

**INVERTEBRATES OF  
SOUTHERN CALIFORNIA  
COASTAL WATERS**

**I. Select Groups of  
Annelids, Arthropods,  
Echinoderms, and  
Molluscs**

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## PREFACE

In July 1973, the Coastal Water Research Project initiated a program to standardize identification of southern California marine invertebrates obtained in trawls, benthic grabs, and intertidal collections. The goal of the program is to decrease the variability of identification of organisms and to obtain large blocks of uniform data, which then will be analyzed to determine the effects of pollution on these organisms.

There are four main steps in the development of a key. First, a large-scale survey of the existing literature is conducted to obtain accurate lists of the species found in local waters and descriptions of these species. Second, the descriptions are compared with specimens in the collections of various organizations to determine the degree of variability in the characteristics that define the species. Third, an illustrated key to the species in the group is prepared using the least variable of the distinguishing characteristics. Finally, a meeting is held with the systematic biologists of various sanitation districts, private companies, and museums in southern California, where the keys are reviewed and tested with specimens to identify and solve any problems with the keys prior to publication.

This volume of keys is the first in a series that will eventually cover the major groups of marine invertebrates. At this time, three additional volumes are in preparation:

- Volume II: Ophiurans
- Volume III: Shrimps (revised)
- Volume IV: Select Groups of Microcrustacea

The keys are not being produced in systematic order. Instead, the order is determined by the identification problems of local field workers and the commonness of the organisms in each group. Thus, this volume contains a number of short keys to families and genera that are particular problems to taxonomists at this time. These short keys may later be incorporated into other, larger volumes as more keys to a particular phylum or class are produced.

This volume focuses on organisms likely to be found in southern California waters at depths to 200 meters in trawl, grab, or dredge samples. As organisms normally found to the north and south of southern California may occasionally be taken in local samples, we have included them here.

Corrections to this volume will be issued periodically as new species are discovered. If you wish to receive these corrections, please keep the Project informed of your correct address.

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## ORGANIZATION OF THE VOLUME

### SECTION 1, CORRECTIONS TO HARTMAN'S ATLAS OF POLYCHAETES

This special section of the volume is not a key but rather a series of notes and additions and corrections to Dr. Hartman's Atlas that are intended to be written into the Atlas. The families are arranged in the order in which they appear in the Atlas, and the page number where the keys to a family appear in the Atlas is given. The section was originally prepared by Dr. Hartman and has been amended and changed by Dr. Fauchald.

### SECTION 2, NOTES ON THE CAPITELLIDAE

The section on the capitellids contains notes from a meeting of local marine biologists on certain Capitellidae genera that are sometimes difficult to identify as well as a key to the genera in the form of a table.

### SECTIONS 3 THROUGH 10

Each of these sections contains one or more keys followed by a series of species pages.

#### The Keys

- To use a key to identify a specimen, start with Statement Number 1. If the statement is true of your specimen, continue through the key until you come to a statement that is true and followed by a species name. If any statement is not true of your specimen, go to the statement number given in parentheses after the number of the untrue statement.

If Statement Number 1 is not true of your specimen, go to the statement number given in parentheses after the number 1. Then continue through the key as described above.

- When you have identified your specimen to species, turn to the species pages following the key and find the page for that species. The species pages are in alphabetical order by genus: There is also an index at the back of the volume to aid in finding a particular species page.

#### The Species Pages

- The front side of each species page contains a drawing of the species or of its identifying character. Information on the specimens illustrated (size, sex, collection data) is given in

a list at the end of the references in the back of the volume.  
volume.

- The reverse side of the species page gives the known synonyms for the species and distribution information in two forms:
  1. The distribution map shows the quadrants off California and Baja California where the species has been taken.
  2. The distribution paragraphs give a general idea of where the species has been found in the world (and thus of its overall range) and lists specific places off California and Baja California where the species has been taken. These paragraphs are arranged by source: The complete citations are given in the references at the back of the volume. The data attributed to the Coastal Water Project are on file at the Project and may be obtained or verified through the authors.

There is room on each species page to record your observations on the species. The authors are interested in having any additional or contradictory information that you may have on the species covered here. We would also like to learn of any species that you have taken but that are not discussed in this volume.

- Identifying characters are only given in the keys at the front of each section (they are not listed on the species pages). Therefore, we suggest you go through the key to obtain the most valid identification of a particular specimen.

A COMMENTARY ON HARTMAN'S  
ATLAS OF POLYCHAETES

Kristian Fauchald

The descriptions and illustrations of polychaetes in the two volumes of Dr. Olga Hartman's Atlas of Polychaetes<sup>1</sup> were taken from the original descriptions of the different species. This procedure is adequate for species that were described from specimens taken in California waters. However, it may be difficult to accurately assign California specimens of species that were originally described using specimens from other areas. Quite frequently, the California specimens are subtly different from the European ones, and the differences may not be noted in the Atlas (although they should be fairly obvious to people familiar with California material). The major purpose of this review is to call attention to these differences.

Before her death in 1974, Dr. Hartman completed a set of corrections to the Atlas, which have been duplicated and have received limited distribution. These corrections are incorporated in this review, with my emendations and additions.

ERRANTIMATE (Volume 1)

A new key to the families of scale worms (Page 13 in the Atlas) is given below:<sup>2</sup>

- |   |              |
|---|--------------|
| 1. Neuracacula distally hammerheaded . . . . .  | PAREULEPIDAE |
| 1. Neuracacula distally pointed . . . . .   | 2            |
| 2. Dorsum with felt, or notosetae harpoon-shaped; prostomium with one median antenna . . . . .            | APHRODITIDAE |
| 2. Dorsum without felt; notosetae never harpoon-shaped; one to three prostomial antennae . . . . .        | 3            |
| 3. Neurosetae composite . . . . .   | 4            |
| 3. Neurosetae simple . . . . .  | 5            |
| 4. All posterior segments with elytrae; prostomium with one or three antennae . . .                       | SIGALIONIDAE |
| 4. Elytrae alternate with dorsal cirri along the whole length of the body; one antennae present . . . . . | PHOLOIDIDAE  |

1. Olga Hartman, Atlas of polychaetous annelids from California, vol. 1 (errantiate, 1968) and vol. 2 (sedentariate, 1969) (Los Angeles: Allan Hancock Found., Univ. So. Calif.).

2. This key was worked out during a class in polychaete biology at Santa Catalina Island in summer 1973 and appears to be easier to use than the current key.

5. Spinning glands present; median antenna, if present, attached near the posterior or middle of the prostomium; notosetae absent . . . . . POLYODONTIDAE
5. Spinning glands absent; median antenna, if present, attached at the anterior margin of the prostomium; notosetae usually present . . . . . POLYNOIDAE

#### Aphroditidae (Page 13 in Atlas)

Few problems exist in the Atlas descriptions of the family Aphroditidae. The species designated Aphrodita japonica in the Atlas may be erroneously named, and it is possible that more than one species is presently hidden under this concept.

The setae of the juvenile aphroditids can be different from those found in the fully adult forms. Also, the setae of the first two or three and the last two or three segments differ from those found in all other setigers, even in the fully adult forms.

#### Polynoidae (Page 37 in Atlas)

Most of the species of the genus Arctonoe are commensal with other organisms. There may be a series of cryptic species present, each associated with a single host, but this has not yet been clarified. Identification of the nominal species is easily based on the details in the setal structures.

The genera Eunoe and Harmothoe can be difficult to separate. Harmothoe has bifid neurosetae, Eunoe does not. This is to be understood very directly: A seta either is bifid or has a single recurved tip; intermediate setae do not exist in principle. However, in practice, one may find setae that could be characterized as intermediates. These are always worn, bidentate setae. The procedure in this case is to scan the whole parapodium for the setae; if a single bidentate seta can be distinguished, the specimen belongs to Harmothoe.<sup>2</sup> Because of the manner in which members of the genus Harmothoe and its allies move, the worn setae will be in the lower part of the fascicle; the setae best protected against wear will be in the middle and upper end of the fascicle, so these areas are the best to scan for the bidentate setae. Also, in most species, setae are exchanged

3. To see the bidentation properly, the preparation must be squeezed a bit, and if unclear, another preparation should be made. To be certain, examination under a compound microscope is a must: There is no way of shortcutting this procedure.

periodically; thus, fresh setae may be present "internally," and these may be scanned in a thoroughly flattened preparation.

Gattyana sometimes seems difficult to identify. However, the notosetae in this species are always much more slender than the neurosetae. If this difference is not very obvious the specimen is not a Gattyana.

The species of Halosydna can be separated on the setal structures--H. brevisetosa has single-tipped neurosetae, H. johnsoni has bifid setae. The procedures given above for distinguishing the setae of Harmothoe and Eunoe are also valid in this case. The experimental work on Halosydna, and the field collections reported (Hillger and Reish 1970; Gaffney 1973), have shortcomings, and the separation of the two species cannot be considered settled. However, since the two populations consistently differ in their ecological features, I prefer to keep them apart as separate species for the time being.

The genus Scalisetosus and related genera may turn up in California collections. They will key out with Lagisca or with Harmothoe/Eunoe, but they are easily distinguished from these groups in that they have a deep pocket approximately midway along the neurosetae, which is obvious even under stereo microscopes. Pettibone (1969) reviewed the group, and I refer to her paper for details. A species has been reported from this coast (Los Angeles County) that does not appear to fit with any of the species described so far.

In Lepidasthenia, we have to add L. virens. This species will key out with L. gigas and can be separated from the latter as follows:

- 3. Subdistal tooth very small, closely appressed to the main fang; body light yellow . . . . . gigas
- 3. Subdistal tooth large, at a distinct angle with the main fang; body dark green or black . . . . . virens

In Lepidonotus, it is possible that what we now refer to as squamatus should go under another name. The setal illustration in the Atlas is poor: Usually the upper part of the neurosetae, above the dentate portion, tapers evenly without the subdistal swelling indicated in the illustration. Another characteristic feature of L. squamatus is that the elytrae tend to hang on tenaciously, even in preserved specimens; however this "character" is also found in Halosydna brevisetosa and thus should not be used alone to identify L. squamatus. Examination of the elytral structures is a must in the genus Lepidonotus.

In general, in the family Polynoidae, generic concepts somewhat overlap. I am hoping that Dr. Pettibone (Smithsonian Institute, Washington, D.C.) will produce a complete revision of this family, which will clarify the generic-level concept.

Polyodontidae (Page 141 in Atlas)

Peisidice does not belong where it is listed in the Atlas. In the key to families, it will key out to family Pholoididae, and the local species should be called Pholoides aspera. This correction is contained in a paper by Dr. Hartman to be published posthumously.

Sigalionidae (Page 151 in Atlas)

The key to the genera of the family Sigalionidae should be changed as follows:

- 3. Third setigerous segment with dorsal cirri . . . . . 3a
- 3. Third segment without dorsal cirri . . . . . 4
- 3a. Elytrae encrusted with sand . . . . . Psammolyce
- 3a. Elytrae not encrusted with sand . . . . . Neoleanira

The latter genus should contain areolata, which is presently considered in Sthenolepis.

The remainder of the sigalionid key is acceptable for the time being. Neoleanira tetragona is one of the most common European forms. Leanira calcis was synonymized with this species by Pettibone (1970); this synonymy appears somewhat premature, and I prefer to keep the species apart for the time being.

Chrysopetalidae (Page 183 in Atlas)

As noted in the Atlas, the chrysopetalid Bhawania may turn up in local collections. Paleanotus bellis, which is listed in the Atlas, may be indistinguishable from P. chrysolepis, in which case the latter name would be valid (more data are needed before this decision can be made).

Amphinomidae (Page 189 in Atlas)

In the genus Chloeia, it is becoming increasingly obvious that the setal structures of C. pinnata and C. entypa may be so variable as to be of no help in separating the two species. There is the possibility that the two can be separated on the basis of color pattern, as indicated by Monro (1933) and, later, Hartman (1940). C. pinnata has three distinct, dark longitudinal stripes, C. entypa has a single wide, vaguely defined, reddish-brown band along the dorsum. It should be noted that this character was not mentioned by

Chamberlin (1919) when he originally described C. entypa. It is thus possible that what we are presently calling C. entypa differs from what Chamberlin described, although it appears likely that we have two species of Chloeia in this area. The color pattern is retained for at least 50 years in preservative.

The generic name Pseudeurythoe should be exchanged for Lino- pherus Langerhans 1881, with genotype, L. canariensis. The authority for this change is a forthcoming publication by Hartman.

#### Phyllodocidae (Page 223 in Atlas)

The genera of the Phyllodocidae are troublesome. One of the main difficulties lies in identifying the numbers of segments present and their degree of fusion. I have found it useful to turn the animals over on the side and to use side-lighting as much as possible. It then becomes relatively simple to see the intersegmental lines laterally, and these can then be followed dorsally and ventrally to resolve degrees of fusion in the anterior end, etc.

Eulalia, Eteone, and Anaitides are by far the most commonly occurring genera. Eteone has only two pairs of tentacular cirri, the other two genera have four. Eulalia has a small median antenna in addition to the four frontal ones, and the posterior margin of the prostomium is straight. Anaitides has four antennae, and the posterior margin of the prostomium is deeply excavate with a small nuchal papilla in the middle.

Anaitides can be separated from Phyllodoce on the arrangement of papillae on the proximal part of the proboscis. The proboscis can be dissected from the ventral side, preferably a little to the side of the midline; the best method is to make a short slit, which can then be opened with a pair of forceps. With horizontal light, it is quite easy to determine the arrangement of the papillae. In dissecting all phyllodocids, it is very important to dehydrate them at least for a short time in alcohol: Formalin-preserved specimens tend to be very slippery and difficult to handle, but just a few minutes in alcohol will make it much easier to handle the material.

Species of Anaitides are difficult to separate. Most specimens from California key out either as williamsi, medipapillata, madeirensis, or groenlandica. The color patterns in these species appear to be highly characteristic. Thus when color patterns are present, use them. The shape of the dorsal and ventral cirri is also characteristic, but cirri from the same body region must be compared as the shape of

these cirri will change along the length of the body. There are also indications that the shape of the cirri may change with the size of the specimen. One character not in the key appears to separate madeirensis from medipapillata--the latter has setae in the third tentacular segment, which the former lacks. A. mucosa has a strongly prolonged ventral cirrus, with the greatest width beyond the tip of the acicular lobe; this feature is otherwise rare in the genus. A. multiseriata has a very characteristic H-shaped color pattern on the prostomium.

In the genus Eteone, the shape of the prostomium and the shape and length of the dorsal cirri are valid specific characters. It must be emphasized that the latter character can be used only when comparing parapodia from the same general body region in two specimens or species. We may have two species currently going under the name dilatae as two distinct color phases, one dark and the other light, are present.

In addition to the species listed, we also have Eulalia myriacyclum Schmarda 1861 in the California fauna. This species will key out with quadrioculata and aviculiseta, but it is easily distinguished from both by its yellow base color, sometimes tinged with orange, and its three very striking black, longitudinal bands. The specimens reported as Eulalia viridis from California differ slightly from the European specimens and may belong to a different species.

The genus Eumida is somewhat difficult to clarify at present. Specimens that key out as E. sanguinea from California differ sharply from specimens from Denmark (the Danish specimens agree with the illustrations in the Atlas fully). It is thus possible that another, possibly undescribed species of Eumida should be recognized from California.

Species of the genus Hesionura will turn up in the sandy beaches; all are small, usually greenish. Another species, not listed in the Atlas, will be reported on central California beaches.

In general, it is not difficult to separate between phyllocids with biramous and uniramous parapodia. Biramous parapodia are in this case defined as parapodia in which both rami have acicular support. In species with uniramous parapodia, the notopodia lack acicula. In some of the forms with biramous parapodia, a few simple setae may be present in the notopodia, but most lack such setae. Generally, the best way to make sure of the presence or absence of notacacula is to make a parapodial preparation and examine it under the compound microscope. It may be necessary to remove the dorsal cirrus in order to make a good preparation.

Paranaitis polynoides has a very characteristic prostomial shape, and the very large spur on the end of the shafts of the setae is also characteristic.

The local species of Phyllodoce, which is actually quite common in shelf depths off Los Angeles Harbor, is apparently undescribed. Considering the general state of the genus, Dr. Hartman decided to postpone naming it until the genus has been revised.

In the genera Steggoa and Sige, the ventral tentacular cirrus is foliose and usually asymmetrical. This character is very distinct and, once seen, is never mistaken for the inflated ventral cirri sometimes found in other genera.

#### Lacydonidae (Page 329 in Atlas)

The local form of Paralacydonia is a small one, usually found in slope and basin depths but sometimes noted on the lower half of the shelf.

Dr. Hartman, in her corrections, wanted to add Phyllodocella bodegae Fauchald and Belman 1971. This is a species of Micronereis and should be referred to the family Nereidae.

#### Hesionidae (Page 357 in Atlas)

In the Hesionidae, the local species of Gyptis, previously referred to as arenicola glabra, should be called G. brevipalpa Hartmann-Schröder 1959. We also have a member of the genus Nereimyra represented in California. The genus will currently key out with Hesionella; the key should be changed as follows:

- |    |  |                   |
|----|--|-------------------|
| 3. | Notosetae absent . . . . .                                       | 5                 |
| 3. | Sparse number of notosetae present . . . . .                     | 4                 |
| 4. | Proboscis terminates distally in a circlet of fimbriae . . . . . | <u>Amphiduros</u> |
| 4. | Proboscis terminates distally in a circlet of papillae . . . . . | <u>Gyptis</u>     |
| 5. | Without palpi . . . . .  | <u>Hesionella</u> |
| 5. | With palpi . . . . .   | <u>Nereimyra</u>  |

Hartman noted in her corrections that another species of Nereimyra is indicated, but did not give any details. A description of the most frequently reported species (Castalia punctata) of the genus can be found in Fauvel (1923).

#### Pilargidae (Page 373 in Atlas)

The genus Loandalia is listed in the Pilargidae key. This genus is not found locally; instead we find Parandalia, which keys out in the same manner as Loandalia. In addition

to the Loandalia species listed, which is correctly named Parandalia fauveli (Berkeley and Berkeley 1941), we find another species of the same genus, P. ocularis Emerson and Fauchald 1971. P. ocularis differs from P. fauveli in that the former has a pair of eyes on the third and fourth setiger and has a different distribution of its dorsal spines.

The couplet identifying the two species of Ancistrostylis listed is reversed; the corrected couplet should read:

1. Notopodial bases prolonged, with transverse rows of papillae . . . . . breviceps
1. Notopodial bases not prolonged, without transverse rows of papillae . . . . . hamata

The first occurrence of the notacicular spines in Sigambra may be difficult to determine. Presently it seems to be best to count from the point of emergent spines.

There appear to be two different populations of Synelmis in California, and more data are needed to determine if there are actually two different species present.

#### Syllidae (Page 395 in Atlas)

In syllids with one large tooth, the tooth is usually visible in a whole mount as a dart-shaped, clear area on the dorsal side. The tooth is usually in what is called an anterior position, which means that it can be found just behind the prostomium. But in one genus, Opisthosyllis (not recorded in the Atlas), the tooth is in a posterior position, just in front of the proventricle. This latter position can be identified as a punctate area, with distinct musculature in the anterior one-third of the specimen. Specimens presently recorded from California appear to belong to Opisthosyllis brunnea Langerhans 1879.

In identifying syllids, accurate examination of the setae is indispensable. The best method is to place the specimen in a depression slide with glycerol alcohol and scan the whole organism with a low-power compound microscope.

The separation between Langerhansia and Typosyllis is based on the setal structures. Langerhansia has long composite spinigers in most setigers, especially noticeable in the median part of the body. Typosyllis has composite falcigers only; these may have long appendages in anterior setigers, but they become shorter and usually stouter in more posterior setigers.

Several syllid genera are frequently considered subgenera of Syllis. The general level of characters separating these genera appears similar to those used in distinguishing other

parts of the family, and they are here considered as separate, valid genera. There is also the practical consideration that, as these genera are very well represented in California, the keys will be easier to use if the genera are kept separate.

Members of the genus Trypanosyllis are usually very strongly flattened and have numerous densely crowded segments. If these characters are not very obvious immediately, the specimens have been wrongly identified and belong to another genus, most probably Typosyllis.

Members of the genus Exogone are best identified by using the key in the Atlas, supplemented with information in Banse (1972a).

It appears likely that we have at least one additional species of Odontosyllis in southern California; however, it has not yet been properly described or identified.

The Atlas key to the genus Typosyllis is presently inadequate--several, obviously different forms will key out under the same name. Imajima (1966) provides some help in the identification. Often the simple setae characteristic of the genus is found only on a few posterior setigers, so it becomes important to scan all segments for the presence of these setae. The genus is presently under revision, and this should be finalized within a couple of years.

#### Nereidae (Page 497 in Atlas)

The generic division suggested by Hartman in the Atlas appears valid; the genus Neanthes has recently been split in two in that Harmann-Schröder (1971) revived the name Hediste Malmgren for N. diversicolor. The genus is separated from Neanthes s. str. by having simple falcigers in posterior neuropodia, which Neanthes lacks. Thus, by changing Couplet 6 in the key to the genera and adding a Couplet 8, the genus can be keyed out:

- 6. Notopodia with homogomph falcigers in addition to spinnigers . . . . . Nereis
- 6. Notopodia without homogomph falcigers . . . . . 8
- \* \* \*
- 8. Neuropodia with simple falcigers in posterior setigers . . . . . Hediste
- 8. Neuropodia without simple falcigers . . . . . Neanthes

Of the specific names in the Atlas, N. caudata is unavailable and the first available name for that species is N. arenaceodentata (Moore 1903). Fauchald (1972a) separated

the genus into a series of groups; this may be of some help in identifying the local species in cases where difficulties arise from using the key in the Atlas. In the key to species, reference to N. diversicolor should be deleted, as this species is now considered in its own genus.

The species of Nereis may be somewhat difficult to identify, and it is not quite clear how many species we actually have in the area. Thus, it is necessary to revise the key (especially with regard to the species that currently are identified as N. latenscens, N. zonata, and N. natans) to determine the number of species involved in these concepts and the way in which they should be defined. At present, it appears preferable to retain the name Nereis mediator Chamberlin 1918 for the species that key out to this name in the Atlas. It has been suggested that this form is identical with N. grubei (Kinberg 1866) originally described from Chile. This synonymy is not unlikely, but only inadequate data from the type localities are available--until the latter species has been clearly defined, it appears best to keep the two apart.

The number of paragnaths in the different areas of the proboscis on Nereis appears to vary somewhat, so an absolute number of paragnaths cannot be used to determine any species. The variability is however strongly limited, and the range, combined with other characters (e.g., the shape of the parapodial lobes), should be sufficient to characterize all the local species of Nereis.

#### Nephtyidae (Page 565 in Atlas)

The Atlas is very useful in the identification of the local nephtyids. A series of species are found somewhat further south on the coasts, and these may be identified with the help of Hartman (1950).

The dorsal color patterns on some members of the genus Nephtys are highly characteristic, but these are obvious only on reasonably fresh specimens.

Careful examination of smaller nephtyids is necessary to separate Nephtys cornuta fransciscana from juveniles of other species. N. c. fransciscana has double ventral antennae; all other species have simple ventral antennae.

#### Sphaerodoridae (Page 599 in Atlas)

The key to the sphaerodorids given in the Atlas is obsolete and should be replaced with the following, which was devised by Hartman and included in her corrections to the

Atlas. I have reviewed the entire family in a recent publication (Fauchald 1974).

1. Dorsum with stalked  
macrotubercles . . . . . Clavodorum clavatum
1. Dorsum with sessile macrotubercles . . . . . 2
2. Dorsum with two rows of macro-  
tubercles; setae composite . . . Ephesiella brevicapitis
2. Dorsum with four or more rows  
of macrotubercles; setae simple  
or composite . . . . . 3
3. Dorsum with four transverse rows  
of spherical capsules to a segment;  
setae composite . . . . . Sphaerodopsis biserialis
3. Dorsum otherwise . . . . . 4
4. Setae simple; dorsum covered with  
small papillae, which are largest  
over parapodia, each with a  
slender distal lobe . . . . . Sphaerodorum papillifer
4. Setae composite . . . . . Sphaerodorum sphaerulifer

This new key reflects two name changes. Sphaerodoridium biserialis has been changed to Sphaerodopsis biserialis, and Sphaerodorum brevicapitis is now Ephesiella brevicapitis.

#### Glyceridae (Page 611 in Atlas)

The examination of proboscideal papillae is necessary for accurate identification of the local glycerids. The easiest way to do this is to remove a small piece of the cuticle--and the epidermis below it--with a pair of point forceps and mount this in a slide, with the surface to be examined up. The mount should be in glycerol-alcohol, and the light should be stopped down considerably. A number of papillae should be carefully examined before deciding on the size, shape, and number of the ridges on the papillae. Hartman (1950) gave an excellent review of both the Glyceridae and the Goniadidae; in case of doubt, this paper should be consulted. Remember, however, that the illustrations of widely dispersed forms are based on California specimens and are not from the original locality.

The easiest way to identify specimens with retractile branchiae that cannot be observed is to assume first the presence and then the absence of this feature while using the key. The identification achieved in this manner can then be checked with the descriptions of the species and, if necessary, with the descriptions given in Hartman (1950).

Goniadidae (Page 641 in Atlas)

The key to species of Glycinde should be corrected to read:

- 1. Dorsal cirrus incised near the tip . . . . . polygnatha
- 1. Dorsal cirrus not incised . . . . . 2
- 2. Notopodial setae are acicular . . . . . armigera
- 2. Notopodial setae are slender and capillary . . . . . wireni

A description of G. wireni can be found in Arwidsson (1899).

The key to species of Goniada should be corrected to read as follows:

- 1. Notopodia with slender, hairlike setae . . . . . 2
- 1. Notopodia with acicular or rodlike setae . . . . . 4
- 2. Notopodia with prolonged presetal lobe . . . . . littorea
- 2. Notopodia without prolonged presetal lobe . . . . . 3
- 3. Prostomium with five or fewer annuli . . . . . annulata
- 3. Prostomium with eight or more annuli . . . . . brunnea
- 4. Body has three regions--anterior uniramous, median subbiramous, and posterior biramous . . . . . acicula
- 4. Body with two regions--anterior uniramous and posterior biramous . . . . . japonica

A description of G. japonica can be found in Imajima and Hartman (1964).

Onuphidae (Page 657 in Atlas)

Small juveniles of the family Onuphidae may be impossible to identify since the setae of the juveniles differ in structure from those of the adults.

In the genus Diopatra, tridentata is the most common in the lower half of the shelf and has smooth tubes. D. splendidissima and D. ornata both have rather ragged tubes and are present in shallow subtidal areas. They can easily be separated on the structure of the pectinate setae in that D. splendidissima has a few coarse teeth in these setae, and D. ornata has many (at least 10) fine teeth.

Species of Nothria with branchiae from the first setiger can be separated as suggested by Hobson (1971). At present, it appears preferable to separate the old genus Onuphis into Onuphis s. str. and Nothria.

It may be difficult to distinguish the different kinds of setae in members of Onuphis and Nothria. Composite

spinigers are most easily seen in Setigers 7 through 12; the structure of the composite falcigers is most obvious in Setigers 1 through 5. The so-called giant hooks are usually about twice the thickness of normal compound falcigers and are normally best developed in Setigers 5 through 12 and less distinctly compound than the other falcigers. The teeth are usually rounded, giving these hooks a parrot-beak appearance. The composite spinigers are always ventrally located in the setal fascicles and are easily seen in a stereo microscope, once one knows what to look for. To get the shape of the hooks, it is of the utmost importance that they be observed in full lateral view.

#### Eunicidae (Page 707 in Atlas)

In the genus Marphysa, the local species with a limited number of pairs of branchiae have been difficult to identify. In addition to looking at the distribution of branchiae, it is important to note the presence of composite spinigers and falcigers. This can be done rapidly by scanning the whole specimen under a stereo microscope--the setal structure is usually distinct. However, the spinigers should also be examined under a compound microscope since falcigers with pointed hooks will appear as spinigers under a stereo microscope.

Two species of Palola are present in the eastern Pacific Ocean. As of now, only one of them, P. paloloides, has been reported from California. The two species can be separated as suggested in Fauchald (1970).

#### Lumbrineridae (Page 739 in Atlas)

In the family Lumbrineridae, the presence of composite falcigers in anterior setigers is relatively easily observed by scanning under a stereo microscope. The difference between yellow and black acicula is most easily seen in posterior setigers. Prolonged posterior parapodial lobes that are distinctly longer than those on anterior setigers are present in some species. Small specimens are not identifiable with current information. Remember that there is a difference between young specimens of a larger species and specimens of a species that becomes sexually mature at a smaller size.

The jaw apparatus of lumbrinerids furnishes very strong characters. Usually overlooked is the shape of the carriers: These carriers are in fact easier to observe, once the specimen has been dissected, than the third and fourth maxillae. Because of the angle of the maxillae and the carriers, they may be seen foreshortened, and this must be accounted for when their shape is used as a means of identification.

Lumbrineris impatiens has been added to the California fauna, although it is uncertain if this species is correctly identified. It can be separated from L. zonata as suggested in the following:

- |  |    |
|--|----|
| 4. Posterior parapodia with prolonged pre- and postsetal lobes . . . . . | 5  |
| 4. Posterior parapodia with prolonged postsetal lobes . . . . .          | 6  |
| 4. Posterior parapodia without prolonged lobes . . . . .                 | 14 |
- \* \* \*
- |  |                  |
|--|------------------|
| 14. Dorsum frequently barred with brown; mandibles separated basally . . . . . | <u>zonata</u>    |
| 14. Dorsum uniformly reddish-orange; mandibles completely fused . . . . .      | <u>impatiens</u> |

L. simplicis Hartman 1959 has been added to the fauna; for an account of this species, see Fauchald (1970).

L. bifilaris sensu Ehlers (1901) has never been recorded from the California fauna. The local specimens belong to L. lagunae (Fauchald 1970).

Two species with bifid posterior hooks are present in the California fauna; neither of these corresponds to L. acuta. One was described by Fauchald (1970); the other may be undescribed.

Two species of the genus Ninoe are currently listed in the Atlas. However, an additional six species are present in western Mexico and thus may occur in the local fauna. They were treated in Fauchald (1970; 1972a).

#### Arabellidae (Page 785 in Atlas)

The easiest way to separate an arabellid from a lumbrinerid is to scan the specimen, especially in posterior setigers, for the presence of the falcigers; these will appear clubbed when present. Arabellids have only limbate setae that are distally pointed, so all setae will either appear pointed or be broken. Additionally, the jaw apparatus of the arabellids is always pitch black, whereas the jaw apparatus of the lumbrinerid is brown. The maxillary carriers in the arabellids are very long and slender; they are short and truncate in lumbrinerids.

Identification of arabellids to genus and species requires dissection of the jaw apparatus. The jaw apparatus should be left in the specimen so that reexamination becomes possible. A number of arabellids appear to have parasitic larval stages in other polychaetes (Emerson 1974).

Lysaretidae (Page 813 in Atlas)

The genus Iphitime was separated from the Lysaretidae by Fauchald (1970). A new species from southern California was described by Pilger (1971). All iphitimids described so far are parasitic in the gill chambers of decapod crustaceans of various kinds, mainly the larger crabs.

Dorvilleidae (Page 815 in Atlas)

The family Dorvilleidae was completely revised at the generic level by Jumars (1974), who also described several new species from California. This revision has led to name changes, as well as changes in the concept of all California species, and the paper should be consulted for identification of the species.

SEDENTARIA (Volume 2)

Orbiniidae (Page 17 in Atlas)

In the Orbiniidae, subpodial lobes are ventral to the parapodia completely and are usually completely separated from the ventral edge of the parapodia; the ventral cirri are, however, associated with the ventral edge of the parapodia.

The orbiinids were revised by Hartman (1957), and more complete descriptions and discussion can be found in this paper.

Paraonidae (Page 49 in Atlas)

Strelzov (1973) published a complete review of the family Paraonidae; another, partial review can be found in Fauchald (1972a). These two papers should be consulted for the generic subdivision of the Paraonidae. Both keys to the genera are given below:

Subdivision of the Paraonidae  
According to Strelzov (1973)

1. Lyrate or acicular setae  
in the notopodia . . . . . Cirrophorus
1. Lyrate or acicular setae absent  
from the notopodia . . . . . 2
2. Unpaired median tentacle present  
on the prostomium . . . . . Aricidea
2. Unpaired median antenna absent . . . . . 3
3. Occipital organs on the posterior margin  
of the prostomium, which has several  
rows of cilia . . . . . Paraonis

3. Occipital organs on the first post-prostomial segment (rudimentary oral segment); prostomium with a single row of cilia or without cilia . . . . . 4
4. Abdominal postbranchial notopodia with specialized setae . . . . . 5
4. Abdominal postbranchial notopodia without specialized setae . . . . . Paraonella
5. Three prebranchial segments; terminal sensory organs absent . . . . . Sabidius
5. More than three prebranchial segments present; terminal sensory organs present . . . . . Tauberia

Subdivision of the Paraonidae  
According to Fauchald (1972a)

1. Median antenna present . . . . . 2
1. Median antenna absent . . . . . 4
2. Modified setae absent . . . . . Aedicira
2. Modified setae present . . . . . 3
3. Modified setae in the notopodia . . . . . Cirrophorus
3. Modified setae in the neuropodia . . . . . Aricidea
4. Modified setae absent . . . . . Paraonides
4. Modified setae present . . . . . 5
5. Modified setae in the notopodia . . . . . Paradoneis
5. Modified setae in the neuropodia . . . . . Paraonis

Among the specific characters that are particularly useful in identifying genera of Paraonidae is the detailed structure of the modified setae. It is important to get a full view of each seta examined and to use optical equipment sufficient to resolve details in the setae.

Spionidae (Page 85 in Atlas)

Revision of the spionids is incomplete and quite extensive, both on the generic and specific levels. In working with the genus Boccardia, it seems best to follow the suggestions made by Blake and Woodwick (1971).

In the genus Laonice, it seems impossible to separate between L. cirrata and L. foliata as suggested in the key. However, L. sacculata can be identified as suggested in the key. We have found L. cirrata in our California collections and have also taken L. appelloefi Söderström 1920 (see Fauchald 1972b for a review).

The genus Nerine is considered a synonym of Scolecopsis, as is Nerinides; however, Nerinides maculata and Nerinides pigmentata actually belong to the genus Pseudomalacoceros.

At the generic level in the key, the name Nerine should be changed to Scoelelepis, and Nerinides should be changed to Pseudomalacoceros. The keys to the species should read:

Pseudomalacoceros

- 1. Paired pigmented spots on the peristomium at the sides of the prostomium . . . . . maculata
- 1. A single pigmented spot on the prostomium . . . . . pigmentata

Scoelelepis

- 1. Prostomium acute; hooded uncini distally tridentate . . . . . acuta
- 1. Prostomium pointed, but not acute; uncini distally bidentate . . . . . squamata
- 1. Prostomium subrectangular, slightly prolonged midfrontally; uncini distally entire . . . . . foliosa occidentalis

Foster (1971) suggested a new subdivision of the species referred to as Prionospio. It appears useful to recognize Paraprionospio for the species with three pairs of bipinnate branchiae. The other genera recognized by Foster have been used by other authors at the subgeneric level; they appear at least as different from each other as the species of Paraprionospio, and the separation is suggested as being useful. Foster (1971) gives a key to genera.

