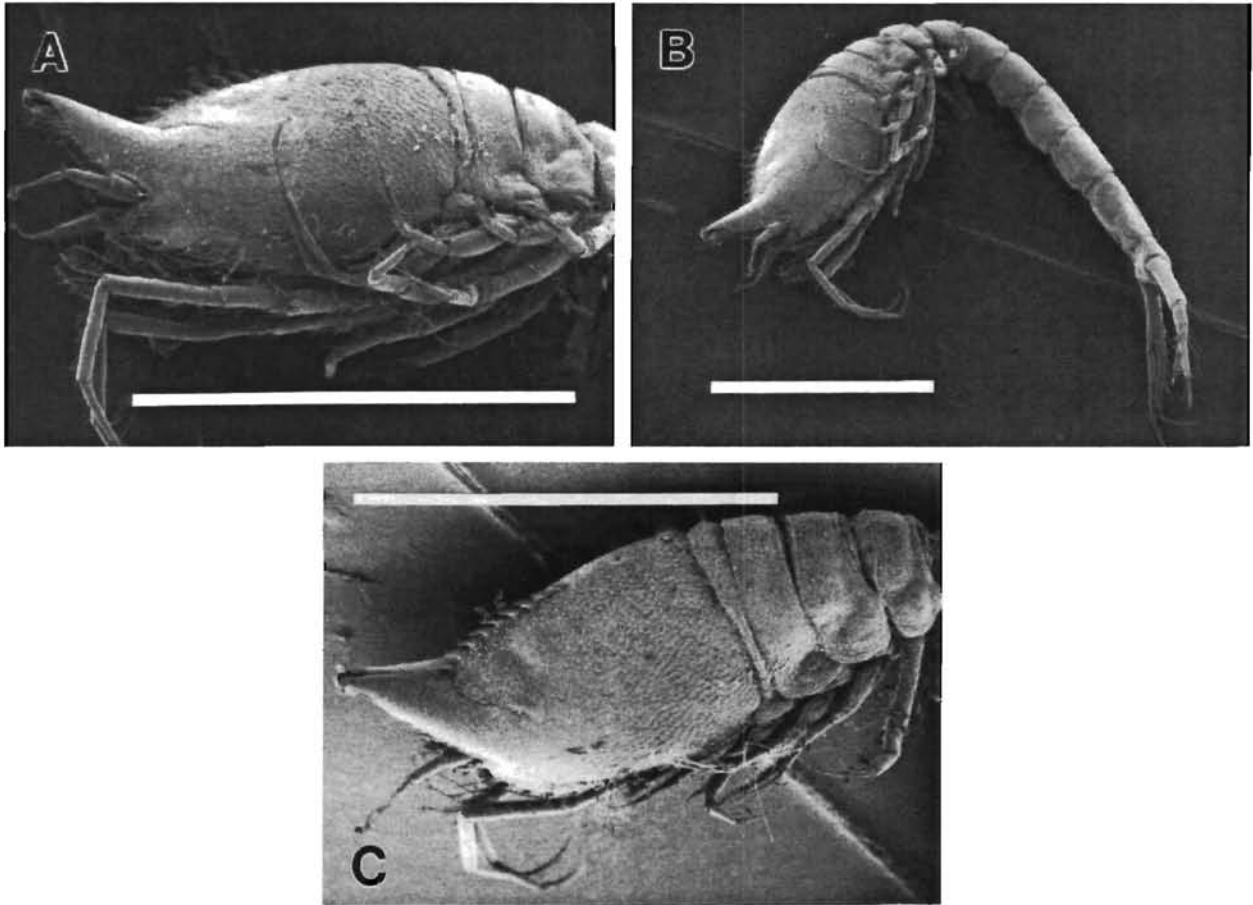


Figure 2.19. *Leucon (Leucon) magnadentata* Given, 1961. Female: A, carapace and anterior pereonites, lateral view; B, body, lateral view; C, carapace and anterior pereonites, dorsolateral view. Scale = 1 mm.

Genus *Eudorella* Norman, 1867

Type Species. *Eudora truncatula* Bate, 1856.

Diagnosis (from Watling, 1991a). Pseudorostrum directed dorsally in both male and female; antenna 1 geniculate between peduncle articles 2 and 3; male antenna 2 with brush of setae on anterior margin of peduncle articles 4 and 5; male antenna 2 flagellum extending nearly to end of pleon; female with exopods on pereopods 1-3; male with exopods on pereopods 1-4; pereopod 2 article 3 lost; uropod endopod 2-articulate; male with 2 pairs of pleopods.

Remarks. This is a cold-water genus represented by approximately 27 known species. The genus has a very conservative body plan, consequently, species are often differentiated on the basis of a narrow suite of features and correct identification of species may be difficult. If the specimen at hand does not fit the species described here, the key to the known species of the world (Watling, 1991a) should be consulted. Any species taken south of the immediate area encompassed by this Atlas are likely to be new to science.

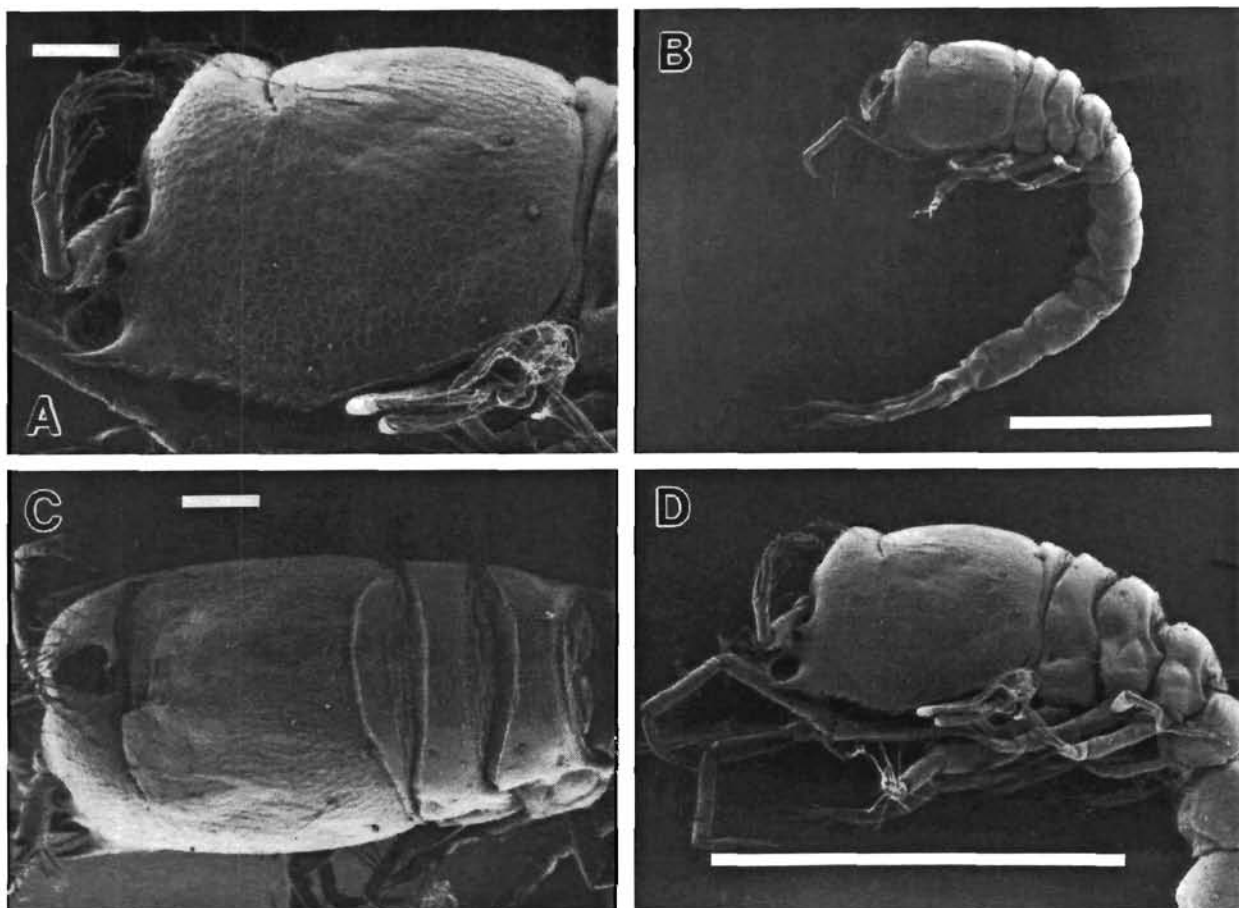


Figure 2.20. *Eudorella pacifica* Hart, 1930. Female: A, carapace, lateral view; B, body, lateral view; C, carapace and anterior pereonites, dorsal view; D, carapace and pereonites, lateral view. Scale A, C = 1 mm, B, D = 1 mm.

***Eudorella pacifica* Hart, 1930**

Figure 2.20

Eudorella tridentata Hart, 1930.

Material Examined. Santa Maria Basin, Phase II. Cruise 1-1 (November, 1986), Sta. R-1 (14), R-2 (33), R-3 (24), R-4 (79), R-5 (53), R-6 (1), PJ-1 (45); Cruise 1-2 (January, 1987), R-1 (14), R-2 (35), R-3 (15), R-4 (46), R-5 (54), R-9 (12), PJ-1 (18); Cruise 1-3 (May, 1987), R-1 (21), R-2 (30), R-4 (84), R-5 (62), R-6 (2), PJ-1 (31); Cruise 2-3 (October, 1987), R-1 (28), R-2 (20), R-3 (33), R-4 (153), R-5 (117), R-8 (1), PJ-1 (36); Cruise 2-4 (February, 1988), R-1 (34), R-2 (28), R-3 (20), R-4 (168), R-5 (159), R-8 (1), PJ-1 (43); Cruise 2-5 (May, 1988), R-1 (30), R-2 (38), R-3 (10), R-4 (138), R-5 (120), R-8 (8), R-9 (61), PJ-1 (23); Cruise 3-1 (October, 1988), R-1 (51), R-2 (22), R-3 (67), R-4 (208), R-5 (36), R-8 (12), PJ-1 (30); Cruise 3-4 (May, 1989), R-1 (61), R-2 (32), R-3 (66), R-4 (156), R-5 (64), R-6 (2), R-8 (21), PJ-1 (35).

Description. Female 4.5 mm, male 6 mm. Antennule peduncle articles 2 and 3 subequal in length; main flagellum basal article with setae along inner margin; accessory flagellum as long as main flagellum basal article. Pereopod 1 article 5 shorter than article 6. Pereopod 2 article 5 about 1.5 times length of article 4. Uropod exopod much shorter than endopod, only as long as endopod basal article.

Remarks. This species shows considerable variation, especially with respect to the teeth in the vicinity of the anteroventral corner and associated notch (Barnard and Given, 1960). Additionally, variation in the length of appendage articles and degree of setation has also been seen, both of which undoubtedly led Hart to create the new species *E. tridentata*. In the Santa Maria Basin area *E. pacifica* is very common and exhibits varying degrees of calcification as well as size of adults.

Type Locality and Type Specimens. Deep Cove, Vancouver Island, British Columbia; holotype in British Columbia Provincial Museum.

Distribution. Very common throughout San Diego and Oregonian Provinces, 20-410 m.

Eudorella redacticruris Watling and McCann, new species

Figure 2.21

Material examined. *Pac Baroness* wreck (34°21.43'N, 120°38.29'W, 410-436 m) and control (34°25.01'N, 120°41.51'W, 432 m) sites, off Point Conception, 135 specimens.

Description. Size of adult female and male, 3.5-4.0 mm. Carapace in both male and female longer than free pereonites; anteroventral angle marked with strong tooth; antennal notch broad and shallow, with only a single tooth marking dorsal boundary in female, no tooth in male. Pereonite 1 visible dorsally, submerged laterally; pereonites 4 and 5 with lateral pleural extension in male. Antennule peduncle articles 2 and 3 subequal in length; accessory flagellum two-thirds length of main flagellum basal article, outer margin of latter with two setae distally. Pereopod 1 articles 5 and 6 subequal in length. Pereopod 2 article 3 absent; article 4 one-half the length of article 5. Pereopod 5 absent in both sexes; male with strongly developed penial lobes. Uropod exopod nearly as long as endopod; terminal seta not fused to endopod distal article; endopod basal article armed with long setae proximally and short, microsetulate setae distally.

Remarks. This species is unique in the genus in having lost the fifth pereopod; however, since the animal otherwise is indistinguishable from *Eudorella*, the erection of a new genus for this aberrant form seems unwarranted. The presence of penial lobes is also quite rare in the Cumacea. Two other species with penial lobes are known, *Campylaspis rowei*, for which the new genus, *Campylaspenis*, was originally erected by Bacescu & Muradian (1974) and *Archaeocuma peruanum*, used to establish the new family Archaeocumatidae by Bacescu (1972). Ledoyer (1988) was not convinced that *Campylaspenis*, with the exception of the penial lobes, was sufficiently different from the remaining *Campylaspis* species to warrant the erection of a new genus; and Day (1988) noted that *Archaeocuma* possessed many of the characters of the Lampropidae. In general, single character differences, even though they seem significant, have not resulted in the erection of new genera, but this view may change as more of these aberrant forms are discovered.

Type Locality and Type Specimens. California, Santa Barbara Co., off Pt. Conception, 34°21.43'N, 120°38.29'W, 430m, holotype USNM 273577, and paratypes USNM 273578 and LACM 95-75.1.

Etymology. From Latin, *redactus* = edited, abridged, and *cruris* = leg, referring to the highly reduced form of the fifth leg.

Distribution. Known only from the type locality.

Eudorella truncatula Bate, 1856

Figure 2.22

Material examined. Santa Maria Basin, Phase II. Cruise 1-1 (November, 1986), Sta. R-7 (7); Cruise 1-2 (January, 1987), R-7 (1); Cruise 1-3 (May, 1987), R-7 (2), R-9 (40); Cruise 2-3 (October, 1987), R-7 (1), R-9 (22); Cruise 2-4 (February, 1988), R-7 (3), R-9 (60); Cruise 3-1 (October, 1988), R-7 (4), R-9 (35); Cruise 3-4 (May, 1989), R-6 (2), R-7 (1), R-9 (58).

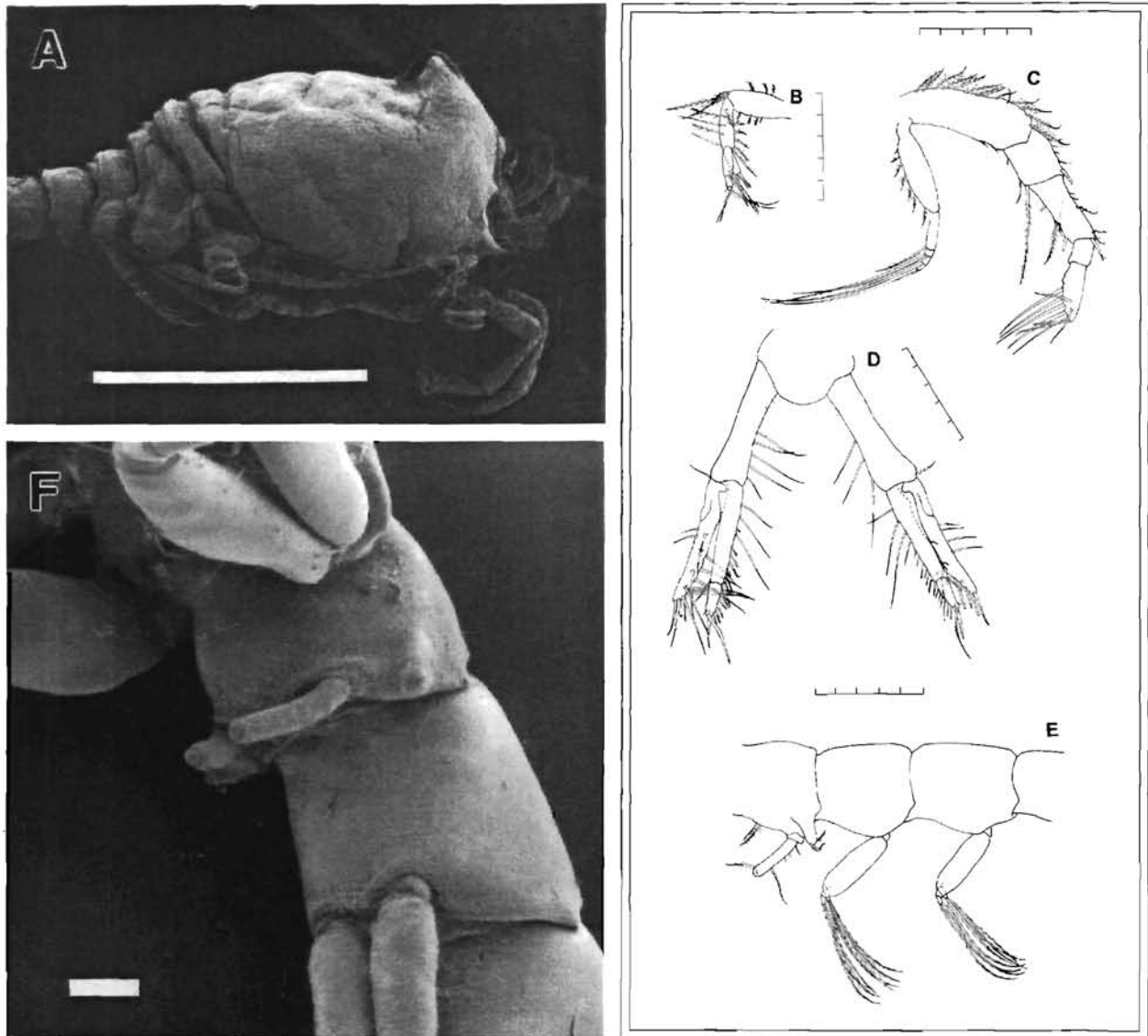


Figure 2.21. *Eudorella redacticruris* Watling and McCann, new species. Female: A, carapace and pereonites, lateral view; B, antenna 1; C, pereopod 2; D, uropods. Male: E, pereonite 5 with penial lobes and pleonites 1 and 2 with appendages; F, ventral view of penial lobes. Scale, A = 1 mm, B-E = 0.5 mm, F=0.1mm.

Description. Adult size, female and male, 5 mm. Antennule peduncle articles 2 and 3 subequal in length; main flagellum basal article with setae on outer margin; accessory flagellum three-fourths length of main flagellum basal article. Pereopod 1 article 5 shorter than article 6. Pereopod 2 articles 4 and 5 subequal in length. Uropod exopod longer than endopod basal article; endopod terminal seta fused to distal article.