Of the local species of Prionospio sensu latu, the one referred to as malmgreni definitely differs from this species as originally described, and cirrifera may presently cover two species in California. P. steenstrupi must also be revised; however, as this species appears to vary considerably wherever it occurs, the concept used in California may be adequate.

An undescribed--or at least unidentified--species of Spio is present in shallow sandy areas off the California coast.

The generic name Rhynchospio should be replaced by Malacoceros.

A revised key to the species of Spiophanes may be helpful:

- 1. Prostomium with pronounced frontal horns . . . . . 2
- 1. Prostomium without pronounced frontal horns . . . . . 3
- 2. Prostomium with eyes . . . . . bobbyx
- 2. Prostomium without eyes . . . . . anoculata
- 3. Interramal pouches present from about Setiger 25 . . . . . fimbriata
- 3. Interramal pouches absent . . . . . 4

- 4. Prostomium with eyes . . . . . 5
- 4. Prostomium without eyes . . . . . pallidus
- 5. Nuchal antenna absent . . . . . missionensis
- 5. Nuchal antenna present . . . . . cirrata

The genus Polydora is presently under revision in California, and identification of these species will have to await publications by Blake and possibly Woodwick.

#### Magelonidae (Page 191 in Atlas)

The family Magelonidae is under revision by Meredith Jones, and it seems best to follow the subdivision indicated in the Atlas until this revision becomes available.

#### Chaetopteridae (Page 207 in Atlas)

The key to genera of the Chaetopteridae has been replaced:

- 1. With two pairs of anterior antennae;  
tube horny, translucent and  
annulated . . . . . Phyllochaetopterus
- 1. With one pair of antennae; tube  
horny or otherwise . . . . . 2
- 2. Median region with notopodia  
medially fused . . . . . Chaetopterus
- 2. Median region with notopodia free  
from one another . . . . . 3
- 3. Notopodia unilobed; tubes  
arenaceous . . . . . Mesochaetopterus
- 3. Notopodia bilobed or trilobed;  
tubes horny and annulated . . . . . Spiochaetopterus

Telepsavus costarum should be referred to as Spiochaetopterus costarum.

#### Cirratulidae (Page 221 of Atlas)

The genus Acrocirrus was made the type-genus of a new family, Acrocirridae, by Banse (1969). Also, a number of small inefficiencies have been found in the key to cirratulid genera. A revised key to the genera has been worked out:

- 1. A pair of long, grooved palpi attached  
at the anterior dorsum . . . . . 2
- 1. Grooved palps absent . . . . . 5
- 2. All setae slender and distally pointed . . . . . Tharyx
- 2. Setae in part acicular spines or hooks . . . . . 3

3. Acicular setae distally excavate;  
body often dark green or black . . . . . Dodecaceria
3. Acicular setae not excavate; body  
white or flesh-colored . . . . . 4
4. Acicular spines in posterior segments  
distally entire . . . . . Chaetozone
4. Acicular spines in posterior segments  
distally bifid or multifid . . . . . Caulleriella
5. One or more anterior segments with  
paired branchiae and/or with a  
transverse row of long tentacular cirri . . . . . 6
5. Anterior region without long  
tentacular structures . . . . . Paricirrus
6. Dorsal tentacular cirri first arise  
from the same segment as the  
anteriormost branchiae . . . . . 7
6. Dorsal tentacular cirri first arise  
posterior to the anteriormost  
branchiae . . . . . Cirriformia
7. Dorsal tentacular cirri on one segment  
only . . . . . Cirratulus
7. Dorsal tentacular cirri on several  
anterior setigers . . . . . Timarete

Chaetozone setosa specimens from California appear to differ significantly from the species as originally described. It may be of value to refer to the California material as questionably identified until proved otherwise.

In the separation between Caulleriella and Chaetozone, it appears best to follow the definition of these two genera as closely as possible, assigning all species with entire spines to Chaetozone and those with bifid or multifid spines to Caulleriella.

In the genus Cirratulus, it seems best to take the conservative approach and use the specific name cirratus, unless the specimens in question fall completely within the other species as described in the Atlas.

A third species of Cirriformia has been recorded from California. The new key to the species is as follows:

1. Posterior spines dark or black . . . . . luxuriosa
1. Posterior spines light yellow . . . . . 2
2. Posterior setigers with at least five  
spines in each ramus . . . . . spirabbranchia
2. Posterior setigers with maximally  
three spines in each ramus . . . . . tentaculata

C. tentaculata (Montagu 1808) was described by Fauvel (1927, pages 91-2, Figures 32a through 32g).

The description of Raricirrus maculata may have to be emended for the local specimens. In addition, the genus Tharyx is presently under revision. The best approach for the present is to follow the definitions in the Atlas as closely as possible until this revision has been published.

#### Flabelligeridae (Page 277 in Atlas)

Of the Flabelligeridae, the genus Fauveliopsis has been made the genotype of its own family, Fauveliopsidae.

The separation between Pherusa neopapillata and P. papillata may be difficult. P. neopapillata is completely covered with short papillae, giving it a velvety appearance; P. papillata has a sparse number of papillae, leaving large areas of epidermis bare. The two species also differ in setal structures, but this may be difficult to observe without good microscopic equipment.

The illustration of the tongue-like prolongation of the brachial membrane in Piromis is somewhat misleading: A better illustration is given for another species (P. roberti, under the name Semiodera roberti) in Hartman (1951).

#### Opheliidae (Page 317 in Atlas)

In the key to genera, the second half of Couplet 4 was omitted:

- 4. Lateral eyespots located between  
some successive parapodia . . . . . Armandia
- 4. Lateral eyespots absent . . . . . Ophelina

It should be noted that the name Ammotrypane is invalid, and should be replaced with Ophelina. The species called Ammotrypane aulogaster should now be called Ophelina acuminata Ørsted 1843.

#### Capitellidae (Page 353)

The capitellid genera and species will be treated in more detail in another review.

#### Maldanidae (Page 419 in Atlas)

Maldanids cannot be identified except as complete specimens; anything else is guesswork and must be avoided.

In the key to maldanid genera, Couplet 7 should be corrected to read:

- 7. Anal plaque with many cirri, but with  
none midventral . . . . . 8
- 7. Anal plaque with or without cirri; if  
cirri present, then one distinctly midventral . . . . 10

Tubes of species in the genus Rhodine are thin, usually copper-colored and very friable.

Oweniidae (Page 485 in Atlas)

The name of the local species of Owenia is collaris. This species was originally described as a subspecies of O. fusi-formis, but it is sufficiently different to merit status as a separate species.

Sabellariidae (Page 495 in Atlas)

The California sabellariids are currently under revision by Dr. David Kirtley (Harbor Branch Foundation, Inc., Fort Pierce, Florida); it seems best to accept the current subdivision until this revision has been published.

Pectinariidae (Page 513 in Atlas)

The curvature of the tubes of Pectinariidae is not a character of generic value. There are however distinct differences in the tube construction in that Pectinaria has smooth-walled tubes fitted together of closely similar grains, whereas Cistenides has irregular or larger particles fitted together so that the tube appears thicker and more ragged.

The separation between Pectinaria californiensis and its subspecies newportensis appears difficult to maintain. It is possible that, if a large amount of data is examined, the difference can be maintained on a statistical basis.

Ampharetidae (Page 519 in Atlas)

In the family Ampharetidae, it may be somewhat difficult to count the numbers of thoracic setigers. Otherwise there do not seem to be any major problems arising from the key to genera in the Atlas.

The distribution of the branchiae in members of the Ampharetidae may be somewhat difficult to determine: The question is whether they are in a three-and-one pattern or in a two-and-two pattern. The last pair of branchiae is always connected to the setiger to which it belongs by a raised ridge and is always behind the other pairs. In the three-and-one arrangement, the medial pair nearly abut in the middorsal line, and the branchial membrane has a very narrow free portion. In the two-and-two arrangement, the medial pair is separated dorsally, and the branchial membrane has a distinct, usually thickened, free portion.

Species of Amage can be identified by the number of abdominal setigers. The number appears to be highly characteristic for each species, but care must be taken in counting them.

Two European species of Ampharete have been reported from California. The data on these do not fit very well with the descriptions; however, the descriptions are old, and more specimens from both areas should be examined and compared before any changes are made.

The species illustrated as Schistocomus hiltoni in the Atlas is actually an undescribed species of Schistocomus. The description given was taken from the original description of S. hiltoni and is thus correct. The unnamed species differs from S. hiltoni in that it has three pairs of branchiae rather than two.

#### Terebellidae (Page 579 in Atlas)

In the key to genera of Terebellidae, there is a change in Couplet 6:

- 6. Short-stemmed uncini in some thoracic and  
all abdominal segments . . . . . Polycirrus
- 6. Long-handled acicular spines in the  
abdomen only; thoracic neurosetae  
absent . . . . . Amaena

Pista fasciata as presently defined may contain more than one species; the problem cannot be solved without access to large amounts of data taken throughout the range of this species.

In the genus Pista, the distribution of the long-handled uncini in the thorax is very important. The best preparation in which to see this is a small piece of the thorax from the anterior and posterior ends of the thorax in glycerol-alcohol. The preparations must be on a flat slide and must be compressed so that a good flattened view of the uncini becomes possible. The genus is large, and several more species may be present in the area. However, no study of the variability of characters in the genus has been made to date.

It is presently impossible to identify members of the genus Polycirrus to species. The whole genus--and indeed the subfamily--need revision.

Separation between Streblosoma and Thelepus is best done on the distribution of branchiae in relation to the first setae: In Streblosoma, the first branchiae and the first setae are on the same segment; Thelepus has setae first present from the second branchial segment.

Sabellidae (Page 655 in Atlas)

In the key to genera of Sabellidae, Couplet 8 should be changed as follows:

- 8. Thoracic neurosetae with long, straight  
acicular stem . . . . . 9
- 8. Thoracic neurosetae with long,  
curved stem . . . . . 10

The key to species of Chone was revised by Dr. Hartman, based on Banse (1972b) :

- 1. Thoracic ventral shields  
well developed . . . . . ecaudata
- 1. Thoracic ventral shields absent . . . . . 2
- 2. Second setiger with unusually broad  
glandular girdle . . . . . veleronis
- 2. Second setiger without such broad  
glandular girdle . . . . . 3
- 3. First setal fascicle of normal size . . . . . 4
- 3. First setal fascicles smaller than others . . . . . 8
- 4. Notosetal fascicle of first setiger  
dorsal to others; thoracic spatulate  
setae with short, pointed tip . . . . . infundibuliformis
- 4. Notosetal fascicle of first setiger  
on same levels as others; thoracic  
setae with long, pointed tip . . . . . 5
- 5. Thoracic inferior notosetae mucronate,  
with abruptly tapered tip . . . . . gracilis
- 5. Thoracic inferior notosetae broadly  
limbate, tip pointed . . . . . minuta
- 6. Oblique collar conceals short base  
of tentacular crown . . . . . magna
- 6. Collar uniformly high; base of tentac-  
ular crown slightly exposed; first  
setal fascicle on same level as  
other setae . . . . . albocincta
- 6. Collar uniformly high; first setal  
fascicle emerges from furrow . . . . . mollis

The definition of several of the species of Chone have been modified as suggested by Banse (1972b). Additional members of Euchone were also described in this paper, which should be consulted for details.

In the key to the species of Pseudopotamilla, the following corrections and amplifications should be made:

- 2. Uncini in last thoracic setigers  
conspicuously reduced in number . . . . . socialis
- 2. Uncini in last thoracic setigers  
not noticeably reduced . . . . . 3

3. Tentacular crown short, compact;  
dorsal collar lobes well developed . . . . . intermedia
3. Tentacular crown long; dorsal  
collar lobes reduced . . . . . debilis

Pseudopotamilla debilis Bush 1904 was reviewed by Hartman (1942).

#### Spirorbinae (Page 782 in Atlas)

In the Spirorbinae, it appears best to follow the Atlas in identification to genera, but to avoid using specific names on material from California until the situation has been clarified. The material is presently under revision.

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## NOTES ON SOUTHERN CALIFORNIA CAPITELLIDAE

In September 1974, a group of southern California marine invertebrate biologists met with Dr. Kristian Fauchald of the Allan Hancock Foundation, University of Southern California, to discuss problems with the systematics of local capitellids. The notes of this meeting, which are given here, may be useful in identifying the species most commonly caught in the area.

### GENERAL INFORMATION

In June 1887, Eisig made the first anatomical study of the Capitellidae. Since then, Fauvel, Hartman, and Hartmann-Schroder have contributed to the literature on the systematics of this family. A major source of information on the family is:

Dahl and Peus. 1971. Die Tierwelt Deutschlands und angrenzenden Meeresteile. Jena, Germany: Gustav Fisher Verlag.

The genera of the family that are known worldwide are as follows:

<u>Anotomastus</u>	<u>Lumbricomastus</u>
<u>Barantolla</u>	<u>Mastobranhus</u>
<u>Branchiocapitella</u>	<u>Mediomastus</u>
<u>Bucherta</u>	<u>Neoheteromastus</u>
<u>Capitella</u>	<u>Neomediomastus</u>
<u>Capitellethus</u>	<u>Neonotomastus</u>
<u>Capitellides</u>	<u>Notodasus</u>
<u>Capitita</u>	<u>Notomastus</u>
<u>Capitobranhus</u>	<u>Paratercapitella</u>
<u>Capitomastus</u>	<u>Parheteromastus</u>
<u>Dasybranus</u>	<u>Peresiella</u>
<u>Decamastus</u>	<u>Protomastobranhus</u>
<u>Heteromastides</u>	<u>Pseudocapitella</u>
<u>Heteromastus</u>	<u>Pseudoleiocapitella</u>
<u>Leiocapitella</u>	<u>Pulliella</u>
<u>Leiocapitellides</u>	<u>Rashgna</u>
<u>Leiochrides</u>	<u>Scyphoproctus</u>
<u>Leiochrus</u>	

### IMPORTANT CHARACTERISTICS OF CAPITELLIDAE

Except for the Glyceridae, the Capitellidae are the only polychaete family with open circulatory systems. Nephridia (capitellids have meta nephridia) branchiae, and setal types have been

used in the systematics of the family. However, the characteristics that seem to be of greatest importance in identifying capitellids are as follows:

- A. The presence or absence of an asetigerous segment.
- B. The number of thoracic segments.
  - 1. Thoracic segments are not dependent on the setal types.
  - 2. Thoracic segments have a rugose skin, and the setae are maintained in small pockets.
  - 3. Abdominal segments do not have a rugose skin, and the setae are on small papillae or bumps (these are not parapodia as they have no acicula).

The variations in these diagnostic characters among the genera of capitellids are given in Table 1.

#### INDIVIDUAL VARIATION OF CAPITELLA CAPITATA

Michael Martin, California State University at Long Beach, has systematically characterized 100 specimens from a laboratory population of Capitella capitata. (This population was initiated with a single female from Los Angeles Harbor and has progressed through 80 to 100 generations; initial observations showed that there were approximately two females to every male.)

Setigers 1 through 7 were examined to determine the types of setae present--simple setae are considered "regular" in this species. No irregularities were found in Setigers 1 through 3, except in six juvenile worms that had some omissions in the setae in these setigers. But a number of irregularities were found in Setigers 4 through 7, as indicated in Table 2. The irregularities were of three types--hooked setae present, a mixture of hooked and simple setae present, and setae absent or omitted. The omissions are relatively unimportant as they probably indicate only that the setae have been shed. However, the other two types of irregularities are of interest: They show that, from a single culture, we can obtain specimens that fit all of the subspecies of C. capitata described in Hartman's Atlas. Therefore, these characters are not diagnostic for determining a subspecies.\* In any case, the identification must focus on the characteristics of the population as a whole, rather than on the features of individual specimens.

#### INDIVIDUAL VARIATION IN DECAMASTUS AND NOTOMASTUS

Jan Stull, David Montagne, and Jim McCammon of the Los Angeles County Sanitation Districts have studied the setation of the thoracic segments of specimens of Notomastus and Decamastus.

\*In spite of the irregularities present, the fifth setiger was found to be the widest of the setigers examined on all 100 specimens.

Table 1. Diagnostic characters of the genera of the family Capitellidae.

Genera	No. of Thoracic Setigers	Setation of Thoracic Segments
<u>Dasybranchus</u>	16 (13)	All thoracic setae simple; then hooks.
<u>Pseudocapitella</u>	15-18	Simple setae on 14 segments; then mixture of simple and hooked.
<u>Anotomastus</u>	18-20	Simple setae on 14 segments; then mixture of simple and hooked.
<u>Leiochrides</u>	12	All thoracic setae simple.
<u>Dasybranchus</u>	13	All thoracic setae simple; then hooks.
<u>Leiocapitella</u>	13-14	Mixture of simple and hooked thoracic setae on all but first few segments.
<u>Scyphoproctus</u>	12	All thoracic setae simple; acicular spines and anal funnel.
<u>Notomastus</u>	11	Generally no hooked setae in thoracic region.
<u>Mastobbranchus</u>	11	No hooked setae in thoracic region.
<u>Parheteromastus</u>	11	4 segments with simple setae; then hooks.
<u>Heteromastus</u>	11	5 segments with simple setae; then hooks.
<u>Neoheteromastus</u>	11	8 segments with simple setae; then hooks.
<u>Mediomastus</u>	10	4 segments with simple setae; then mixture of simple and hooked.
<u>Capitita</u>	10	4 segments with simple setae; then mixture of simple and hooked.
<u>Neomediomastus</u>	10	Hooks beginning on or before 10th segment.
<u>Decamastus</u>	10	Hooks beginning after 10th segment.
<u>Capitella</u>	9	4 segments with simple setae; then mixture of simple and hooked.
<u>Notodasus</u>	11	11 thoracic segments and notopodia on 1st two abdominal segments with capillary setae.

Table 2. Irregularities in Setigers 4 through 7, Capitella capitata.

	Setiger			
	4	5	6	7
General				
No. of Individuals with Irregularities	9	18	17	36
Sex of Individuals with Irregularities				
Male	4	4	4	9
Female	1	10	9	21
Not known	4	4	4	6
Type of Irregularity				
Notopodium Setae				
Hooked	0	1	3	9
Hooked and Simple	4	8	6	13
Omitted	1	1	0	1
Neuropodium Setae				
Hooked	1	3	5	15
Hooked and simple	6	15	8	16
Omitted	1	0	1	1

Table 3. Setation of Thoracic Segments in Decamastus.\*

No. of Specimens	Segments			
	1 through 8	9	10	11
86	S/S	S/S	S/S	H/H
6	S/S	S/S	S/M	H/H
3	S/S	S/S	S/H	H/H
2	S/S	S/S	S/S	S/S
1	S/S	S/S	S/S	H/S
1	S/S	S/S	S/S	M/H
1	S/S	S/S	S/M	H/H
1	S/S	S/M	S/M	H/H
1	S/S	S/M	S/H	H/H

\*S = simple setae; H = hooked setae; M = mixture of hooked and simple. The first symbol in each pair refers to the notopodia; the second, to the neuropodia.

Table 4. Setation of Thoracic Segments  
in Notomastus.\*

No. of Specimens	Segments					
	1 through 6	7	8	9	10	11
56	S/-	S/-	S/-	S/-	S/-	S/S
4	S/-	S/-	S/-	S/-	S/-	S/M
4	S/-	S/-	S/-	S/-	S/-	S/H
4	S/-	S/-	S/-	S/-	S/M	M/H
2	S/-	S/-	S/-	S/-	S/-	M/H
2	S/-	S/-	S/-	S/-	M/M	M/H
2	S/-	S/M	M/M	M/M	M/H	H/H
1	S/-	S/-	S/-	S/-	S/-	M/M
1	S/-	S/-	S/-	S/-	S/-	H/H
1	S/-	S/-	S/-	S/-	S/M	S/M
1	S/-	S/-	S/-	S/-	S/M	H/H
1	S/-	S/-	S/-	S/-	M/M	M/M
1	S/-	S/-	S/M	S/M	M/M	M/H

\*S = simple setae; H = hooked setae; M = mixture of hooked and simple. The first symbol in each pair refers to the notopodia; the second, to the neuropodia.

Their findings, which are given in Tables 3 and 4, show that this is a good diagnostic character for these two genera: Of the 102 Decamastus specimens examined, 86 had simple setae on both the notopodia and neuropodia of Segments 1 through 10 and hooked setae on Segment 11. Fifty-six of the 80 Notomastus specimens examined had simple setae on the notopodia (and no setae on the neuropodia) of Segments 1 through 10 and simple setae on both sides of Segment 11.



KEY TO CANCER

Jack Q. Word

CANCER

Brachyura:Brachyrhyncha

- Cancer productus Randall 1839
- Cancer gracilis Dana 1852
- Cancer oregonensis (Dana 1852)
- Cancer amphioetus Rathbun 1898
- Cancer antennarius Stimpson 1856
- Cancer jordani Rathbun 1900
- Cancer branneri Rathbun 1926
- Cancer anthonyi Rathbun 1897

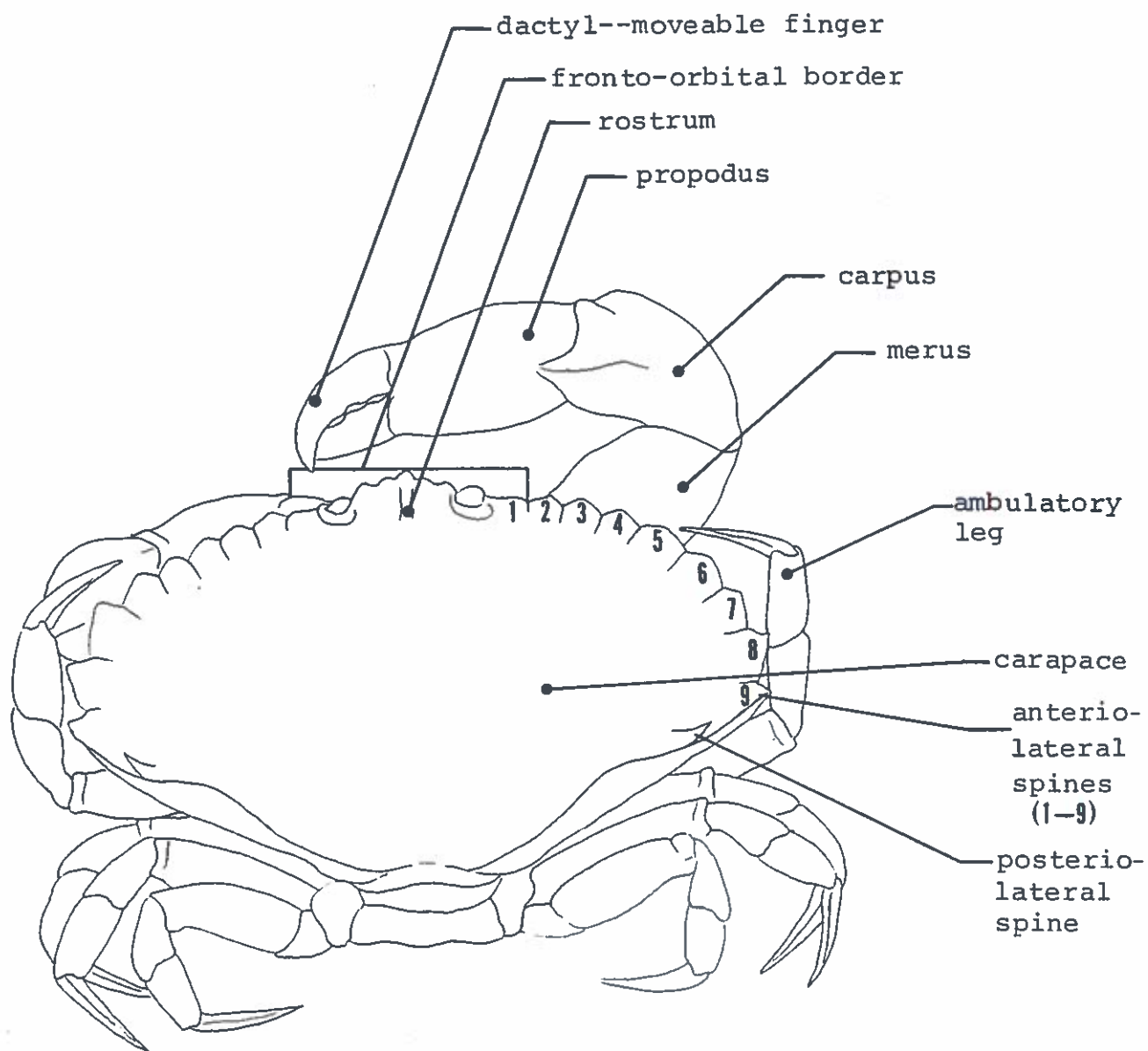


Diagram of crab features.

KEY TO THE  
GENUS CANCER

- 1 . . . (2) Rostral teeth form a single produced plate in one plane. Rostral teeth may be either clearly evident or only slightly visible.

Cancer productus

- 2 . . . (1) Rostral teeth do not form a single produced plate. Teeth are evident and occupy more than one vertical plane.

- 3 . . . (4) Fingers of chelipeds are light in color.

Cancer gracilis

- 4 . . . (3) Fingers of chelipeds at least partially black in color.

- 5 . . . (10) Carapace widest at seventh or eighth lateral tooth.

- 6 . . . (7) No definite demarcation from antero-lateral to postero-lateral teeth (12 to 13 lateral teeth).

Cancer oregonesis

- 7 . . . (6) A definite demarcation point between the antero-lateral and postero-lateral teeth.

- 8 . . . (9) Outer frontal orbital tooth has definite shape (Figure 1).

Cancer amphioetus

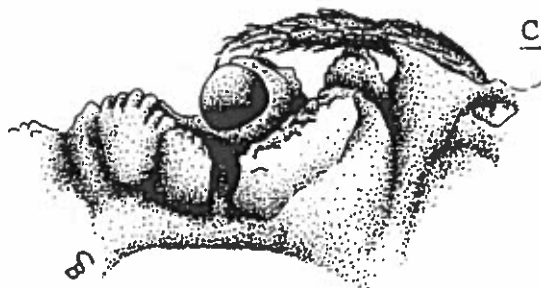


Figure 1.

- 9 . . . (8) Outer frontal orbital tooth not as above.

Cancer antennarius

- 10 . . . (5) Carapace widest at ninth antero-lateral tooth.  
 11 . . . (12) Edges of frontal orbital teeth are typically shaped as in the drawing (Figure 2).

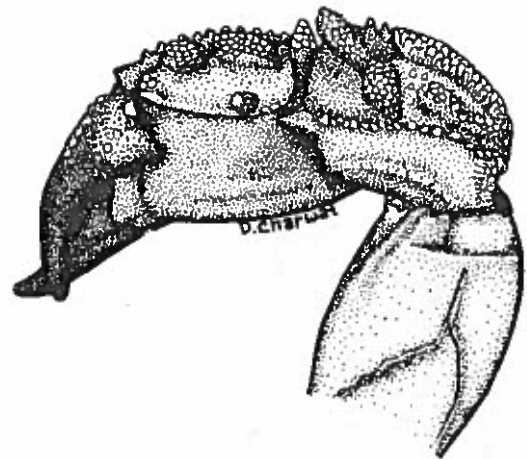
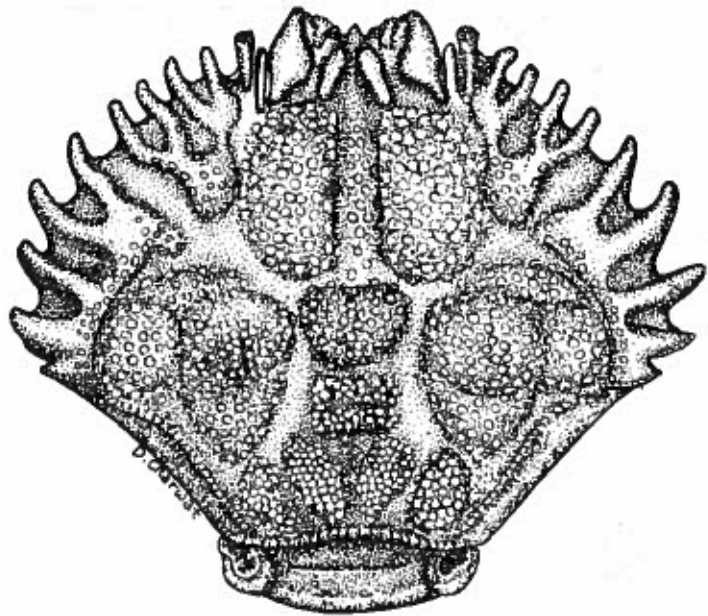
Cancer jordani



Figure 2.

- 12 . . . (11) Edges of fronto-orbital teeth are at most granulate.  
 13 . . . (14) Outer frontal orbital tooth has a definite shape (Figure 1).  
Cancer amphioetus  
 14 . . . (13) Outer frontal orbital tooth are not as above.  
 15 . . . (16) First postero-lateral spine is directed upward (vertically) not laterally.  
Cancer branneri  
 16 . . . (15) First postero-lateral spine is directed laterally (towards the margin) not vertically.  
 17 . . . (18) Antero-lateral teeth alternate in size (only seen in juveniles approximately 5 mm or less) Carapace is not hairy.  
Cancer anthonyi  
 18 . . . (17) Antero-lateral teeth do not alternate in size.  
 19 . . . (20) Antero-lateral teeth broadly triangular never spiny or pointed (no red freckles on ventral surface).  
Cancer anthonyi  
 20 . . . (19) Antero-lateral teeth thick but often tipped with a spine (red freckles present on abdomen).

Cancer antennarius



Right cheliped.

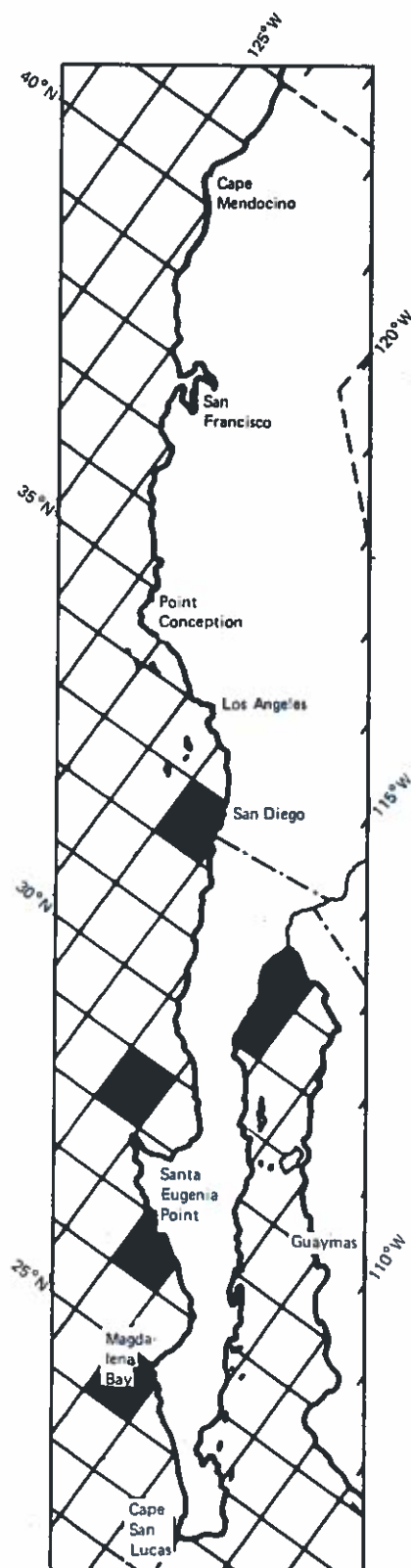
Cancer amphioetus Rathbun 1898

SYNONYMS

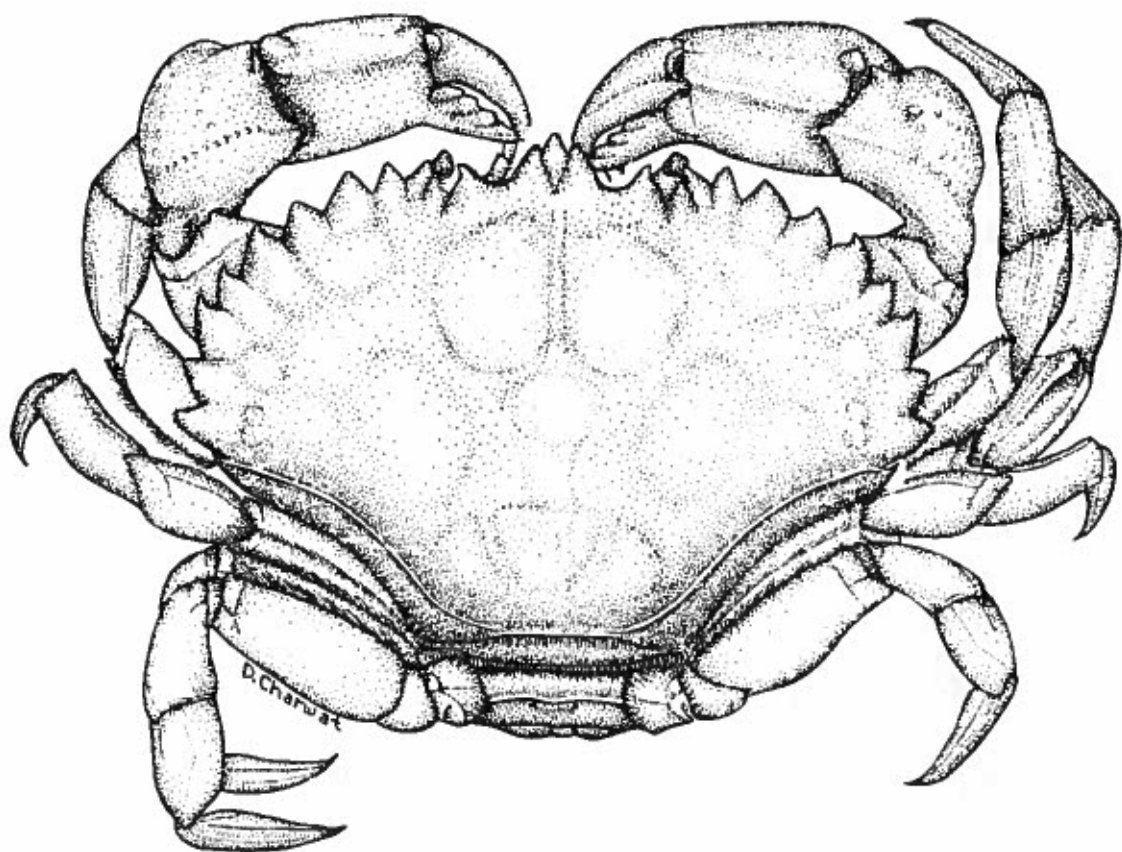
Trichocarcinus dentatus Miers 1879.  
Cancer pygmaeus Ortmann 1893. Cancer  
bullatus Balss 1922.

DISTRIBUTION

From Rathbun 1930: La Jolla and San Diego Bay, California. Cerros Island, Santa Maria Bay, Abreojos Point, Magdalena Bay, Consag Point, Diggs Point, and Cape Tepoca, Baja California. Northwest of Guaymas, Gulf of California, Mexico. Japan. Korea.



Cancer antennarius Stimpson 1856



Margin of outer orbital tooth is  
smooth or tipped with spine.

Cancer antennarius Stimpson 1856

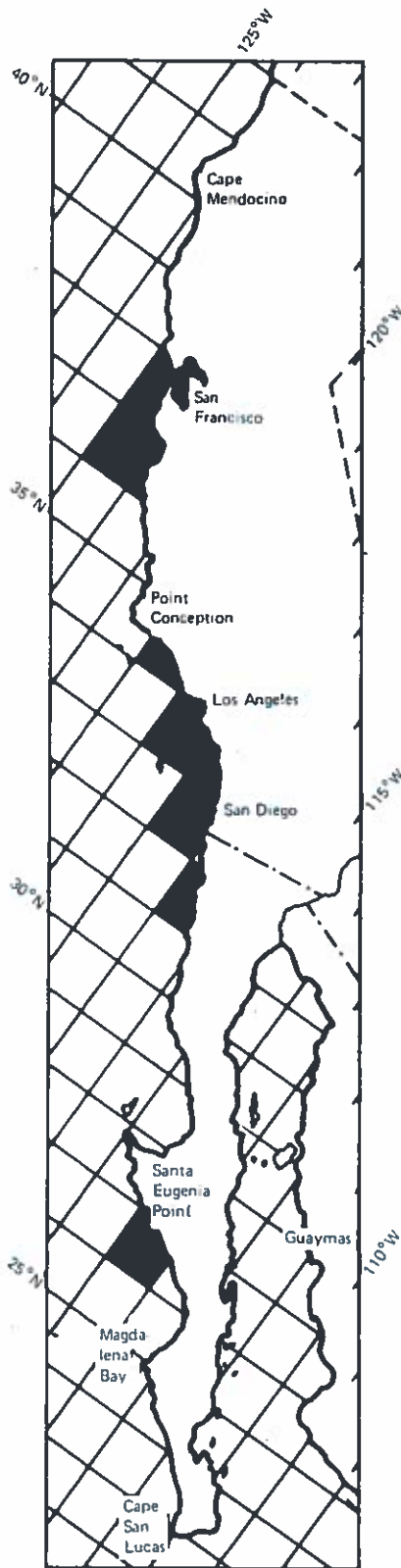
SYNONYM

Cancer antennaria Stimpson 1856.

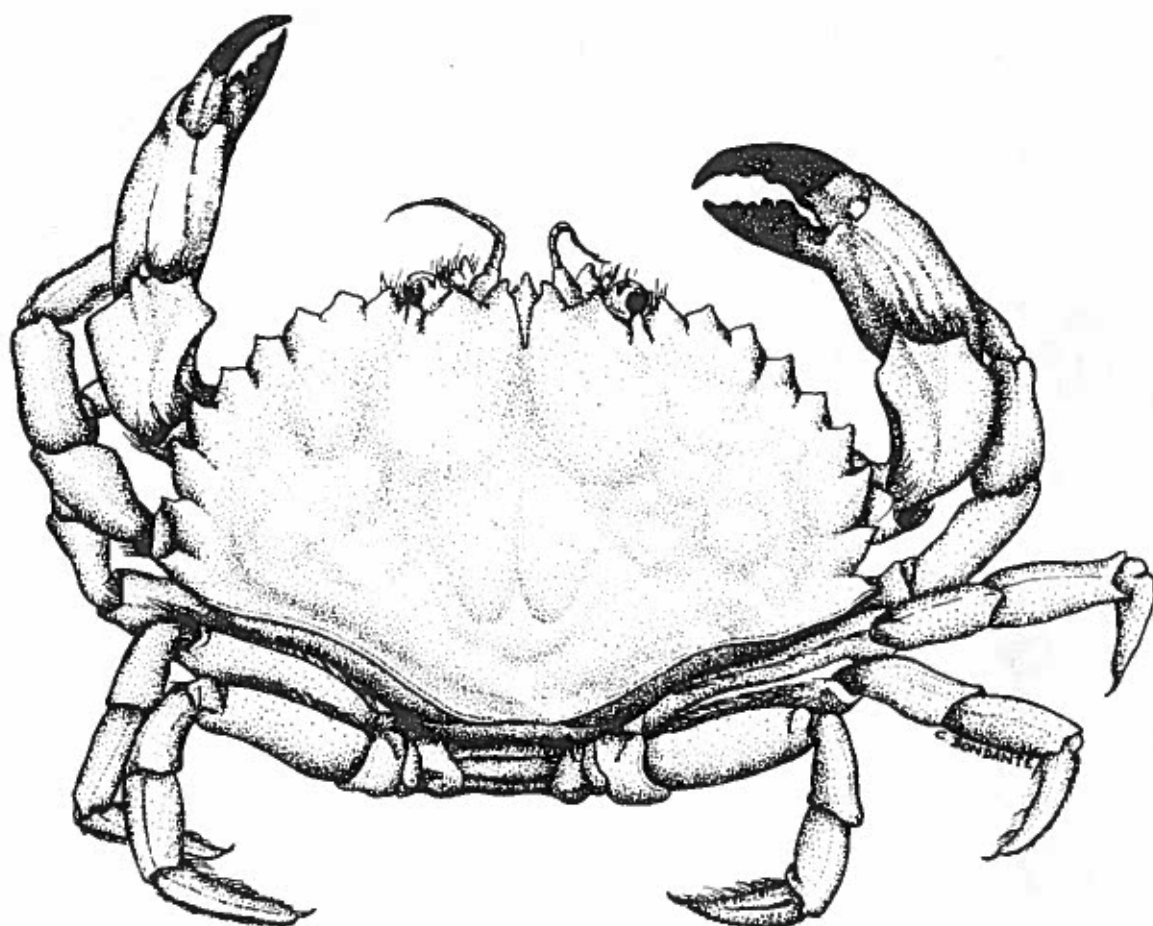
DISTRIBUTION

From Rathbun 1930: Tomales Bay, San Francisco Bay, Half Moon Bay, Santa Cruz, Monterey Bay, Pacific Grove, Santa Barbara, Santa Monica Bay, San Pedro Bay, Long Beach, Laguna Beach, Santa Catalina Island, La Jolla, and San Diego, California. Todos Santos Island and Abreojos Point (1924), Baja California.

From Coastal Water Project data: Palos Verdes and Orange County, California. Is found near rocks in the intertidal zone at depths to 30 m. Found gravid in May and June.



Cancer anthonyi Rathbun 1897

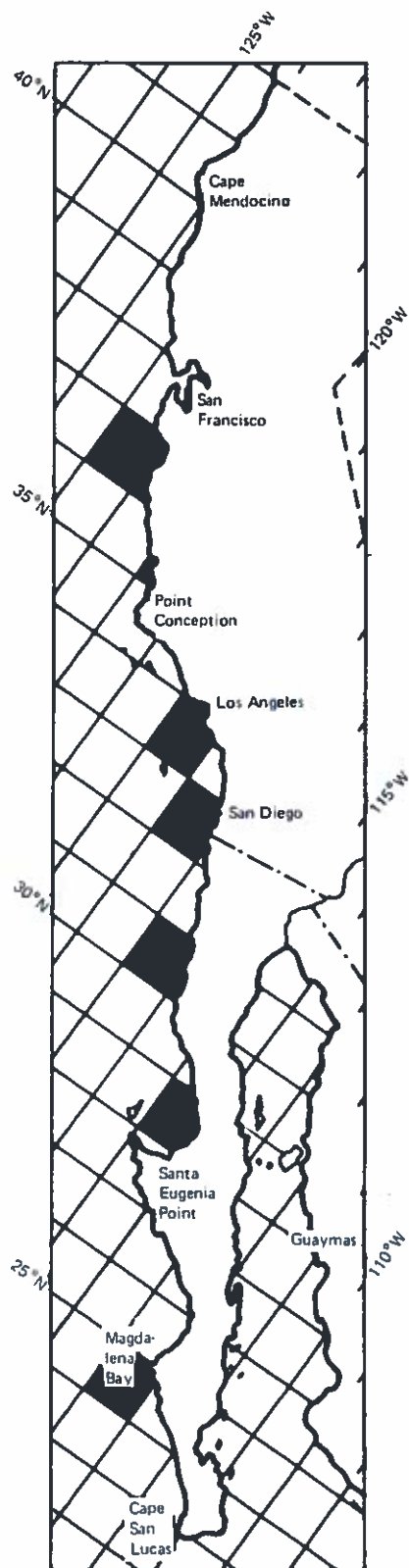


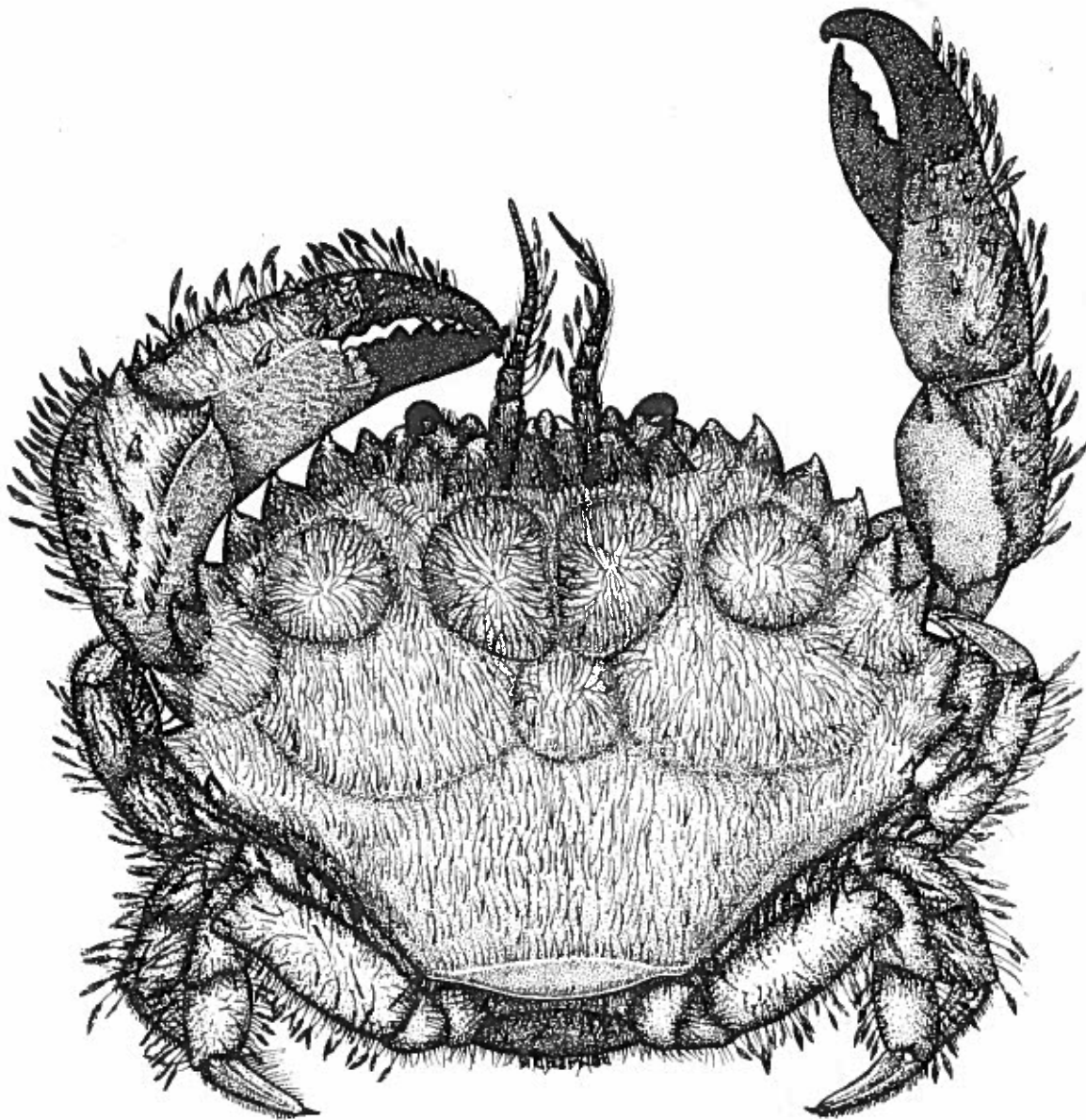
Cancer anthonyi Rathbun 1897

DISTRIBUTION

From Rathbun 1930: Monterey Bay, Morro Bay, Seal Beach, Long Beach, Anaheim Bay, Santa Catalina Island, La Jolla, and San Diego, California. Cape Colnett, Playa Maria Bay, Rosario Bay, and Magdalena Bay, Baja California.

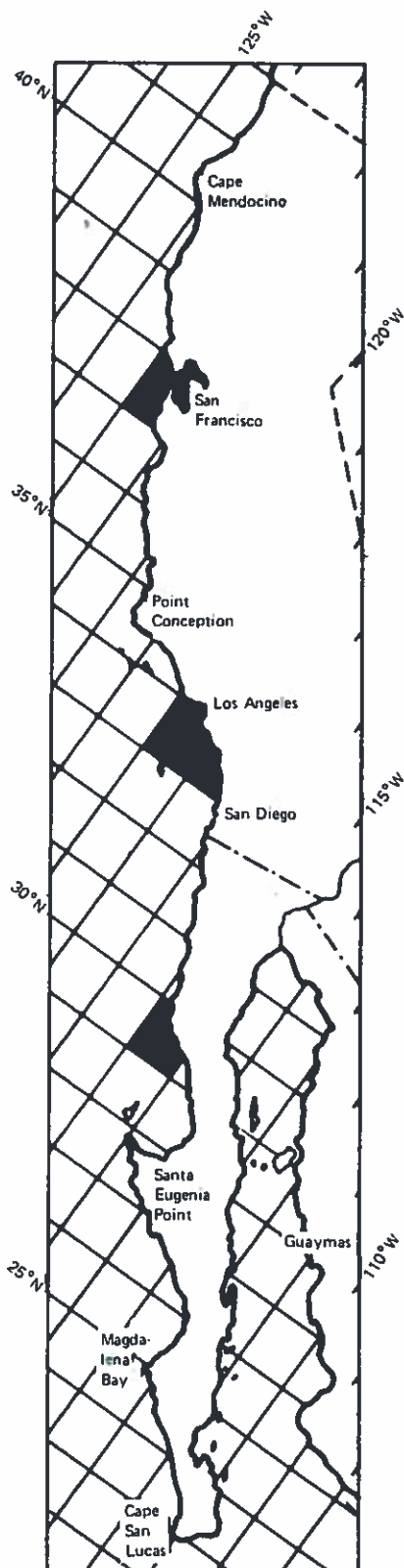
From Coastal Water Project data: Santa Monica Bay, Palos Verdes, San Pedro, Orange County, and Dana Point, California. Occurs commonly in waters of 30 to 60 m. Appears to be associated with rock formations. Found gravid between June and September.





First postero-lateral tooth is directed vertically.

Cancer branneri Rathbun 1926



SYNONYM

Cancer gibbosulus Rathbun 1898 (part).

DISTRIBUTION

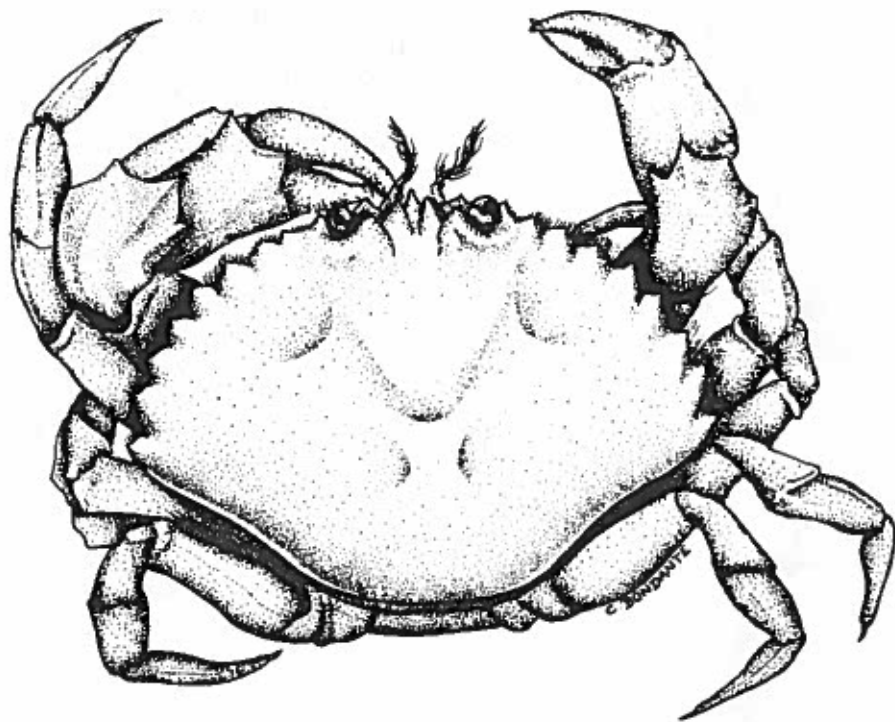
From Nininger 1916: Laguna Beach, California.

From Schmitt 1921: San Geronimo Island, Baja California.

From Rathbun 1930: Alaska. Canada. Oregon. San Francisco, Farallon Islands, Seal Beach, and Santa Catalina Island, California.

From Word's data: Found on intertidal rocks, Lunada Bay, California, 1965.

Cancer gracilis Dana 1852



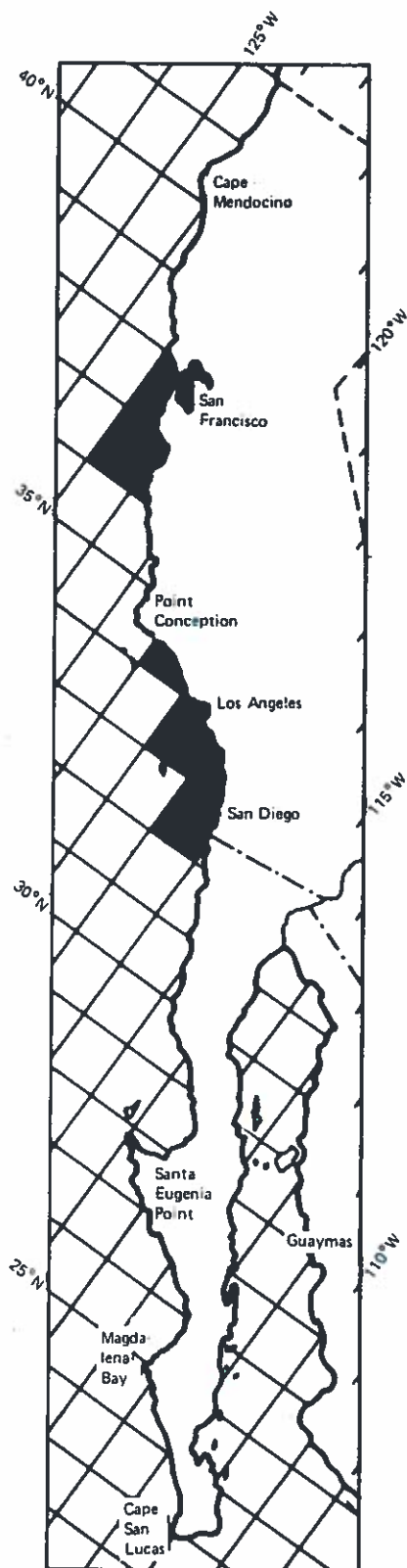
Cancer gracilis Dana 1852

DISTRIBUTION

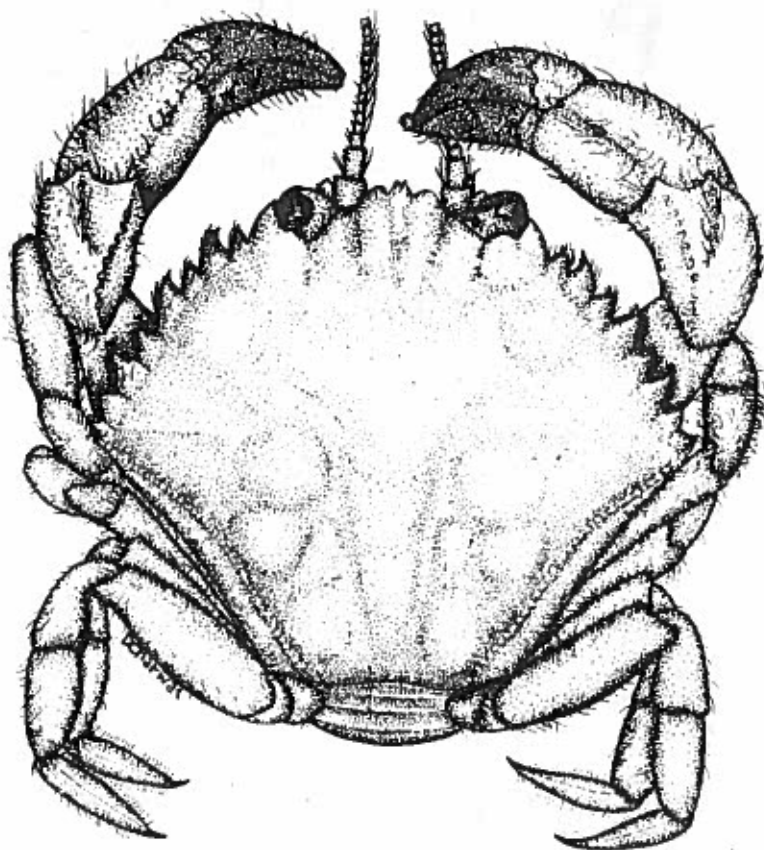
From Rathbun 1930: Alaska. Canada. Washington. Oregon. Drakes Bay, Bolinas Point, San Francisco Bay, Farallon Islands, Point Montara, Pescadero Point, Point Ano Nuevo, Santa Cruz, Monterey, Monterey Bay, Pacific Grove, Santa Barbara, Santa Monica Bay, Point Vicente, Point Fermin, Long Beach, Newport Bay, and Laguna Beach, California.

From Holmes 1900: Tomales Bay and San Diego, California.

From Coastal Water Project data: Port Hueneme, Santa Monica Bay, Palos Verdes, San Pedro Bay, Orange County, and Dana Point, California. Is found in bays and in the subtidal zone at depths to 60 m, but is more commonly found in less than 30 m of water. Is often found in association with Pelagia sp., a large jellyfish. Newly settled juveniles appear in the trawl catches generally in May.



Cancer jordani Rathbun 1900



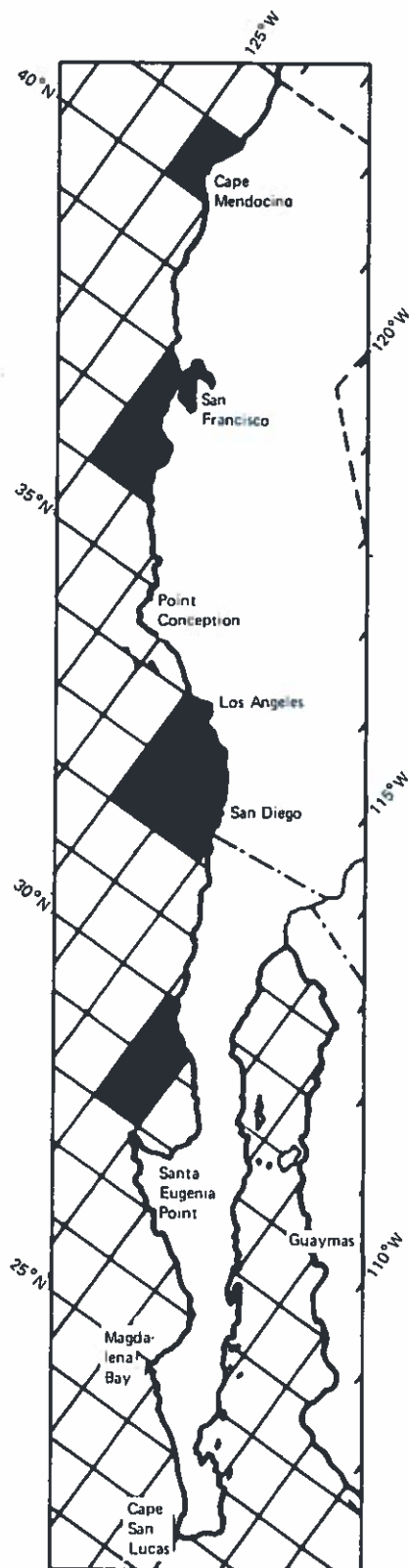
Frontal orbital margin with spines on teeth.

Cancer jordani Rathbun 1900

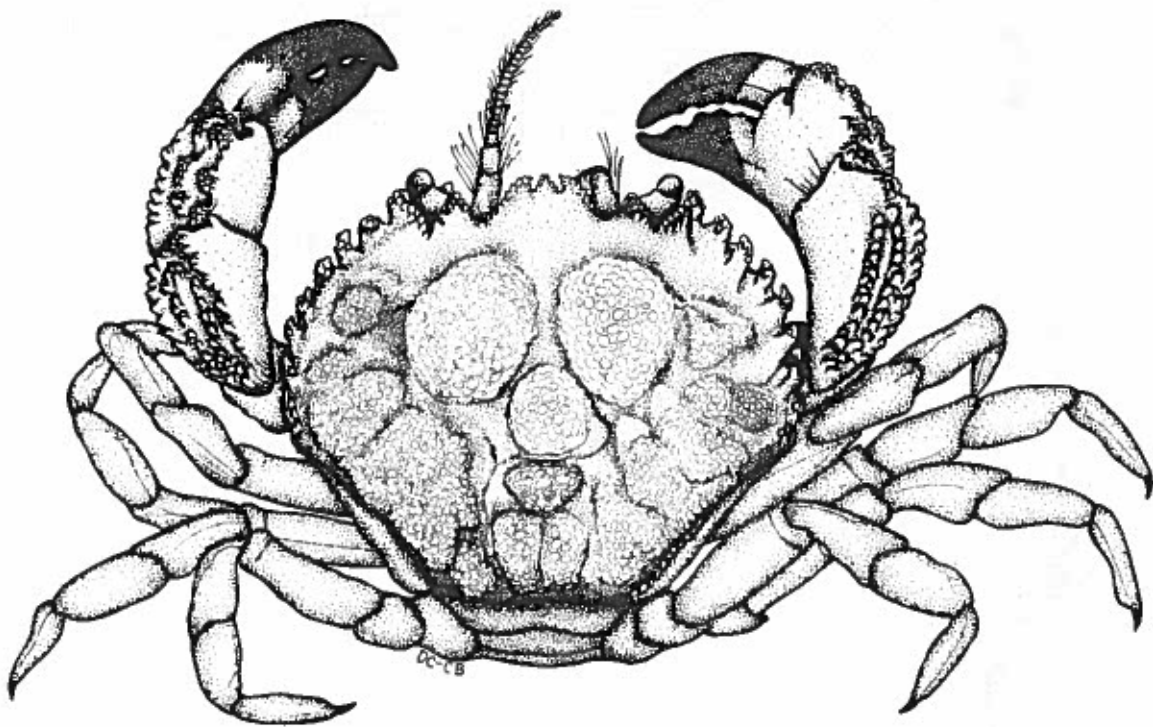
DISTRIBUTION

From Rathbun 1930: Humboldt Bay, Half-Moon Bay, Monterey Bay, Monterey, Santa Monica Bay, Point Vicente, Point Fermin, San Pedro, Long Beach, Seal Beach, Newport Beach, Laguna Beach, Santa Catalina Island, San Nicolas Island, La Jolla, and San Diego, California. Cedros Island and San Geronimo Island, Baja California.

From Coastal Water Project data: Orange County, California. Is found in shallow waters at depths of 9 to 18 m off San Clemente Island in much algal debris.



Cancer oregonensis (Dana 1852)



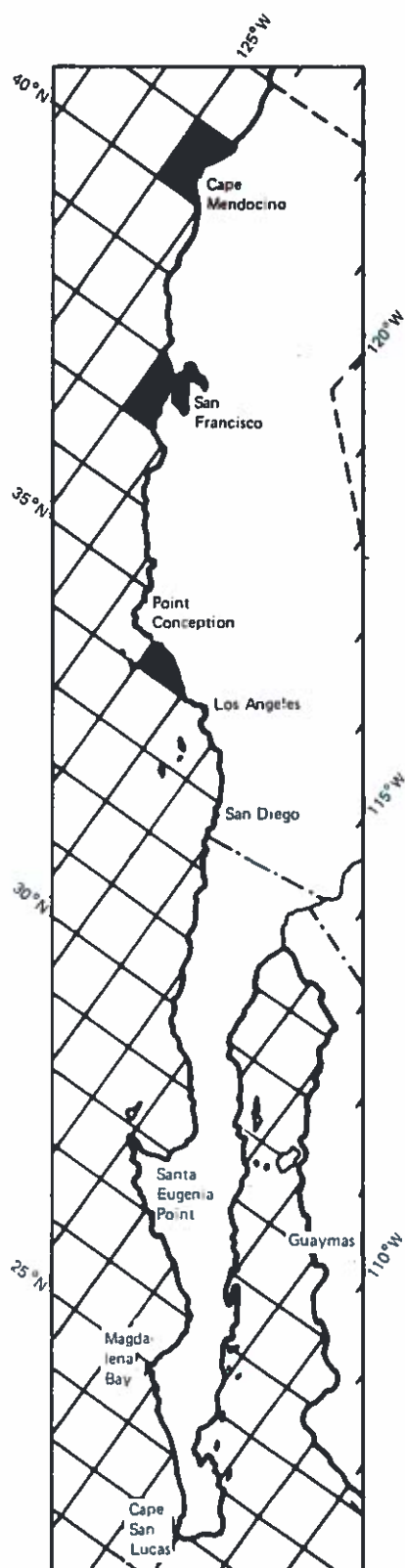
Cancer oregonensis (Dana 1852)

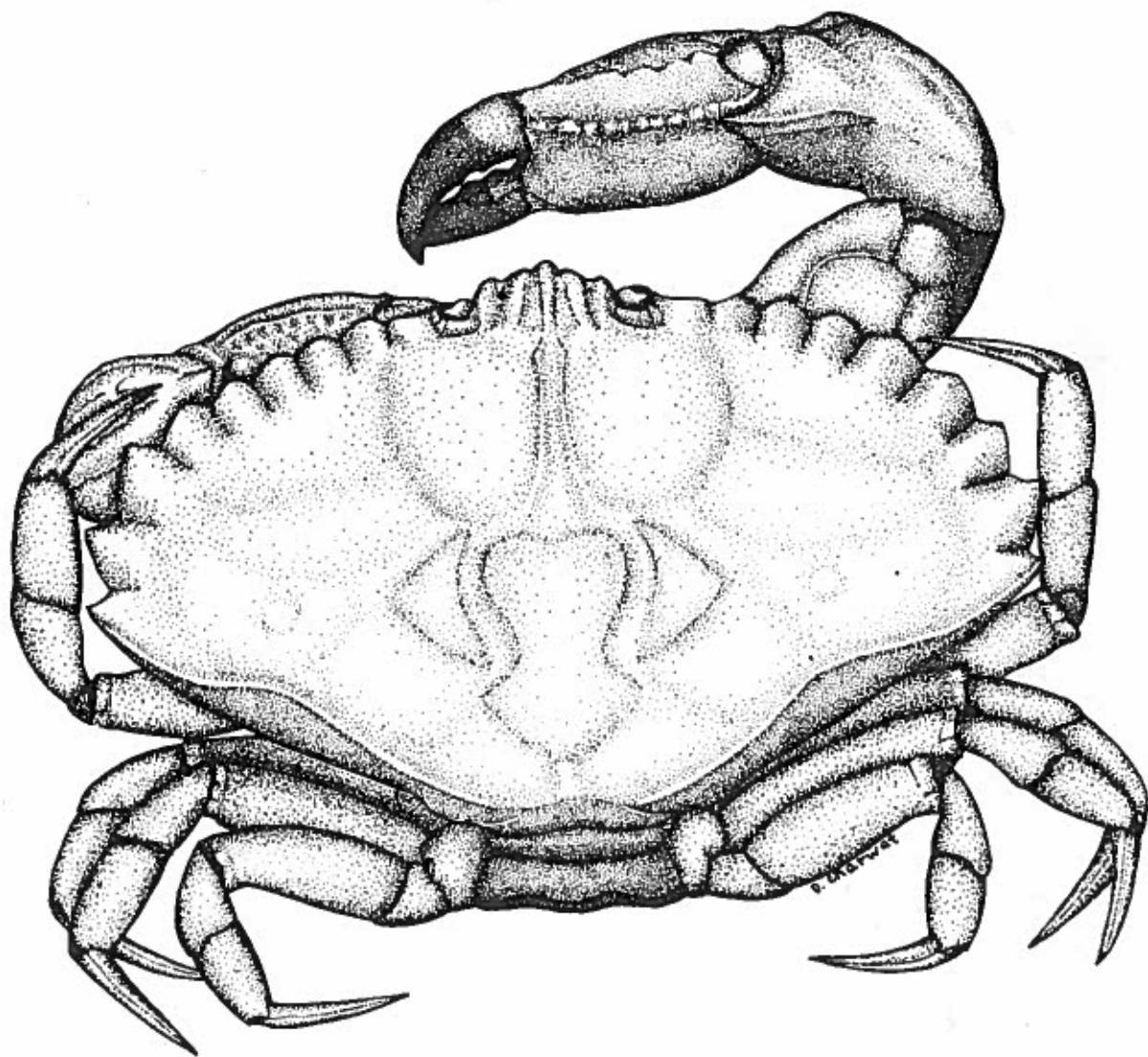
SYNONYMS

Trichocera oregonensis Dana 1852.  
Platycarcinus recurvidens Bate 1864.  
Trichocarcinus oregonensis Miers 1879.  
Trichocarcinus recurvidens Walker 1898.  
Trichocarcinus walkeri Holmes 1900.  
Cancer oregonensis Rathbun 1898.

DISTRIBUTION

From Rathbun 1930: Alaska. Canada. Washington. Oregon. Humboldt Bay, Farallon Islands, and Santa Barbara, California.





Mature specimen: Rostral teeth clearly evident.



Immature specimen: Rostral teeth undeveloped  
but do form produced plate.