Remarks. This is a widespread northern cold-water species which seems to exhibit a significant amount of variation. At least four species have been described from the eastern North Atlantic and Mediterranean which may be variants of *E. truncatula*. This species has hitherto not been recorded from the U.S. west coast; however, since it is known to occur in boreal waters, it is possible that it will be found at outer shelf depths from California to Alaska.

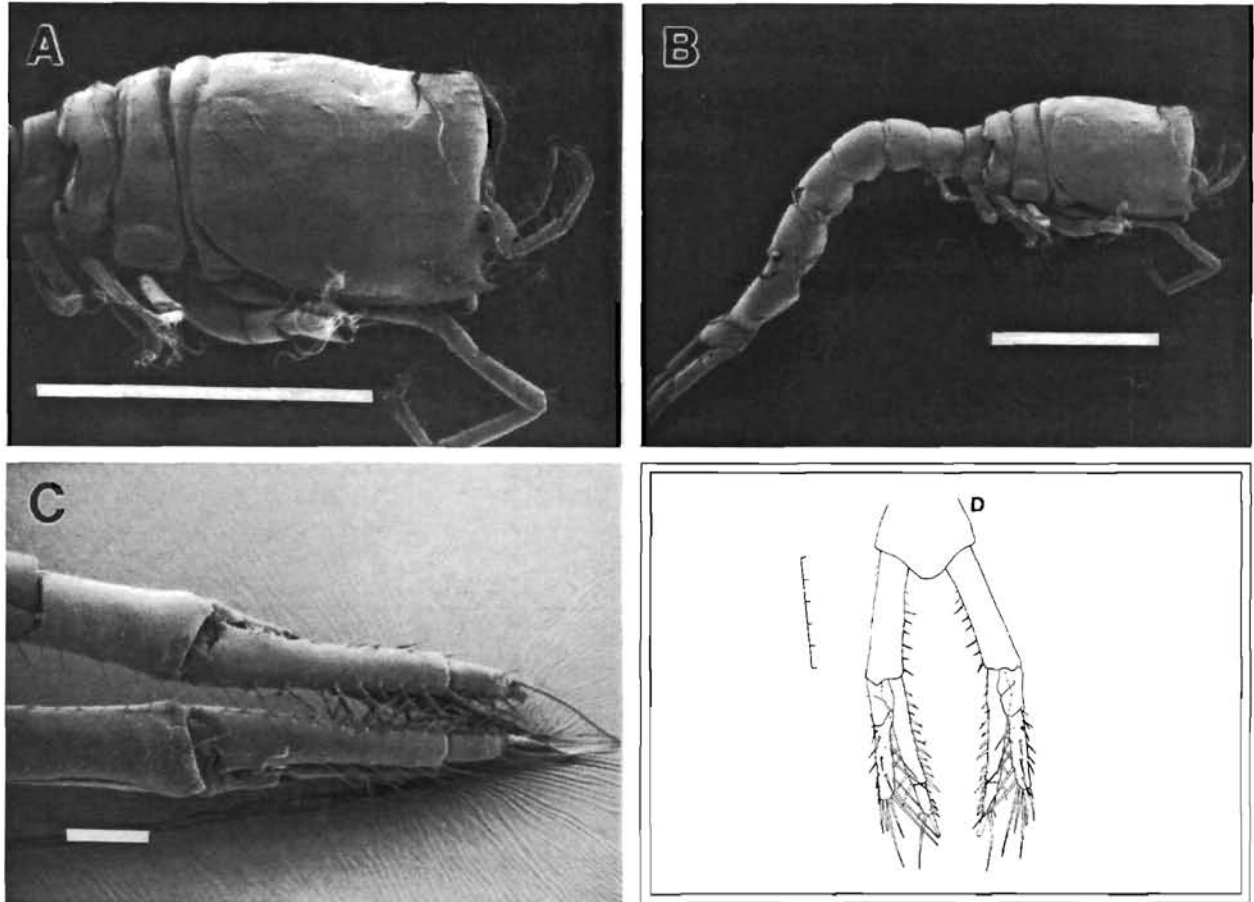


Figure 2.22. *Eudorella truncatula* Bate, 1856. Female: A, carapace and pereonites 1-4, lateral view; B, body, lateral view; C, D, uropods. Scale, A, B = 1 mm, scale C = 0.1 mm, D = 0.5 mm.

Type Locality and Type Specimen. British Isles; holotype in Natural History Museum, London.

Distribution. Boreal N.E. and N.W. Atlantic, Mediterranean, and boreal N.E. Pacific, shallow shelf to deep bathyal. Record from New Zealand is doubtful.

Genus *Eudorellopsis* Sars, 1883

Type Species. *Leucon deformis* Krøyer, 1846.

Diagnosis (from Watling, 1991a). Pseudorostrum directed dorsally in both male and female; antenna 1 geniculate between peduncle articles 1 and 2; male antenna 2 with brush of setae on anterior margin of peduncle articles 4 and 5; male antenna 2 flagellum extending well along pleon; female with exopods on pereopods 1-3; male with exopods on pereopods 1-4; pereopod 2 article 3 lost; uropod endopod peduncle 2-articulate; male with 2 pairs of pleopods.

Remarks. Species in this genus have been found, with one exception (New Zealand), in the North Atlantic and North Pacific.

Eudorellopsis longirostris Given, 1961

Figure 2.23

Material Examined. Santa Maria Basin, Phase II. Cruise 1-1 (November, 1986), Sta. R-4 (6); Cruise 1-2 (January, 1987), R-4 (2); Cruise 1-3 (May, 1989), R-4 (14); Cruise 2-3 (October, 1987), R-4 (4); Cruise 2-4 (February, 1988), R-4 (4), R-5 (1); Cruise 2-5 (May, 1988), R-4 (12), R-5 (3); Cruise 3-1 (October, 1988), R-4 (5), R-5 (2); Cruise 3-4 (May, 1989), R-4 (17), R-5 (2).

Description. Size of adult female, 4 mm. Carapace with 2 oblique, curving, lateral ridges, uppermost terminating anteriorly in small horn; pseudorostral lobes with covering of fine setae; anteroventral margin finely serrate. Uropod endopod nearly as long as exopod; endopod basal article strongly armed with medial setae; distal article about one-third length of proximal article, terminal seta slender, not approaching fusion with distal article.

Remarks. The only other species with anterolateral horns, *E. ushakovi* Lomakina, also has one or more dorsomedial horns on the carapace, and the anteroventral margin of the carapace is coarsely serrate.

Type Locality and Type Specimens. R/V *Velero IV* Sta. 5828-58, 10 miles 231.5° true from Ventura Pier light, depth 186 m; holotype AHF 584 (now in Los Angeles County Natural History Museum).

Distribution. Southern California, in sandy sediments, 43-183 m.

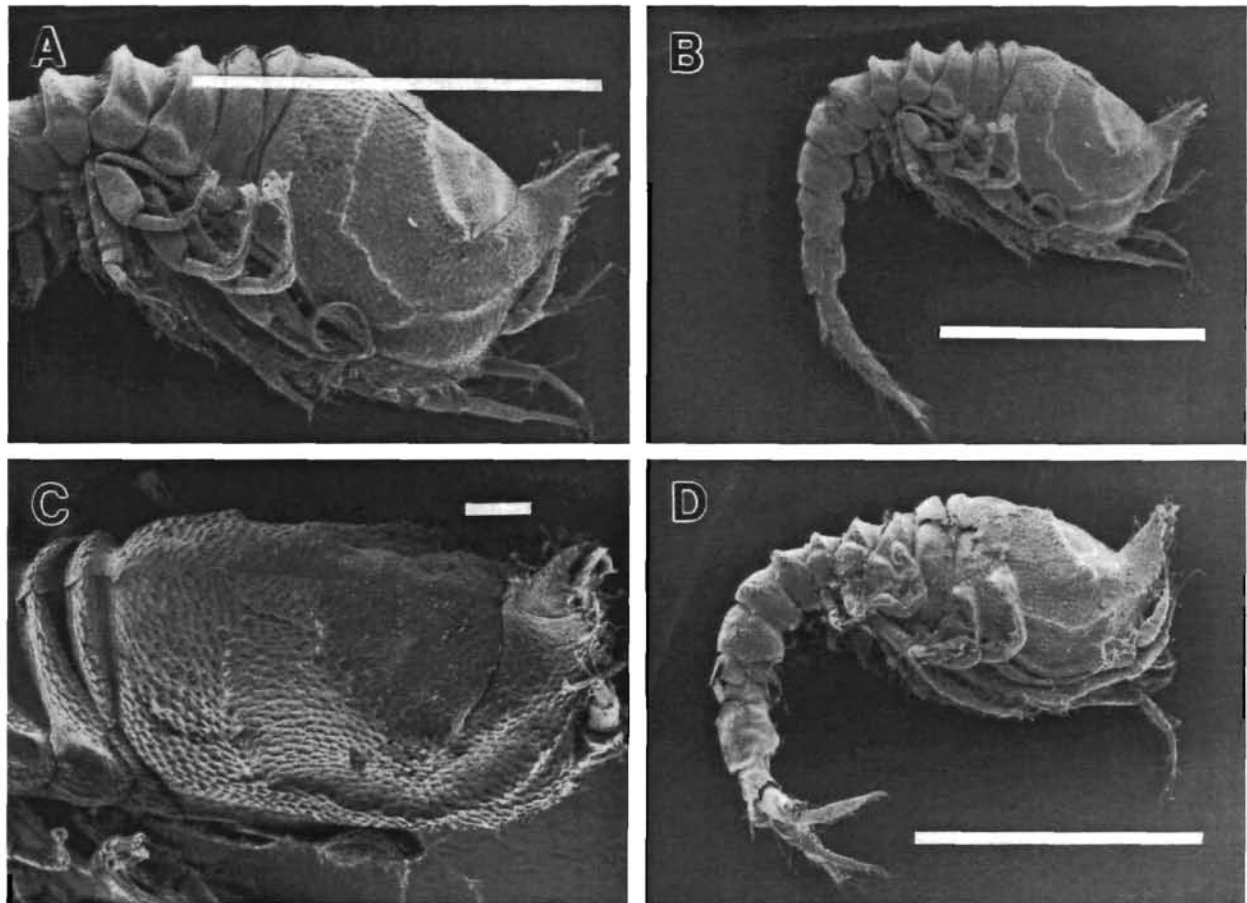


Figure 2.23. *Eudorellopsis longirostris* Given, 1961. Subadult male: A, carapace and pereonites, lateral view; B, body, lateral view; C, carapace, dorsal view. Subadult female: D, body, lateral view. Scale A, B, D = 1 mm, C = 0.1 mm.

Family Nannastacidae

Diagnosis (emended from Jones, 1963). Mandibles naviculoid with columnar molar or truncate with styliform molar. Maxilla 1 palp with 1 or 2 setae. Exopods present on maxilliped 3 and pereopods 1-4, occasionally absent from pereopods 3 and/or 4, in male, and in female on maxilliped 3 and pereopods 1 and 2, occasionally absent from maxilliped 3 while occurring on pereopods 1 and 2, or absent from all appendages. Pleopods absent in male. Telson absent. Uropod endopod uniarticulate.

Remarks. The Nannastacidae are often difficult to distinguish from specific members of the Bodotriidae, especially those where the male is unknown, or where, as in some members of the Mancocuminae, the male lacks pleopods. In the Santa Maria Basin region, the family is represented only by the genera *Campylaspis*, *Procampylaspis*, and *Cumella*, all of which have a characteristic carapace shape, and so are easily recognizable.

Key to the Nannastacidae of the Santa Maria Basin

- 1A. Carapace basically smooth, may be covered with fine sediment, lateral sulcus may be present 2
- 1B. Carapace with tubercles, ridges, spines covering large areas of the carapace or otherwise conspicuous 6

- 2A. Carapace covered with fine detritus, 3 or 4 spines occasionally visible, maxilliped 2 dactyl with recurved teeth *Procampylaspis caenosa*
- 2B. Carapace features visible, not covered excessively with detritus 3

- 3A. Pereonites 4 and 5, pleonites 1-3 with dorsolateral spikes *Campylaspis blakei*
- 3B. Pereonites and pleonites without dorsolateral spikes 4

- 4A. Carapace without lateral sulcus *Campylaspis rufa*
- 4B. Carapace with lateral sulcus 5

- 5A. Carapace lateral sulcus narrow; uropod exopod without setae on outside margin *Campylaspis canaliculata*
- 5B. Carapace lateral sulcus wide; uropod exopod with setae on outside margin *Campylaspis biplicata*

- 6A. Carapace with conspicuous middorsal ridge or spines 7
- 6B. Carapace ornamentation primarily dorsolateral 8

- 7A. Carapace with middorsal row of large curved spines *Cumella californica*
- 7B. Carapace with middorsal ridge *Cumella morion*

- 8A. Carapace with lateral ridges, without tubercles *Campylaspis hartae*
- 8B. Carapace with tubercles or tuberculate ridges 9

- 9A. Uropod peduncle and endopod with many evenly-spaced medial setae
 *Campylaspis rubromaculata*
- 9B. Uropod peduncle devoid of medial setae, endopod with 1-3 medial setae
 *Campylaspis maculinodulosa*

Genus *Campylaspis* Sars, 1865

Type Species. *Cuma rubicunda* Lilljeborg, 1855

Diagnosis (after Jones, 1974). Carapace strongly elevated posteriorly in females, often covering anterior pereonites; anteroventral corner little or not produced; ocular lobe single, middorsal, often rudimentary. Mandible molar styliform. Maxilla reduced to simple plate without movable endites. Antenna 1 peduncle article 2 without process, subequal to or longer than article 3. First maxilliped reduced, with only three articles, terminal article very small. Second maxilliped with propodus articulated at near right-angle to carpus and ending in broad seta, dactyl short and ending in 2 or more distal diverging spines. Female maxilliped 3, pereopods 1 and 2 with exopods; male maxilliped 3 and pereopods 1-4 with exopods. Pereopod 1 with ischium not specially elongated. Uropod peduncle usually as long as or longer than pleonite 6; exopod basal article short, not submerged in peduncle; exopod longer than its terminal seta.

Remarks. The genus *Campylaspis* belongs to a group of genera (including *Procampylaspis*, *Camylaspides*, *Paracampylaspis*) within the Nannastacidae characterized by the carapace being elevated posterodorsally. In this group the primary generic characters are associated with head or anterior thoracic appendages. For example, in *Procampylaspis*, the dactyl of maxilliped 2 is clawed, rake-like, in *Campylaspides*, it is in the form of a trident, and in *Paracampylaspis*, while the dactyl of maxilliped 2 is highly reduced, the carpus of maxilliped 3 is greatly expanded.

Campylaspis canaliculata Zimmer, 1936

Figure 2.24

Material Examined. Santa Maria Basin, Phase II. Cruise 1-2 (January, 1987), Sta. R-1 (2), R-3 (1), R-4 (1), R-6 (1), R-8 (2), R-9 (1); Cruise 1-3 (May, 1987), R-1 (1); Cruise 2-3 (October, 1987), R-1 (1), R-3 (1), R-4 (1), R-9 (2); Cruise 2-4 (February, 1988), R-1 (4), R-4 (5), R-8 (1), PJ-1 (2); Cruise 2-5 (May, 1988), R-1 (1), R-4 (1), R-5 (1); Cruise 3-1 (October, 1988), R-1 (4), R-4 (1), R-8 (2), R-9 (1); Cruise 3-4 (May, 1989), R-4 (5), R-9 (2).

Description. Female, 4 mm. Carapace smoothly rounded, elevated posteriorly, with small, lateral, upwardly curving sulcus extending from ventral margin of pseudorostral lobe to middle of carapace side; in dorsal view, carapace moderately pointed anteriorly; pseudorostral lobes of normal short length; eyelobe with 3 lenses. Pereonites 1 and 2 with mid-dorsal projections (lappets) which fit into posteromedian depression on carapace. Pereopod 2 article 7 as long as article 5, not distally tapering. Uropod peduncle about twice length of endopod, and slightly longer than last 2 pleonites, armed medially with 2-7 heavy setae; endopod with 2-7 heavy setae; exopod shorter and more slender than endopod, with single subterminal median seta. Male, 4 mm. Carapace more elongate and less arched than that of female; lenses of eyelobe enlarged; lateral sulcus not present. Pereonites 1 and 2 with middorsal projections; pereonite 1 mostly obscured by dorsal margin of carapace; remaining pereonites and pleonites with paired dorsolateral ridges. Uropod peduncles much longer than those of female, about as long as last 4 pleonites; medial margin of endopod and peduncle armed continuously with finely serrate setae; exopod as in female.

Remarks. Previously known from 2 specimens, both females. This is the only smooth carapace form in this region with a narrow lateral sulcus.