Cancer productus Randall 1839

SYNONYMS

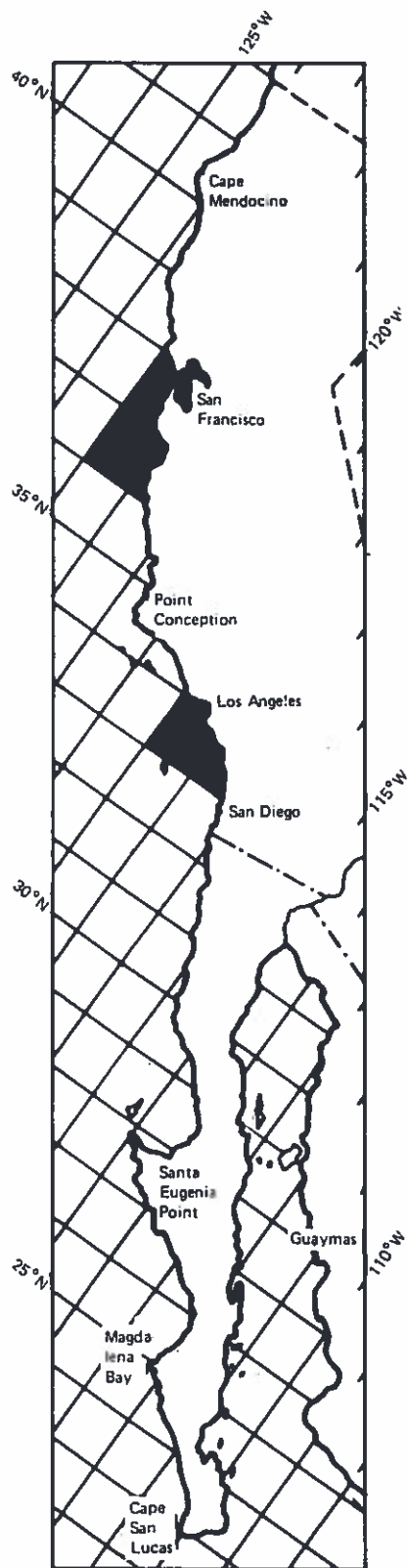
Platycarcinus productus Gibbes 1880.

Cancer perlatus Stimpson 1856.

DISTRIBUTION

From Rathbun 1930: Alaska. Canada. Washington. Oregon. Tomales Bay, San Francisco Bay, Half Moon Bay, Monterey Bay, Pacific Grove, and Laguna Beach, California.

From Coastal Water Project data: Palos Verdes, California. Is believed to occur around deeper rock formations at 30 to 60 m. Found gravid between December and June.



KEY TO LOXORHYNCHUS

Danuta K. Charwat

LOXORHYNCHUS  
Brachyura:Inachidae

Loxorhynchus crispatus Stimpson 1857

Loxorhynchus grandis Stimpson 1857



KEY TO THE  
GENUS LOXORHYNCHUS

- 1 . . . (2) Carapace covered with numerous small, evenly  
distributed tubercles.  
Loxorhynchus grandis
- 2 . . . (1) Surface of carapace has seven large mounds,  
each armed with one prominent spine.  
Loxorhynchus crispatus

6

(1)

10

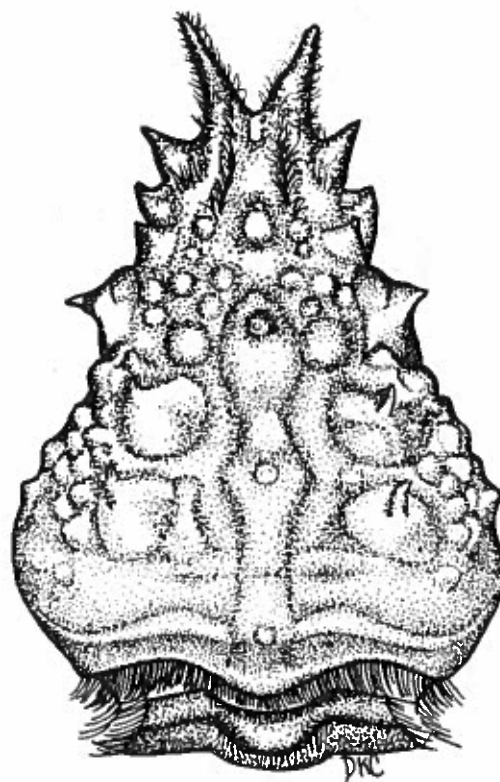
15

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25

30

Loxorhynchus crispatus Stimpson 1857

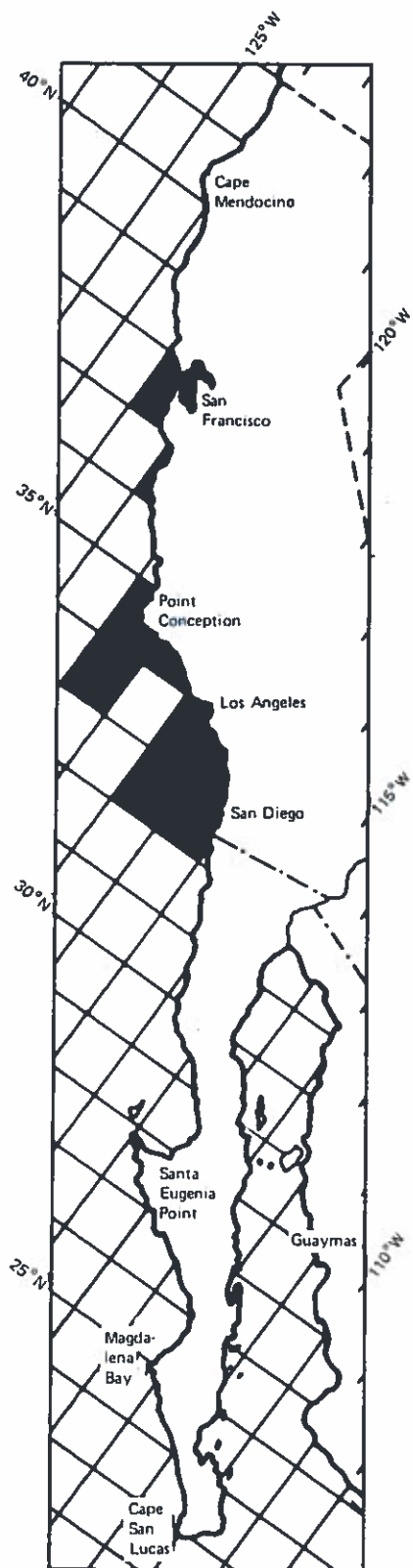


Loxorhynchus crispatus Stimpson 1857

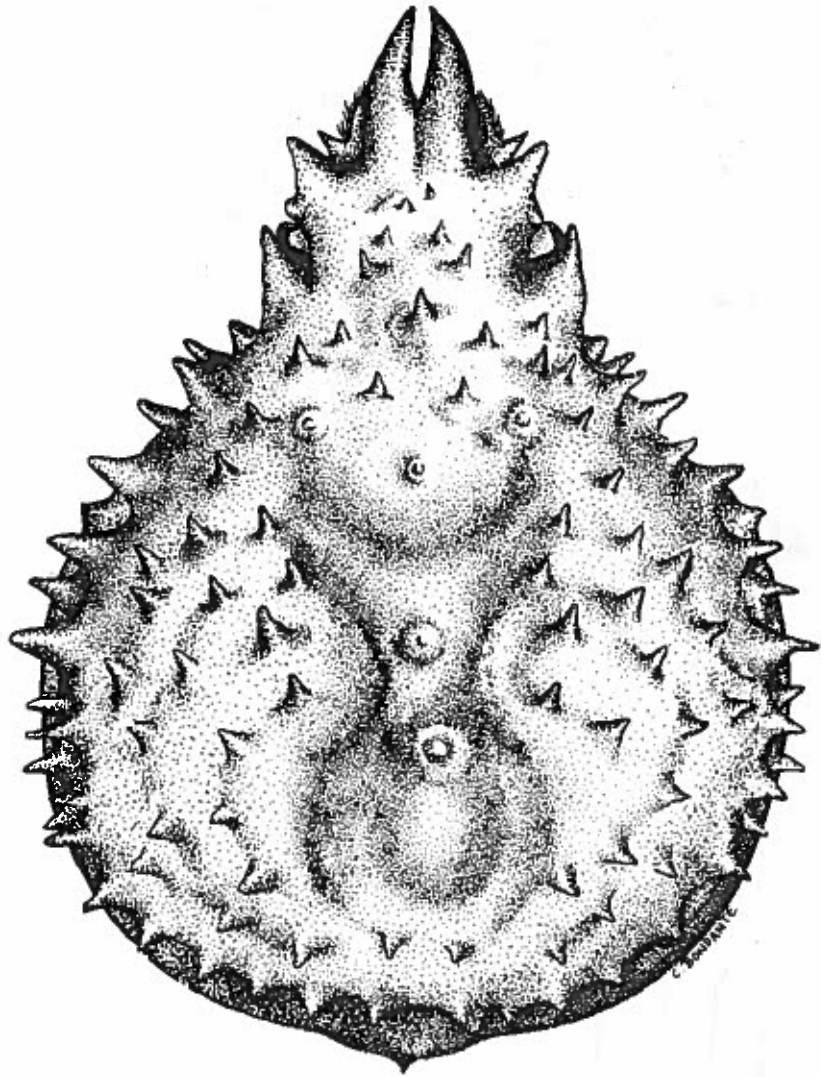
DISTRIBUTION

From Holmes 1900: Farallon Islands, San Francisco Bay, Monterey, Santa Barbara, San Pedro, San Diego, and San Miguel Island, California. Found at 5 to 95 m depths.

From Garth 1958: Point Reyes (Schmitt), Point Conception (Rathbun, 55 to 80 m), Santa Rosa Island, Santa Cruz Island, San Nicolas Island, Santa Catalina Island, Santa Monica Bay, Venice, Wilmington, and Laguna Beach (Hilton).



Loxorhynchus grandis Stimpson 1857



Loxorhynchus grandis Stimpson 1857

SYNONYMS

Loxorhynchus grandis Stimpson 1857 (part).

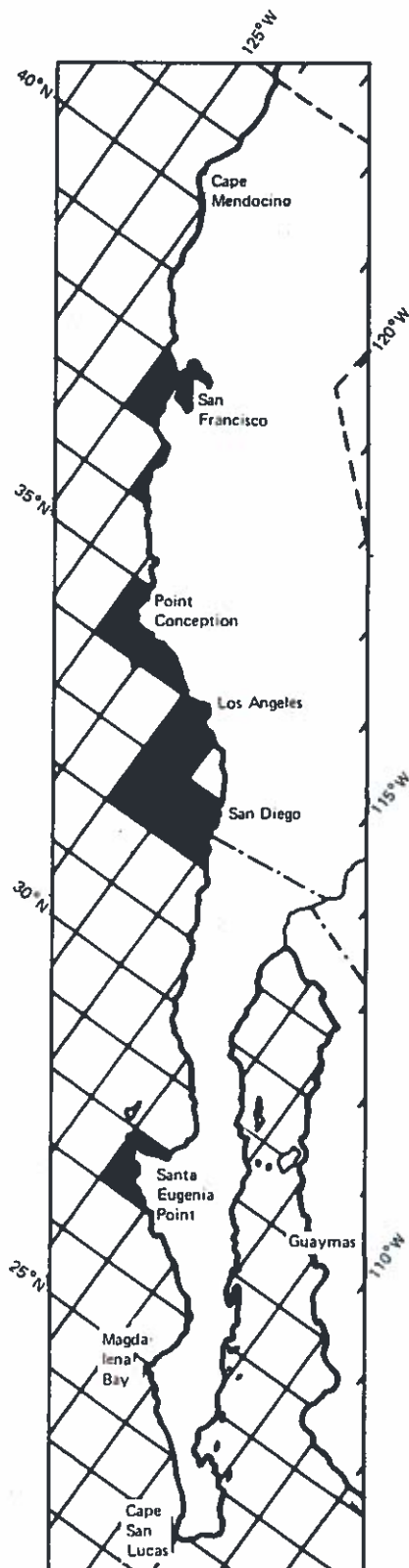
Loxorhynchus grandus Weymouth 1910.

Mithrax rostratus Boone 1930 (part).

DISTRIBUTION

From Holmes 1900: Farallon Islands, San Francisco Bay, Monterey, Santa Barbara, San Pedro, San Diego, and San Miguel Island, California.

From Garth 1958: Laguna Beach (Baker), Santa Catalina Island (Lockington), San Clemente Island (Rathbun), and La Jolla (Boone), California. Ensenada (Rathbun) and Point San Bartolome (Rathbun), Baja California.



KEY TO XANTHIDAE  
Danuta K. Charwat

XANTHIDAE  
Brachyura:Brachyrhyncha

- Pilumnus spinohirsutus (Lockington 1876)
- Heteractea lunata (Milne-Edwards and Lucas 1843)
- Paraxanthias taylori (Stimpson 1860)
- Cycloxanthops novemdentatus (Lockington 1877)
- Lophopanopeus bellus (Stimpson 1862)
- Lophopanopeus frontalis (Rathbun 1893)
- Lophopanopeus leucomanus (Lockington 1876)



KEY TO THE GENERA OF THE  
FAMILY XANTHIDAE\*

- 1 . . . (4) Body and chelipeds markedly hairy.
- 2 . . . (3) Fronto-orbital border about one-third the greatest width of the carapace.  
Pilumnus (P. spinohirsutus)
- 3 . . . (2) Fronto-orbital border one-half or more than one-half the greatest width of the carapace. Ambulatory legs armed above with a lunate crest.  
Heteractea (H. lunata)
- 4 . . . (1) Body and chelipeds not markedly hairy.
- 5 . . . (6) Chelipeds with large and prominent granules.  
Paraxanthias (P. taylori)
- 6 . . . (5) Chelipeds smooth, pitted, or with small bumps.
- 7 . . . (8) Nine lateral teeth on carapace. Fronto-orbital border less than one-half the greatest width of the carapace.  
Cycloxanthops (C. novemdentatus)
- 8 . . . (7) Three to four teeth on carapace. Fronto-orbital border one-half or more than one-half the greatest width of the carapace.  
Lophopanopeus

\*Refer to Page 36 for a diagram of crab features.



KEY TO THE  
GENUS LOPHOPANOPEUS

- 1 . . . (2) Carpus of cheliped and dorsal edge of propodus covered with irregular bumps; surface of dactyl and merus granulated. Lateral projection on male pleopod. (Refer to L. leucomanus for body type.)

Lophopanopeus bellus

- 2 . . . (1) Cheliped smooth or pitted; no raised bumps.

- 3 . . . (4) Lateral projection on male pleopod. No enlarged tooth at base (proximal end) of moveable finger of major cheliped. Carpal and propodal segments of walking legs conspicuously pubescent. (Refer to L. leucomanus for body type.)

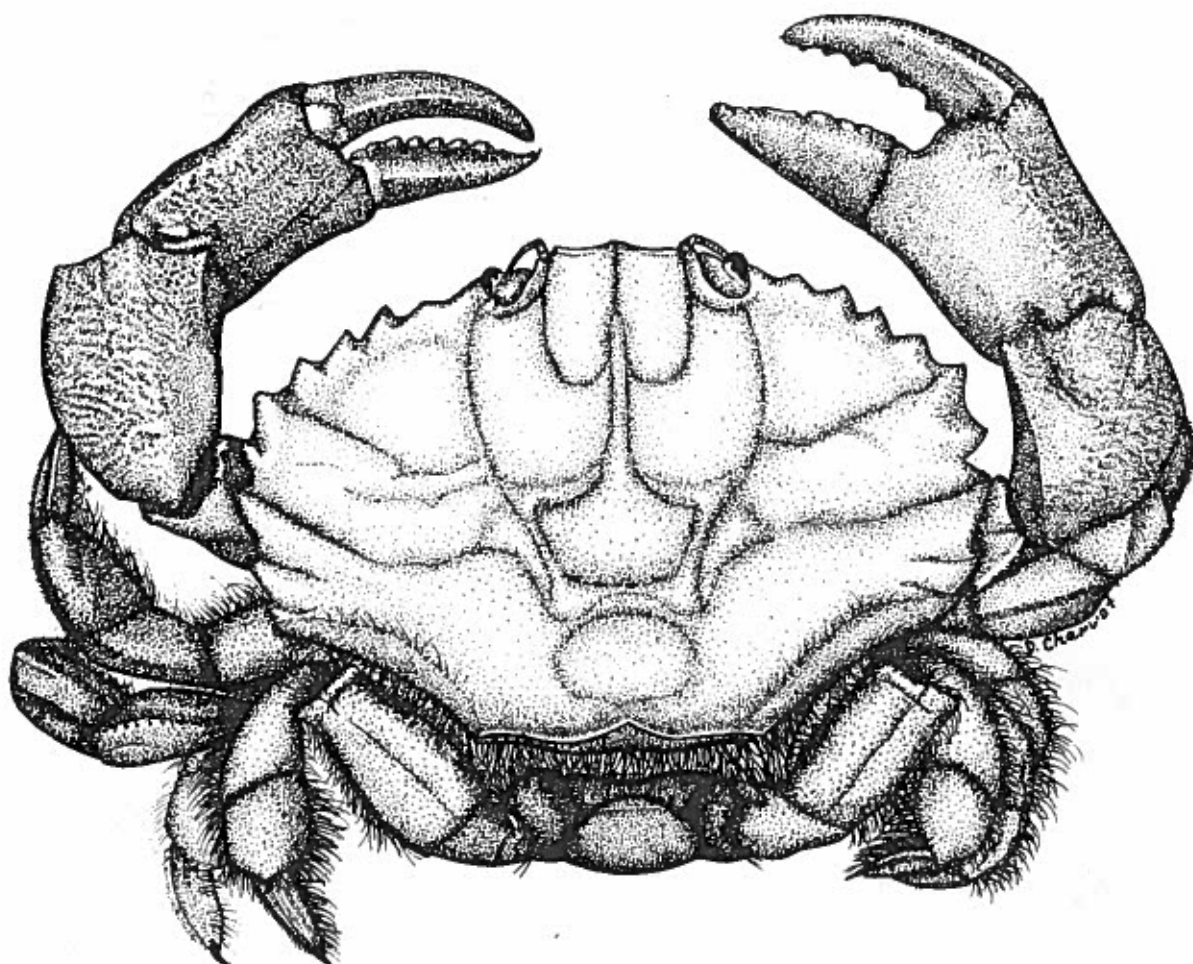
Lophopanopeus frontalis

- 4 . . . (3) Lateral projection on male pleopod. Enlarged tooth present at base (proximal end) of moveable finger of major cheliped. Carpal and propodal segments of walking legs not conspicuously pubescent.

Lophopanopeus leucomanus



Cycloxanthops novemdentatus (Lockington 1877)



Cycloxanthops novemdentatus (Lockington 1877)

SYNONYMS

Xanthodes? novem-dentatus Lockington 1877. Cycloxanthops novemdentatus Holmes 1900; Rathbun 1904; Weymouth 1910; Baker 1912. Cycloxanthus californiensis Rathbun 1893. Cycloxanthops rugosa Holmes 1900.

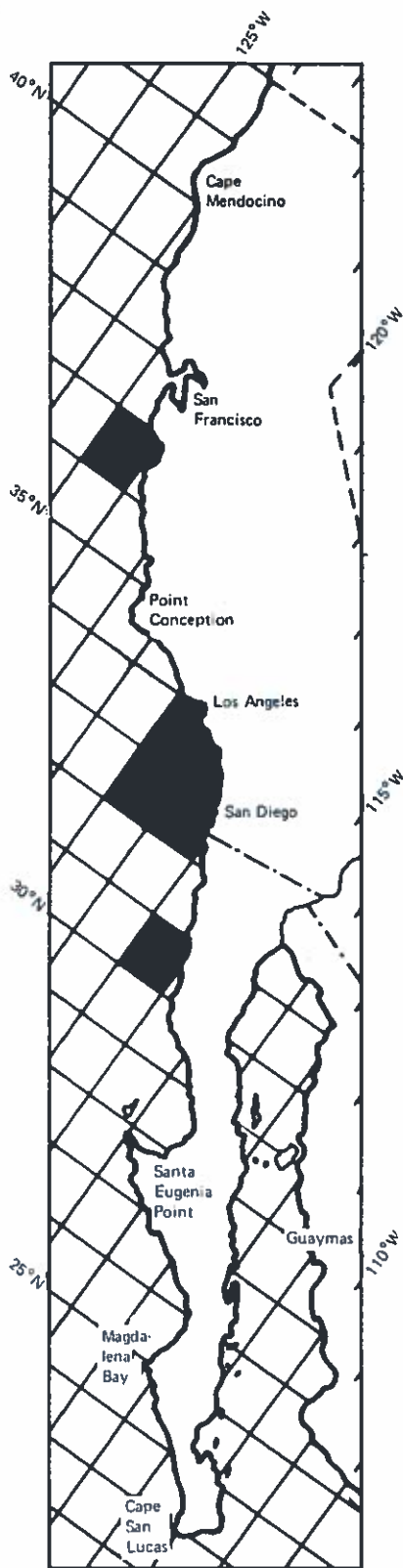
DISTRIBUTION

From Holmes 1900: Santa Catalina Island, San Clemente Island, and San Diego, California. Guadalupe Island, Baja California.

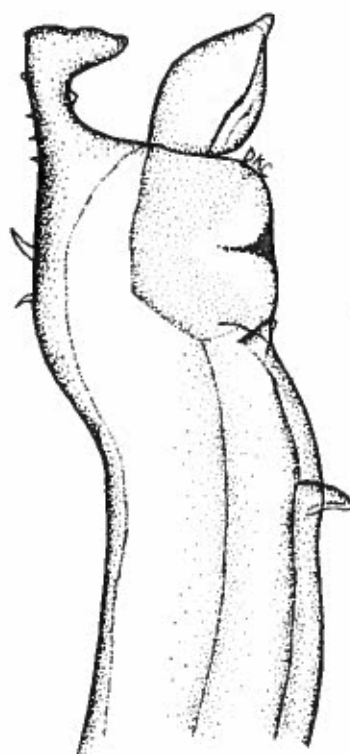
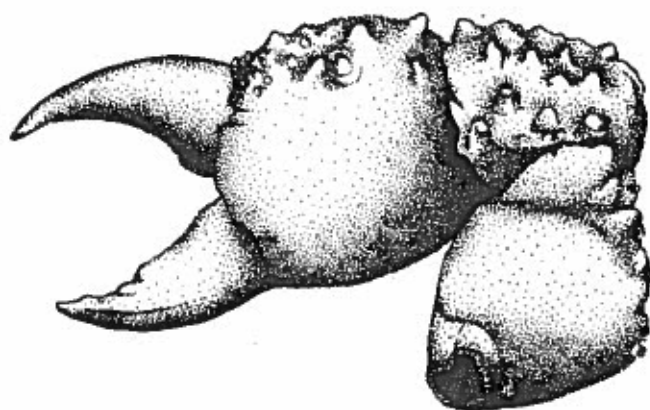
From Nininger 1916: Laguna Beach, California.

From Schmitt 1921: Ranges from Monterey Bay, California, to Guadalupe and San Martin Islands, Baja California.

From Rathbun 1930: Venice, Redondo Beach, Point Fermin, San Pedro Bay, Long Beach, Laguna Beach, San Nicolas Island, and San Clemente Island, California. San Martin Island, Baja California.



Lophopanopeus bellus (Stimpson 1862)



Tip of male pleopod.

Lophopanopeus bellus (Stimpson 1860)

SYNONYMS

Xantho bella Stimpson 1860 (1860 part).  
Lophoxanthus bellus Milne-Edwards 1879  
(part); Holmes 1900. Lophopanopeus  
bellus Rathbun 1898. Lophozozymus  
(Lophoxanthus) bellus Miers 1886.  
Xanthodes hemphillii Lockington 1876  
(1877). Xantho hemphilliana Lockington  
1876. Lophopanopeus diegensis Rathbun  
1900, 1930; Weymouth 1910; Schmitt 1921;  
Johnson and Snook 1935.

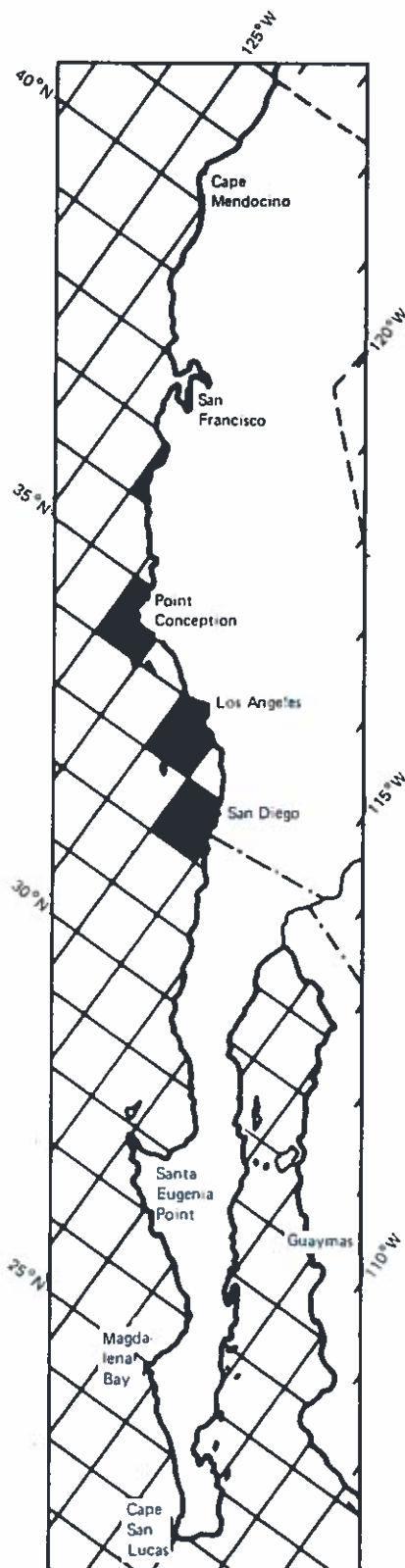
DISTRIBUTION

From Holmes 1900: Canada. Washington.  
Monterey, California.

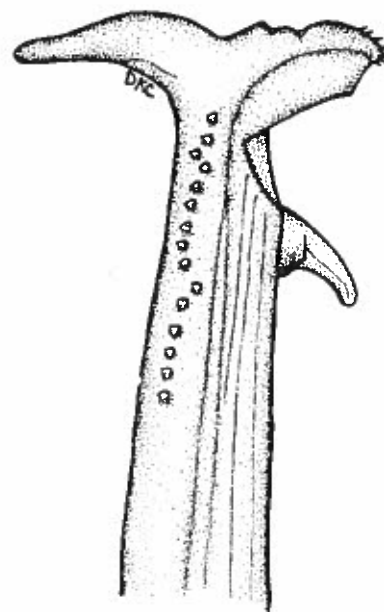
From Rathbun 1910: Alaska. Canada.  
Point Conception (55 m) and San Diego  
(18 m), California

From Rathbun 1930: Pacific Grove, Santa  
Monica Bay, Venice, Point Vicente, Point  
Fermin, Long Beach, and Santa Catalina  
Island, California.

From Glassell 1935: San Pedro, Califor-  
nia.



Lophopanopeus frontalis (Rathbun 1893)



First male pleopod.

Lophopanopeus frontalis (Rathbun 1893)

SYNONYMS

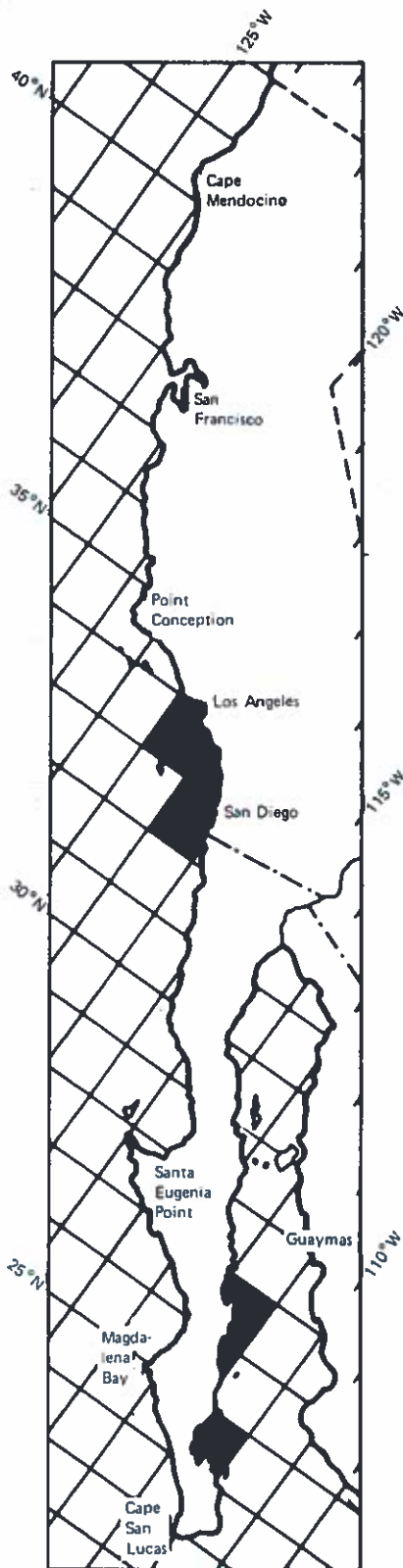
Lophozozymus (Lophoxanthus) frontalis  
Rathbun 1893. Lophoxanthus frontalis  
Rathbun 1900. Lophoxanthis frontalis  
Holmes 1900. Xanthodes leucomanus  
Lockington 1876 (1877). Lophopanopeus  
lockingtoni Rathbun 1900. Lophopanopeus  
frontalis Rathbun 1904.

DISTRIBUTION

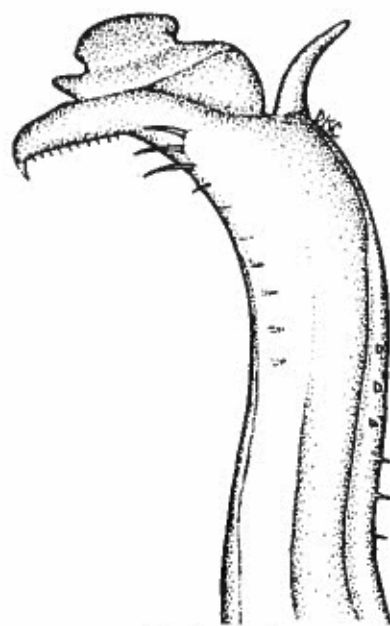
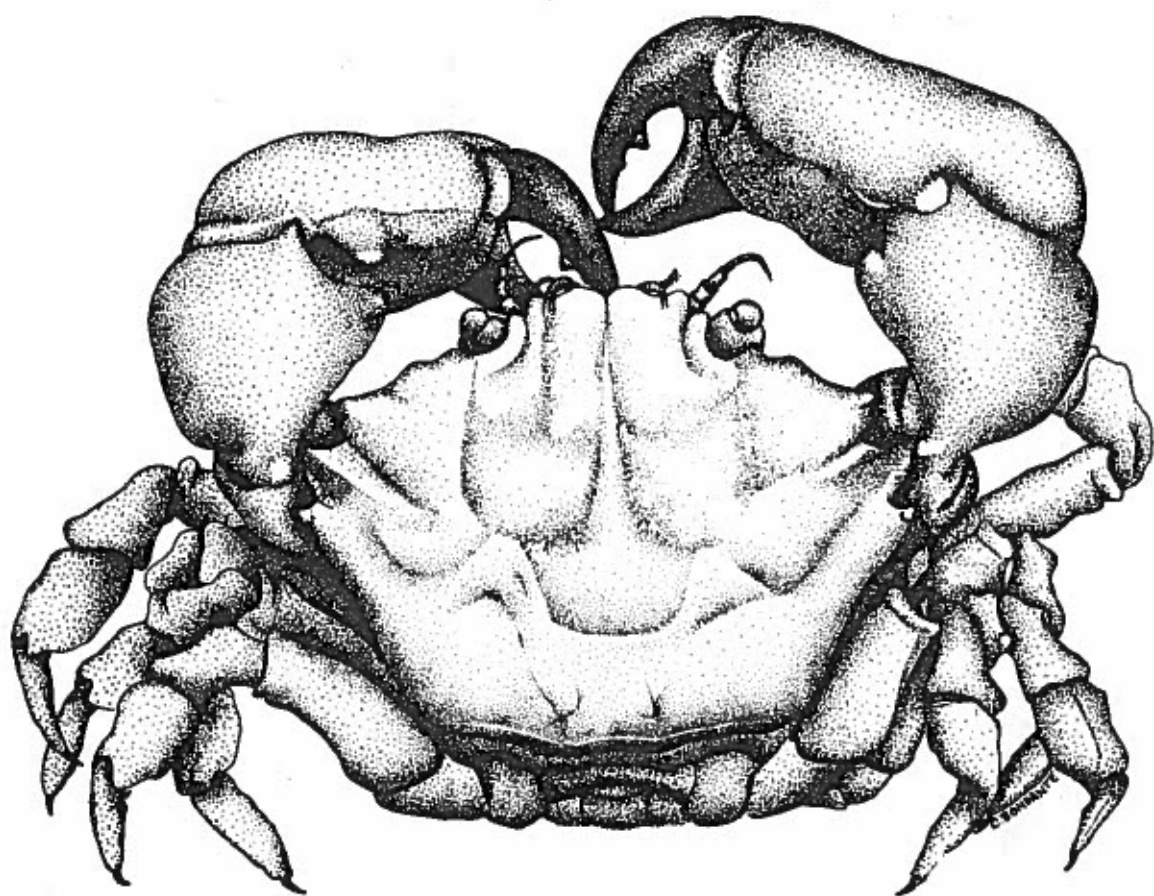
From Rathbun 1910: San Diego, California. La Paz, Mulege Bay, and Port Escondido, Gulf of California, Mexico.

From Schmitt 1921: Santa Monica Bay and San Pedro Bay, California.

From Rathbun 1930: Anaheim Bay, Long Beach, and Newport Bay, California.



Lophopanopeus leucomanus (Lockington 1876)



Male pleopod.

Lophopanopeus leucomanus (Lockington 1876)

SYNONYMS

Xanthodes leucomanus Lockington 1876 (1877 part). Lophoxanthus bellus Milne-Edwards 1876 (part). Lophoxanthus leucomanus Holmes 1900. Xantho bella Stimpson 1860 (part). Lophopanopeus heathi Rathbun 1900, 1904, 1930; Weymouth 1900; Schmitt 1921; Johnson and Snook 1935; Ricketts and Calvin 1939; Hewatt 1946.