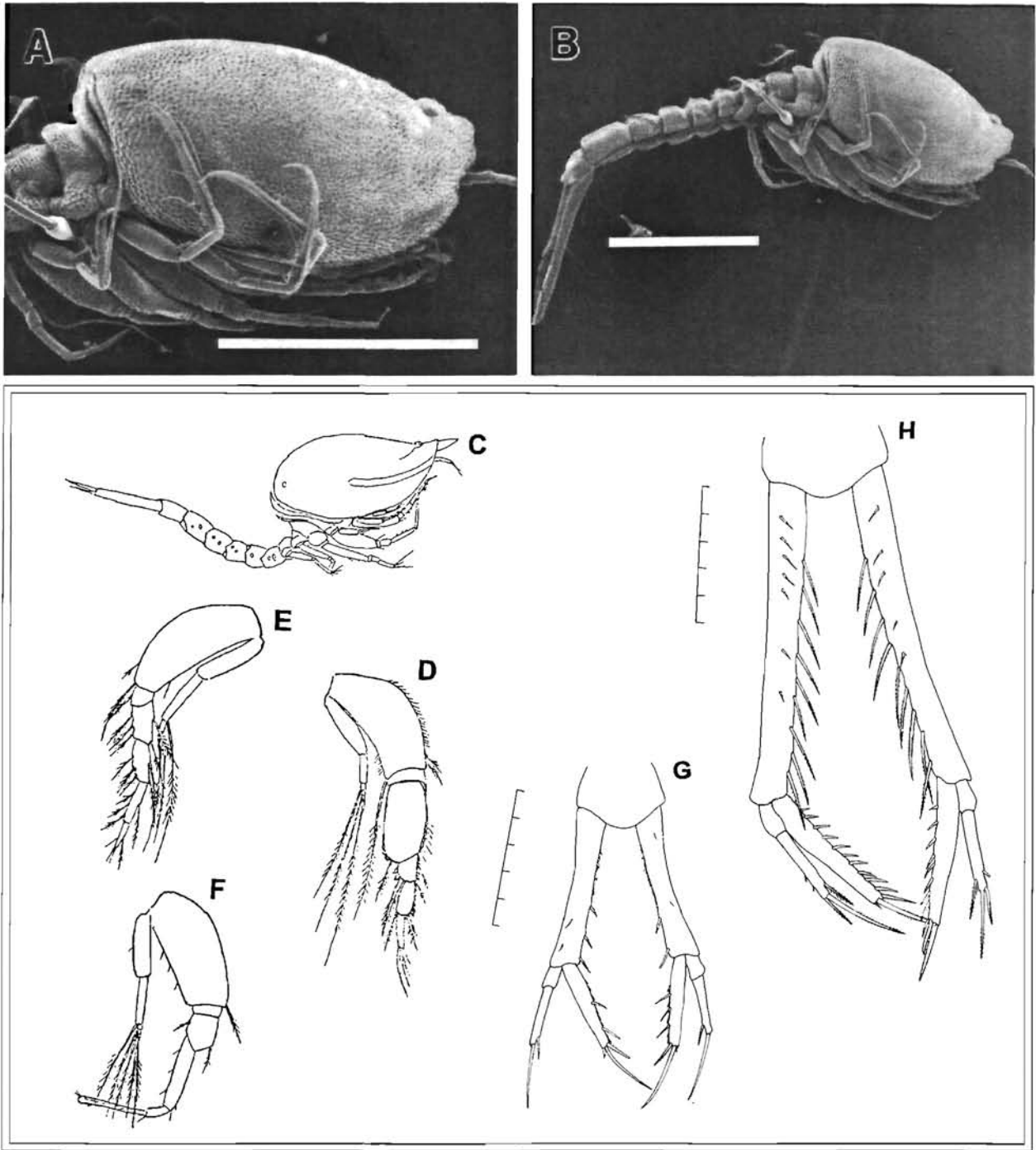


Figure 2.24. *Campylaspis canaliculata* Zimmer, 1936. Male: A, carapace and pereonites 1-2, lateral view; B, body, lateral view; H, uropods. Female: C, body, lateral view; D, maxilliped 3; E, pereopod 1; F, pereopod 2; G, uropods. Scale A, B = 1 mm, G, H = 0.5 mm (C-F from Zimmer, 1936; no scale provided).

Type Locality and Type Specimens. Between Corona Del Mar and Balboa, California, holotype USNM 7148.

Distribution. Southern California including San Diego and southern Oregonian Provinces, 14-410 m.

Campylaspis rufa Hart, 1930

Figure 2.25

Material Examined. Santa Maria Basin region, Phase II. Cruise 1-1 (November, 1986), Sta. R-3 (2); Cruise 1-2 (January, 1987), R-7 (4).

Description. Female, 3.5 mm. Carapace large, smooth, comprising more than half total length of body, extending dorsally over pereonites 1-3; antennal notch obsolete; eyelobe broadened, without lenses. Pereopod 2 articles 5 and 7 subequal in length. Uropod peduncles twice length of endopod and approximately equal in length to last 2 pleonites combined; medial margin of peduncle armed with large scales giving coarsely serrate appearance; endopod with about 7 medial setae. Color dark reddish-brown to orange, with large dark red chromatophores scattered over body.

Remarks. The very small adult body size and smooth, reddish brown carapace serves to distinguish this species from all others in the Santa Maria Basin region. *Campylaspis rufa* has never been found in even moderate abundance; its occurrence here extends its range throughout the Oregonian Province.

Type Locality and Type Specimens. Mitlenatch, Vancouver Island, British Columbia, 200 m.; type in British Columbia Provincial Museum.

Distribution. Vancouver Island to Point Conception, 200 - 565 m.

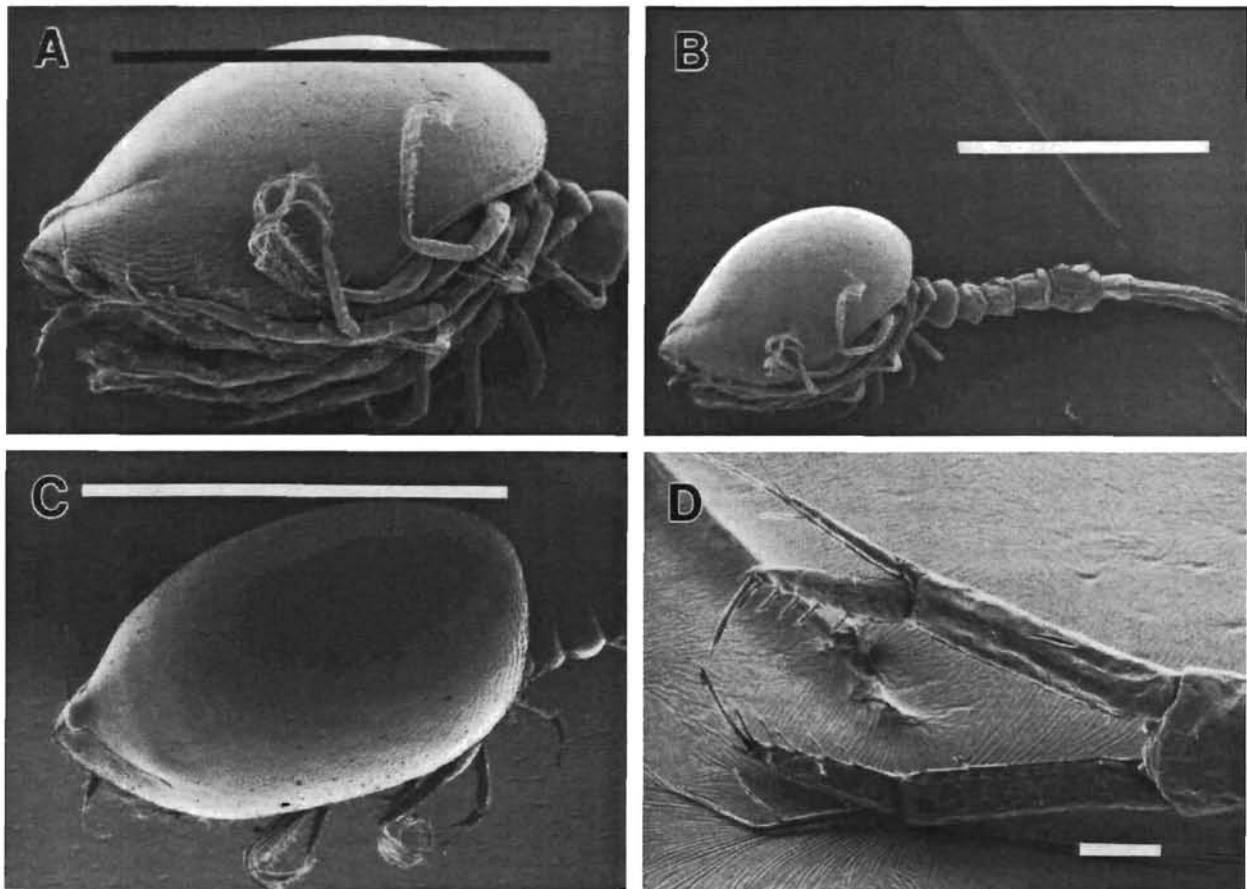


Figure 2.25. *Campylaspis rufa* Hart, 1930. Female: A, carapace and pereonites, lateral view; B, body, lateral view; C, carapace, dorsal view; D, uropods. Scale A-C = 1mm, D = 0.1 mm.

Campylaspis rubromaculata Lie, 1971

Figure 2.26

Campylaspis nodulosa Lie, 1969 (*non* Sars, 1887)

Material Examined. Santa Maria Basin, Phase II, Cruise 1-1 (November, 1986), Sta. R-4 (1), R-5 (14), R-7 (8), PJ-1 (15); Cruise 1-2 (January, 1987), R-1 (3), R-2 (1), R-4 (1), R-5 (4), PJ-1 (10); Cruise 1-3 (May, 1987), R-1 (3), R-8 (3), PJ-1 (9); Cruise 2-3 (October, 1987), R-5 (3), PJ-1 (6); Cruise 2-4 (January, 1988), R-1 (2), R-8 (2), PJ-1 (16); Cruise 2-5 (May, 1988), R-1 (1), PJ-1 (2); Cruise 3-1 (October, 1988), PJ-1 (1); Cruise 3-4 (May, 1989), R-1 (3), R-8 (1), PJ-1 (9).

Description. Female, 4 mm. Carapace elevated posteriorly, covered with low tubercles in middorsal region, laterally forming dorsal border to sulcus, with single ridge of low tubercles forming ventral border to sulcus and short row of 3 tubercles extending into sulcus dorsally; pseudorostral lobes without tubercles dorsally, slightly elongate; eyelobe enlarged, without noticeable lenses. Pereonites 1 and 2 with middorsal projections, pereonite 1 visible in lateral view; pereonites 3-5 with strong ridge along posterior border. Pereopod 2 article 7 nearly 1.5 times length article 5; articles 4 and 5 armed with plumose setae. Uropod peduncle as long as last 2 pleonites combined and more than twice length of endopod; latter terminally quadrate, armed with 3-5 setae medially and 1 short and 1 long setae terminally; exopod shorter than endopod, with single subterminal seta medially. Color in life, orange with red pigment chromatophores.

Remarks. This species was originally described by Lie (1969), but the proposed name, *Campylaspis nodulosa*, was occupied as Sars (1887) had described a species from the North Atlantic with that name. *Campylaspis rubromaculata* bears considerable resemblance to *C. sagamiensis* Gamô and *C. maculinodulosa* Watling and McCann, which is described below. See remarks under that species for characters which can be used for their separation.

Type Locality and Type Specimens. Puget Sound, Seattle, Washington, Holotype female, USNM 125081, 23 m.

Distribution. Southern California to Washington, 22-565 meters.

Campylaspis maculinodulosa Watling and McCann, new species

Figure 2.27

Material Examined. Santa Maria Basin, Phase II, Cruise 1-1 (November, 1986), Sta. R-1 (19), R-4 (5), PJ-1 (5); Cruise 1-2 (January, 1987), R-1 (3), R-4 (4), R-8 (2), PJ-1 (2); Cruise 1-3 (May, 1987), R-1 (16), R-4 (1), R-5 (1), R-8 (3), PJ-1 (2); Cruise 2-3 (October, 1987), R-1 (12), R-4 (4), R-5 (2), R-8 (4), PJ-1 (2); Cruise 2-4 (January, 1988), R-1 (3), R-4 (3); Cruise 2-5 (May, 1988), R-1 (20), R-4 (6), R-8 (16); Cruise 3-1 (October, 1988), R-1 (12), R-4 (5), R-8 (2); Cruise 3-4 (May, 1989), R-1 (24), R-8 (11).

Description. Adult size, female and male, 2.0 mm. Carapace slightly elevated posteriorly, with covering of non-contiguous low tubercles dorsally; lateral sulcus bordered with lightly tuberculate ridge dorsally and row of widely spaced tubercles ventrally; pseudorostral lobes longer than normal for the genus, with row of 3 tubercles extending anteriorly from lateral carapace ridge; eyelobe distinct, without noticeable lenses. Pereonites 1 and 2 with middorsal projections; pereonites 3 and 4 with low dorsolateral tubercles. Pereopod 2 article 3 present; article 7 only slightly longer than article 5. Uropod peduncle as long as last 2 pleonites combined and nearly twice length of endopod; rami subequal in length; peduncle unarmed medially and endopod with 1 or 2 medial setae. Color in life translucent white with spots on tubercles. Male carapace lower and more elongate, only 2 lateral tubercles at posterior end of sulcus; uropod longer than in female, with about 10 evenly spaced setae on peduncle medial margin, endopod with 4-5 medial setae.

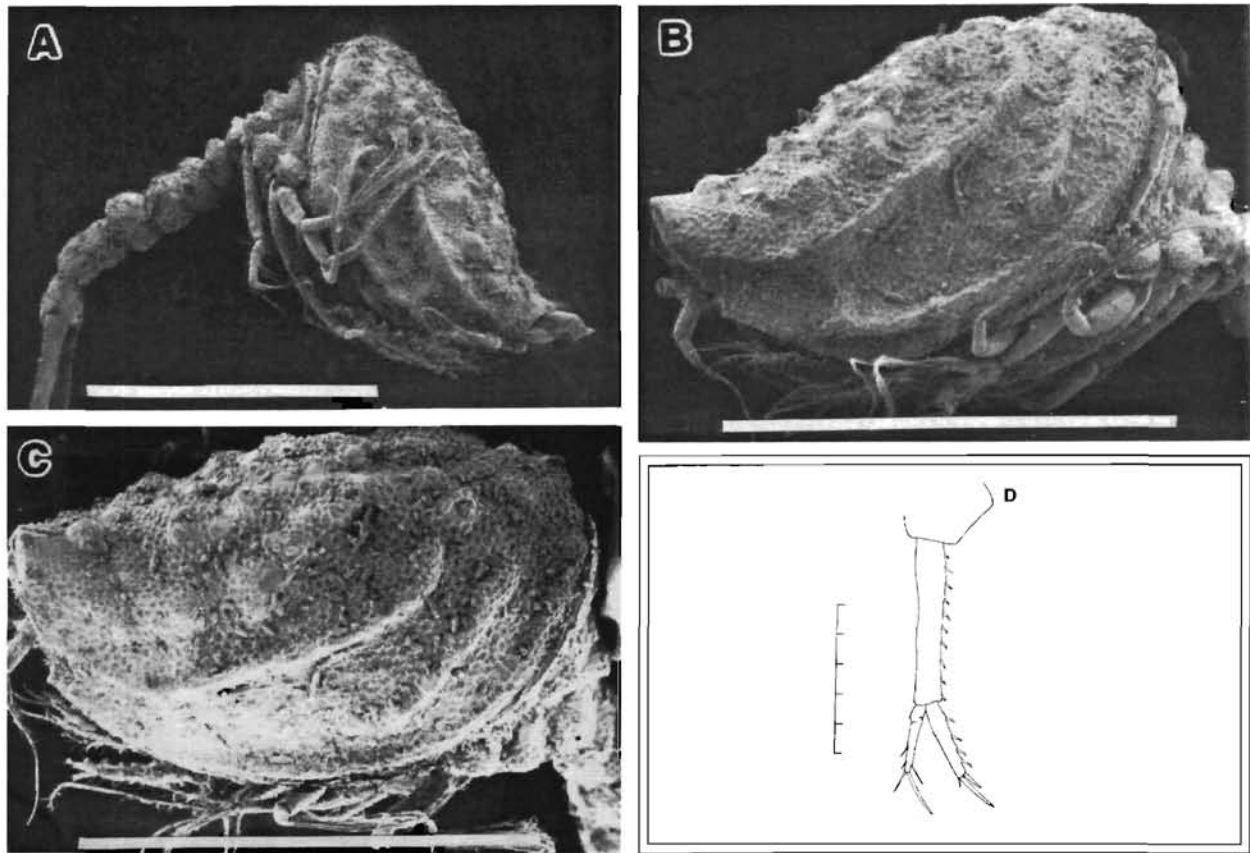


Figure 2.26. *Campylaspis rubromaculata* Lie, 1971. Subadult female: A, body, lateral view; B, carapace and anterior pereonites, lateral view; C, carapace, dorsal view; E, uropod. Scale, A-C, 1.0 mm, D = 0.5 mm.

Remarks. This species is very similar in general form to *C. rubromaculata*, but differs from the latter in the presence of tubercles rather than a short ridge at the posterior end of the carapace lateral sulcus, and in the lack of setae on the medial margin of the female uropod peduncle. *Campylaspis sagamiensis* Gamô exhibits a very similar arrangement of tubercles on the carapace, but differs from *C. maculinodulosa* in having the tubercles more widely separated such that a continuous ridge is not formed above the sulcus, and in its weakly setose male uropod peduncle.

Type Locality and Type Specimens. California, Santa Maria Basin, off Point San Luis, Sta.R-1 35°05.83'N, 120°49.16'W, 91 m, holotype USNM 273575, paratypes USNM 273567 and LACM 95-74.1.

Etymology. From Latin, *maculosus*, = spotted, and L., *nodulus*, = knob, referring to the chromatophores that are associated primarily with the tubercles on the carapace.

Distribution. Known only from the Santa Maria Basin region, 90-154 m.