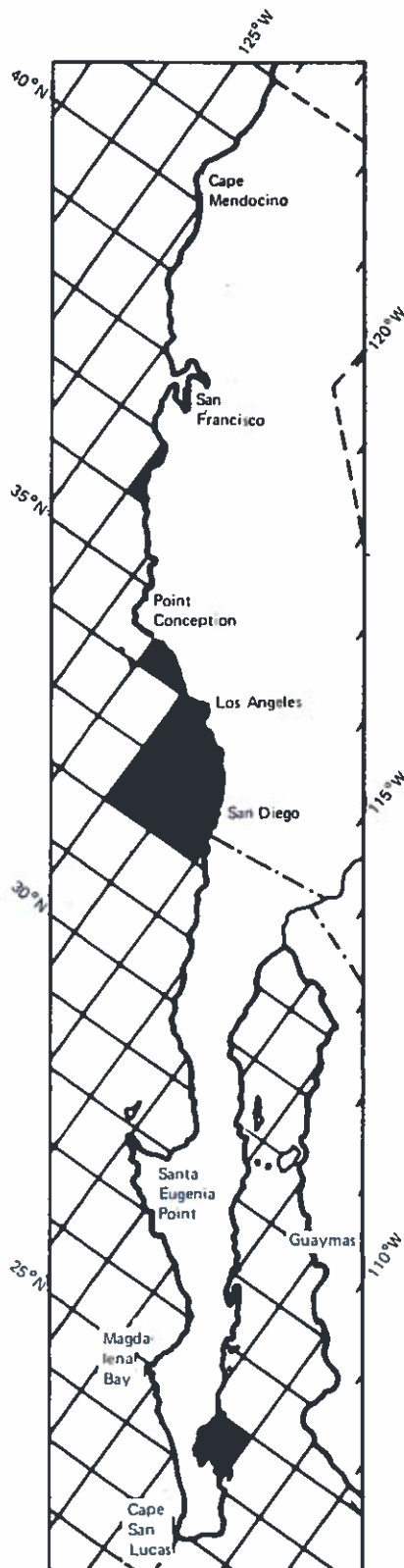
DISTRIBUTION

From Holmes 1900: San Clemente Island, California.

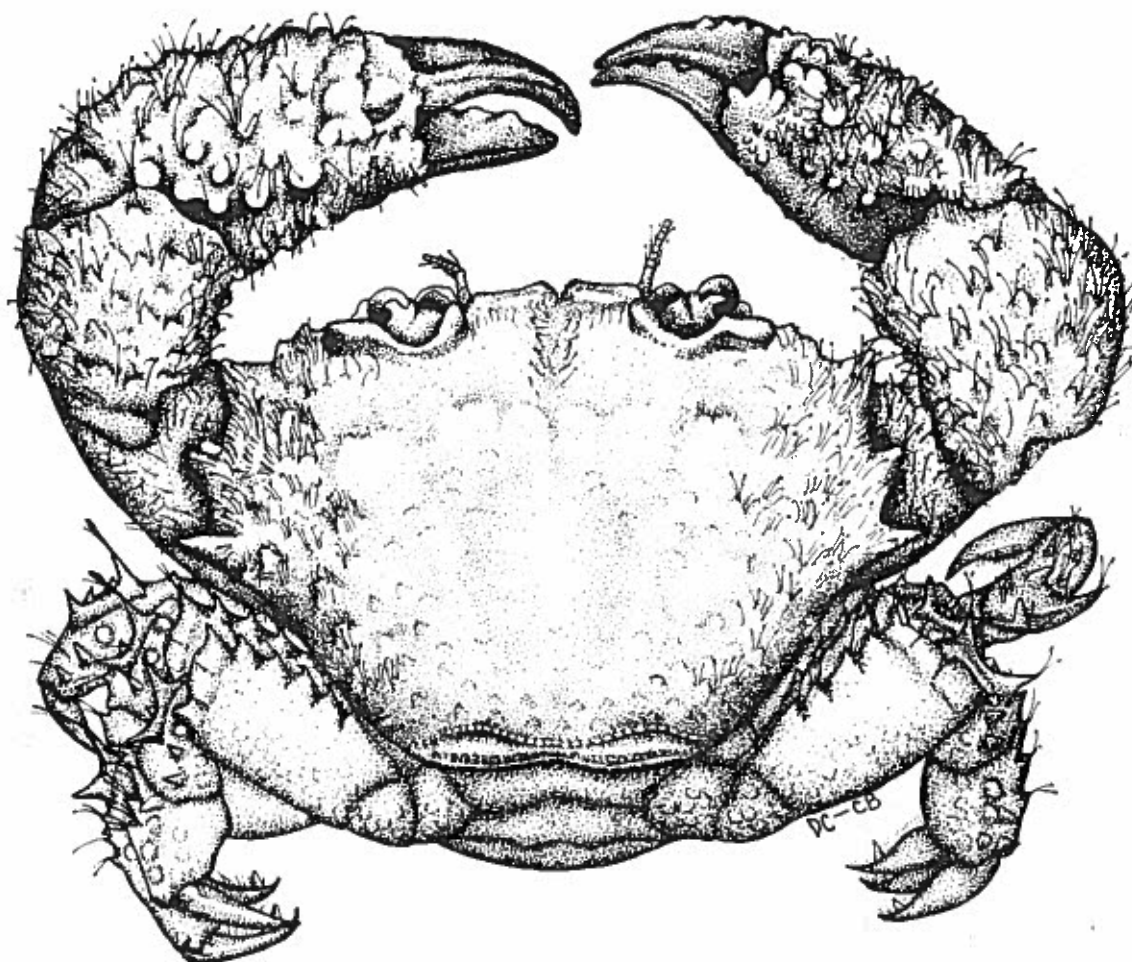
From Rathbun 1910: Monterey (Lockington), Monterey Bay, Santa Rosa Island (Lockington), Santa Catalina Island, and San Diego, California. La Paz, Gulf of California, Mexico (Lockington).

From Schmitt 1921: Laguna Beach, California.

From Rathbun 1930: Venice, Santa Monica Bay, Point Vicente, Seal Beach, and Laguna Beach, California.



Heteractea lunata (Milne-Edwards and Lucas 1843)



Heteractea lunata (Milne-Edwards and Lucas 1843)

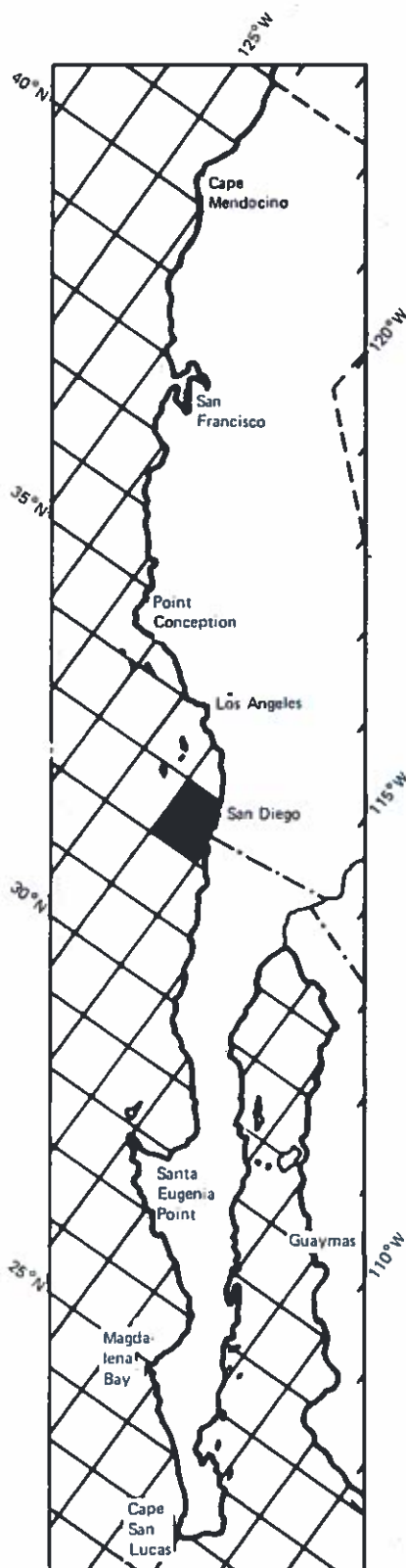
SYNONYMS

Pilumnus lunatus Milne-Edwards and Lucas 1843. Heteractea pilosus Lockington 1876 (1877). Heteractea lunata Kingsley 1879 (1880).

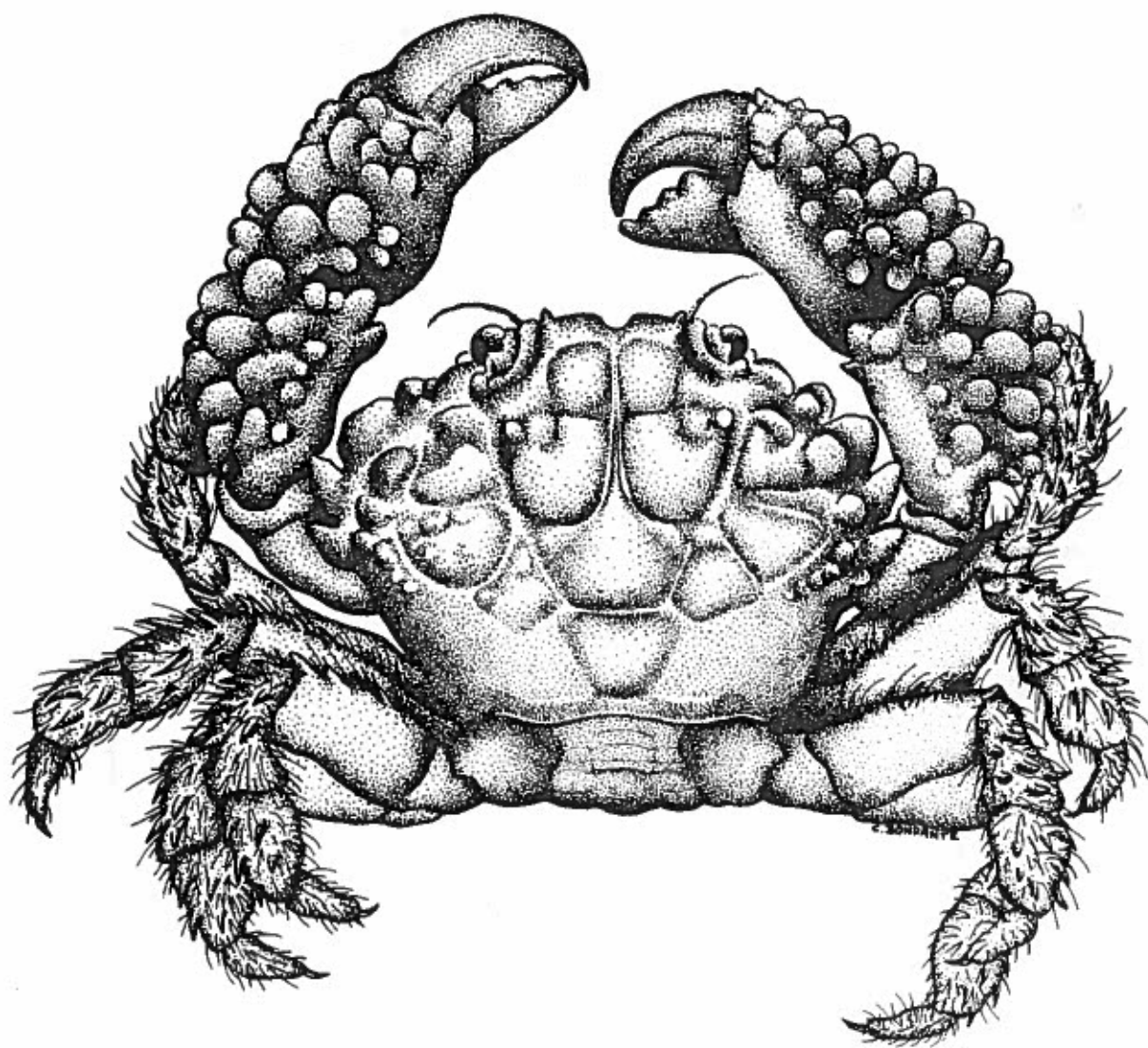
DISTRIBUTION

From Schmitt 1921: San Diego, California. Valparaiso, Chile.

From Rathbun 1930: Los Coronados Islands, Baja California, and Maria Madre Island, Gulf of California, Mexico. Panama and Toboguilla Island (Albatross Expedition).



Paraxanthias taylori (Stimpson 1860)



Paraxanthias taylori (Stimpson 1860)

SYNONYMS

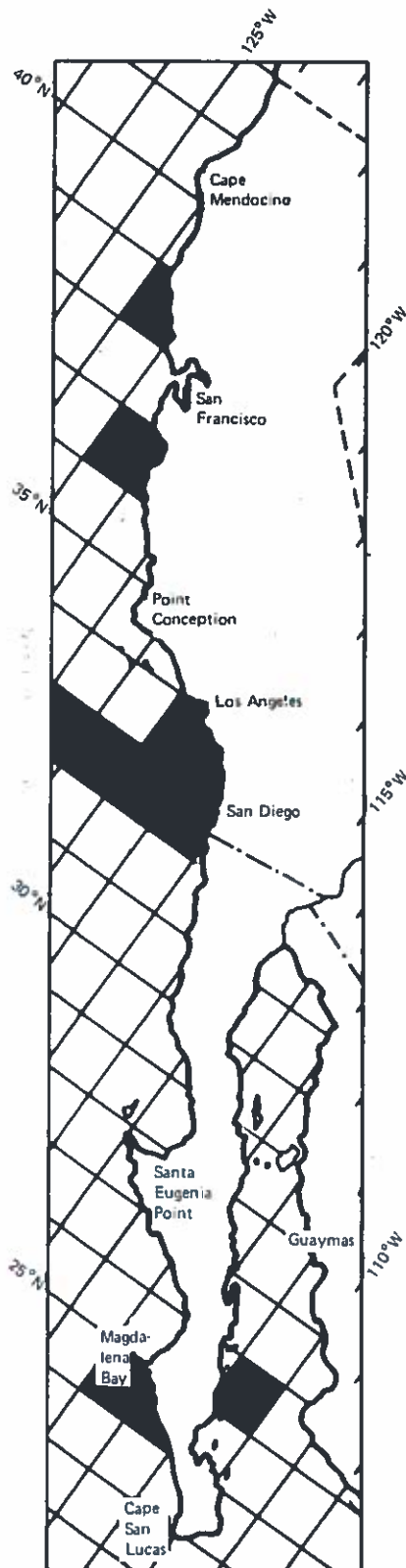
Xanthodes taylori Stimpson 1860 (1862), 1879. Xantho spini-tuberculatus Lockington 1877. Xanthias taylori Holmes 1900; Rathbun 1904; Weymouth 1910; Baker 1912. Paraxanthias taylori Odhner 1925.

DISTRIBUTION

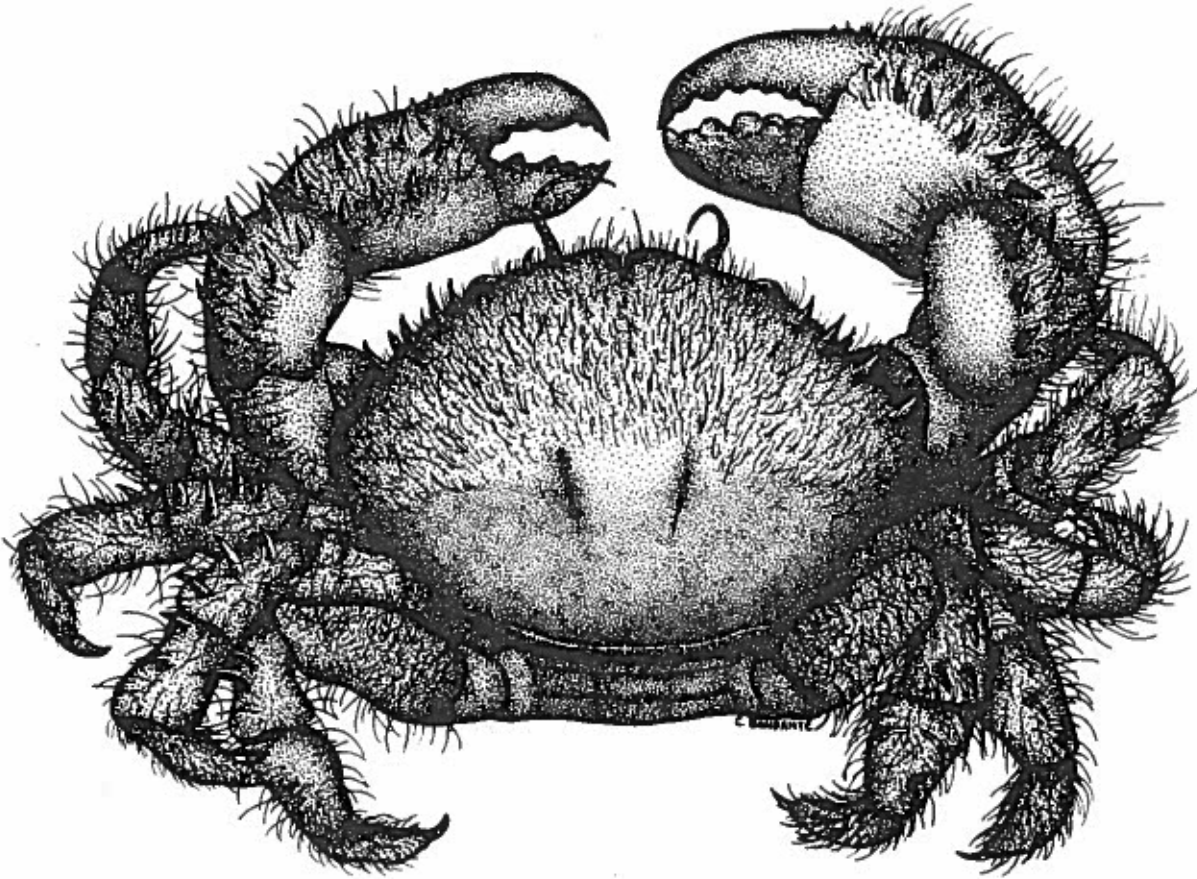
From Holmes 1900: Monterey, Santa Rosa, San Pedro, Santa Catalina Island, and San Diego, California. Magdalena Bay and San José Island, Baja California.

From Rathbun 1910: Pacific Grove, California.

From Rathbun 1930: Venice, Point Vicente, Long Beach, Seal Beach, Laguna Beach, San Nicolas Island, San Clemente Island, and Cortes Bank, California.



Pilumnus spinohirsutus (Lockington 1876)



Pilumnus spinohirsutus (Lockington 1876)

SYNONYMS

Acanthus spino-hirsutus Lockington 1876 (1877). Pilumnus spino-hirsutus Streets and Kingsley 1877; Kingsley 1879; Milne-Edwards (?); Miers 1886; Holmes 1900. Pilumnus spinohirsutus Rathbun 1904.

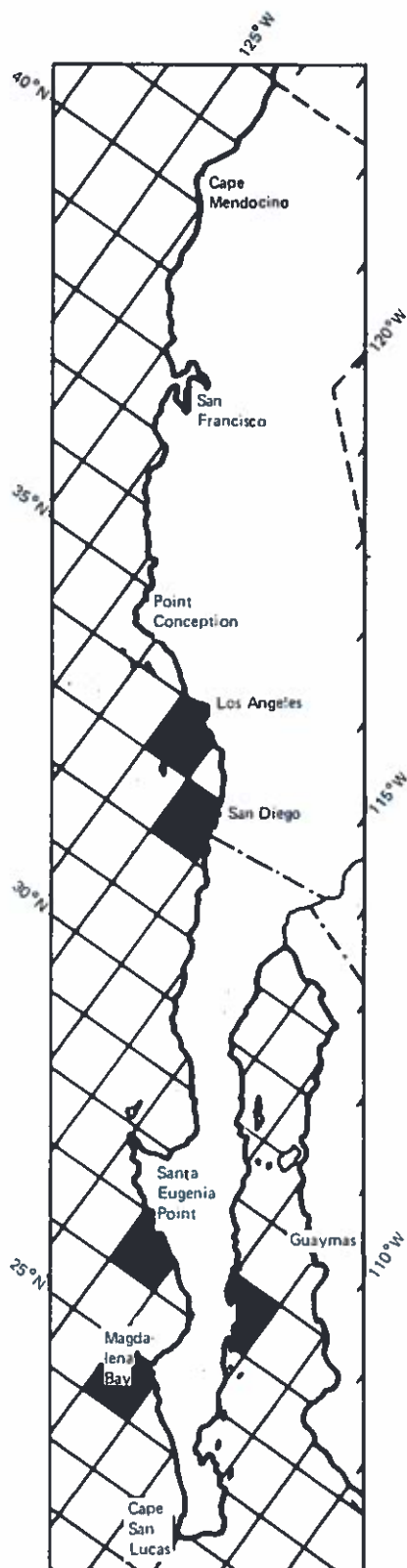
DISTRIBUTION

From Holmes 1900: San Diego, California. Mulege Bay, Baja California.

From Rathbun 1910: Santa Elena Bay, Ecuador.

From Schmitt 1921: Venice, California.

From Rathbun 1930: Long Beach, San Pedro, and Santa Catalina Island, California. Point Abreojos and Magdalena Bay, Baja California.



KEY TO ASTROPECTEN

Jack Q. Word

ASTROPECTEN  
Asteroidea: Astropectinidae

Astropecten braziliensis armatus Gray Doderlein 1917  
Astropecten verrilli (Fisher 1906)



KEY TO THE  
GENUS ASTROPECTEN

- 1 . . . (2) Spines present on supramarginal plates. One or two rows of spines may be found on each plate, or spines may be restricted to one or two in inframarginal region.

Astropecten braziliensis armatus

- 2 . . . (1) Spines not present on supramarginal plates.  
3 . . . (6) Adambulacral spines are chisel-shaped.  
4 . . . (5) The central paxillae in each group of paxillae are enlarged.

Astropecten braziliensis armatus

- 5 . . . (4) Central paxillae are not enlarged.

Astropecten verrilli

- 6 . . . (3) Adambulacral spines are not chisel-shaped.

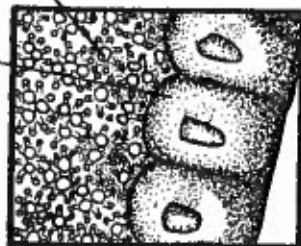
Astropecten verrilli



Astropecten braziliensis armatus Gray Doderlein 1917

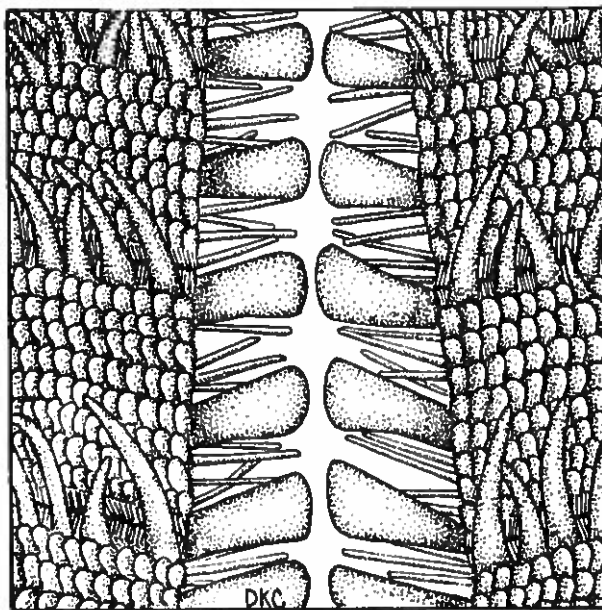
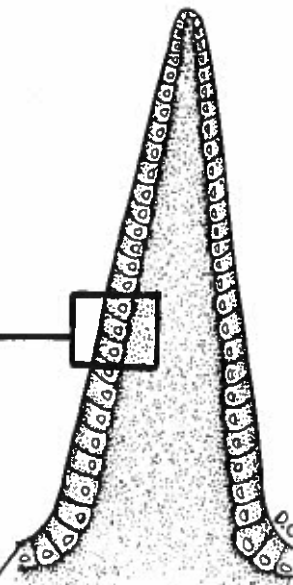
enlarged central paxillae

supramarginal plates



Enlarged view of aboral surface.

inframarginal region



Enlarged view of ambulacrum.

Astropecten braziliensis armatus Gray Doderlein 1917

SYNONYMS

Astropecten erinaceus Gray 1840; Verrill 1867; Perrier 1875; Sladen 1889; Fisher 1906. Astropecten örstedii Lütken 1859; Verrill 1867. Astropecten sidealis Verrill . Astropecten braziliensis-armatus Doderlein 1917.

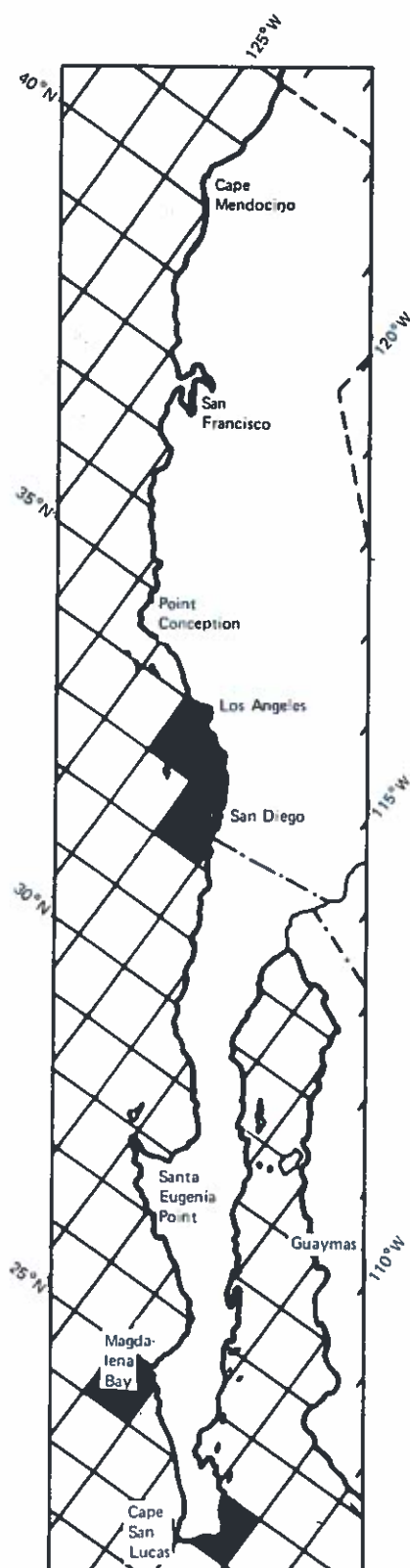
DISTRIBUTION

From Fisher 1911: Long Beach, San Pedro, and San Diego Bay, California.

From Ulrey 1918: Venice, Newport, and Balboa, California.

From Fisher 1930: Ranges from San Pedro, California, to Ecuador at depths of 0 to 55 m.

From Zeisenhenne 1937: Magdalena Bay and Arena Bank, Baja California. Clarión Island, Revillagigedo group, Mexico.



Astropecten verrilli (Fisher 1906)

Astropecten verrilli (Fisher 1906)

SYNONYMS

Astropecten californicus Fisher 1906.

Astropecten verrilli de Loriol 1917.

DISTRIBUTION

From Fisher 1911: Bodega Head, Point Reyes, Point Ano Nuevo, Santa Cruz, Monterey Bay, Half Moon Bay, between Cape San Martin and Piedras Blancas, Santa Barbara, between Santa Barbara and San Nicolas Island, San Miguel Island, Santa Cruz Island, Santa Rosa Island, Point Conception, San Pedro, San Diego, and Cortes Bank, California. Guadalupe Island, Los Coronados Islands, and Cedros Island, Baja California.

From Ulrey 1918: Malibu, Santa Monica Bay, Marina del Rey, Venice, Manhattan Beach, Point Fermin, Point Dume, and Redondo Beach, California.



KEY TO PISASTER  
Danuta K. Charwat

PISASTER  
Echinodermata:Asteroidea

Pisaster brevispinus (Stimpson 1857)  
Pisaster giganteus (Stimpson 1857)  
Pisaster ochraceus (Brandt 1835)

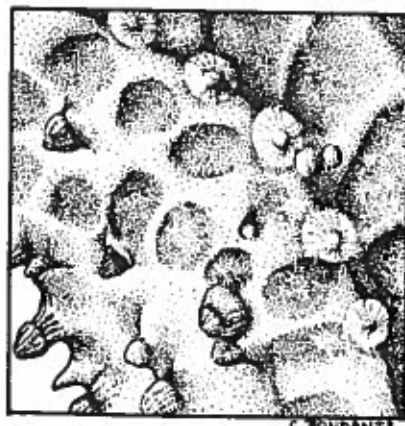
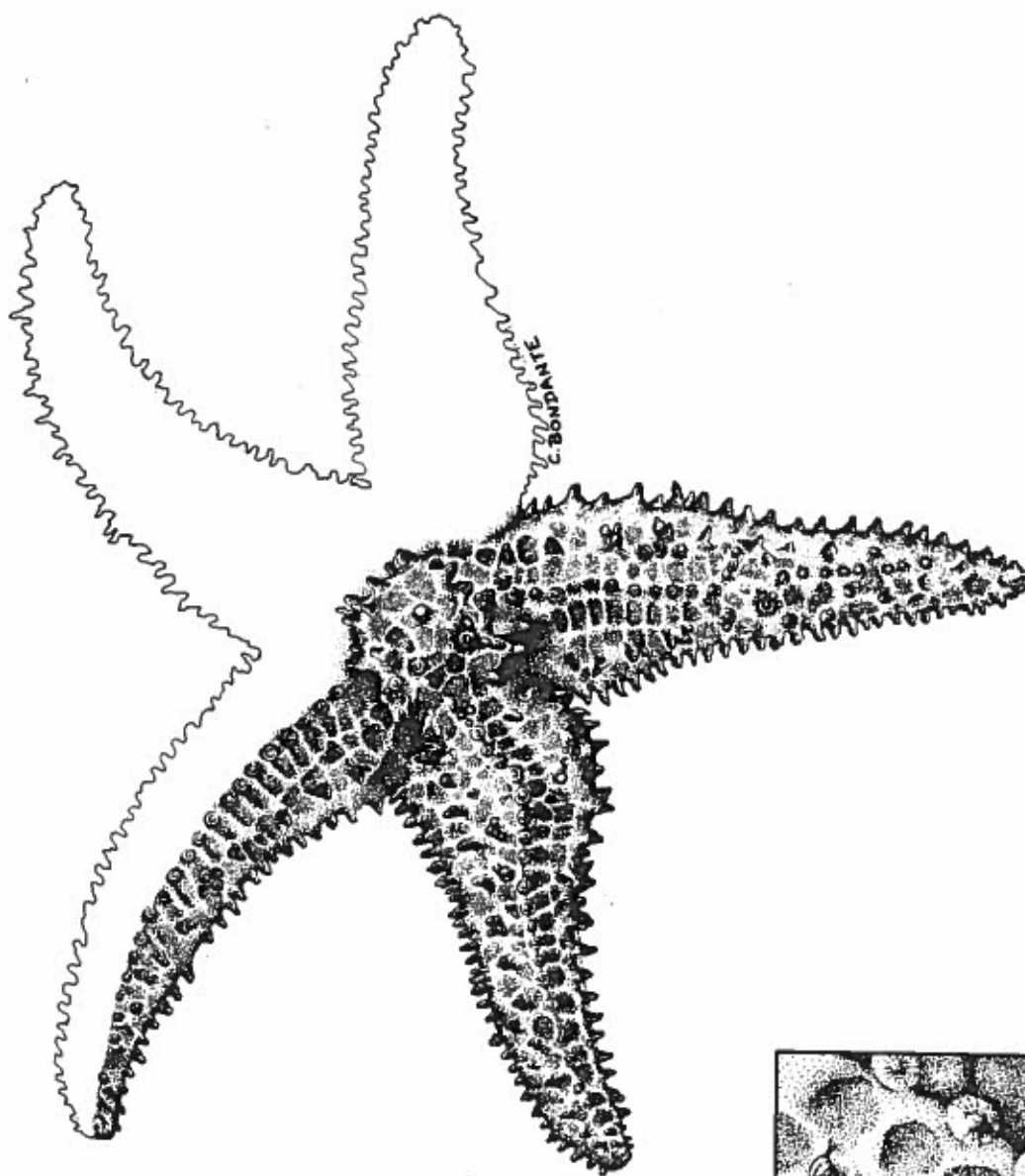


KEY TO THE  
GENUS PISASTER

- 1 . . . (4) A dense cluster of spines in the shape of a pentagon present at the center of the disk.
- 2 . . . (3) Dorsal spines white, capitate (flattened on top). (Spines form isolated clumps or a reticulated pattern.)  
Pisaster ochraceus
- 3 . . . (2) Dorsal spines pink, short, clavate, with sub-acute tips.  
Pisaster brevispinus
- 4 . . . (1) Cluster of spines in the shape of a pentagon not present at the center of the disk.
- 5 . . . (6) A conspicuous median band of spines present on the dorsal surface of each ray.  
Pisaster brevispinus
- 6 . . . (5) Spines are distributed equidistantly over entire dorsal surface; no median band present.  
Pisaster giganteus



Pisaster brevispinus (Stimpson 1857)



Closeup of aboral spines.

Pisaster brevispinus (Stimpson 1857)

SYNONYMS

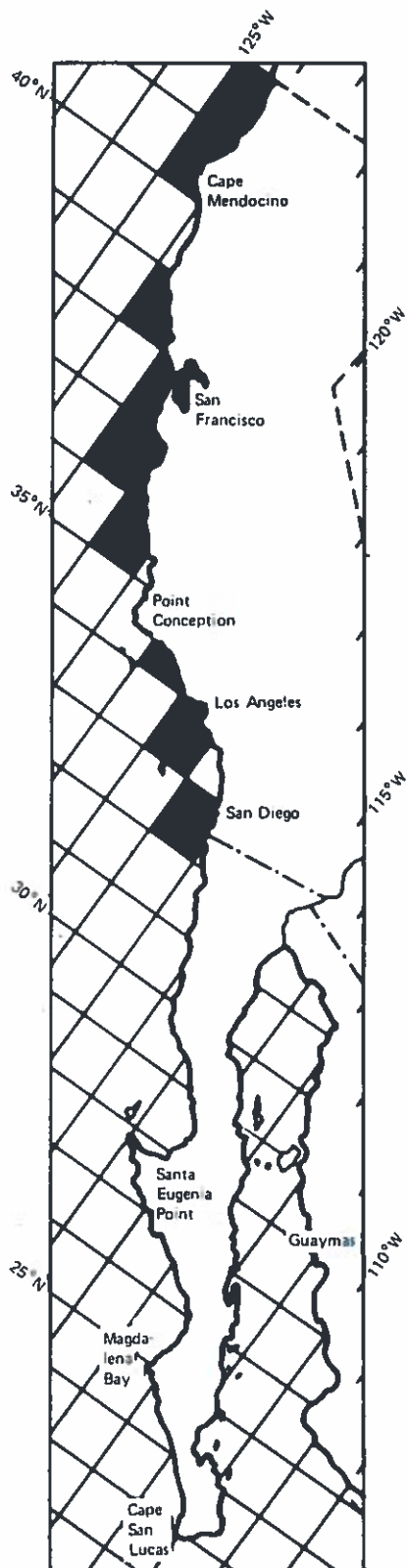
Asterias brevispina Stimpson 1857.  
Asterias paucispina Stimpson 1862; Perrier 1875. Asterias (Pisaster) papulosa Verrill 1909. Pisaster brevispinus Verrill 1914. Pisaster papulosus Verrill 1914. Pisaster? paucispinus Verrill 1914.

DISTRIBUTION

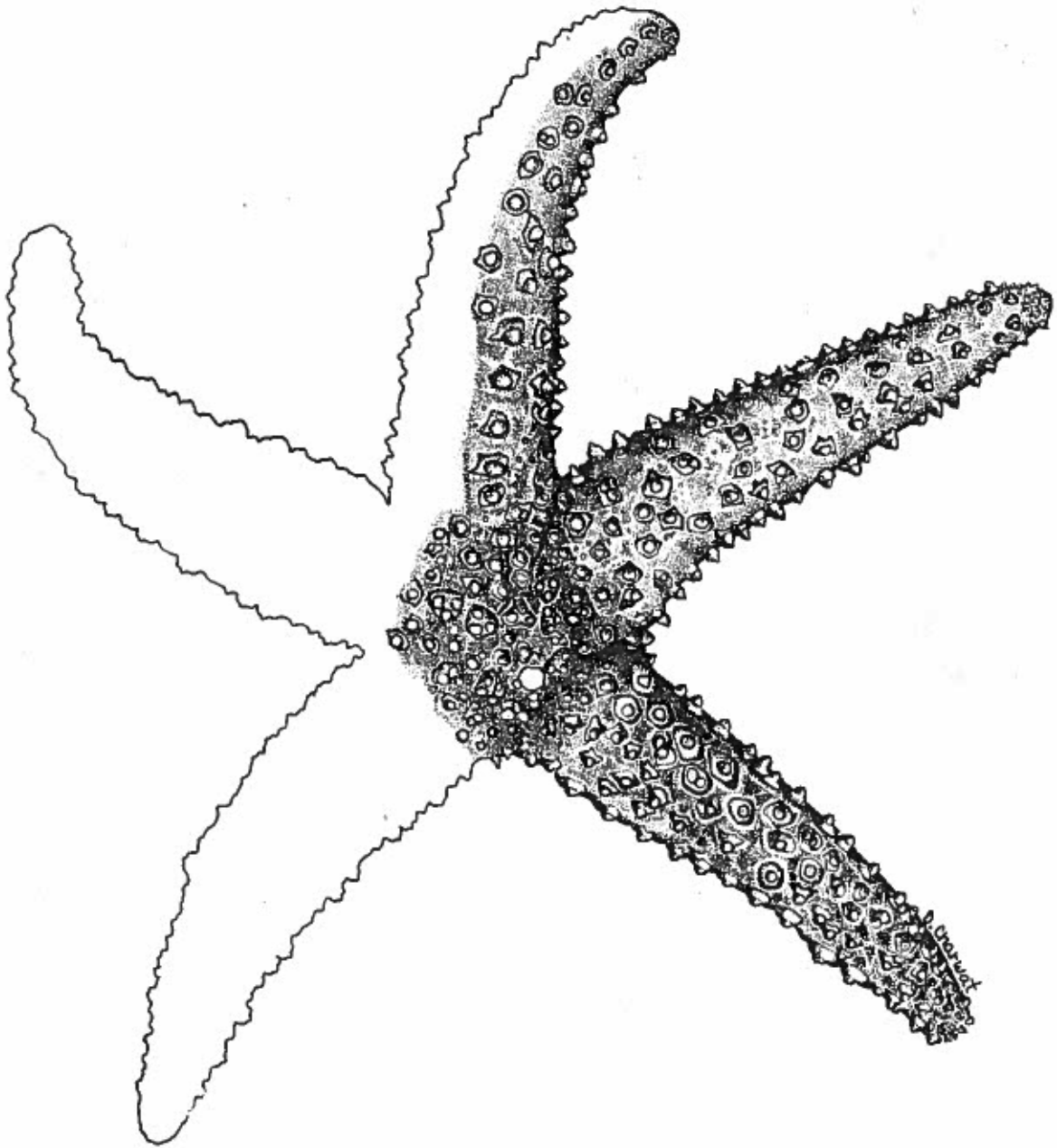
From Fisher 1930: Alaska. Canada. Washington. Crescent City, Humboldt Bay, Tomales Bay, Point Reyes, San Francisco Bay (10 to 15 m), Bolinas, Monterey Bay (10 to 60 m), Half Moon Bay, San Simeon Bay, Point Ano Nuevo, Santa Cruz, and Santa Barbara.

From Hopkins and Crozier 1966: Santa Barbara, La Jolla (20 m), and Mission Bay (10 m).

From Coastal Water Project data: Zuma Beach and Palos Verdes, California.



Pisaster giganteus (Stimpson 1857)



Pisaster giganteus (Stimpson 1857)

SYNONYMS

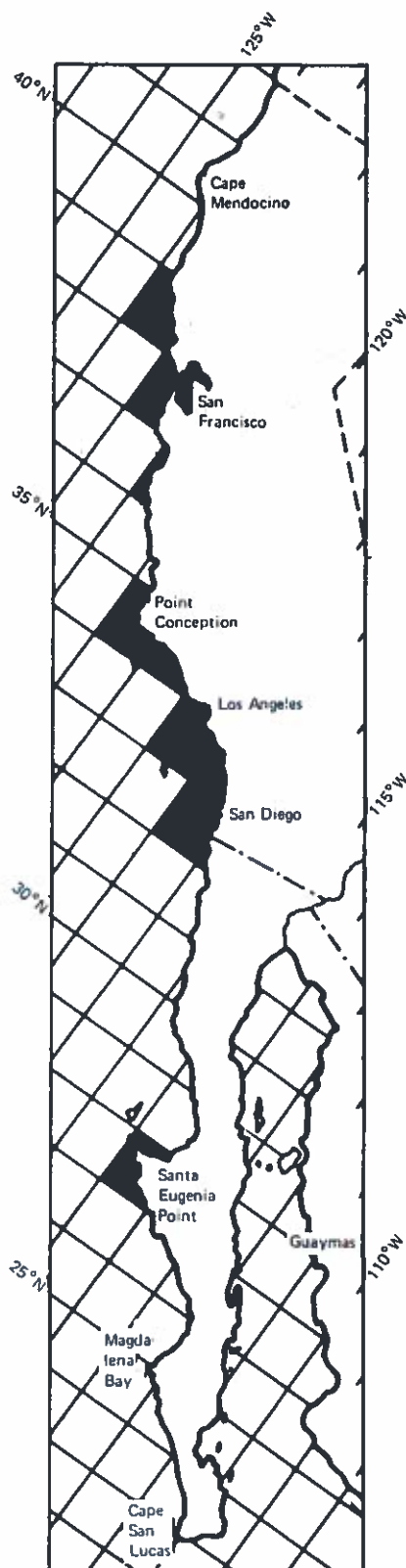
Asterias gigantea Stimpson 1857; Verrill 1867. Asterias lutkeni Stimpson 1862; Verrill 1867; Perrier 1875; Bell 1881; Sladen 1889; De Loriol 1897. Asterias exquisita de Loriol 1887. Calliasterias exquisita Fewkes 1889. Pisaster lutkeni Fisher 1908; Verrill 1914. Pisaster giganteus Verrill 1909, 1914; Fisher 1926.

DISTRIBUTION

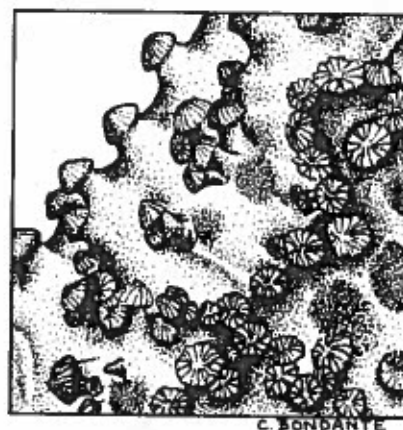
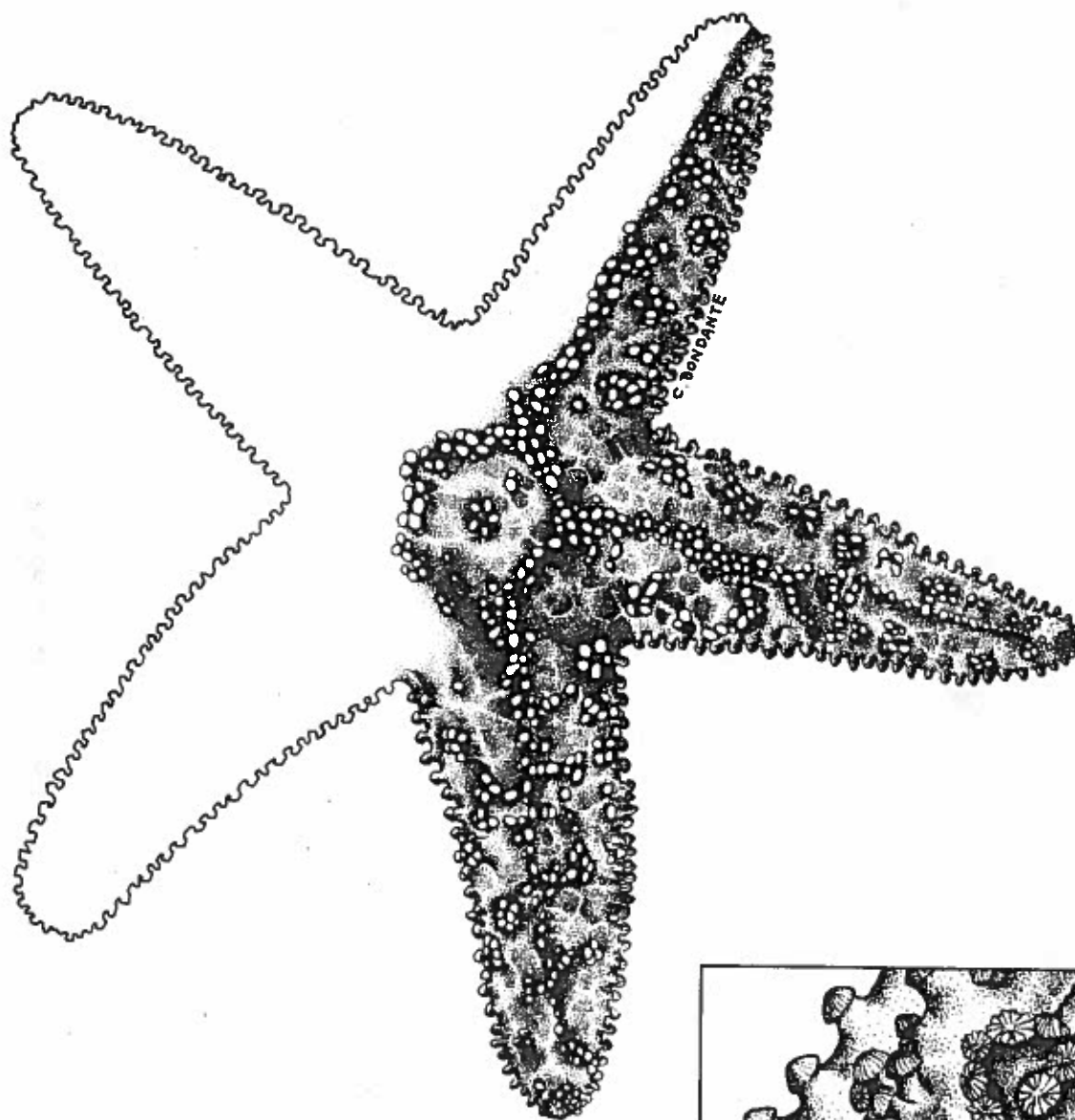
From Fisher 1930: Tomales Bay, Monterey Bay, San Luis Obispo, Santa Barbara, Venice, Laguna Beach, La Jolla, and San Diego, California. Baja California (26 km south of U.S./Mexico border). Ranges from Vancouver Island, British Columbia, Canada, to northern Baja California.

From Hopkins and Crozier 1966: San Pablo Bay, Baja California.

From Coastal Water Project data: Paradise Cove, California.



Pisaster ochraceous (Brandt 1835)



Closeup of aboral spines.

Pisaster ochraceous (Brandt 1835)

SYNONYMS

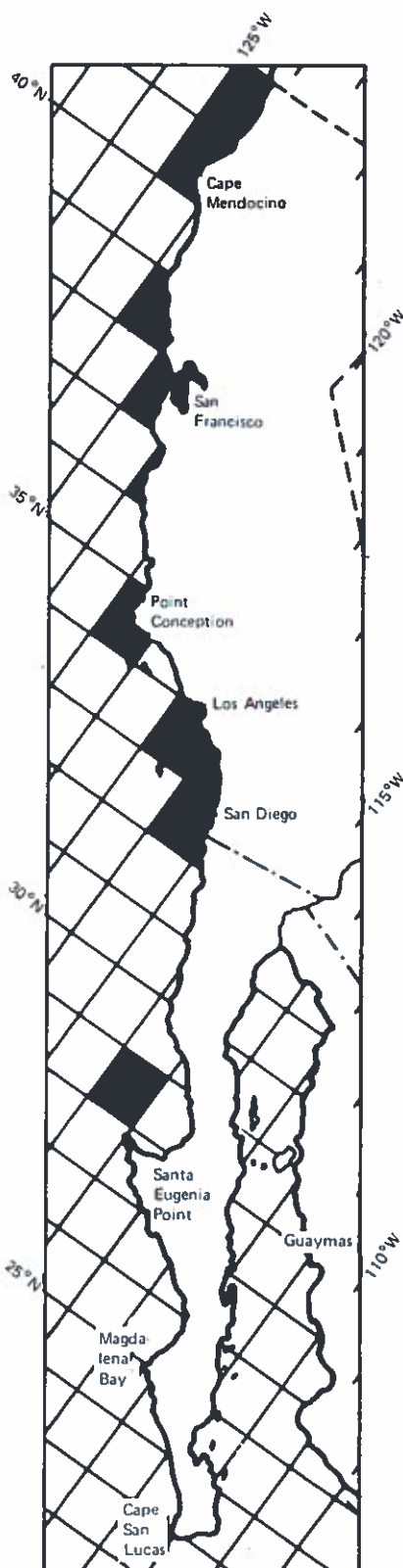
Asterias ochracea Brandt 1835; Stimpson 1867; Verrill 1867; Perrier 1875; Whiteaves 1887; Agassiz 1877; Sladen 1889; Clark 1907. Asterias janthina Brandt 1835. Asteracanthion margaritifera Müller and Troschel 1842. Asterias conferta Stimpson 1862; Verrill 1867; Perrier 1875; Sladen 1889; Bell 1881; Whiteaves 1887; De Loriol 1897. Asterias fissispina Stimpson 1862; Verrill 1867. P[isaster] ochraceous Verrill 1909. Pisaster ochraceous Fisher 1908; Verrill 1909, 1914; Clark 1913; Fisher 1926. Pisaster confertus Verrill 1909, 1914. Pisaster fissispinus Verrill 1924.

DISTRIBUTION

From Fisher 1930: Crescent City, Trinidad, Humboldt Bay, Drakes Bay, San Francisco Bay, Farallon Islands, Monterey, Point Sal, Santa Cruz, Venice, and Laguna Beach, California. Ranges from southern Alaska to Baja California.

From Hopkins and Crozier 1966: San Diego, California. Tijuana and Cedros Island, Baja California.

From Coastal Water Project data: Malibu and Santa Monica Bay, California.



KEY TO REGULAR URCHINS

Jack Q. Word

REGULAR URCHINS

Echinodermata:Echinoidea

Family Centrechinidae

Centrostephanus coronatus (Verrill 1867)

Family Arbaciidae

Arbacia incisa (Blainville; ?Gmelin)

Family Echinidae

Lytechinus anamesus H. L. Clark 1912

Lytechinus pictus (Verrill 1867)

Family Strongylocentrotidae

Allocentrotus fragilis (Jackson 1912)

Strongylocentrotus franciscanus (A. Agassiz 1863)

Strongylocentrotus purpuratus (Stimpson 1857)

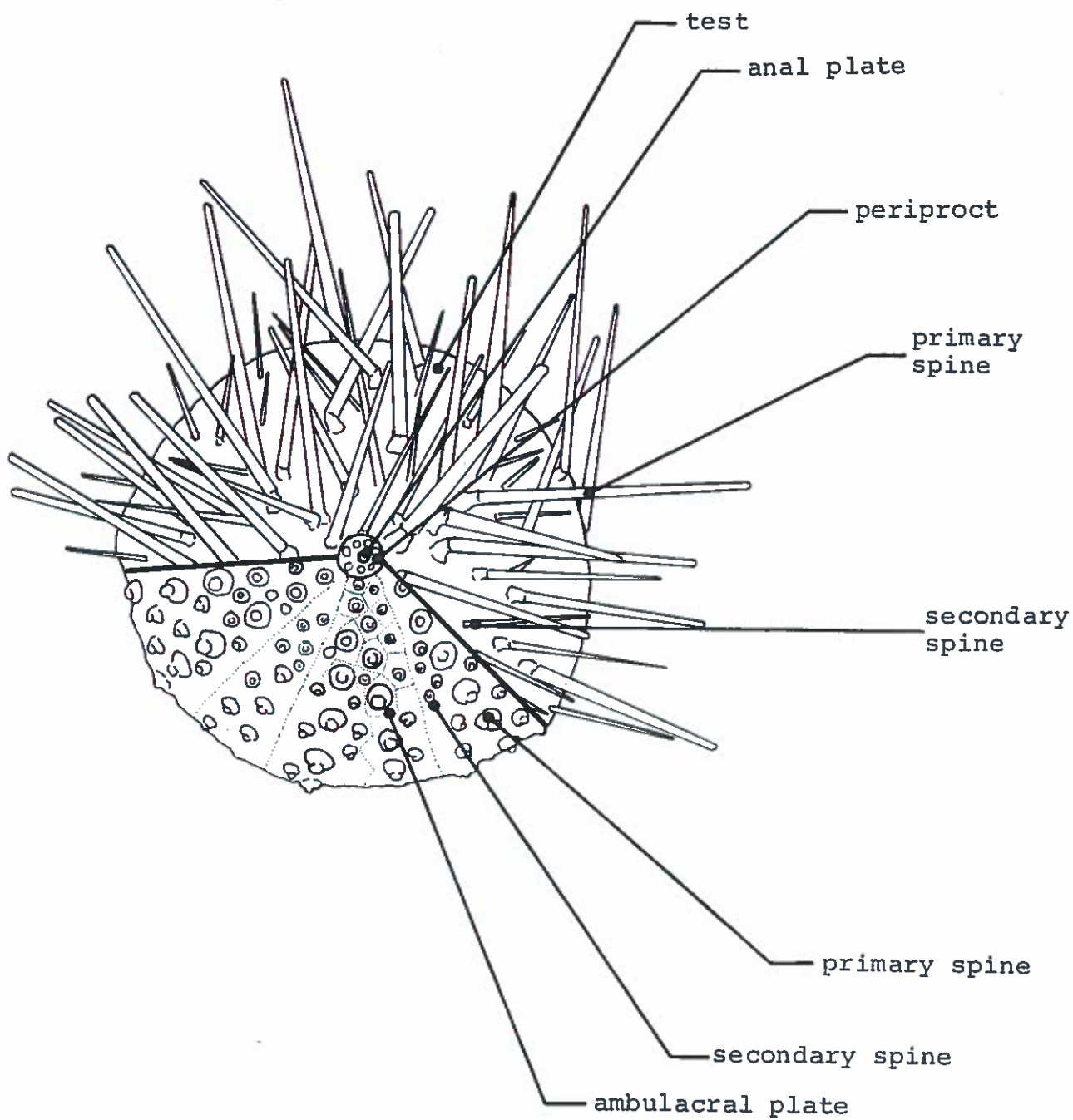


Diagram of regular urchin features.

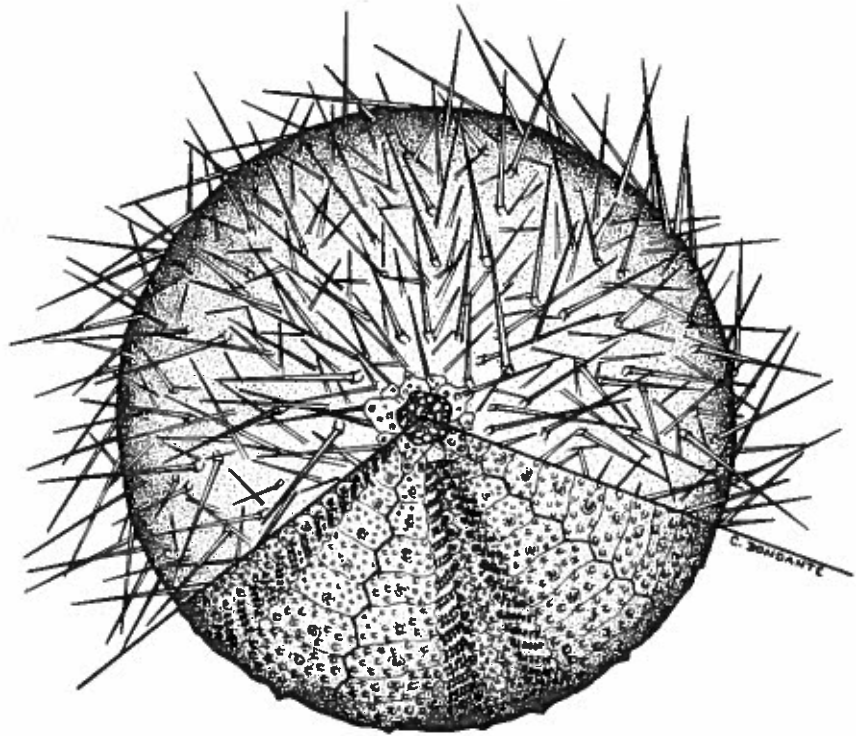
KEY TO THE  
REGULAR URCHINS

- 1 . . . (2) Spines are hollow.  
Centrostephanus coronatus
- 2 . . . (1) Spines are not hollow.
- 3 . . . (4) Periproct with four, sometimes five, large plates that act like valves on the central anus.  
Arbacia incisa
- 4 . . . (3) Periproct not as above, but with many small plates and a few large plates.
- 5 . . . (8) Ambulacral plates of test each with a single primary spine and no secondary spines.
- 6 . . . (7) Blotches of gray or dull purple appear on upper side of test. In juveniles, the test is pure white, with long acute white spines. Color eventually becomes rather yellow, and blotches appear.  
Lytechinus anamesus
- 7 . . . (6) Spines are short, thick, blunt, and dark in color. Color of test is dark gray. In juveniles, the test is rose-colored, purple, or violet--these colors are soon replaced by gray.  
Lytechinus pictus
- 8 . . . (5) Ambulacral plates of test have a primary spine and several secondary spines.
- 9 . . . (10) Test is flattened dorsal-ventrally.  
Allocentrotus fragilis
- 10 . . . (9) Test is not flattened dorsal-ventrally.

11 . . . (12) Spines are long and have a reddish tinge.  
Strongylocentrotus franciscanus

12 . . . (11) Spines are short and have a purplish tinge.  
Strongylocentrotus purpuratus

Allocentrotus fragilis (Jackson 1912)



Allocentrotus fragilis (Jackson 1912)

SYNONYMS

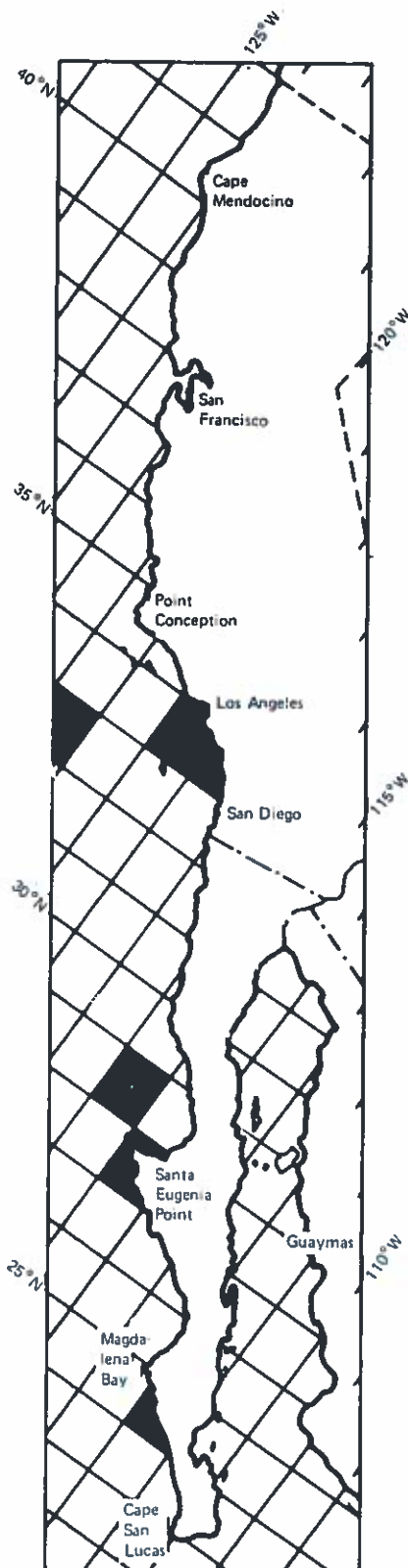
Strongylocentrotus fragilis Jackson 1912;  
Clark 1912. Allocentrotus fragilis Mor-  
tensen 1942, 1943.

DISTRIBUTION

From Grant and Hertlein 1938: Newport  
Beach and Cortes Bank (12 to 18 m),  
California. Point Santa Eugenia, Baja  
California.

From Clark 1948: Santa Catalina Island,  
California (Jackson). Cedros Island,  
Baja California. Ranges from Vancouver  
Island, British Columbia, Canada, to  
Baja California.

From Coastal Water Project data: Palos  
Verdes, California.



Arbacia incisa (Blainville; ?Gmelin)

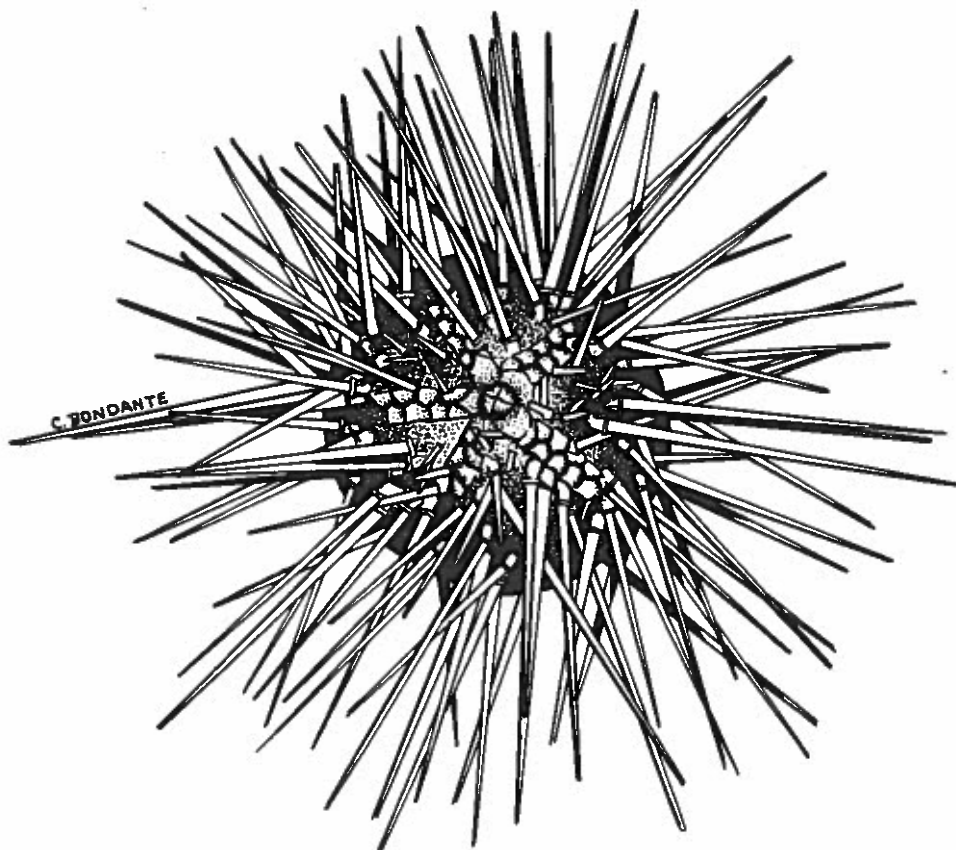


Illustration after  
Clark 1940.

Arbacia incisa (Blainville; ?Gmelin)

SYNONYMS

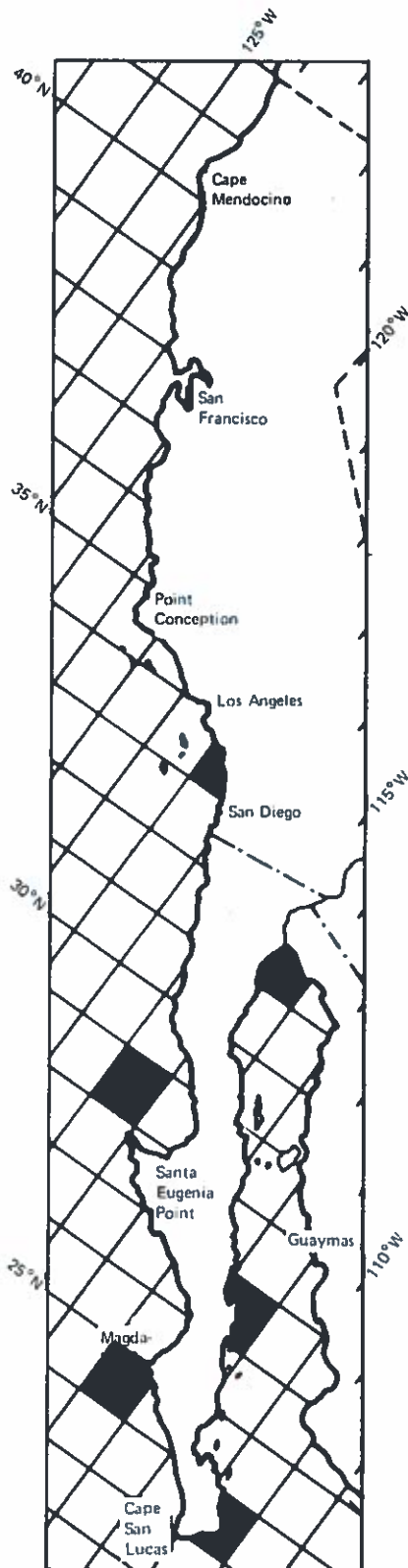
Echinus stellatus Blainville 1825.  
Echinocidaris incisa A. Agassiz 1863.  
Echinocidaris stellata Verrill 1867.  
Arbacia stellata A. Agassiz 1872; Lockington 1875; Clark 1902; Mortensen 1935.  
Arbacia incisa Clark 1910, 1913, 1923; Boone 1926; Zeisenhenne 1937; Clark 1940. Agarites stellatus A. Agassiz 1846. Echinocidaris longispina Lütken 1864. Agarites incisus Lambert and Thiery 1914.

DISTRIBUTION

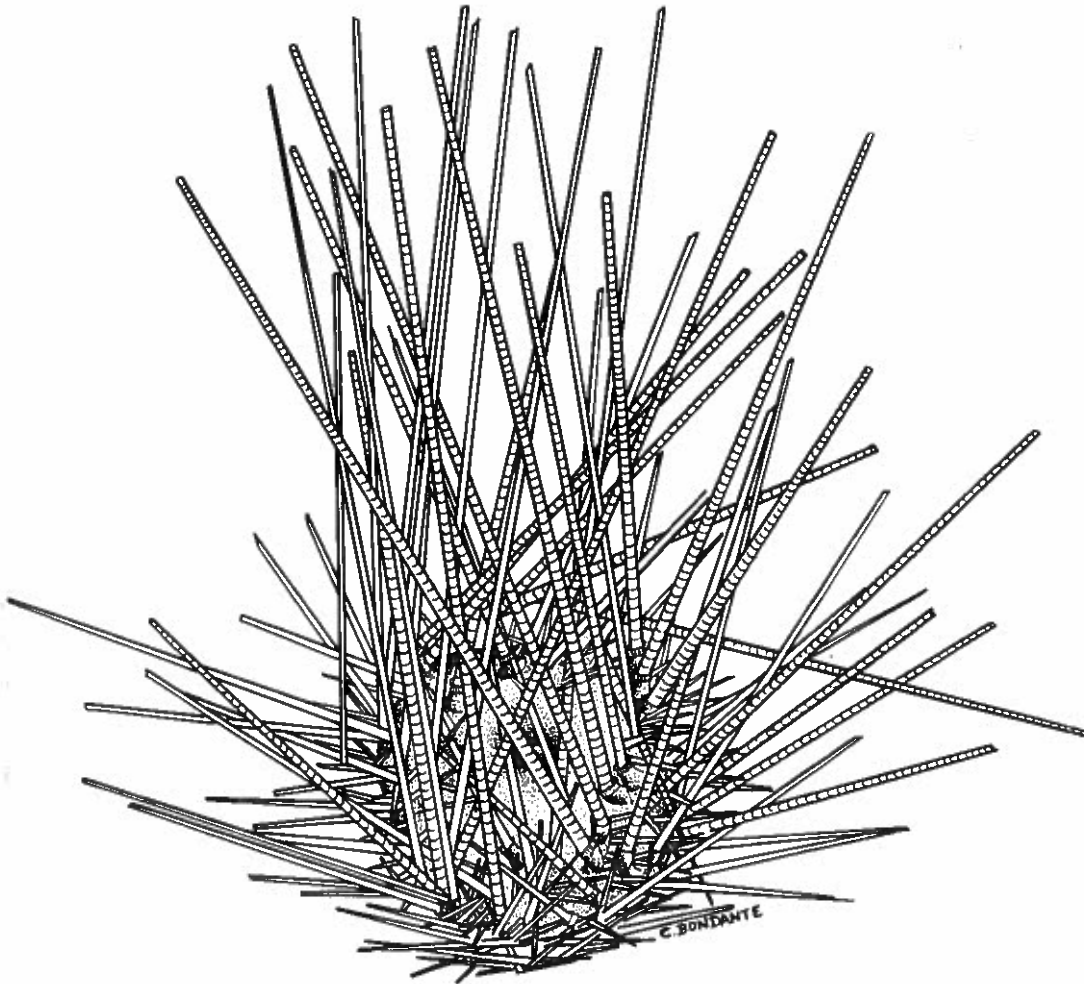
From Grant and Hertlein 1938: San Felipe, Magdalena Bay, Cedros Island (dredge), and West Benito Island, Baja California. Galapagos Island.

From Clark 1940: Arena Bank and Santa Inez Bay, Baja California (0 to 8 m).

From Clark 1948: Newport Harbor, California. Honda Bay, Panama. Gorgona Island, Colombia. Santa Elena Bay and La Plata Island, Ecuador. Zorritos Light, South Bay, Lobos de Afuera, and Middle Chincha Island, Peru.