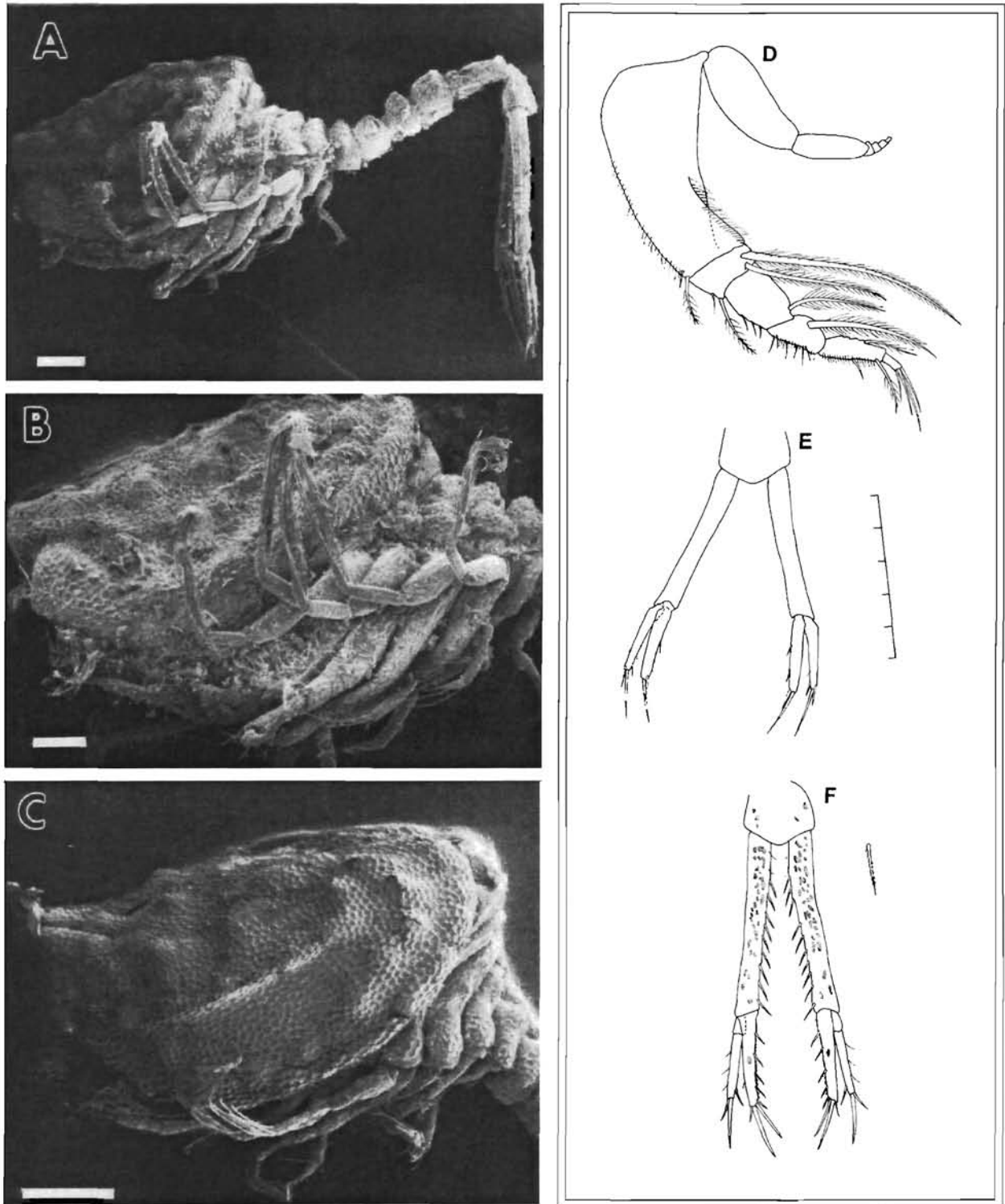


Figure 2.27. *Campylaspis maculinodulosa* Watling and McCann, new species. Male: A, body, lateral view; B, carapace and pereonites, lateral view; F, uropods. Female: C, carapace and pereonites, lateral view; D, maxilliped 3; E, uropods. Scale, A= 0.1 mm, B,C = 0.2 mm, E = 0.5 mm.

Campylaspis hartae Lie, 1969

Figure 2.28

Material Examined. Santa Maria Basin, Phase II, Cruise 1-2 (January, 1987), Sta. R-5 (3), PJ-1 (3); Cruise 1-3 (May, 1987), R-1 (7), R-5 (8); Cruise 2-3 (October, 1987), R-5 (17), R-8 (4); Cruise 2-4 (January, 1988), R-5 (5); Cruise 2-5 (May, 1988), R-5 (8); Cruise 3-1 (October, 1988), R-4 (4), R-5 (4), R-8 (1); Cruise 3-4 (May, 1988), R-4 (2), R-5 (3).

Description. Adult female, 3.5 mm. Carapace strongly elevated posteriorly, with several series of strong ridges bordering deep sulci, 3 of which transverse, with first crossing frontal lobe and joining lateral ventral ridges anteriorly, second passing obliquely posteriorly to middorsal region, and posteriormost running from ventrolateral ridge to middorsal ridge, 2 of which are horizontal and border lateral sulcus. Eyelobe enlarged but without distinct lenses. Pereonite 1 only with strong middorsal projection. Pereopod 2 article 3 distinct, article 7 short and wide but longer than article 5, armed with several lateral setae. Uropod peduncle nearly equal in length to last 2 pleonites and 2 to 2.5 times length of endopod; peduncle unarmed medially, but heavily scaled, endopod with 3 medial setae. Immature male very similar to female; uropod endopod with more medial setae, but peduncle remains without medial setae.

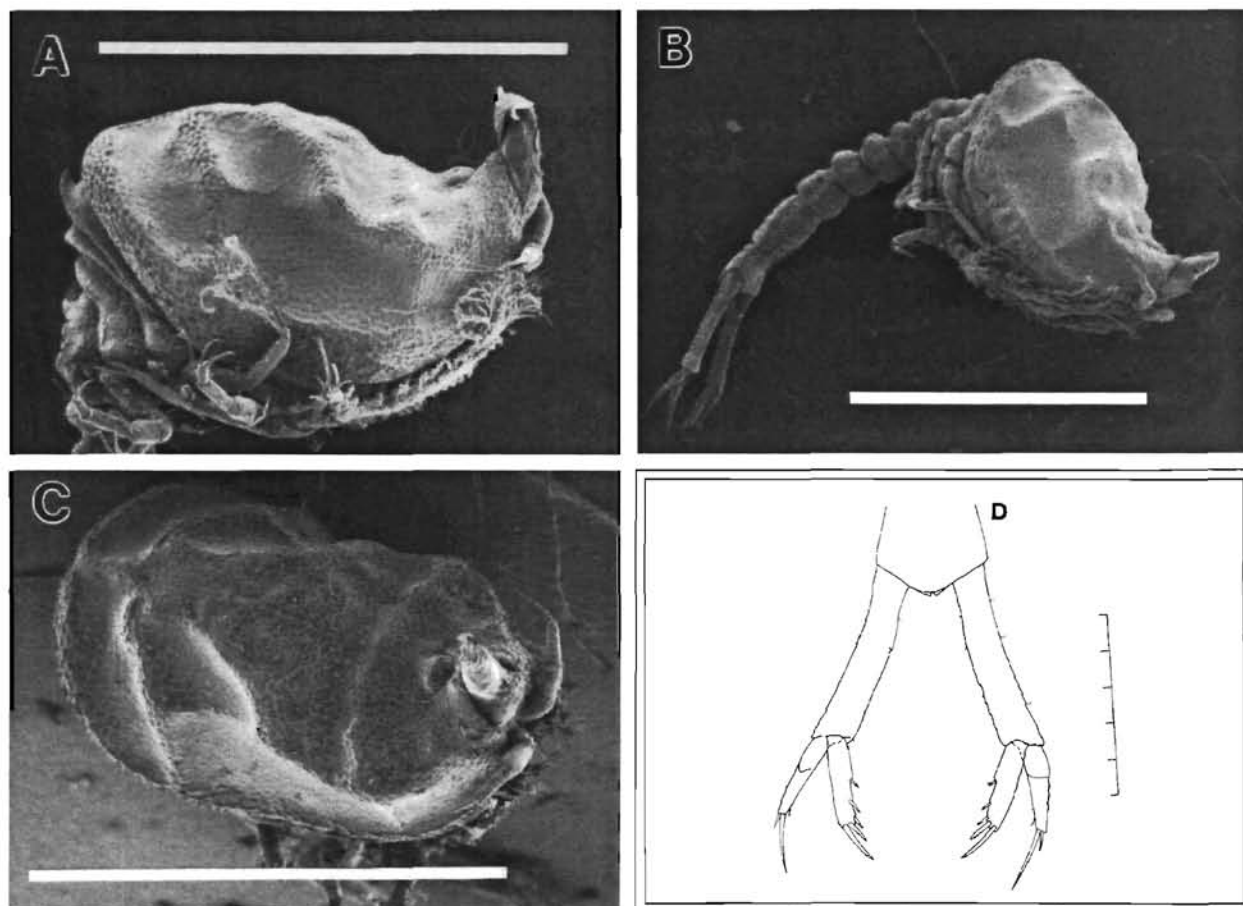


Figure 2.28. *Campylaspis hartae* Lie, 1969. Female: A, carapace and pereonites, lateral view; B, body, lateral view; C, carapace, dorsal view; D, uropods. Scale, A-C = 1 mm, D = 0.5 mm.

Remarks. This species can be distinguished from all others in this region by the very deep depressions between the ridges combined with the absence of tubercles on the carapace. Of the 69 specimens examined in this study only a single individual was a male. Lie did not record a male from the type locality. While mature males of campylaspids are always rare, they are usually encountered at some time during the year.

Type Locality and Type Specimens. Puget Sound, off Seattle, 22-23 m, sediment >80% sand, mean particle size 0.113-0.235 mm. Holotype, USNM 125077.

Distribution. Probably distributed throughout San Diego and the Oregonian Provinces, a species of the shallow shelf, known thus far from depths of 22-154 m.

Campylaspis blakei Watling and McCann, new species

Figure 2.29

Material Examined. Santa Maria Basin, Phase II, Cruise 1-1 (November, 1986), Sta. R-4 (1), R-5 (6); Cruise 1-2 (January, 1987), R-2 (1), PJ-1 (2); Cruise 1-3 (May, 1987), R-5 (5); Cruise 2-3 (October, 1987), R-2 (1), PJ-1 (3); Cruise 2-4 (January, 1988), PJ-1 (1); Cruise 2-5 (May, 1988), R-2 (1), R-5 (2), PJ-1 (1); Cruise 3-1 (October, 1988), R-4 (1), R-5 (1), PJ-1 (7); Cruise 3-4 (May, 1989), PJ-1 (2).

Description. Female, 3 mm. Carapace strongly elevated posterodistally, broadly rounded, with gently sloping lateral sulcus not bounded by ridges; with paired set of 3 small spines dorsolaterally near posterior margin; eyelobe small, distinct; pseudorostral lobes ordinary. Pereonites 1 and 2 with middorsal projections; pereonite 4 with dorsally projecting lateral spines; pereonite 5 with both dorsolateral and lateral dorsally projecting spines. Similar spines also on pleonites 1-4. Pereopod 2 article 3 distinct; article 7 as long as article 5. Uropod peduncle as long as last 3 pleonites combined and about 2.5 times length of endopod; peduncle slightly flared terminally. Endopod and distal half of peduncle armed with 4 to 6 and 4 setae respectively. Color in life, white to gray, translucent. Male unknown.

Remarks. This species is unique among members of this genus which have a smooth carapace in possessing blunt, dorsally projecting spines on the pereonites and pleonites.

Type Locality and Type Specimens. California, Santa Maria basin, off Purisima Point, Sta. R-5, 34°42.69'N, 120°50.83'W, 154 m, holotype USNM 273548, paratypes USNM 273549 and LACM 95-73.1.

Etymology. The species is named in honor of my friend and colleague, the lead scientist of the Santa Maria Basin macrobenthic sampling program, and senior editor of this Atlas project, in recognition of his many contributions to our knowledge of the benthic fauna of the Southern California continental shelf.

Distribution. Known from the Santa Maria Basin area and off Pt. Loma, San Diego, 92-161 m.

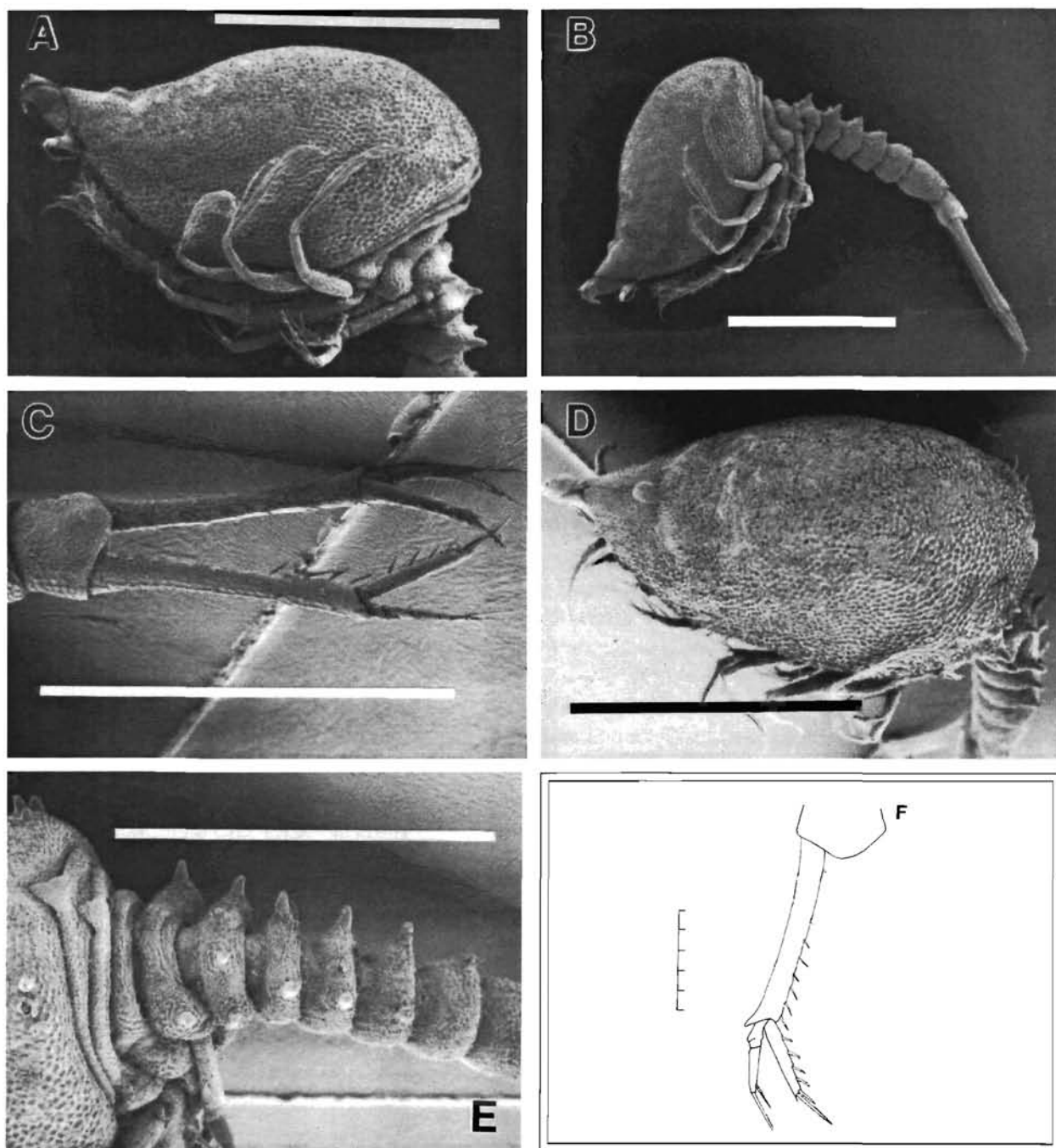


Figure 2.29. *Campylaspis blakei* Watling and McCann, new species. Female: A, carapace and pereonites, lateral view; B, body, lateral view; C, uropods; D, carapace, dorsal view; E, pereonites 1-5 and pleonites 1-4, dorsal view; F, uropod. Scale, A-E = 1 mm, F = 0.5 mm.

Campylaspis biplicata Watling and McCann, new species

Figure 2.30a, b

Material Examined. Santa Maria Basin Region, Phase II, Cruise 1-1 (November, 1986), Sta. R-6 (17), PJ-1 (3); Cruise 1-2 (January, 1987), R-1 (1), R-3 (6), R-5 (11), R-6 (1); Cruise 1-3 (May, 1987), R-3 (9), R-5 (7), R-6 (9), R-9 (10), PJ-1 (2); Cruise 2-3 (October, 1987), R-2 (1), R-3 (18), R-5 (4), R-6 (11), R-9 (4), PJ-1 (3); Cruise 2-4 (January, 1988), R-3 (11), R-5 (20), R-6 (10), R-9 (5), PJ-1 (2); Cruise 2-5 (May, 1988), R-3 (1), R-5 (14), R-6 (12), R-9 (2), PJ-1 (1); Cruise 3-1 (October, 1988), R-1 (2), R-3 (15), R-5 (20), R-6 (14), R-9 (7), PJ-1 (3); Cruise 3-4 (May, 1989), R-3 (3), R-4 (1), R-5 (24), R-6 (11), R-9 (3), PJ-1 (8).

Description. Adult size, female and male, 2.0 mm. Carapace extended strongly posteriorly, appearing flattened dorsally; with lateral, nearly horizontal sulcus becoming wider from posterior to anterior, bounded above and below by soft ridges ornamented with pigment spots; eyelobe small, pseudorostral lobes slightly enlarged, branchial siphons about twice length of pseudorostrum. Pereonites 1 and 2 with middorsal projections; pleonite 4 pleurae extending back along pereonite 5. Pereopod 2 article 3 distinct, article 7 longer than article 5, with terminal seta as long as article in length. Uropod peduncle as long as last 3 pleonites combined and twice length of endopod, with only a few weak setae; exopod basal article half length of distal article; endopod with 3-5 medial setae. Male uropod endopod somewhat more robust than in female.

Remarks. The presence of two, three, or four subparallel lateral ridges on the carapace occurs in several species, many of which have been found in the deep Atlantic (e.g., *C. arcuata* Jones, *C. plicata* Jones, *C. valleculata* Jones, *C. exarata* Jones, *C. bicarinata* Jones, *C. crispa* Lomakina, *C. johnstoni* Hale, *C. macrophthalma* Sars, *C. sinuosa* Gamô, *C. umbensis* Gurwitschi, *C. undata* Sars). The appendage morphology of *C. biplicata* is somewhat similar to that seen in *C. crispa* and *C. umbensis*, however, both of these species have three ridges that are more vertical (relative to the ventral margin). In the form of the ridges *C. plicata* resembles most closely the Atlantic species of Jones and Sars, but differs from them in the form of the appendages, especially the uropod.

Type Locality and Type Specimens. California, Santa Maria Basin, off Point Sal, Sta. R-9, 34°53.68'N, 120°59.12'W, 410 m, holotype USNM 273546, paratypes USNM 273547 and LACM 95-72.1.

Etymology. From Latin, *bis* = two, and *L. plicatus* = fold, referring to the two lateral ridges on the carapace.

Distribution. Known from Puget Sound to San Diego, including the Santa Maria Basin Region, 47-410 m, with most specimens found at 145-410 m.

Genus *Procampylaspis* Bonnier, 1896

Type Species. *Procampylaspis echinata* Bonnier, 1896.

Diagnosis. Carapace strongly elevated in female, occasionally covering part of first pereonite; anterolateral corner not produced in females, weakly produced in males; ocular lobe single, middorsal, often rudimentary. Mandible molar elongate, weakly triturative distally. Maxilla with movable endites. Antenna 1 peduncle article 2 without process, longer than article 3. First maxilliped 6-articulate, dactyl minute. Maxilliped 2 dactyl with recurved processes, claw-like. Female maxilliped 3, pereopods 1 and 2 with exopods; male maxilliped 3 and pereopods 1-4 with exopods. Pereopod 1 article 3 (ischium) subequal to or longer than article 4. Uropod peduncle usually as long as or longer than pleonite 6; exopod basal article short, not submerged in peduncle; exopod longer than its terminal seta.

Remarks. This genus is distinguished from other members of the family by the shape of the dactyl on maxilliped 2 and the elongate ischium on pereopod 1.