Centrostephanus coronatus (Verrill 1867)



Centrostephanus coronatus (Verrill 1867)

SYNONYMS

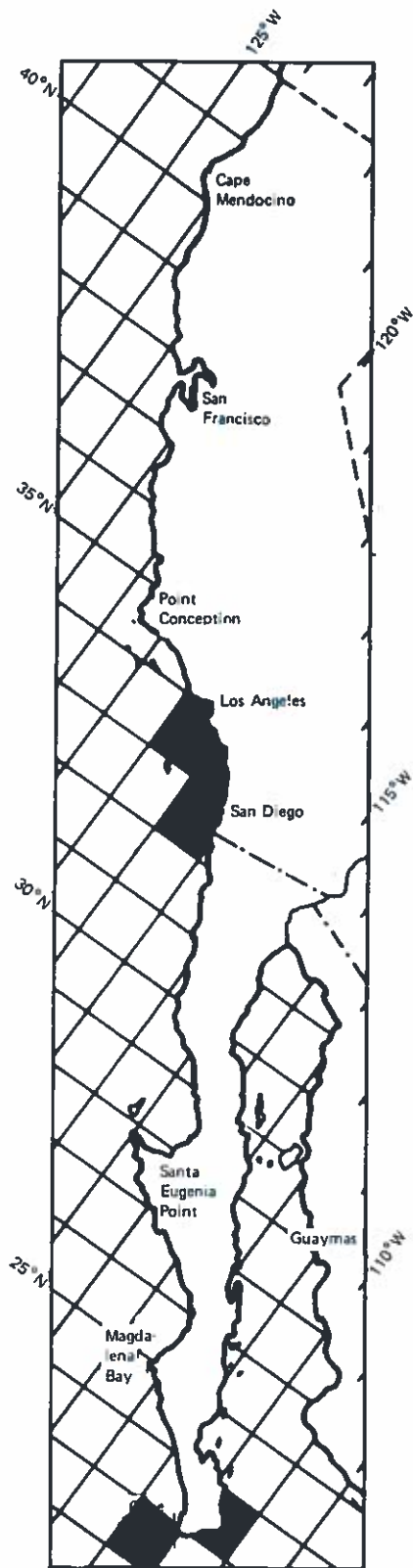
Echinodiadema coronata Verrill 1867.  
Centrostephanus coronatus A. Agassiz  
1872; Mortensen 1940.

DISTRIBUTION

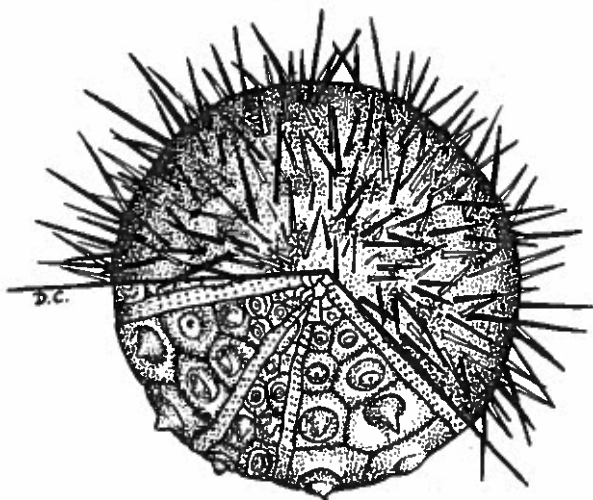
From Grant and Hertlein 1938: Orange County, California. Cape San Lucas, Baja California. La Libertad (Sonora) and San Felipe, Mexico.

From Clark 1940: Arena Bank, Baja California.

From Clark 1948: Newport Beach and Corona del Mar, California. Galapagos Albemarle, and James Islands, Ecuador.



Lytechinus anamesus H. L. Clark 1912



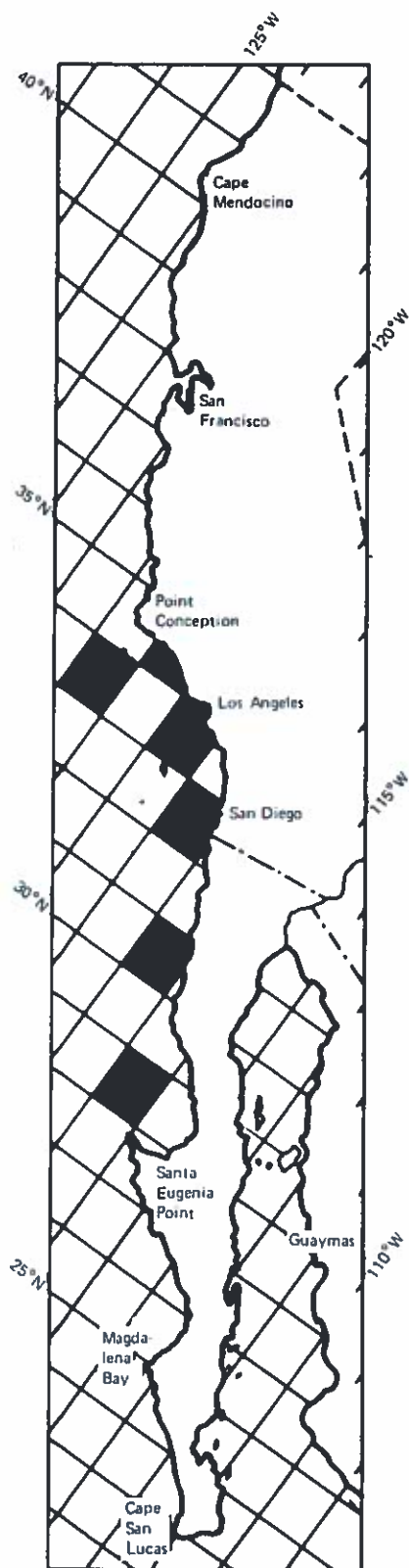
Lytechinus anamesus H. L. Clark 1912

DISTRIBUTION

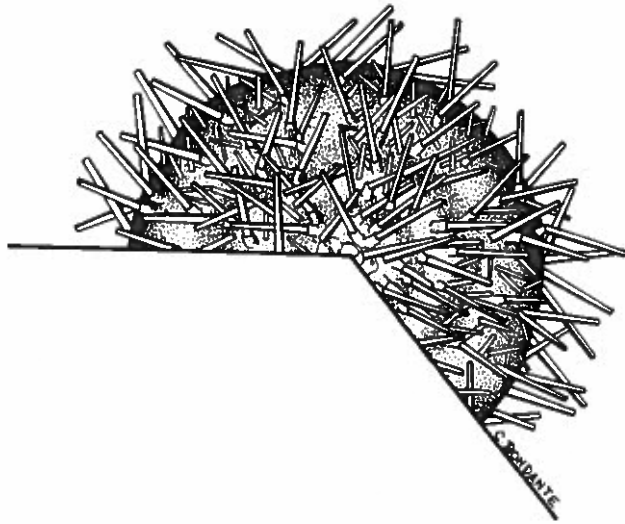
From Grant and Hertlein 1938: Santa Barbara, San Pedro, and San Nicolas Island, California. Guadalupe Island, San Bartolome Bay, San Martin Island, and Cedros Island, Baja California.

From Clark 1948: Santa Rosa Island (30 to 36 m, 34°53'35"N), Santa Catalina Island, and San Diego, California. Thurloe Head, Baja California.

From Coastal Water Project data: Palos Verdes, California.



Lytechinus pictus (Verrill 1867)



Lytechinus pictus (Verrill 1867)

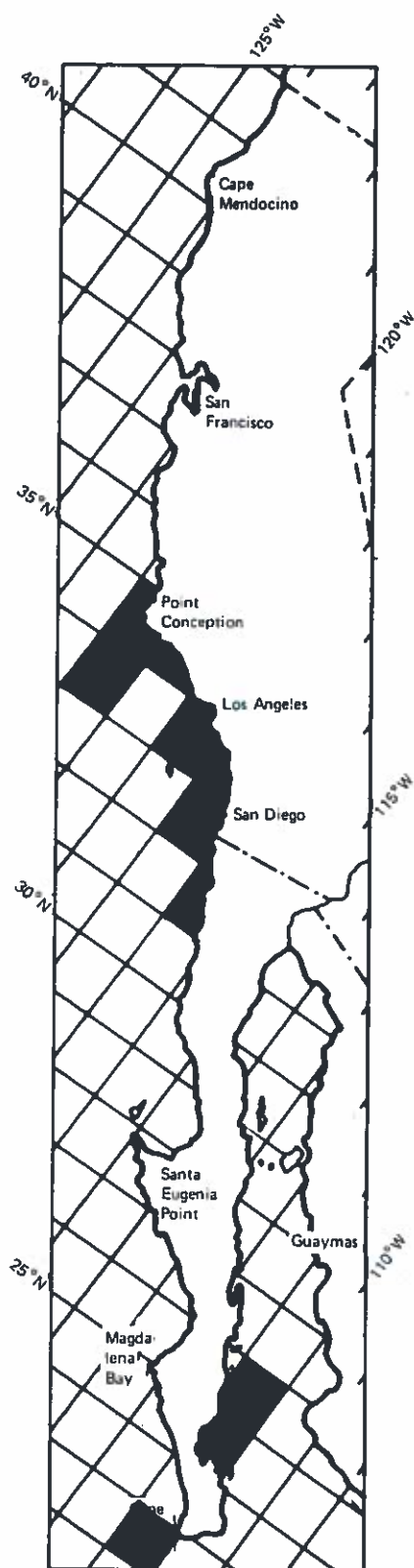
SYNONYMS

Psammechinus pictus Verrill 1867.  
Lytechinus pictus Clark 1912.

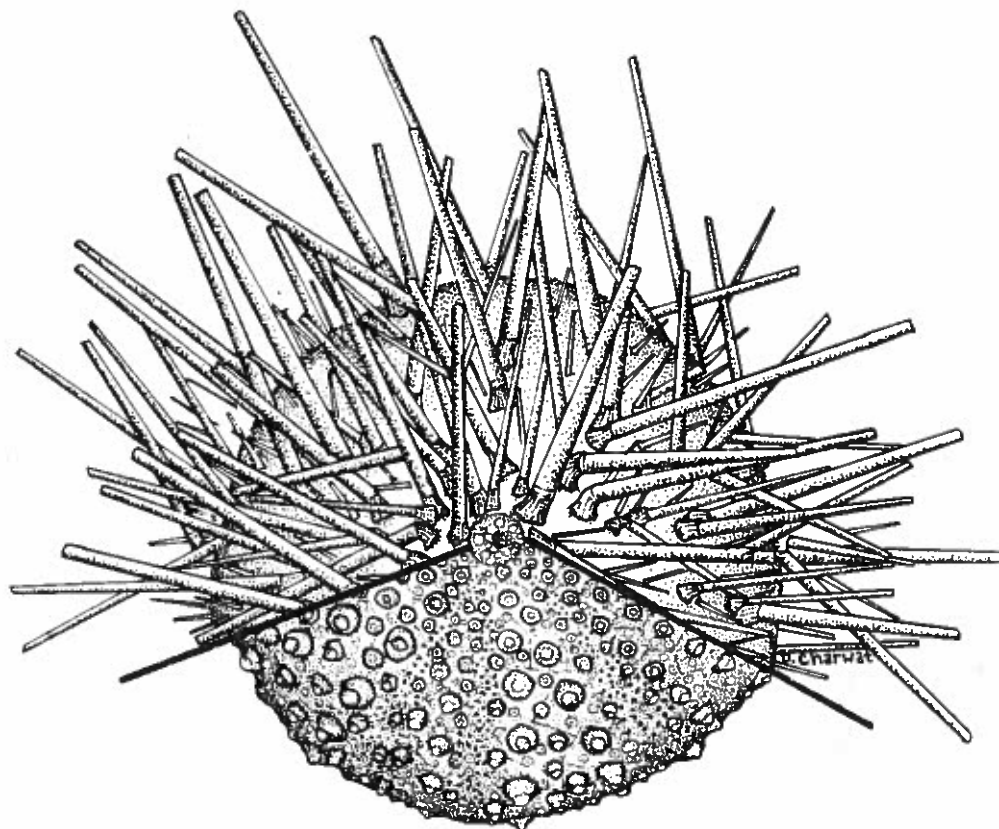
DISTRIBUTION

From Grant and Hertlein 1938: Mugu Lagoon (Ventura County), Palos Verdes, and San Diego, California. Cape San Lucas, La Paz, Aqua Verde Bay, Espiritu Santo Island, San Jose Island, Estero de Punta Banda, and Todos Santos Bay, Baja California.

From Clark 1948: Channel Islands (1 to 12 m), Newport Beach, Balboa, and Corona del Mar, California. La Plata, Ecuador (2 to 3 m). Gorgona Island, Colombia (6 m). Honda Bay, Panama (1 to 2 m).



Strongylocentrotus franciscanus (A. Agassiz 1863)



Strongylocentrotus franciscanus (A. Agassiz 1863)

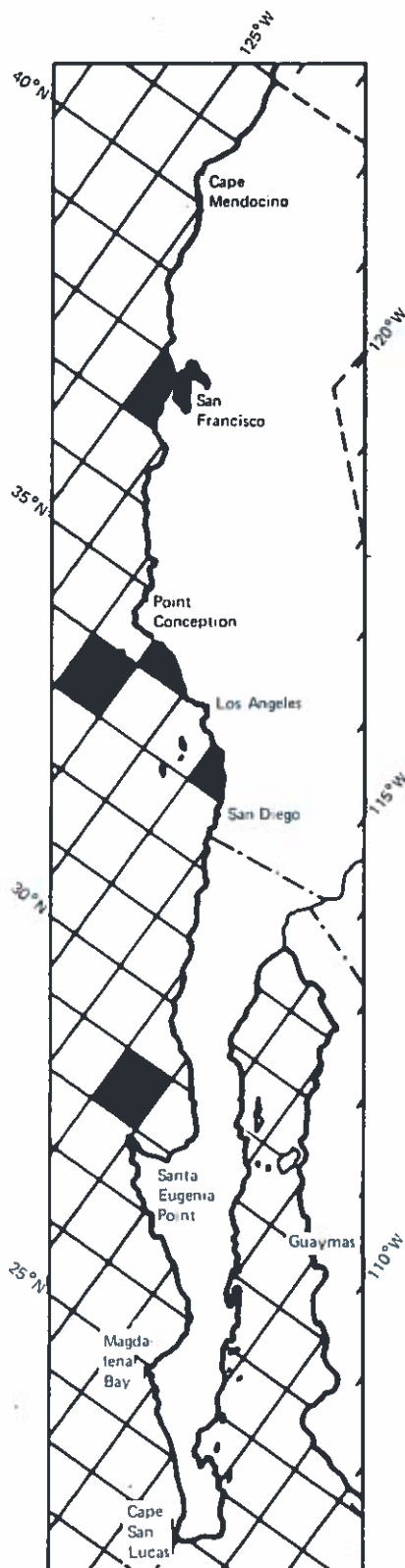
SYNONYMS

Toxocidaris franciscana A. Agassiz 1863.  
Strongylocentrotus franciscanus A. Agassiz 1872; Mortensen 1943.

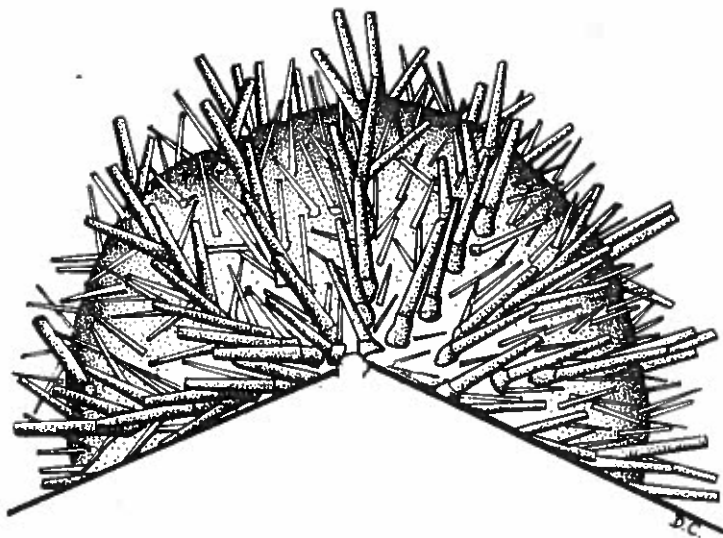
DISTRIBUTION

From Grant and Hertlein 1938: Washington. Santa Rosa Island, California.

From Clark 1948: Oregon. San Francisco (type), Newport Beach, and Balboa, California. Cedros Island, Thurloe Bay, and Petatlan Bay, Baja California.



Strongylocentrotus purpuratus (Stimpson 1857)



Strongylocentrotus purpuratus (Stimpson 1857)

SYNONYMS

Echinus purpuratus Stimpson 1857. Loxechinus purpuratus A. Agassiz 1863. Strongylocentrotus purpuratus A. Agassiz 1872; Mortensen 1943. ?Loxechinus violacens Perrier 1875. Strongylocentrotus purpurascens Stimpson 1900. Toxocidaris purpurata Lambert and Thiery 1914.

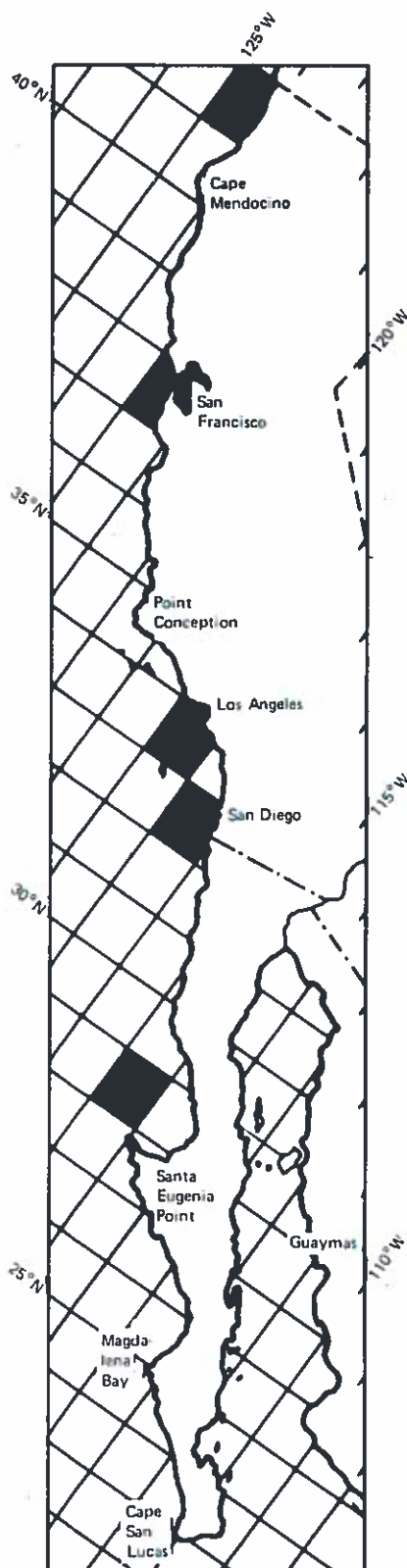
DISTRIBUTION

From Grant and Hertlein 1938: Washington. Crescent City and San Diego, California. Cedros Island, Baja California.

From Clark 1940: Guadalupe Island, Baja California.

From Clark 1948: Oregon. San Francisco, California (type). Petatlan Bay, Mexico. Ranges from Vancouver Island, British Columbia, Canada, to Baja California.

From Coastal Water Project data: Palos Verdes, California.



KEY TO IRREGULAR URCHINS  
Danuta K. Charwat and Jack Q. Word

IRREGULAR URCHINS  
Echinodermata:Echinoidea

Family Hemiasteridae  
Brisaster latifrons (A. Agassiz 1898)

Family Spatangidae  
Lovenia cordiformis A. Agassiz 1872  
Brissopsis pacifica (A. Agassiz 1898)  
Spatangus californicus H. L. Clark 1917  
Gonimaretia laevis H. L. Clark 1917

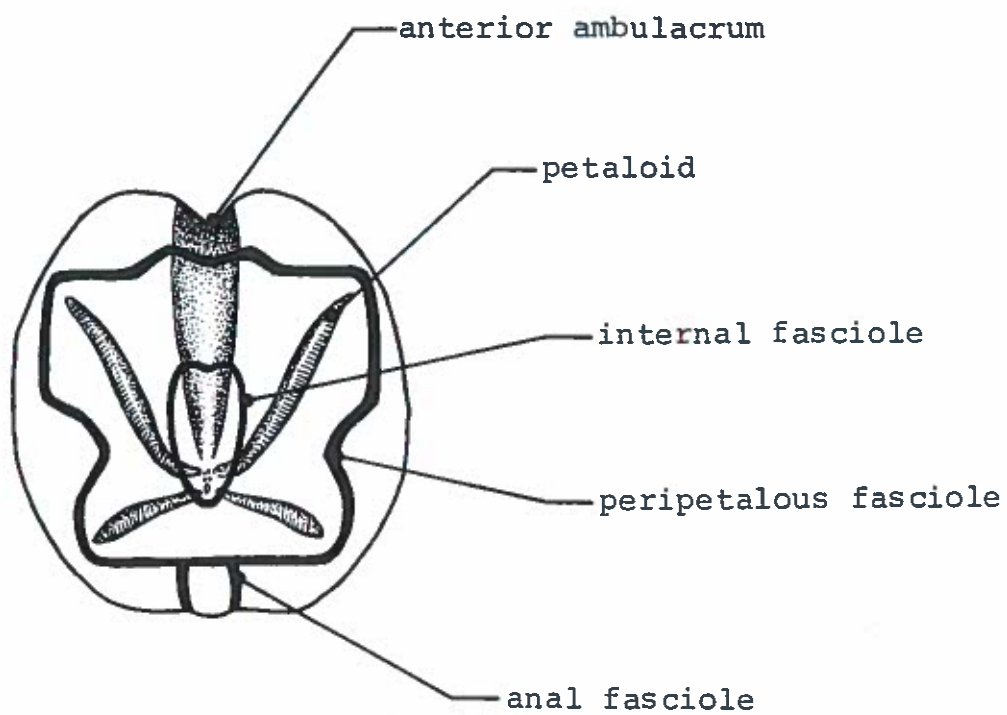


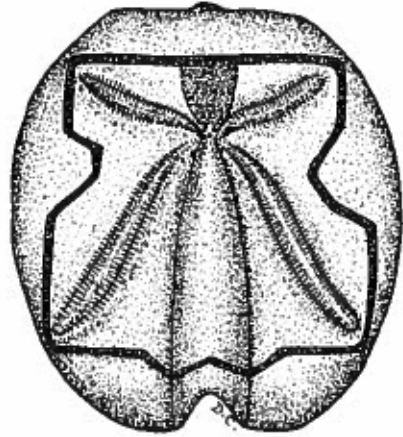
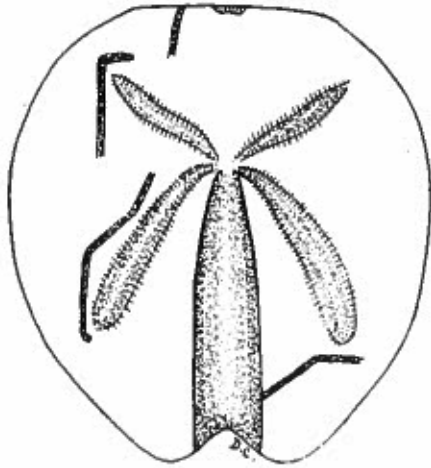
Diagram of irregular urchin features (aboral view).

KEY TO THE  
IRREGULAR URCHINS

- 1 . . . (2) Petaloids deeply sunken (anterior petaloids long, reaching almost to margins of test; posterior petaloids shorter, approximately one-half the length of the anterior ones).  
Brisaster latifrons
- 2 . . . (1) Petaloids not deeply sunken.
- 3 . . . (4) Test elongate, with elongate spines three-fourths to full length of test anteriorly, with two to three tufts of elongate spines at posterior end. An internal fasciole is present.  
Lovenia cordiformis
- 4 . . . (3) Test not elongate. Internal fasciole is not present.
- 5 . . . (8) Test appears bifurcate at anterior end.
- 6 . . . (7) Peripetalous fasciole present.  
Brissopsis pacifica
- 7 . . . (6) Peripetalous fasciole not present.  
Spatangus californicus
- 8 . . . (5) Test more ovoid than elongate and bifurcate at posterior end.  
Gonimaretia laevis



Brisaster latifrons (A. Agassiz 1898)



Fascioles not well developed.

Brisaster latifrons (A. Agassiz 1898)

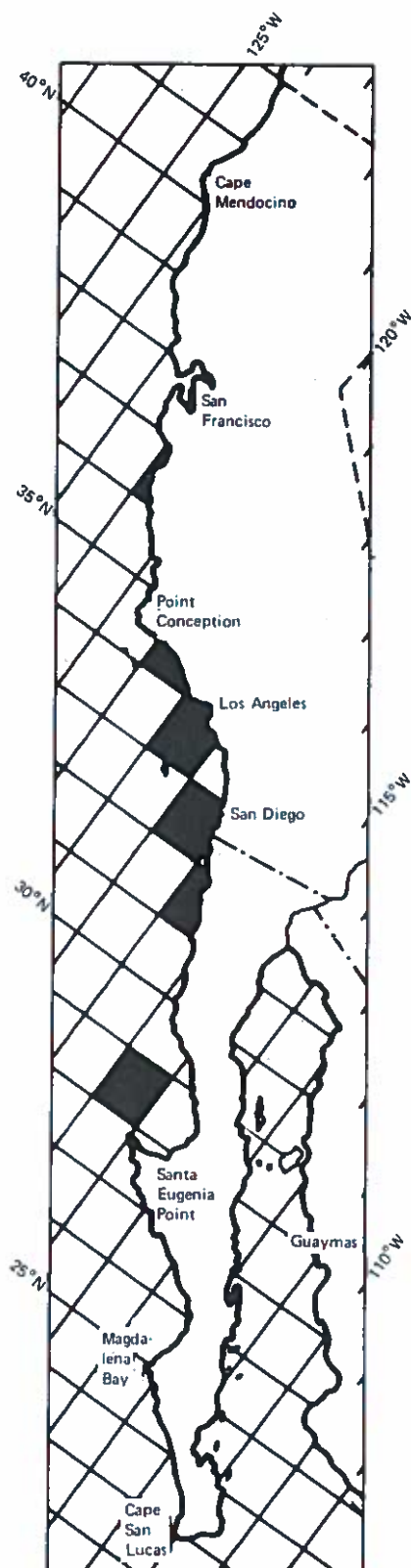
SYNONYMS

Schizaster latifrons A. Agassiz 1898.  
Schizaster townsendi A. Agassiz 1898.  
Schizaster (Brisaster) townsendi Mortensen 1907. Brisaster latifrons Clark 1913, 1917, 1937; Koehler 1924; Grant and Hertlein 1938; McCauley 1967. Brisaster townsendi Clark 1917 (according to McCauley 1967). Oppissaster latifrons Lambert and Thiéry 1924.

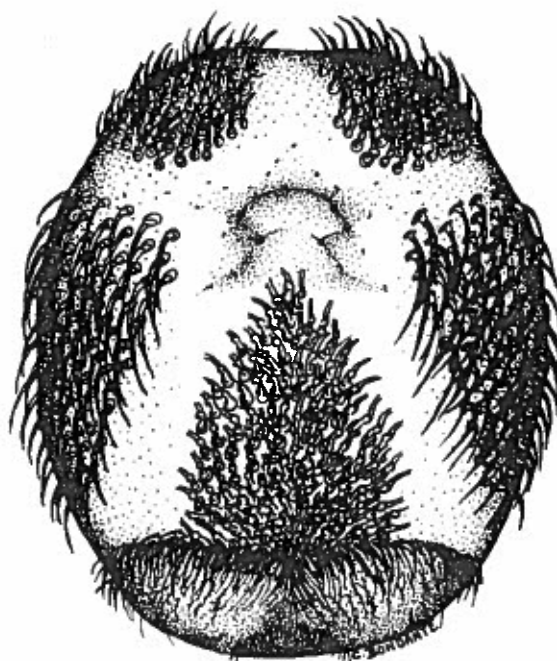
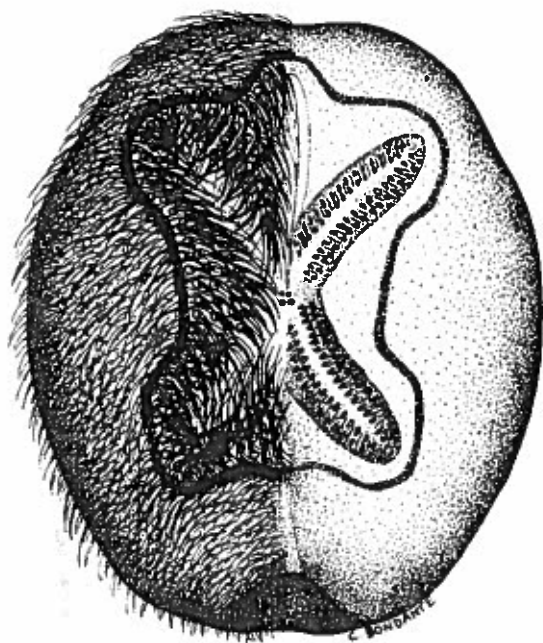
DISTRIBUTION

From Grant and Hertlein 1938: Japan. Korea. Washington (35m). Monterey, Santa Cruz Island, and La Jolla, California. Tres Marias Island, Cedros Island, and Cape Colnett, Baja California. Ranges from Vancouver Island, British Columbia, Canada, to the Gulf of California, Mexico.

From Clark 1948: Redondo Beach (15 to 55m), San Pedro Channel (70 to 80 m), and Santa Cruz Island (20 to 40 m).



Brissopsis pacifica (A. Agassiz 1898)



Brissopsis pacifica (A. Agassiz 1898)

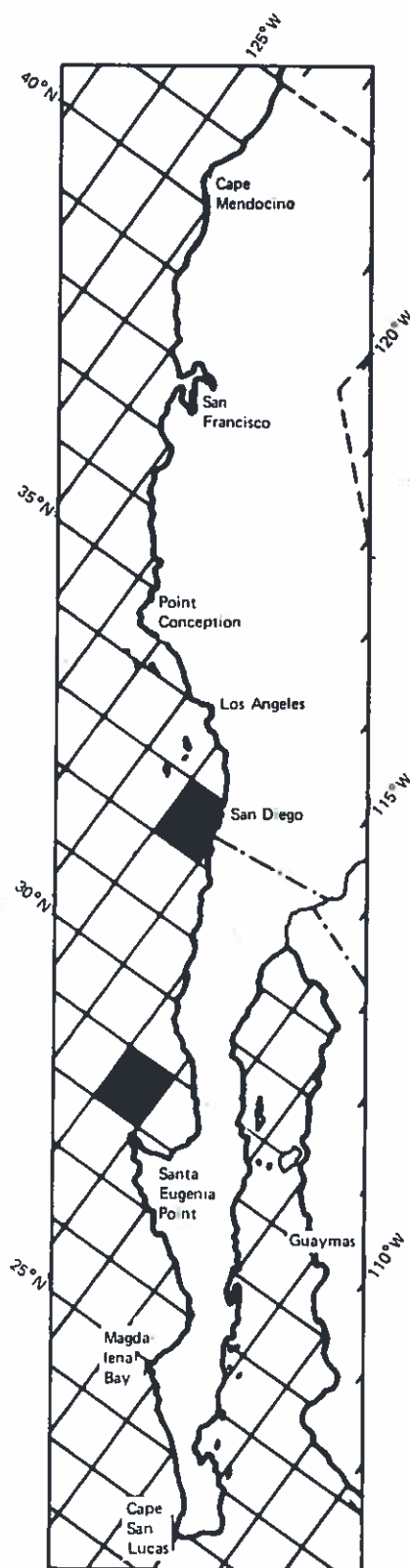
SYNONYMS

Toxobrissus pacificus A. Agassiz 1898, 1904. Brissopsis pacifica Mortensen 1907; Clark 1917, 1923, 1948; Grant and Hertlein 1938; Zeisenhenne 1937. Kleinia pacifica Lambert and Thiery 1925.

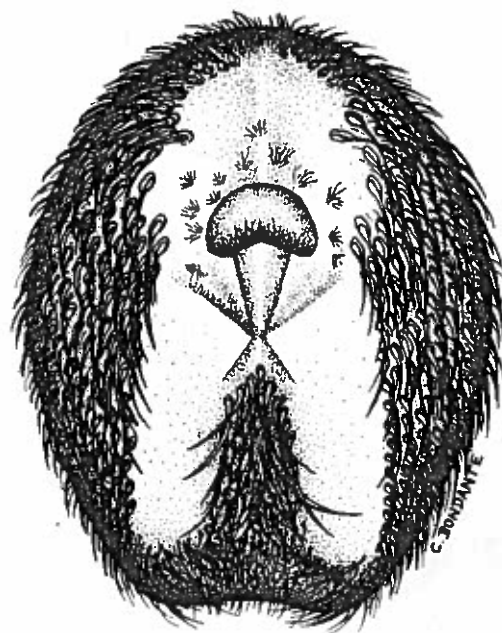
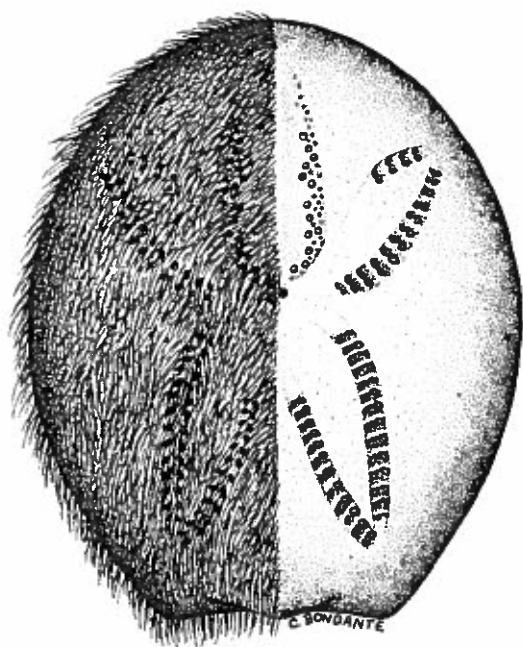
DISTRIBUTION

From Grant and Hertlein 1938: La Jolla, California (dredge 450 m). Found at depths of 6 to 120 m.

From Clark 1940: Cedros Island and San José Point, Baja California (10 to 20 m).