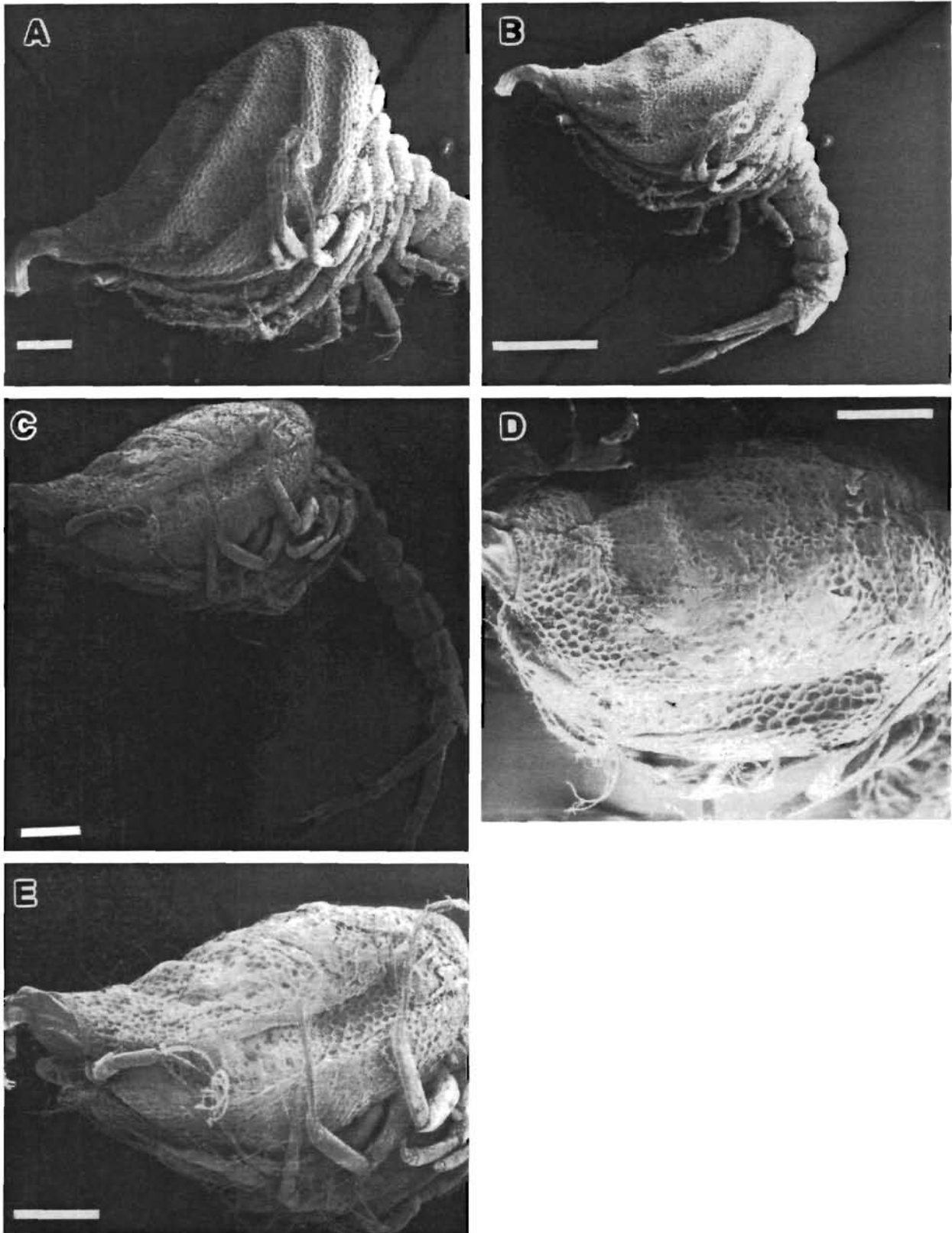


Figure 2.30a. *Campylaspis biplicata* Watling and McCann, new species. Female: A, carapace and pereonites, lateral view; B, body, lateral view. Male: C, body, lateral view; D, carapace, dorsal view; E, same, lateral view. Scale, A = 0.2 mm, C-E = 0.3 mm, B = 0.5 mm.

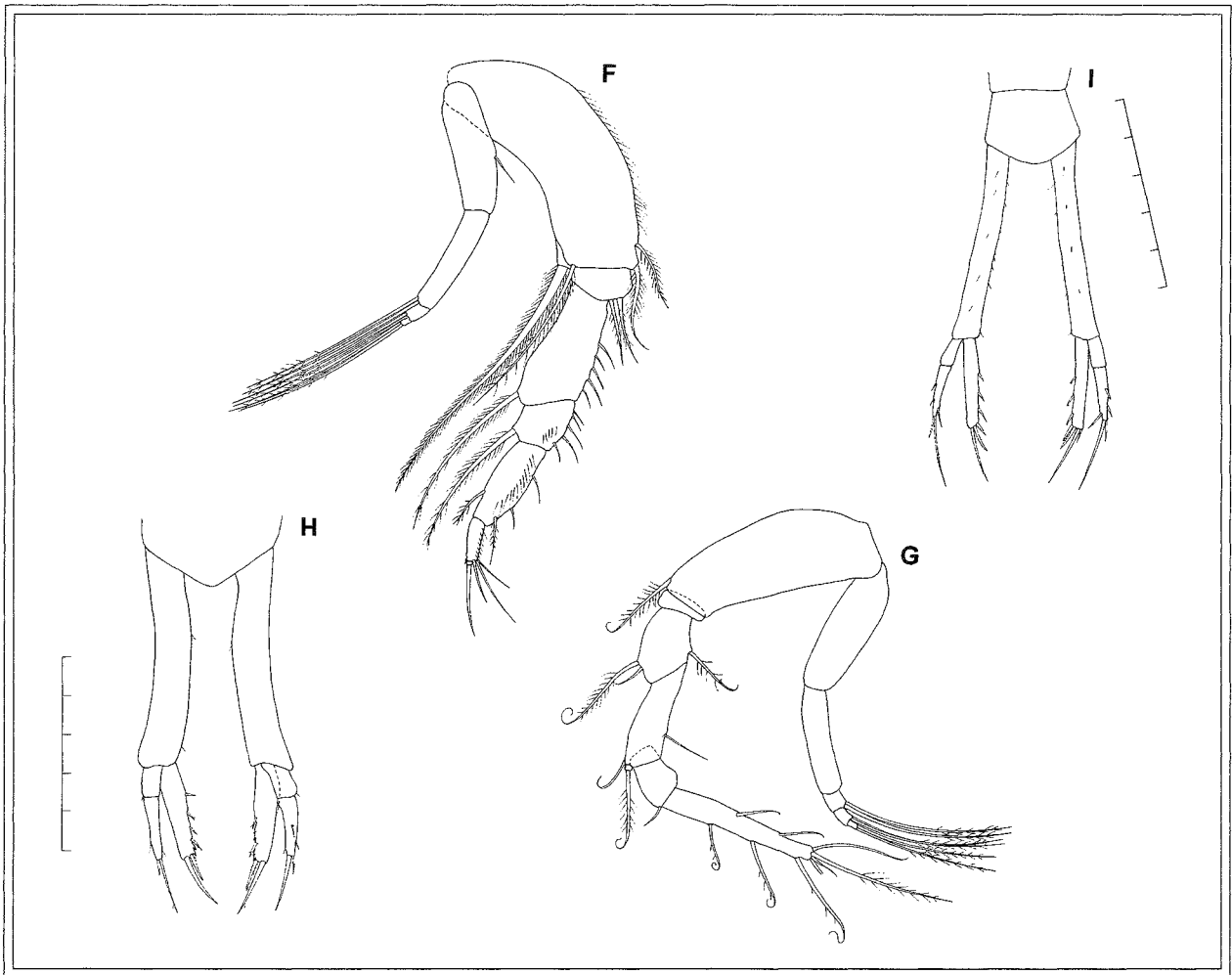


Figure 2.30b. *Campylaspis biplicata* Watling and McCann, new species. Female: F, maxilliped 3; G, pereopod 2; H, uropod. Male: I, uropod. Scale H, I = 0.5 mm.

***Procampylaspis caenosa* Watling and McCann, new species**

Figure 2.31

Material Examined. Santa Maria Basin Region, Phase II, Cruise 1-1 (November, 1986), Sta. R-1 (3), R-2 (3), PJ-1 (8); Cruise 1-2 (January, 1987), R-1 (6), R-2 (4), R-4 (5), R-5 (7), PJ-1 (3); Cruise 1-3 May, 1987, R-1 (6), R-2 (3), R-4 (1), R-5 (8), PJ-1 (9); Cruise 2-3 (October, 1987), R-1 (6), R-2 (6), R-4 (11), R-8 (6), PJ-1 (6); Cruise 2-4 (January, 1988), R-1 (4), R-4 (15), R-5 (3), R-8 (2), PJ-1 (1); Cruise 2-5 (May, 1988), R-1 (5), R-4 (10), R-5 (3), R-8 (4); Cruise 3-1 (October, 1988), R-1 (6), R-4 (3), R-5 (1), R-8 (2), PJ-1 (6); Cruise 3-4 (May, 1989), R-1 (3), R-4 (10), R-8 (3), PJ-1 (4).

Description. Female, 3.0 mm. Carapace slightly elevated dorsally; covered with dense coating of sediment through which shallow lateral sulcus visible, bordered above and below by low ridges, upper of which may bear 3-5 large conical spines; pseudorostral lobes enlarged, directed somewhat upward; eyelobe not distinct. Pereonites 1 and 2 without middorsal projections. Pleonites 1-5 with paired dorsolateral spines. Maxilliped 2, articles 6 and 7 subequal in length; terminal article with 4 large recurved claw-like teeth, and 1

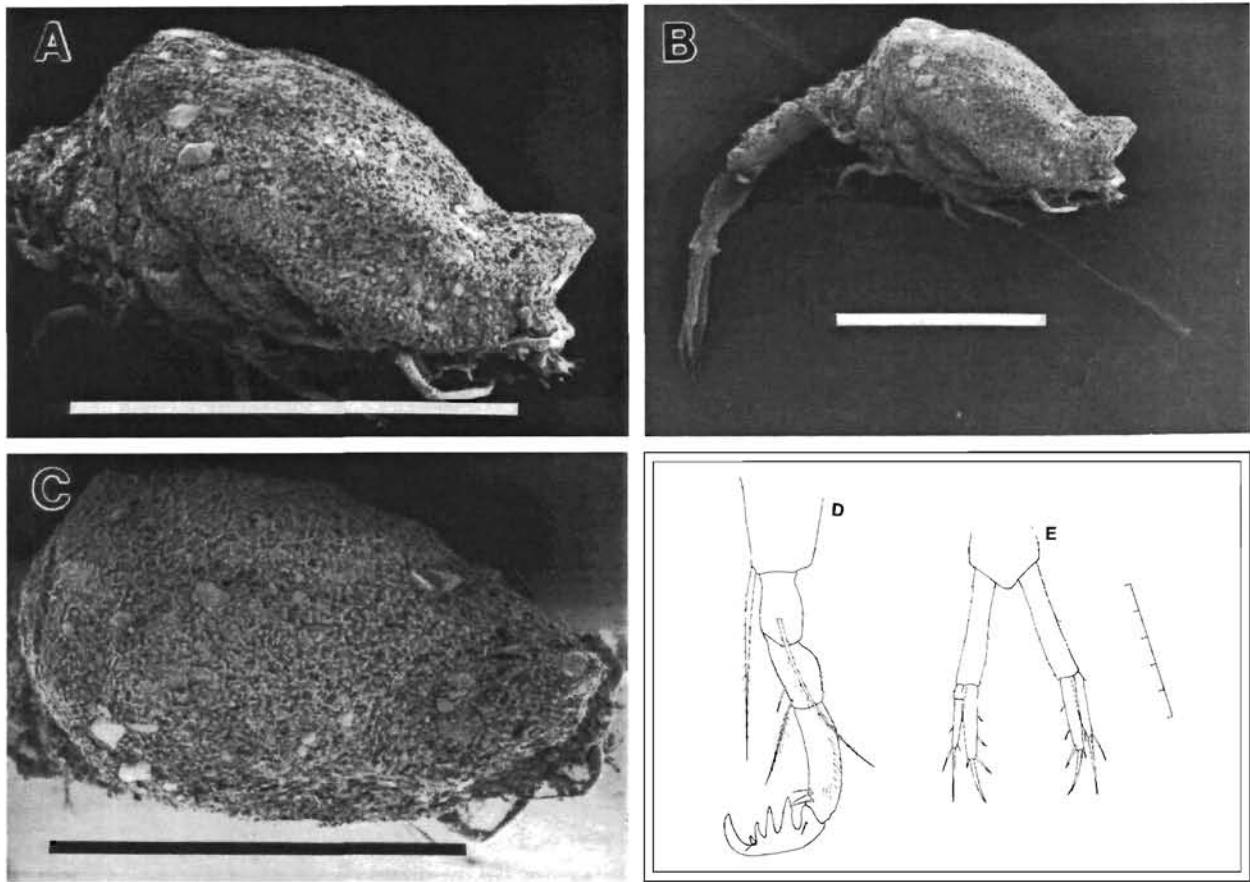


Figure 2.31. *Procampylaspis caenosa* Watling and McCann, new species. Female: A, Carapace and anterior pereonites, lateral view; B, body, lateral view; C, carapace, dorsal view; D, maxilliped 2; E, uropods. Scale, A-C = 1 mm, E = 0.5 mm.

smaller tooth nestled between penultimate and last claw. Uropod peduncle 1.5 times length of endopod; medial margin of peduncle unarmed, of endopod with 2 setae; exopod with very long terminal seta, extending to end of endopod terminal seta. Male, similar to female but carapace and uropod peduncles more elongate.

Remarks. The combination of conical carapace spines and broad lateral sulcus, along with the details of the maxilliped 2 dactyl, help to distinguish this sediment-covered species. Of the 26 known species of *Procampylaspis*, only 5 have been found at shallow shelf depths.

Type Locality and Type Specimens. California, Santa Maria Basin, off Purisima Point, Sta. R-4, 34°43.01'N, 120°47.39'W, 92 m, holotype USNM 273542, paratype USNM 273543 and LACM 95-71.2.

Distribution. Known from the Santa Maria Basin region and off Pt. Loma, San Diego, 47-161 m.

Etymology. From Latin, *caenosus*, = muddy, dirty, referring to the covering of sediment particles on the carapace surface.

Genus *Cumella* Sars, 1865

Type Species. *Cumella pygmaea* Sars, 1865

Diagnosis (from Watling, 1991b). Carapace anteroventral corner acute to slightly rounded, not strongly projecting; ocular lobe single, middorsal; siphons united medially, occasionally slightly separated; pseudorostral lobes of varying length, usually slightly to strongly upturned, meeting in front of eyelobe. Mandible molar columnar. Maxilla with movable endites. Antenna 1 peduncle article 2 with or without process, subequal to or longer than article 3. Maxilliped 1 of normal length. Female maxilliped 3, pereopods 1 and 2 with exopods; male maxilliped 3 and pereopods 1-4 with exopods. Uropod peduncle usually as long as or longer than pleonite 6; exopod basal article short, not submerged in peduncle; exopod much longer than its terminal seta.

Remarks. Following the lead of Bacescu (1971) who erected the first subgenus in this very large genus, Watling (1991b) added three additional subgenera in an attempt to define some pattern among the species. For diagnoses of the subgenera, see Watling (1991b).

Cumella (Cumella) morion Watling and McCann, new species

Figure 2.32

Material Examined. Santa Maria Basin Region, Phase II, Cruise 1-1 (November, 1986), Sta. R-4 (17); Cruise 1-2 (January, 1987), R-1 (8), R-4 (5), R-8 (11); Cruise 1-3 (May, 1987), R-1 (13), R-4 (39), R-8 (4); Cruise 2-3 (October, 1987), R-1 (1), R-4 (24), R-8 (14); Cruise 2-4 (January, 1988), R-1 (4), R-4 (21), R-5 (1), R-8 (8), PJ-1 (1); Cruise 2-5 (May, 1988), R-1 (2), R-4 (107), R-8 (5); Cruise 3-1 (October, 1988), R-1 (4), R-4 (31), R-8 (16); Cruise 3-4 (May, 1989), R-1 (1), R-4 (110), R-8 (4).

Description. Female, 1.5 mm. Carapace with flared ridge along posterodorsal margin, dorsally joining large middorsal crest which originates on frontal lobe; eyelobe without obvious lenses; pseudorostral lobe with short, curved horizontal ridge extending onto carapace frontal lobe. Pereonites 1 and 2 with thickened posterior margin; pereonite 3 with slight middorsal process. Body compressed laterally. Pleonites 1 -4 with dorsally-directed middorsal processes. Uropod peduncle and endopod subequal in length, about as long as last 2 pleonites combined; endopod with 2 medial setae and 2 terminal setae.

Remarks. This species is quite similar in carapace shape and appendage morphology to *C. (C.) rigida* Gamô and *C. (C.) sadoensis* Gamô, but differs from both in not possessing a dorsolateral vertical ridge midway along the carapace and in bearing vertical processes on pleonites 1 - 3.

Type Locality and Type Specimens. California, Santa Maria Basin, off Purisima Point, Sta. R-4, 34°43.01'N, 120°47.39'W, 92 m, holotype USNM 273544, paratype USNM 273545 and LACM 95-71.1.

Etymology. A morion is a visor-less helmet with a high crest worn by some 16th century soldiers, for example, the Spanish conquistadors who frequented the Californian shores, and to which the carapace of this species bears some resemblance.

Distribution. Known only from the Santa Maria Basin region, most abundant at the 90 m stations, but occasionally found to 154 m.

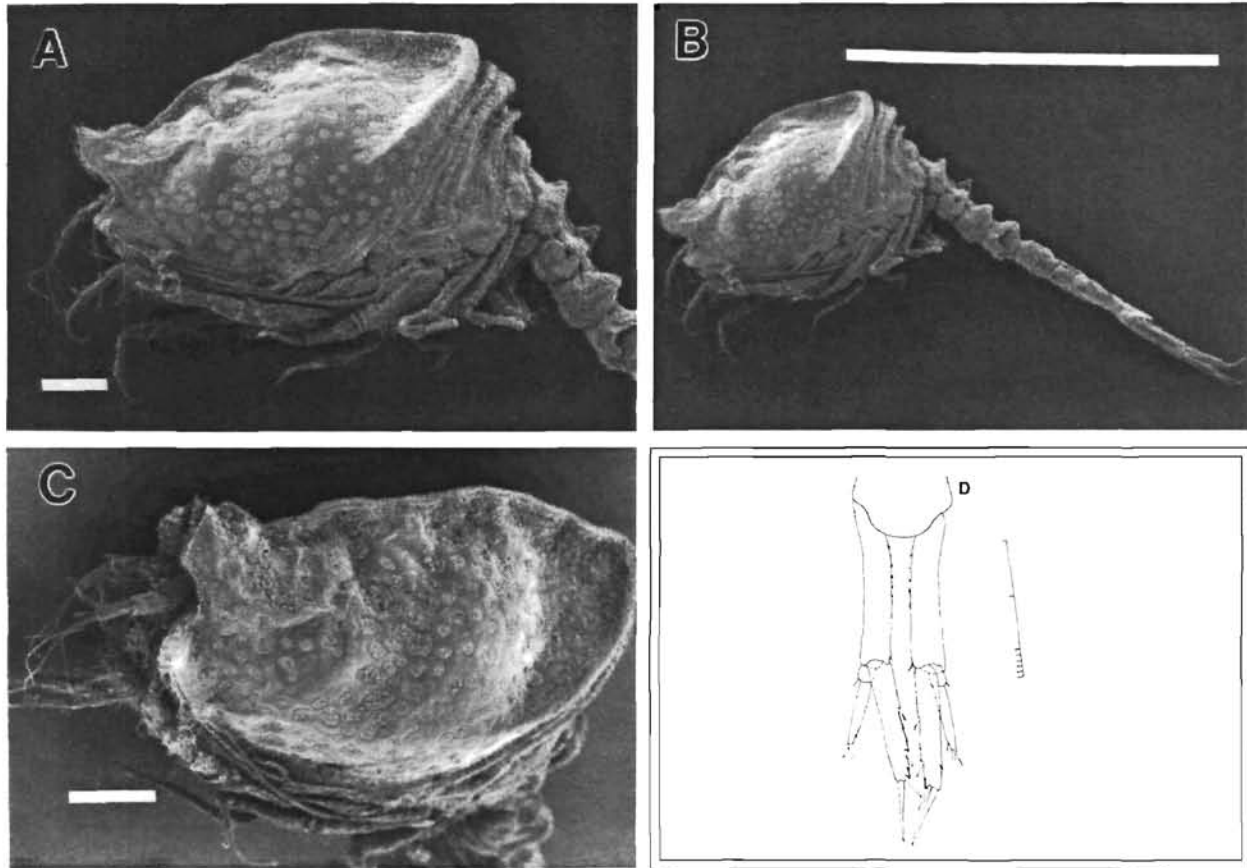


Figure 2.32. *Cumella (Cumella) morion* Watling and McCann, new species. Female: A, carapace, pereonites, and anterior pleonites, lateral view; B, body, lateral view; C, carapace, anterodorsal view; D, uropods. Scale, A,C, D = 0.2 mm, B = 1 mm.

***Cumella (Cumella) californica* Watling and McCann, new species**

Figure 2.33

Material Examined. Santa Maria Basin Region, Phase II, Cruise 1-1 (November, 1986), Sta. R-4 (2), PJ-1 (1); Cruise 1-2 (January, 1987), R-4 (4), R-5 (1), R-8 (2), PJ-1 (1); Cruise 1-3 (May, 1989), R-4 (1), R-5 (5), R-8 (1), PJ-1 (6); Cruise 2-3 (October, 1987), R-4 (24), R-5 (3), R-8 (4), PJ-1 (1); Cruise 2-4 (January, 1988), R-4 (7), R-5 (1), R-8 (6), PJ-1 (4); Cruise 2-5 (May, 1988), R-4 (2), R-5 (1), R-8 (13), PJ-1 (2); Cruise 3-1 (October, 1988), R-4 (9), R-5 (2), R-8 (20), PJ-1 (3); Cruise 3-4 (May, 1989), R-4 (23), R-8 (3), PJ-1 (15).

Description. Female, 2 mm. Carapace with swollen ridge parallel to posterior margin, giving appearance of elevated submarginal region dorsally; 4-5 spines in middorsal row beginning on frontal lobe; eyelobe small; pseudorostral lobes directed forward, subacute. Pereonites with flared lateral margins, becoming nearly horizontal. Uropod peduncle as long as last pleonite; endopod as long as peduncle, with elongate, partially fused terminal seta; exopod distal article as long as terminal seta.

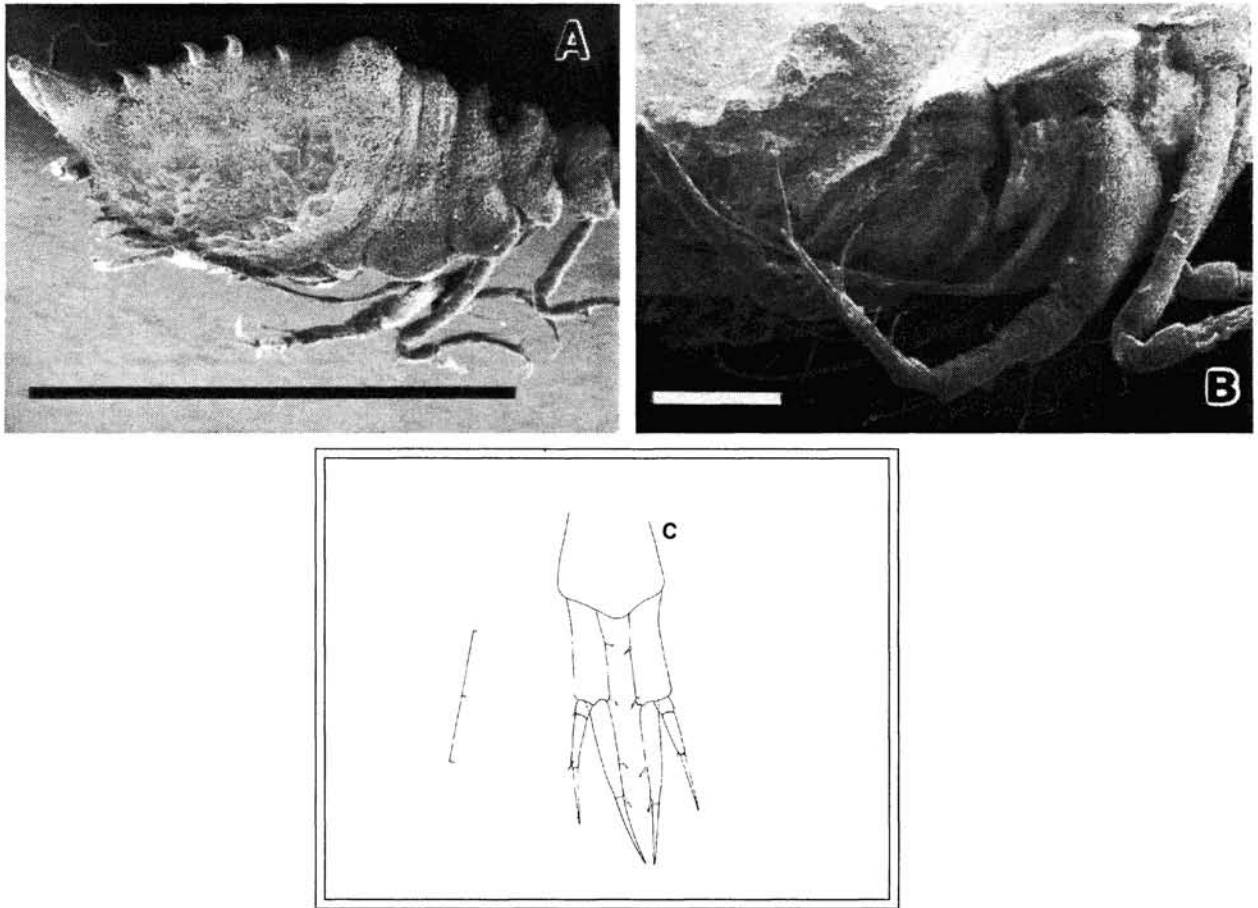


Figure 2.33. *Cumella (Cumella) californica* Watling and McCann, new species. Female: A, carapace and pereonites, dorsolateral view; B, pereonites and pereopods 1-3; C, uropods. Scale, A = 1 mm, B,C = 0.2 mm.

Remarks. In addition to the new species described here, three *Cumella (Cumella)* species are known to have coarse spines along the middorsal crest of the carapace, viz., *C. (C.) arguta* Gamô, *C. (C.) meridionalis* Jones, and *C. (C.) quadrispinosa* Gamô. None have the broadly flaring pleurites nor the short uropod peduncles seen in *C. (C.) californica*.

Type Locality and Type Specimens. California, Santa Maria Basin, off Purisima Point, Sta. R-4, 34°43.01'N, 120°47.39'W, 92 m, holotype USNM 273540, paratype USNM 273541 and LACM 95-70.1.

Distribution. Known from the Santa Maria Basin Region and off Pt. Loma, San Diego, 45-154 m.

Acknowledgements

We would like to express our appreciation to several people who helped with the production of this paper. Most of the line drawings in the species descriptions are the wonderful handiwork of Patrice Rossi, with a few being contributed by B. McKenzie. The original introductory figures are the work of C. Chisholm. Very able assistance with the SEM was always kindly given by K. Edwards. Additional distribution records were made available by Tim Stebbins of the City of San Diego Marine Biology Lab, and the participants of a cumacean workshop held at Friday Harbor Laboratories in February, 1995. This project was supported by the U.S. Department of the Interior, Minerals Management Service, under Contract No. 14-35-0001-30484.

Literature Cited

- Bacescu-Mester, L. 1967. Contribution to the knowledge of the genus *Leptostylis* Sars (Cumacea): three new species collected by the Vema Expedition. *Crustaceana* 13: 265-274.
- Bate, S. 1856. On the British Diastylidae. *The Annals and Magazine of Natural History* 102: 449-465.
- Calman, W.T. 1912. The Crustacea of the Order Cumacea in the collection of the United States National Museum. *Proceedings of the United States National Museum* 41:604-674.
- Day, J. 1978. Southern African Cumacea. Part 3. Families Lampropidae and Ceratocumatidae. *Annals of the South African Museum* 76: 137-189.
- Day, J. 1980. Southern African Cumacea. Part 4. Families Gynodiastylidae and Diastylidae. *Annals of the South African Museum* 82: 187-292.
- Gamô, S. 1962. On the cumacean Crustacea from Tanabe Bay, Kii Peninsula. *Publications of the Seto Marine Biological Laboratory* 10:154-210.
- Given, R.R. 1961. The cumacean fauna of the Southern California continental shelf. No. 1, Family Leuconidae. *Bulletin of the Southern California Academy of Sciences* 60: 129-146.
- Given, R.R. 1964. The cumacean fauna of the southern California continental shelf. No. 2. The new family Mesolampropidae. *Crustaceana* 7: 284-292.
- Gladfelter, W.B. 1975. Quantitative distribution of shallow-water Cumacea from the vicinity of Dillon Beach, California, with description of five new species. *Crustaceana* 29: 241-251.
- Harada, I. 1959. Cumacean fauna of Japan. I. Family Lampropidae. *Japanese Journal of Zoology* 12: 229-246.
- Hart, J.F.L. 1930. Some Cumacea of the Vancouver Island Region. *Contributions to Canadian Biology and Fisheries, n.s.*, 6: 25-40.
- Jones, N.S. 1963. The marine fauna of New Zealand: Crustaceans of the Order Cumacea. *New Zealand Oceanographic Institute Memoir* 23: 1-81.
- Jones, N.S. 1969. The systematics and distribution of Cumacea from depths exceeding 200 meters. *Galathea Report. Scientific results of the Danish Deep-Sea Expedition round the World 1950-52* 10: 100-180.
- Krøyer, H. 1841. Fire nye arter af Slaegten Cuma. *Naturhistorisk Tidsskrift* 3: 503-534.
- Krøyer, H. 1846. Carcinologiske bidrag. *Naturhistorisk Tidsskrift, Ser. 2*, 2: 123-211.
- Lie, U. 1969. Cumacea from Puget Sound and off the northwestern coast of Washington, with descriptions of two new species. *Crustaceana* 17: 19-30.
- Lie, U. 1971. Additional Cumacea from Washington, U.S.A., with description of a new species. *Crustaceana* 21: 33-36.
- Norman, A.M. 1867. On the Crustacea, Echinodermata, Polypora, Actinozoa and Hydrozoa. Report of the committee appointed for the purpose of exploring the coasts of the Hebrides by means of the dredge. *Report of the British Association for the Advancement of Science* 36: 193-206.
- Sars, G.O. 1869. Undersøgelser over Christianafjord dybvandsfauna. *Nyt Magazin for Naturvidenskaberne* 11: 1-58.

- Sars, G.O. 1878, 1879 Nye Bidrag til Kundskaben om Middelhavets Invertebratfauna. II. Middelhavets Cumaceer. Separataftryk af Archiv for Mathematik og Naturvidenskab 3: 461-512; 4: 1-144.
- Sars, G.O. 1883. Oversigt af Norges Crustaceer med foreløbige bemærkninger over de nye eller mindre bekjende Arter. 1. Förhandlingar VidenskabsSelskabet i Christiania 1882:1-124.
- Sars, G.O. 1887. Report on the Cumacea collected by H.M.S. Challenger during the years 1873-1876. Report on the Scientific Results of the Voyage of the H.M.S. Challenger During the Years 1873-1876 Under the Command of George S. Nares and Frank Tourle Thomson 19(55): 1-78.
- Sars, G.O. 1900. Cumacea. An Account of the Crustacea of Norway 3: 1-115.
- Say, T. 1818. An account of the Crustacea of the United States (continued). Journal of the Academy of Natural Sciences of Philadelphia 1: 313-319.
- Schram, F.R. 1986. Crustacea. New York: Oxford University Press, 606 pp.
- Stebbing, T.R.R. 1912. The Symfoda (Part VI of S. A. Crustacea, for the marine investigations in South Africa). Annals of the South Africa Museum 10: 129-176.
- Watling, L. 1979. Crustacea: Cumacea. Marine Flora and Fauna of the Northeastern United States. NOAA Technical Report NMFS Circular 423: 1-22.
- Watling, L. 1983. Peracaridan disunity and its bearing on eumalacostracan phylogeny with a redefinition of eumalacostracan superorders. Crustacean Issues 1: 213-228.
- Watling, L. 1991a. Revision of the cumacean Family Leuconidae. Journal of Crustacean Biology 11: 569-582.
- Watling, L. 1991b. Rediagnosis and revision of some Nannastacidae (Crustacea: Cumacea). Proceedings of the Biological Society of Washington 104: 751-757.
- Zimmer, C. 1926. Northern and Arctic invertebrates in the collection of the Swedish State Museum (Riksmuseum). Kungliga Svenska Vetenskaps-Akademiens Handlingar 3: 1-88.
- Zimmer, C. 1936. California Crustacea of the Order Cumacea. Proceedings of the United States National Museum 83: 423-439.
- Zimmer, C. 1943. Cumaceen des Stillen Ozeans. Archiv für Naturgeschichte 12: 130-174.

Attachment I

Phase I and II manuscript names with formal equivalents

Family Diastylidae

Diastylis paraspinulosa = *D. sentosa* **new species**

Diastylis sp. 1 = *Diastylis pellucida* Hart, 1930

Diastylis sp. 2 = *Diastylis sentosa* **new species**

Diastylis sp. 5 = *Diastylis santamariensis* **new species**

Diastylis sp. A = *Diastylis crenellata* **new species***

Diastylis sp. E = *Diastylis quadriplicata* **new species**

Leptostylis longimana = *Leptostylis calva* **new species**

Leptostylis villosa = *Leptostylis* ? (specimens too damaged, but are definitely not *L. villosa*).

Leptostylis sp. 1 = *Leptostylis abditis* **new species**

Leptostylis sp. A = *Leptostylis calva* **new species**

Leptostylis sp. E = *Diastylis crenellata* **new species***

Family Leuconidae

Hemileucon sp. 1 = *Alloeoleucon santamariensis* **new species**

Leucon sp. H = *Leucon (Diaphonoleucon) declivis*, **new species**

Leucon sp. A = *Leucon (Leucon) falcicosta*, **new species**

Leucon (? *Epileucon*) sp. B = *Leucon (Crymoleucon) bishopi* Bacescu, 1988

Eudorella sp. 2 = *Eudorella redacticruris* **new species**

Eudorella sp. 1 = *Eudorella truncatula* Bate, 1856

Family Nannastacidae

Campylaspis sp. N = manca, probably of *C. rubromaculata*

Campylaspis sp. 6 = *Campylaspis rufa* Hart, 1930

Campylaspis sp. 1 = *Campylaspis maculinodulosa*, **new species**

Campylaspis sp. 10, *Campylaspis* sp. 12 = *Campylaspis hartae* Lie, 1969

Campylaspis sp. E = *Campylaspis blakei*, **new species**

Campylaspis sp. B, sp. 7, sp. 8, sp. 9, and *Campylaspis* nr. *crispa* = *Campylaspis biplicata*, **new species**

Campylaspis sp. 4 = *Procampylaspis caenosa*, **new species**

Cumella sp. 1 = *Cumella (Cumella) morion*, **new species**

Cumella sp. 2 = *Cumella (Cumella) californica*, **new species**

*Note that *Diastylis crenellata* is correctly listed twice on the checklist.

Attachment II

List of cumaceans previously found in the Oregonian Province

Family Diastylidae

Anchicolurus occidentalis (Calman, 1912) as
Colurostylis (?)

Diastylis abbotti Gladfelter, 1975

Diastylis californica Zimmer 1936

Diastylis paraspinulosa Zimmer, 1926

Diastylis pellucida Hart, 1930

Diastylis umatillensis Lie, 1969

Diastylopsis dawsoni Smith, 1880

Leptostylis villosa Sars, 1869 (doubtful record
of Hart, 1930)

Family Lampropidae

Hemilamprops californica Zimmer, 1936

Hemilamprops gracilis Hart, 1930

Lamprops carinata Hart, 1930

Lamprops quadriplicata Smith, 1879

Lamprops serrata Hart, 1930

Lamprops tomalesi Gladfelter, 1975

Lamprops triserrata Gladfelter, 1975

Lamprops krasheninnikovi Derzhavin, 1926

Lamprops obfuscata (Gladfelter, 1975)

Mesolamprops bispinosa Given, 1964

Mesolamprops dillonensis Gladfelter, 1975

Family Leuconidae

Eudorella pacifica Hart, 1930 (includes
Eudorella tridentata Hart, 1930)

Eudorellopsis biplicata Calman, 1912

Eudorellopsis integra Smith, 1879

Eudorellopsis longirostris Given, 1961

Leucon armatus Given, 1961

Leucon magnadentata Given, 1961

Leucon subnasica Given, 1961

Family Nannastacidae

Campylaspis canaliculata Zimmer, 1936

Campylaspis hartae Lie, 1969

Campylaspis rubromaculata Lie, 1969

Campylaspis rufa Hart, 1930

Cumella vulgaris Hart, 1930

Family Bodotriidae

Cyclaspis nubila Zimmer, 1936

Appendix

Lists and Maps of Stations

Table A.1. Position of soft-substrate stations taken during the Phase I Reconnaissance.

Station	Latitude	Longitude	Depth (m)
1	35°27.86'N	121°05.33'W	98
2	35°27.70'N	121°06.52'W	200
3	35°27.07'N	121°10.20'W	291
4	35°26.56'N	121°14.93'W	393
5	35°25.77'N	121°21.69'W	585
6	35°20.88'N	120°59.62'W	109
7	35°20.65'N	121°02.57'W	197
8	35°20.00'N	121°06.58'W	308
9	35°19.48'N	121°10.06'W	398
10	35°18.28'N	121°18.65'W	591
11	35°17.80'N	121°22.13'W	690
12	35°15.03'N	120°57.31'W	98
13	35°14.54'N	120°59.77'W	197
14	35°14.15'N	121°02.04'W	299
15	35°13.98'N	121°04.54'W	393
16	35°12.23'N	121°16.29'W	591
17	35°11.61'N	121°22.55'W	654
18	35°09.08'N	120°56.55'W	197
19	35°08.93'N	120°59.66'W	296
20	35°15.72'N	121°04.68'W	396
21	35°06.11'N	120°44.82'W	49
22	35°05.85'N	120°50.23'W	99
23	35°05.60'N	120°55.18'W	195
25	35°05.07'N	121°00.75'W	390
26	35°04.38'N	121°15.99'W	590
27	35°04.30'N	121°19.27'W	611
28	35°04.22'N	121°19.65'W	603
30	34°54.19'N	120°47.07'W	98
31	34°53.76'N	120°52.96'W	200
32	34°53.56'N	120°56.81'W	297
33	34°53.43'N	120°59.66'W	396
34	34°53.15'N	121°04.40'W	492
35	34°52.96'N	121°10.30'W	548
36	34°52.77'N	121°15.37'W	492
38	34°49.81'N	120°52.66'W	197
39	34°49.53'N	120°56.85'W	294
40	34°49.24'N	121°00.81'W	392
41	34°48.35'N	121°19.14'W	495
42	34°48.04'N	120°47.50'W	100
43	34°46.59'N	120°52.92'W	197
45	34°44.91'N	120°59.59'W	395
46	34°41.22'N	121°13.56'W	597
47	34°41.99'N	121°10.81'W	378
48	34°45.11'N	120°52.85'W	196
49	34°45.03'N	120°56.31'W	290
50	34°37.80'N	121°01.66'W	591
52	34°39.56'N	120°47.64'W	98
53	34°37.69'N	120°50.38'W	196
54	34°36.57'N	120°52.02'W	396
55	34°33.66'N	120°56.31'W	590
56	34°30.32'N	121°01.02'W	900

Table A.1 (Continued)

Station	Latitude	Longitude	Depth (m)
58	34°34.35'N	120°45.18'W	99
59	34°33.65'N	120°47.18'W	216
60	34°33.25'N	120°48.34'W	275
61	34°33.01'N	120°48.89'W	345
62	34°30.46'N	120°52.13'W	582
63	34°26.29'N	120°58.08'W	930
64	34°33.15'N	120°40.90'W	59
65	34°31.27'N	120°43.27'W	107
66	34°30.46'N	120°44.55'W	201
67	34°30.29'N	120°45.50'W	282
68	34°29.24'N	120°45.99'W	390
69	34°22.88'N	120°54.20'W	927
70	34°29.67'N	120°43.70'W	200
71	34°29.04'N	120°44.01'W	306
72	34°28.41'N	120°44.76'W	401
73	34°28.21'N	120°36.80'W	98
74	34°26.84'N	120°38.61'W	201
75	34°26.08'N	120°39.65'W	293
76	34°25.59'N	120°40.98'W	387
77	34°22.62'N	120°44.02'W	578
78	34°18.78'N	120°49.30'W	762
79	34°24.12'N	120°28.32'W	98
80	34°22.86'N	120°28.34'W	196
81	34°21.26'N	120°28.83'W	294
82	34°18.71'N	120°29.55'W	394
83	34°17.20'N	120°30.20'W	444
84	34°13.54'N	120°31.19'W	394
85	34°25.88'N	120°16.31'W	113
86	34°24.45'N	120°17.02'W	197
87	34°21.60'N	120°17.11'W	299
88	34°17.89'N	120°16.86'W	393
89	34°13.79'N	120°16.56'W	471
90	34°09.44'N	120°16.30'W	375
91	34°11.73'N	120°07.43'W	540
92	34°08.70'N	120°07.50'W	444
93	34°07.63'N	120°07.51'W	357
96	34°22.91'N	120°05.42'W	296
94	34°24.54'N	120°05.47'W	96
95	34°23.70'N	120°05.47'W	198
97	34°22.28'N	120°05.49'W	393
98	34°12.87'N	120°05.59'W	561
99	34°11.22'N	120°05.86'W	540
100	34°08.67'N	120°05.50'W	443
101	34°07.51'N	120°05.65'W	357
102	34°59.71'N	120°48.22'W	99
103	34°59.63'N	120°53.56'W	197
104	34°59.45'N	120°56.49'W	294
105	34°59.23'N	120°59.60'W	392
106	34°58.95'N	121°04.42'W	492
107	34°58.65'N	121°15.08'W	573
108	34°58.21'N	121°17.88'W	492

Note: Sample labels from the Soft-substrate stations have several identification codes which include a station number, sample type, replicate number, and analysis type. These are as follows: 001 to 200 = the range of station numbers; BSS = Benthic Sediment Single (i.e., a non-replicated station); BSR = Benthic Sediment Replicate (three replicates taken at this station); BSV = Benthic Sediment Variance (subsamples); 01-09 = replicate numbers; TX = a taxonomy sample. Sample labels having the designation BRA, represents a sample from rocks taken as part of the hard bottom survey.

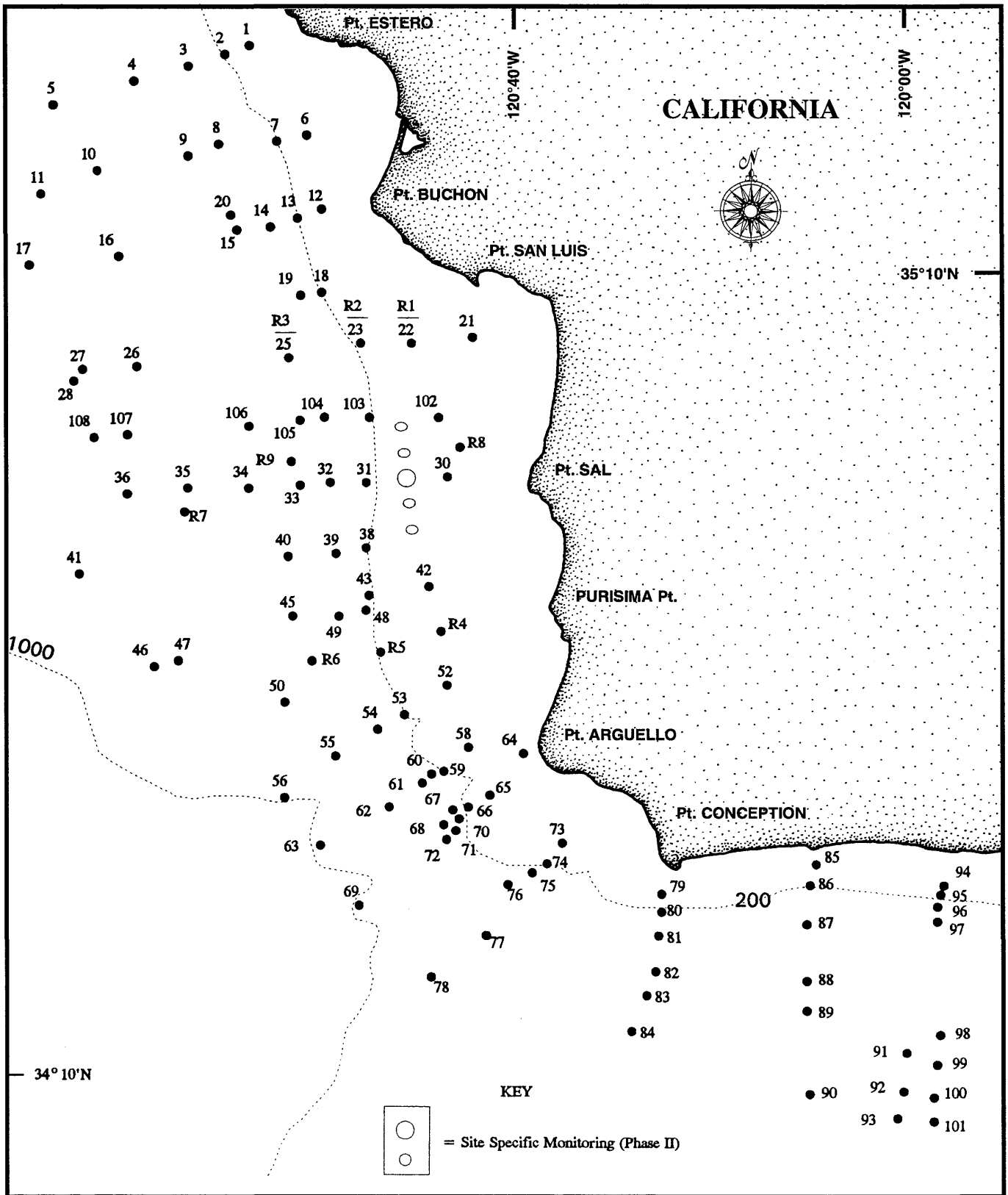


Figure 1.1. Map showing location of soft-substrate stations from the Phase I Reconnaissance and Phase II Monitoring Programs.

Table A.2. Location of soft-substrate stations taken during the Phase II Monitoring Program.

Station	Latitude	Longitude	Depth (m)
R-1	35°05.83'N	120°49.16'W	91
R-2	35°05.50'N	120°53.40'W	161
R-3	35°05.30'N	121°00.90'W	409
R-4	34°43.01'N	120°47.39'W	92
R-5	34°42.69'N	120°50.83'W	154
R-6	34°41.40'N	120°57.90'W	410
R-7	34°52.90'N	121°10.30'W	565
R-8	34°55.30'N	120°45.87'W	90
R-9	34°53.68'N	120°59.12'W	410
PJ-1	34°55.79'N	120°49.91'W	145
PJ-2	34°55.32'N	120°49.59'W	142
PJ-3	34°56.26'N	120°49.58'W	138
PJ-4	34°56.26'N	120°50.24'W	150
PJ-5	34°55.32'N	120°50.24'W	152
PJ-6	34°54.71'N	120°49.91'W	148
PJ-7	34°55.79'N	120°48.60'W	123
PJ-8	34°56.87'N	120°49.91'W	142
PJ-9	34°55.79'N	120°51.23'W	169
PJ-10	34°53.63'N	120°49.91'W	147
PJ-11	34°57.95'N	120°49.91'W	136
PJ-12	34°55.58'N	120°49.91'W	145
PJ-13	34°56.01'N	120°49.91'W	144
PJ-14	34°55.79'N	120°49.26'W	134
PJ-15	34°55.79'N	120°50.57'W	155
PJ-16	34°55.03'N	120°48.99'W	130
PJ-17	34°56.56'N	120°48.98'W	126
PJ-18	34°56.56'N	120°50.84'W	158
PJ-19	34°55.03'N	120°50.84'W	167
PJ-20	34°50.38'N	120°49.91'W	148
PJ-21	35°01.23'N	120°51.15'W	143
PJ-22	34°55.25'N	120°49.93'W	143
PJ-23	34°56.33'N	120°49.90'W	143

Table A.3. Sampling dates of MMS Phase II Monitoring Program.

Cruise	Date
1-1	October 1986
1-2	January 1987
1-3	May 1987
2-1	July 1987
2-3	October 1987
2-4	January 1988
2-5	May 1988
3-1	October 1988
3-4	May 1989

Table A.4. MMS Phase I - Locations of hard-substrate transects.

Station	Beginning Latitude	Longitude	End Latitude	Longitude	Depth (m)
1 A/B	34°24.454'N	120°01.876'W	34°24.464'N	120°00.878'W	69-73.5
1 C/D	34°24.076'N	120°00.443'W	34°24.184'N	120°01.480'W	73.5-78
2 A/B	34°11.377'N	120°29.318'W	34°11.289'N	120°28.774'W	110-126
2 C/D	34°10.984'N	120°28.094'W	34°10.780'N	120°27.554'W	120-123
4 A/B	34°27.539'N	120°40.364'W	34°28.162'N	120°40.189'W	168-237
6 A/B	34°30.246'N	120°35.555'W	— — —	— — —	54-63
6 C/D	— — —	— — —	34°30.421'N	120°34.315'W	54-63
13 A/B	34°42.570'N	120°47.899'W	34°42.107'N	120°48.253'W	92-100
13 C/D	34°42.556'N	120°48.147'W	34°42.974'N	120°47.424'W	88.5-100.5
14 A/B	34°43.589'N	120°49.093'W	34°42.826'N	120°48.370'W	96-105
14 C/D	34°43.244'N	120°49.406'W	34°42.893'N	120°48.822'W	105-117
16 A/B	34°46.544'N	120°50.197'W	34°45.912'N	120°49.726'W	91.5-123
17 A/B	34°49.382'N	120°50.768'W	34°49.600'N	120°50.688'W	160.5-168
19 A/B	34°47.833'N	120°51.425'W	34°47.097'N	120°50.793'W	148.5-177
20 A/B	34°46.470'N	120°50.289'W	34°46.140'N	120°49.885'W	90-130.5
21 A/B	34°47.335'N	120°45.903'W	34°47.548'N	120°46.123'W	75-90
22 A/B	34°50.365'N	120°48.221'W	34°50.990'N	120°48.365'W	114-115.5
23 A/B	34°49.868'N	120°47.393'W	34°50.003'N	120°47.480'W	93-102
25 A/B	35°05.662'N	120°47.562'W	35°06.036'N	120°47.652'W	64.5-72
26 C/D	35°11.586'N	120°55.556'W	35°11.555'N	120°55.233'W	108-111
27 A/B	35°20.906'N	120°59.657'W	35°21.035'N	120°59.603'W	96-126
28 A/B	35°21.539'N	120°59.641'W	35°21.867'N	120°59.299'W	96-105
29 A/B	35°27.864'N	121°05.331'W	35°27.805'N	121°05.277'W	102-106.5

Table A.5. MMS Phase II - Locations of hard-substrate photosurvey stations.

Station	Latitude	Longitude	Depth (m)
PH-E	34°30.26'N	120°42.76'W	119
PH-F	34°30.81'N	120°42.36'W	105
PH-I	34°29.96'N	120°41.68'W	107
PH-J	34°29.82'N	120°41.82'W	117
PH-K	34°29.37'N	120°42.26'W	160
PH-N	34°29.21'N	120°42.05'W	166
PH-R	34°29.11'N	120°42.67'W	213
PH-U	34°31.48'N	120°43.51'W	113
PH-W	34°31.52'N	120°45.86'W	195

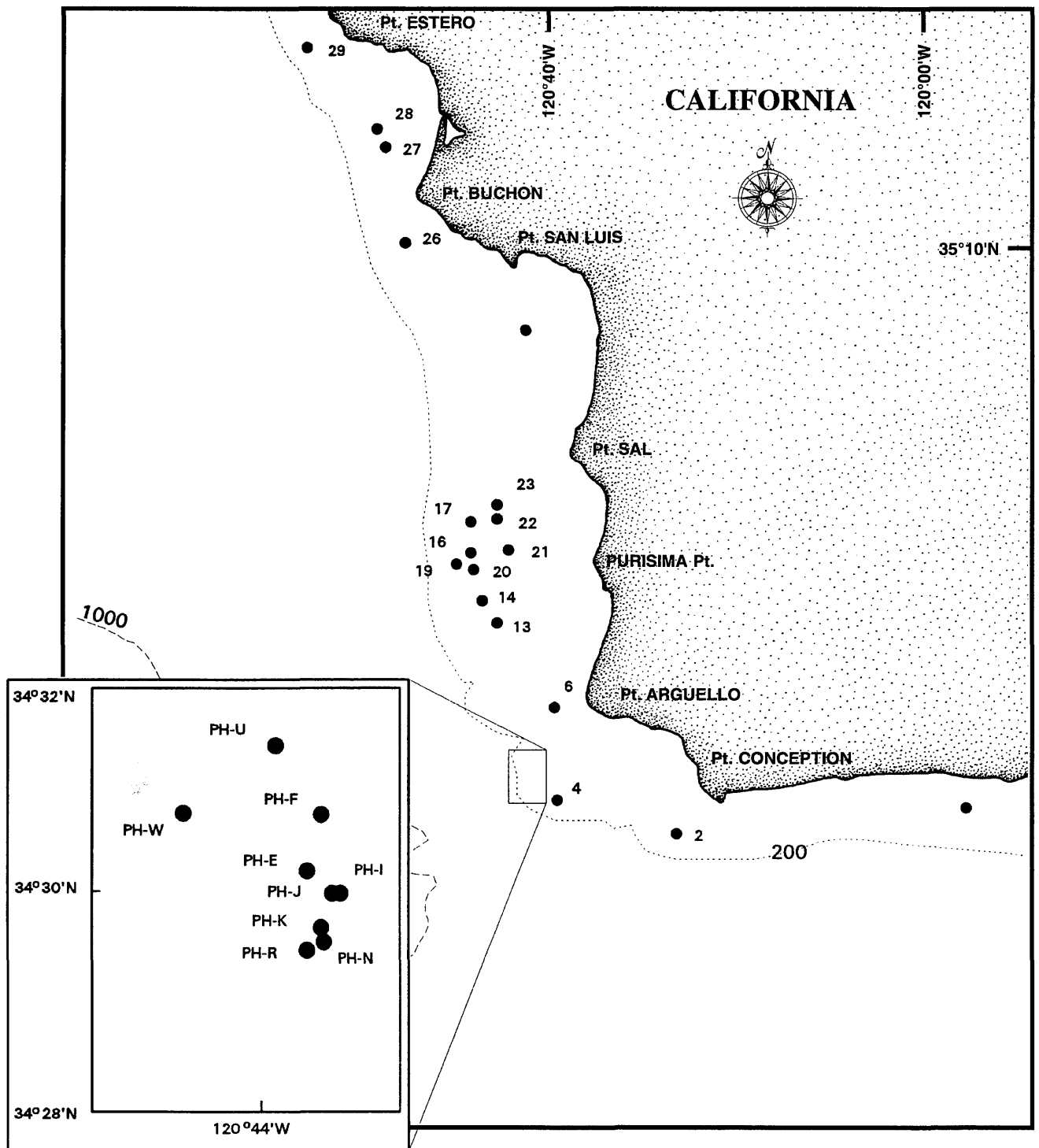


Figure 1.2. Map showing location of hard-substrate stations from the Phase I Reconnaissance and

Index

A

abditis, *Leptostylis* 129, 139, 140
abyssi, *Pseudotanais* 262
Acanthaspidiidae 65
acarina, *Ilyarachna* 67, 96
Aega 30
Aegidae 28, 29, 30, 36
Akanthinotanais 264
Akanthophoreinae 184, 195, 203, 204, 207, 224
alaskensis, *Diastylis* 133, 135
allelomorphus, *Idarcturus* 50
Alloeoleucon 145
Amakusanthura 11
amdrupii, *Leptognathia* 231, 234
Amphipoda 181
Anarthridae 184, 186, 188, 193, 195, 197, 203, 204, 220
Anarthrurinae 184, 188, 203, 204, 220
Anatanais 204
Ancininae 28
Angeliera 63
angustata, *Rocinela* 30, 31
Anisopoda 181
Antheluridae 9
Anthracocaridomorpha 181, 182
Anthuridae 9, 10
Anthuridea 4, 8, 9
Anuropidae 28
Apanthura 11
Apanthuretta 11
Apseudidae 182, 197, 207
Apseudoidea 192, 193
Apseudomorpha 181, 182, 195, 207
Araphura 188, 205, 234
Archaeocuma 156
Arcturella 50
Arcturidae 47, 50
Arcturina 50
Arcturoopsis 50
arcuata, *Campylaspis* 170
arguta, *Cumella* (*Cumella*) 176
armata, *Leptognathia* 231, 234
armatus, *Leucon* 144, 151
Asellidae 62
Asellita 181
Asellota 2, 4, 8, 59

Astacilla 50
Astacillidae 50
Atlantasellidae 62
atlanticus, *Munnopsurus* 98
auritochelus, *Carpoapseudes* 208
Austroleucon 145

B

Bathynomus 28
Belizanthura 19
bellicauda, *Paranthura* 21
belliceps, *Rocinela* 30, 31
Belonectes 94
bicarinata, *Campylaspis* 170
bidentata, *Diastylis* 133, 134
biplicata, *Campylaspis* 160, 170
bisetulosa, *Paraleptognathia* 206, 226
bishopi, *Leucon* 149
blakei, *Campylaspis* 160, 168
Bodotriidae 127, 128
Bopyridae 22, 24
Bopyroidea 22
Brachycarida 121
breviaria, *Araphura* 206, 234, 239
brevicornis, *Joeropsis* 88
breviremis, *Leptognathia* 247
breviremis, *Leptognathia* cf. 206, 247

C

cadieni, *Tanaopsis* 206, 207, 249
caenosa, *Procampylaspis* 160, 172
Calabozoidea 4, 8
Calathura 21
calcareia, *Synidotea* 54, 56
californica, *Cumella* 160, 175
californica, *Diastylis* 129, 133, 135
californica, *Hemilamprops* (?) 142
californicus, *Hemilamprops* 142
californicus, *Lampropoides* 142
californiense, *Pleurogonium* 68, 76, 78
californiensis, *Amakusanthura* 13
californiensis, *Apanthura* 11
californiensis, *Eurycope* 66, 92
californiensis, *Hemilamprops* 142
californiensis, *Pancolus* 212
californiensis, *Pseudotanais* 206, 207, 260

californiensis, *Siphonolabrum* 205, 206, 220
calva, *Leptostylis* 129, 139, 140
Campylaspenis 156
Campylaspis 125, 160, 161
Camylaspides 161
canaliculata, *Campylaspis* 160, 161
caraspinosus, *Carpoapseudes* 203, 207
Carboniferous species 182
carinata, *Serolis* 36
carinatus, *Nannonisconus* 102
Carpoapseudes 207
cavolinii, *Tanais* 190
Chaulioleona 205, 206, 207, 231, 242
chromatocephala, *Munna* 71
Cirolanidae 28, 29, 33, 36
clementensis, *Gnathia* 42
complanata, *Eurycope* 92
concava, *Joeropsis* 67, 88
coralensis, *Zeuxo* 212
Corallanidae 29, 36
cornuta, *Eugerdella* 106
cornuta, *Rocinela* 31
cornuta, *Tridentella* 38
coronadoensis, *Gnathia* 42
crassus, *Typhlotanais* 206, 254, 256
crenellata, *Diastylis* 129, 131, 135
crenulatifrons, *Gnathia* 42, 43
crispa, *Campylaspis* 170
Crymoleucon 147, 149
Cryptoniscidae 22
Cryptoniscoidea 22
Cumacea 121, 181
Cumella 160, 174
cuspirostris, *Araphura* 206, 236
Cyathura 11, 13
Cymothoidae 29, 36

D

dagama, *Stenetrium* 69
Dajidae 22
dalli, *Diastylis* 133
declivis, *Leucon* 144, 147
deep-sea species 182
deformis, *Leucon* 158
Dendrotiidae 65
dentata, *Chaulioleona* 206, 231

denticulata, *Ilyarachna* 97
derived families 197
Desmosoma 106
Desmosomatidae 60, 64, 66, 104
Diaphonoleucon 144, 147
Diastylidae 128, 129
Diastylis 129, 139
Dikonophora 182, 184
dillonensis, *Mesolamprops* 143
dubia, *Joeropsis* 88
dubia, *Leptochelia* 205, 213
dubia, *Paramunna* 75
dulongii, *Tanais* 190

E

echinata, *Diastylis* 130
echinata, *Procampylaspis* 170
Echinothambematidae 65
edwardsi, *Diastylis* 133
Egregia 15
elegans, *Paranthura* 21, 22
Entoniscidae 22
Epicaridea 4, 7, 22
Epileucon 150
erostrata, *Janiralata* 84
erratum, *Austrosignum* 73
erratum, *Munnogonium* 73, 75
Eucarida 1
Eudorella 144, 153, 156
Eudorellopsis 158
Eugerd 64
Eugerdellatinae 108
Eurycope 90, 92
Eurycopinae 64, 90, 92, 94
evolutionary center 196
exarata, *Campylaspis* 170

F

falcicosta, *Leucon* 144, 150
fastigatum, *Siphonolabrum* 186, 195
fernaldi, *Munna* 71
Flabellifera 4, 8, 28
foliata, *Luidia* 78
forcipatus, *Pseudotanais* 193
fossil species 182

G

Gammaridea 181
geminatum, *Haliophasma* 15
geminatum, *Silophasma* 15
giganteus, *Munnopsurus* 100
globifrons, *Munnogonium* 75
glutacantha, *Tridentella* 38

Gnathia 41, 42
Gnathiidea 2, 4, 7, 41
Gnathostenetroididae 63
goodsiri, *Diastylis* 121
gracilis, *Apseudes* 207
gracilis, *Leptognathia* 226
gracilis, *Paraleptognathia* 226
gracilis, *Paraleptognathia* cf. 206, 224, 228
grande, *Munnogonium* 75
guaroensis, *Cyathura* 13, 15
guillei, *Pseudotanais* 260

H

halei, *Munna* 71
Haliophasma 11, 15
Haplomunnidae 66
Haploniscidae 66
hartae, *Campylaspis* 160, 167
hastata, *Leptognathia* 231, 234
hedgpethi, *Idarcturus* 50
Hemilamprops 142, 143
Hemileucon 145
heteroclitus, *Gammarus* 181
Heteroleucon 145
Heteropa 181
Heteropoda 181
Heterotanais-type 193
Heterotanoides 185
hirsuta, *Gnathia* 43
Hoplocarida 1
Horolanthura 19
houstoni, *Excorallana* 29
Hyssura 18, 19
Hyssuridae 9, 10, 18

I

Iais 67
Ianiropsis 67
Idarcturus 50
Idotea 53
Idoteidae 47, 53
Idoteides 181
Ilyarachna 96
Ilyarachninae 64, 96
impressus, *Paratanais* 220
intermedius, *Paratanais* 205, 218
Ischnomesidae 65
Isopoda 1, 181

J

Jaeropsini 86
Janiralata 67, 80, 82
Janirellidae 66
Janiridae 65, 67
Janiroidea 63, 104
joanneae, *Metacirirolana* 34
Joeropsididae 65, 86
Joeropsis 86
johnstoni, *Campylaspis* 170
jonesi, *Pseudotanais* 262

K

Katianiridae 65
Kensleyanthura 19
kobjakovae, *Leucon* 151
koreaensis, *Janiralata* 84
Kupellonura 18, 19

L

Laminaria 15
Lampropidae 128, 142
Lampropoides 143
Lamprops 142, 143
largoensis, *Pagurapseudes* 195
lata, *Joeropsis* 90
laticauda, *Rocinela* 30, 31
latipleonus, *Nannonisconus* 102
lepechini, *Diastylis* 133
Leptochelia 181, 205, 213
Leptocheliidae 181, 184, 186, 188, 193, 195, 197, 203, 204, 213
Leptognathia 231, 247
Leptognathiinae 188, 196, 197, 203, 204, 247
Leptostylis 123, 129, 139
Leucon 144, 147, 150, 151
Leuconidae 127, 128, 144
Leviapseudes 208
Limnoriidae 28
linearis, *Paranthura* 21
Long-tailed isopods 4
longimana, *Diastylis* 139
longipes, *Munnopsurus* 100
longirostris, *Eudorellopsis* 144, 158
Lyidotea 53

M

macrophthalma, *Campylaspis* 170
Macrostylidae 64
maculinodulosa, *Campylaspis* 161, 164
magnadentata, *Leucon* 144, 153

magnifica, *Synidotea* 56
makrothrix, *Pseudotanais* 205, 258
maledivensis, *Zeuxo* 204, 210
maltinii, *Munnogonium* 75
 Marine Isopoda 1
media, *Synidotea* 54, 56
meridionalis, *Cumella* 176
Mesolamprops 142, 143
 Mesosignidae 66
Metacircrolana 33
Microarcturus 50
 Microcerberidae 62
 Microcerberidea 4, 8
Microcharon 63
 Microparasellidae 63, 65
Microparasellus 65
 Mictacea 181
 Mictosomatidae 66
minutus, *Munnopsurus* 98
Momedossa 104
 Monokonophora 182, 184
montereyensis, *Idotea* 53
morion, *Cumella* 160, 174
munda, *Cyathura* 13
Munida 25
Munidion 24
Munna 71, 75
 Munnidae 71
Munnogonium 73, 75
 Munnopsidae 90
 Munnopsididae 64
Munnopsurus 96, 98
murilloi, *Rocinela* 30, 31
mutsuensis, *Heterosignum* 75
 Mysidacea 181

N

Nannastacidae 125, 127, 128, 160
 Nannoniscidae 66, 102
Nannonisconus 102
nasica, *Cuma* 147
Neastacilla 50
Neoarcturus 50
Neohyssura 19
 Neotanaidae 197
 Neotanaidomorpha 181, 182, 190, 197
Nippoleucon 145
nodulosa, *Campylaspis* 164
normani, *Zeuxo* 212
notabilis, *Synaptotanais* 212

O

occidentalis, *Janiralata* 82, 84
ochotensis, *Munnopsurus* 100
oerstedti, *Heterotanais* 192
 Oniscidea 4, 8, 59
ornata, *Diastylis* 130

P

pacifica, *Epileucon* 149
pacifica, *Eudorella* 145, 154
pacifica, *Leucon* 150
Pancolus 184, 204
Paracampylaspis 161
Paracharon 63
Paradiastylis 128
paralaskensis, *Diastylis* 135
Paraleptognathia 205, 224
Paramunna 75
 Paramunnidae 64, 73
paranormani, *Zeuxo* 212
Paranthura 21
 Paranthuridae 8, 9, 10, 21
paraspiculosa, *Diastylis* 129, 130
 Paratanaidae 184, 196, 197, 203, 204, 218
Paratanais 205, 218
paucispinis, *Joeropsis* 88
pellucida, *Diastylis* 129, 133, 138
Pentidotea 53
 Peracarida 1, 121, 181
 Permian species 182
peruanum, *Archaeocuma* 156
phillipsi, *Scoloura* 206, 228
 Phorotopodidae 28
 Phreatoicidea 4, 7, 59
planipes, *Pleuroncodis* 25
 plesiomorphic families 197
 Pleurocopidae 64
Pleurogonium 76
Pleuroncodes 25
pleuroncodis, *Munidion* 25
Pleuropriion 50
plicata, *Campylaspis* 170
princeps, *Munidion* 25
Procampylaspis 160, 161, 170, 173
Prochelator 108
productatridens, *Gnathia* 42, 43
profunda, *Ilyarachna* 97
profunda, *Momodossa* 104
propinquus, *Tanaella* 205, 239
 Protojaniridae 63
Pseudanthura 21

Pseudarcturella 50
 Pseudojaniridae 63
pseudonormani, *Anatanais* 212
 Pseudotanaidae 184, 186, 188, 193, 195, 196, 197, 203, 204, 258
Pseudotanais 186, 206, 207, 258
Pseudotanais-type 193
pygmaea, *Cumella* 174

Q

quadriplacata, *Diastylis* 129, 133
quadrispinosa, *Cumella* 176
quinicornis, *Tridentella* 38

R

rajata, *Janiralata* 84, 86
rathkei, *Cuma* 129
redacticruris, *Eudorella* 145, 156
refulgens, *Munida* 25
rescata, *Idotea* 53, 54
rigida, *Cumella* 174
Rocinela 30, 31
rosea, *Vaunthompsonia* 142
rowei, *Campylaspis* 156
rubicunda, *Cuma* 161
rubromaculata, *Campylaspis* 160, 163, 165
rufa, *Campylaspis* 160, 162
rufescens, *Idotea* 54

S

sadoensis, *Cumella* 174
sagamiensis, *Campylaspis* 164, 165
sanctaecrucis, *Gnathia* 42, 43
santamariensis, *Alloeoleucon* 144, 145
santamariensis, *Diastylis* 129, 135
 Santiidae 64
Scoloura 184, 205, 206, 228
scorpioides, *Diastylis* 133
sedis, *incertae* 181
sentosa, *Diastylis* 129, 130
 Serolidae 28, 29, 34
Serolis 34
serrulirostris, *Leucon* 147
setosa, *Joeropsis* 90
 short-tailed isopods 4
Silophasma 15
Sinelobus 204
sinuosa, *Campylaspis* 170
Siphonolabrum 186, 188, 205, 206, 220
Smicrostoma 38

Solaster 82

- solasteri*, *Janiralata* 82, 84
sp., *Tanaella* 240
sp. A, *Araphura* 236
sp. A, *Belonectes* 66, 94
sp. A, *Desmosoma* 68, 106
sp. A, *Janiralata* 67, 80, 84
sp. A, *Joeropsis* 67, 90
sp. A, *Kupellonura* 19
sp. A, *Leptognathia* 236
sp. A, *Munna* 64, 71
sp. A, *Munnopsurus* 67, 98
sp. A, *Pleurogonium* 68, 77, 78
sp. A, *Prochelator* 68, 108
sp. A, *Stenetrium* 63, 69
sp. A, *Tanaopsis* 252
sp. A, *Typhlotanais* 256
sp. B, *Araphura* 239
sp. B, *Janiralata* 67, 82
sp. B, *Leptognathia* 240, 252
sp. B, *Munnopsurus* 67, 99, 100
sp. C, *Janiralata* 67, 84
sp. C, *Leptognathia* 226, 229
sp. D, *Janiralata* 67, 86
sp. D, *Leptognathia* 239
sp. E, *Leptostylis* 133
sp. H, *Leptognathia* 256
spp., *Desmosoma* 106
spp. A, *Cryptocope* 252
spp. A, *Janiralata* 84
spp. B, *Cryptocope* 252
Spelaeogriphacea 181
Sphaeromatidae 8, 28, 29
spinanotandus, *Paratanais* 220
spinifrons, *Munna* 71
spinulosa, *Diastylis* 130
stanfordi, *Sinelobus* 212
Stenasellidae 62
Stenetriidae 68
Stenetrium 68
stephensi, *Munna* 71
steveni, *Gnathia* 42
stricto, sensu 65
subtilis, *Munnogonium* 75
symmetrica, *Desmosoma* 104
symmetrica, *Momedossa* 68, 104,
106
Synaptotanais 204
Syncarida 1
Synidotea 53, 54

T

- talpa*, *Apseudes* 181
Tanaella 205, 239
Tanaidacea 181
Tanaidae 182, 188, 192, 193,
195, 196, 197, 203, 210
Tanaidomorpha 181, 182, 210
Tanais 184
Tanais-type 193
Tanaopsis 188, 206, 249
Thambematidae 66
Thermosbaenacea 1
tillerae, *Austrosignum* 68, 73
tillerae, *Munnogonium* 73, 75
tillerae, *Munnogonium* cf. 73
tridens, *Gnathia* 42, 47
tridentata, *Eudorella* 155
Tridentella 38
Tridentellidae 29, 36
trilobata, *Gnathia* 42
truncatula, *Eudora* 153
truncatula, *Eudorella* 145, 156
Typhlotanaidae 184, 186, 188, 193,
197, 203, 204, 253
Typhlotanais 206, 253
typica, *Munnogonium* 75

U

- umbensis*, *Campylaspis* 170
uncatus, *Prochelator* 108
undata, *Campylaspis* 170
Uromunna 71
ushakovi, *Eudorellopsis* 159

V

- valleculata*, *Campylaspis* 170
Valvifera 2, 4, 8, 47
villosa, *Leptostylis* 139
virginiana, *Tridentella* 38

W

- waldronense*, *Munnogonium* 75
williamsae, *Typhlotanais* 206, 253, 256
wilsoni, *Munnogonium* 75

Z

- Zeuxo* 184, 204, 210