Gonimaretia laevis H. L. Clark 1917

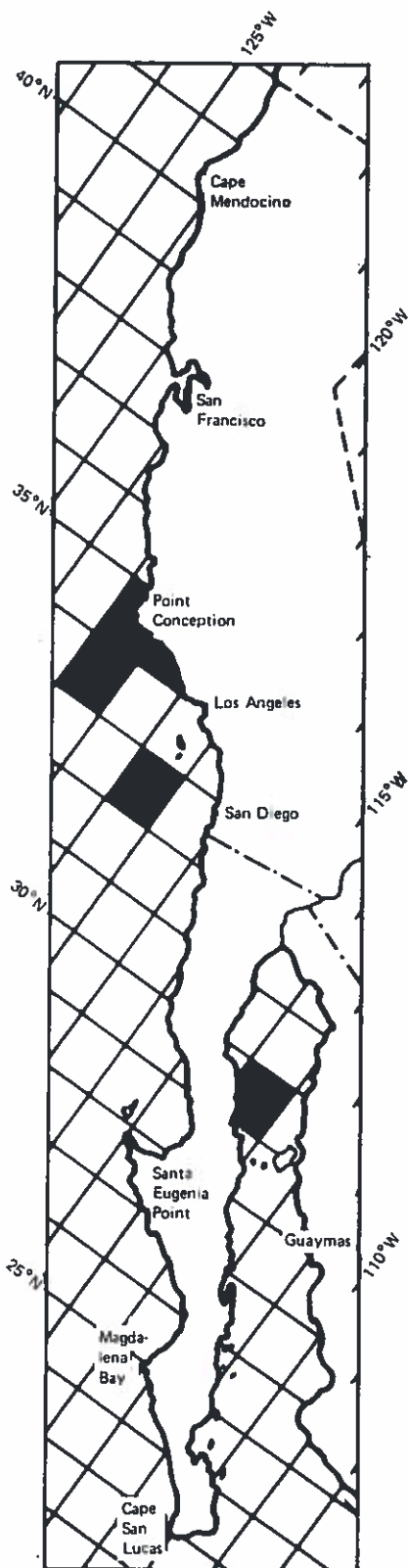


Gonimaretia laevis H. L. Clark 1917

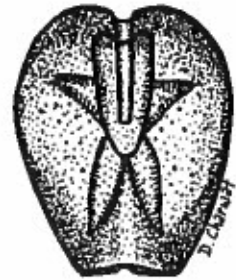
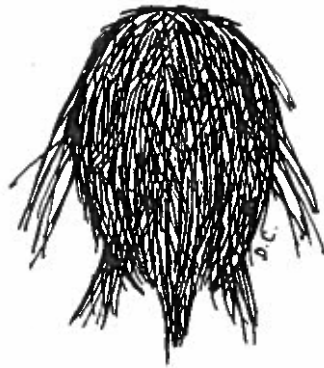
DISTRIBUTION

From Grant and Hertlein 1938: San Clemente Island, California (18 m).

From Clark 1948: Channel Islands, California. Ángel de la Guardia Island, Gulf of California, Mexico.



Lovenia cordiformis A. Agassiz 1872



Fascioles well developed.

Lovenia cordiformis A. Agassiz 1872

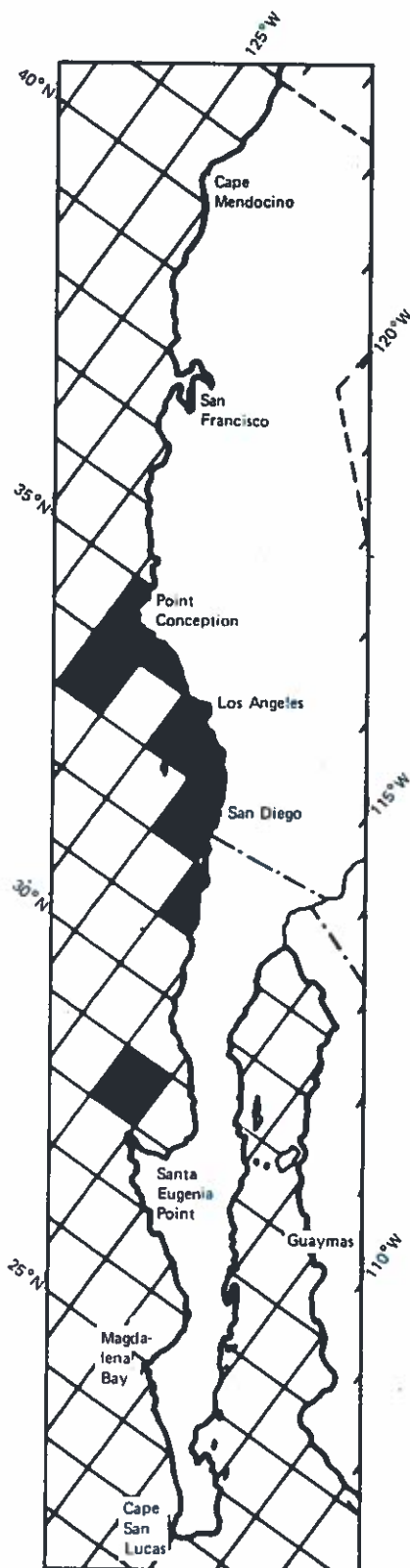
SYNONYM

Lovenia cordiformis A. Agassiz 1900  
(typographical error).

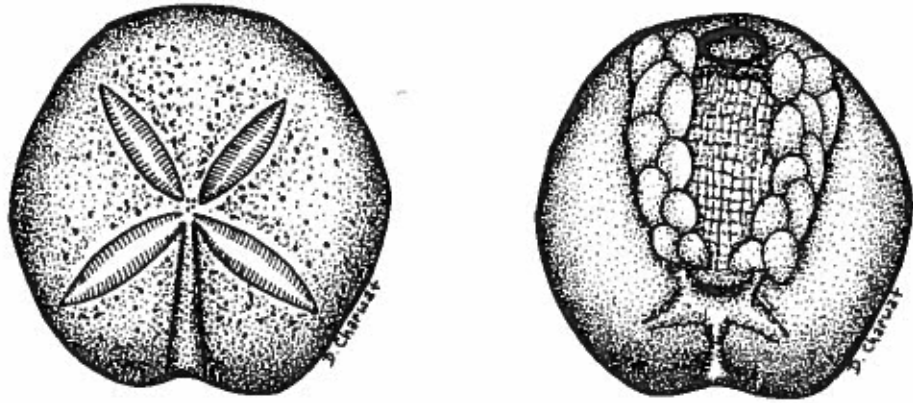
DISTRIBUTION

From Grant and Hertlein 1938: Point Conception, Santa Barbara, and La Jolla, California. Estero de Punta Banda, Todos Santos Bay, San Martin Island, and Cedros Island, Baja California. Mejia Island, Gulf of California, Mexico.

From Clark 1948: San Pedro, Channel Islands, Newport Beach, and Corona del Mar, California. Secas Island and Jicarita Island, Panama. Socorro Island (3 to 9 m). Galapagos Island.



Spatangus californicus H. L. Clark 1917



Spatangus californicus H. L. Clark 1917

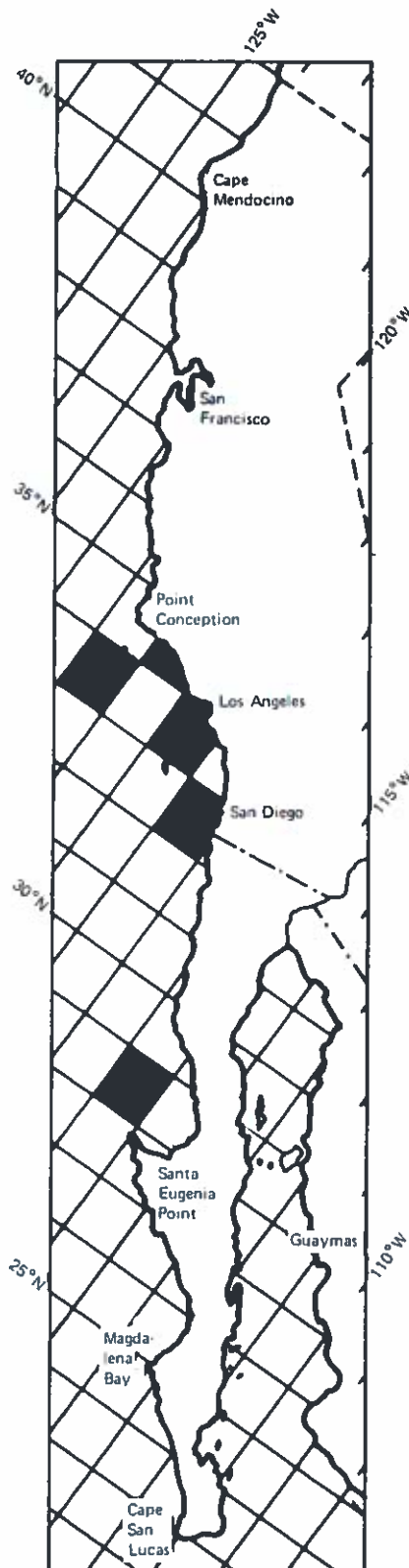
SYNONYM

Prospatangus californicus Lambert and Thiery 1924.

DISTRIBUTION

From Grant and Hertlein 1938: Santa Catalina Island (10 to 25 m) and La Jolla, California. Cedros Island, Baja California. From 450-m dredge samples.

From Clark 1948: Santa Rosa Island, California (40 to 100 m). San Benito Island, Baja California. Coronados Island and San Francisquito Bay, Gulf of California, Mexico.



KEYS TO NATICIDAE

Jack Q. Word

NATICIDAE

Gastropoda: Mesogastropoda

Callinaticina oldroydii (Dall 1897)

Sinum scopulosum (Conrad 1849)

Sinum keratium (Dall 1919)

Sinum debile (Gould 1852)

Polinices draconis (Dall 1903)

Polinices lewisii (Gould 1847)

Neverita alta (Arnold 1903)

Neverita reclusiana (Deshayes 1839)

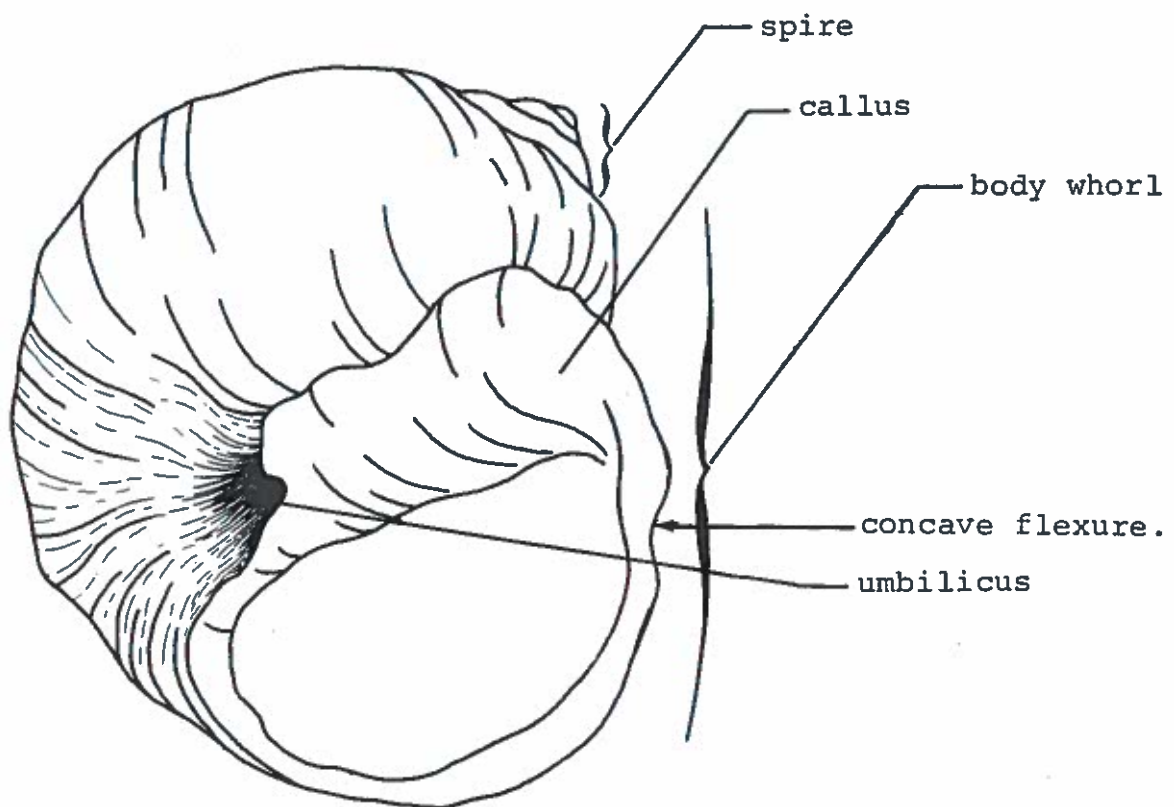


Diagram of naticid features.

## KEYS TO NATICIDAE\*

### KEY TO THE GENERA POLINICES AND NEVERITA

- 1 . . . (4) Callus entering from the upper part of the inner lip, nearly filling umbilicus.
- 2 . . . (3) Umbilical callus brown.
- Neverita alta
- 3 . . . (2) Umbilical callus white.
- Neverita reclusiana
- 4 . . . (1) Callus underdeveloped; does not extend from the upper part of the inner lip and does not close the umbilicus.
- 5 . . . (6) Slight concave flexure on the side of the body whorl is present.
- Polinices lewisii
- 6 . . . (5) Slight concave flexure on the side of the body whorl is not present.
- Polinices draconis

### KEY TO THE GENUS CALLINATICINA

Callinaticina oldroydii is the only species commonly found in the Southern California Bight. It is similar in appearance to Polinices draconis but is distinguishable by its lighter weight and by the thinness of its shell.

### KEY TO THE GENUS SINUM

- 1 . . . (4) Shell convex.
- 2 . . . (3) Shell is spirally striate. This is the largest of the local species.
- Sinum scopulosum

\*Key to the genera of the family Naticidae can be found in Keen 1974.

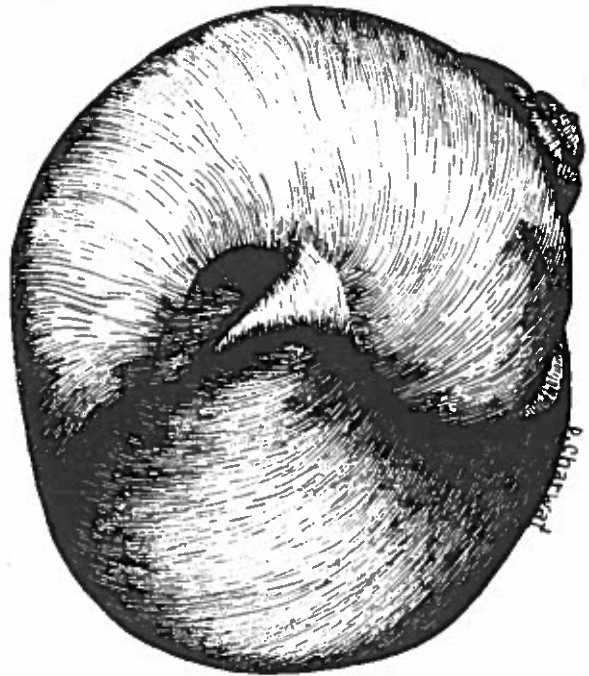
- 3 . . . (2) Shell has only fine incremented lines, which  
give in places a punctate effect.

Sinum keratium

- 4 . . . (1) Shell is depressed, small, thin, and  
translucent.

Sinum debile

Calinaticina oldroydii (Dall 1897)



Calinaticina oldroydii (Dall 1897)

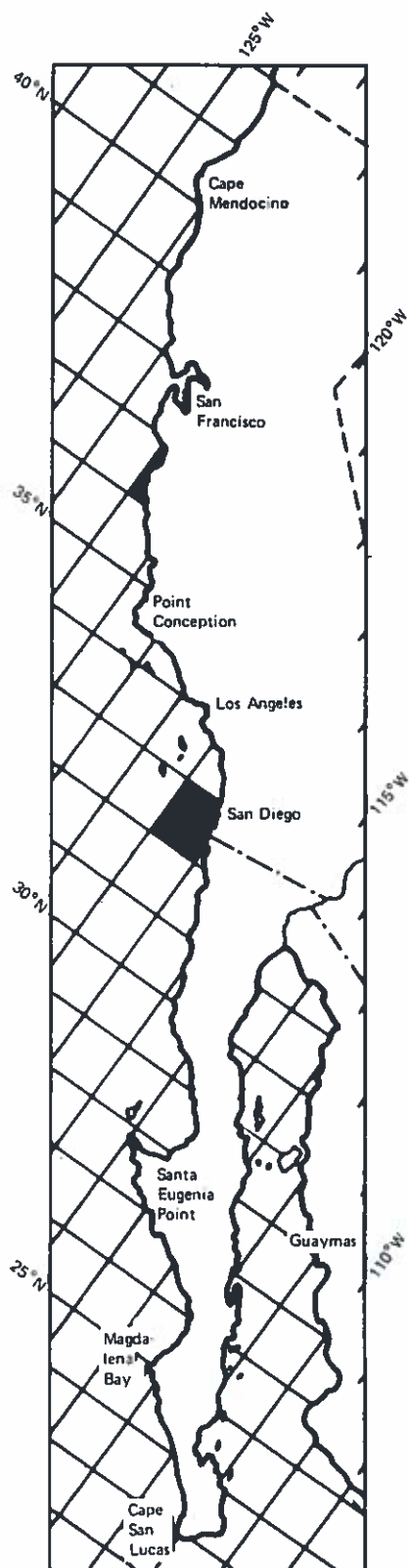
SYNONYMS

Eunaticina oldroydii Dall 1897. Calinaticina Burch and Campbell 1963.

DISTRIBUTION

From Oldroyd 1927: Ranges from Oregon to San Diego, California.

From Smith and Gordon 1948: Monterey Bay, California in 54 to 134 meter depths in mud.



Neverita alta (Arnold 1903)



Neverita alta (Arnold 1903)

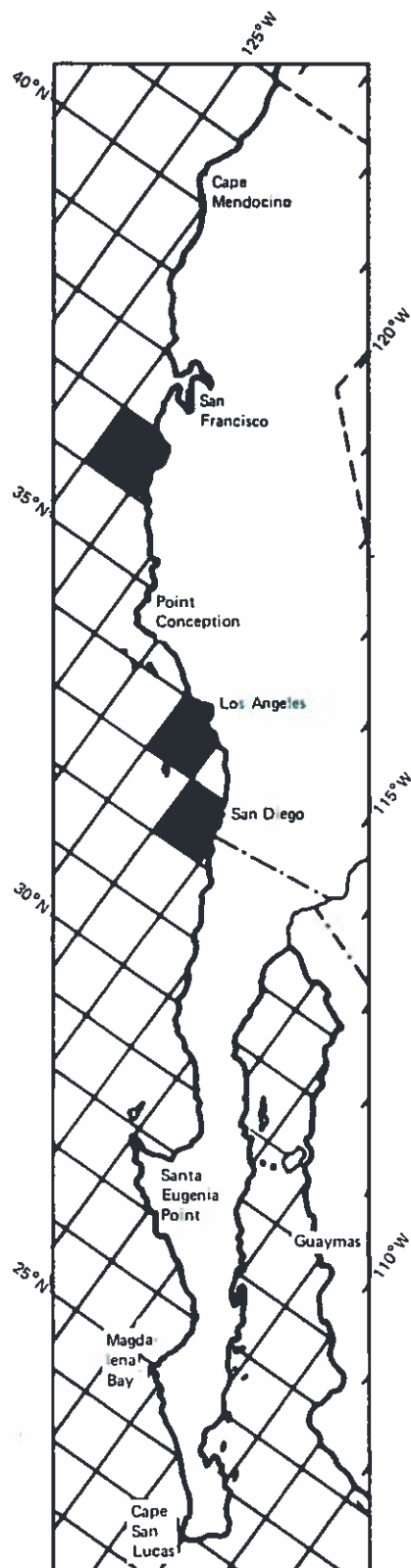
SYNONYMS

Polinices (Neverita) recluziana var. alta (Dall) Arnold 1903; not, Pilsbry 1929. Neverita recluziana var. alta Dall 1909; "not Neverita recluziana var. alta Dall" Arnold 1910; Dall 1921; Oldroyd 1927. Neverita alta Arnold Pilsbry 1929.

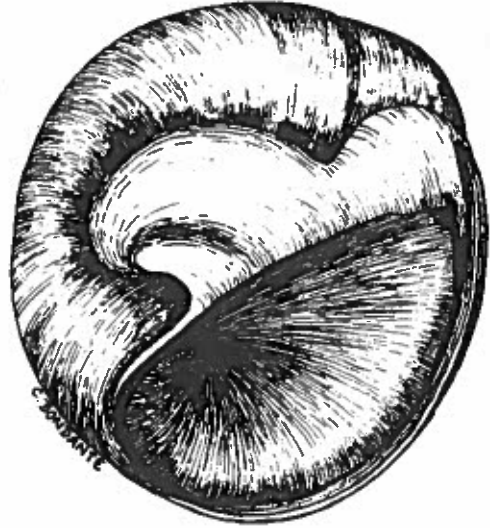
DISTRIBUTION

From Oldroyd 1927: Ranges from Monterey, California to Santa Catalina Island, California.

From Pilsbry 1929: Ranges from Monterey, California to San Diego, California.



Neverita reclusiana (Deshayes 1839)



# Neverita reclusiana (Deshayes 1839)

## SYNONYMS

Natica reclusiana Deshayes 1839; Reeve 1855; Sowerby 1883. Neverita reclusiana Deshayes H. and A. Adams 1853; Gabb 1868-9. Neverita reclusiana Petit, Carpenter 1864; Dall 1874; Cooper 1888; Keep 1888, 1892; Eldridge and Arnold 1907; Arnold and Anderson 1907; Weaver 1909; Arnold 1910; Arnold and Anderson 1910; Smith 1912; English 1914. Natica (Neverita) reclusiana Petit Tryon 1886; Williamson 1892; Clark 1915; Nomland 1916; Martin 1916; Moody 1916; Clark 1918. Polynices (Neverita) reclusiana Deshayes Dall 1892. Polynices (Neverita) reclusiana Petit Arnold 1903. Polinices (Neverita) reclusianus Deshayes Dall 1909, 1921; Oldroyd 1927; Hertlein and Jordan 1927. Natica reclusiana Petit Nomland 1917; Wagner and Schilling 1923; Kew 1924. Polinices reclusiana Deshayes Jordan 1924. Neverita reclusiana (Deshayes) Pilsbry 1929. Neverita reclusiana alta Dall 1878; Nomland 1917. Polinices (Neverita) reclusiana var. alta Dall 1909; not "Neverita reclusiana var. alta Dall" Arnold 1910; Dall 1921; Oldroyd 1927. ?Polynices (Neverita) reclusiana Petit variety alta Dall Arnold 1903. "Neverita callosa Gabb" Anderson and Martin 1914. "Neverita reclusiana Petit, typical form" Arnold, all except 1903. Natica (Neverita) reclusiana andersoni Clark Nomland 1917; Clark 1918.

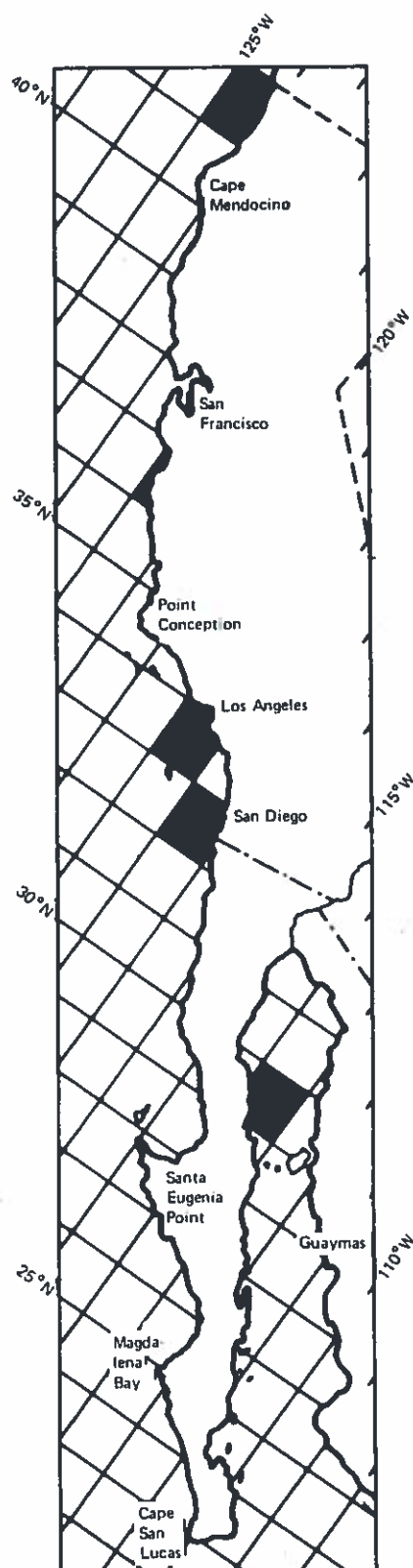
## DISTRIBUTION

From Coastal Water Project data: Palos Verdes, California.

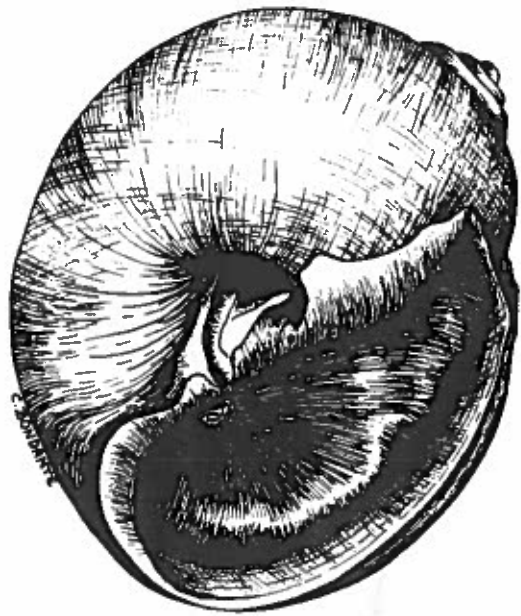
From Oldroyd 1927: Ranges from Crescent City, California to Tres Marias Island, Mexico. Chile.

From Coan 1968: Bahia de los Angeles, Baja California.

From Grant and Gale 1971: Ranges from Monterey to San Diego, California. Santa Catalina Island, California.



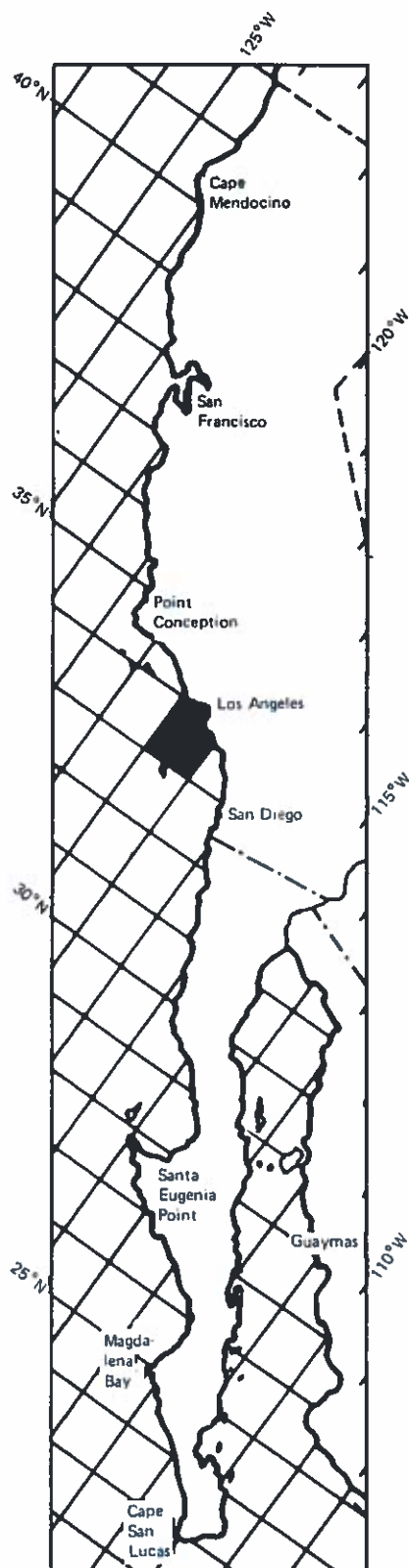
Polinices draconis Dall 1903



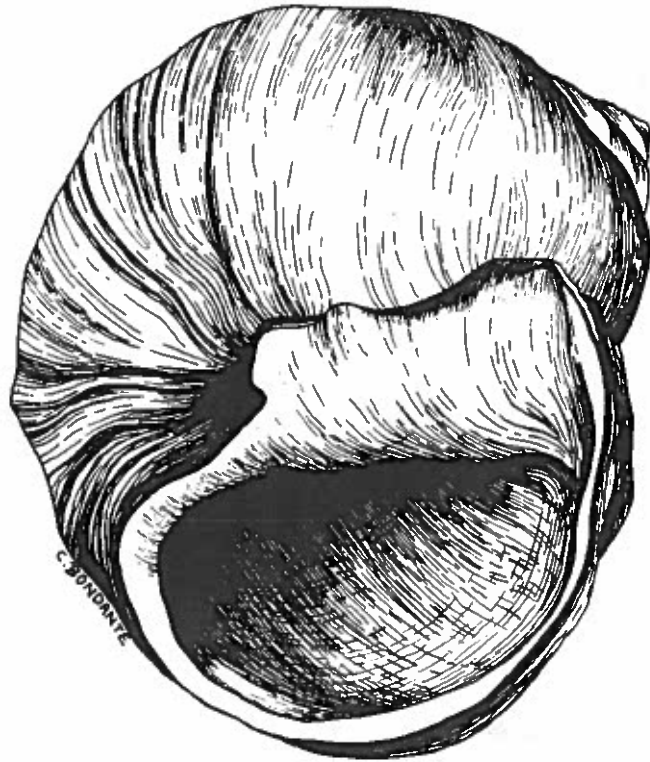
Polinices draconis Dall 1903

DISTRIBUTION

From Oldroyd 1927: Ranges from Port Althorp to Santa Catalina Island, California.



Polinices lewisii (Gould 1847)



Polinices lewisii (Gould 1847)

SYNONYMS

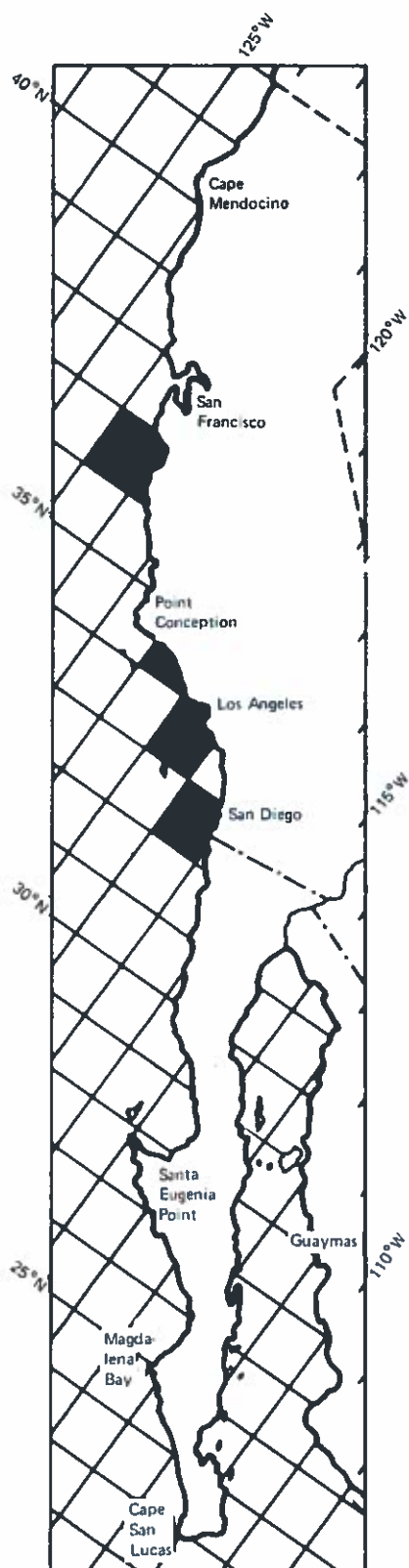
Natica lewisii Gould 1847. Lunatia lewisii Carpenter 1864. Polinices lewisii Arnold 1903. Polinices (Euspira) lewisii Dall 1921.

DISTRIBUTION

From Oldroyd 1927: Ranges from Nanaimo, British Columbia, Canada to San Pedro, California.

From Grant and Gale 1971: Ranges from Duncan Bay, British Columbia, Canada to Santa Barbara, California and San Diego, California.

From Smith and Gordon 1948: Monterey and Elkhorn Slough, California. Found sub-tidal to 45 meters.



Sinum debile (Gould 1852)

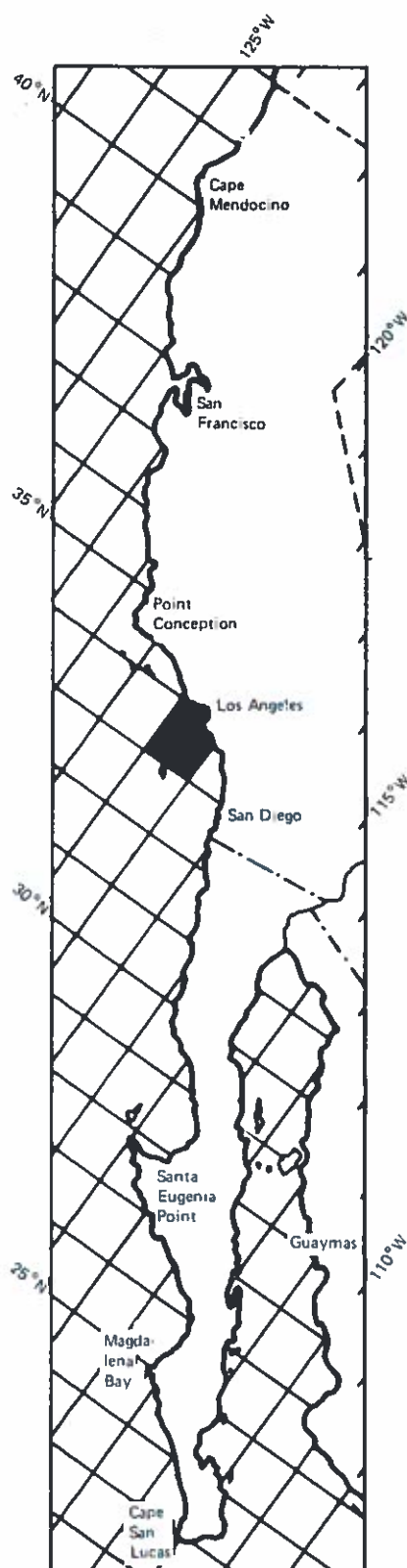
Sinum debile (Gould 1852)

SYNONYMS

Sigaretus debilis Gould 1853; Carpenter 1856; Tyron 1886; Cooper 1888; Keep 1888, 1892; Arnold 1903. Sinum debile (Gould) Dall 1921; Oldroyd 1927.

DISTRIBUTION

From Oldroyd 1927: Ranges from Santa Catalina Island, California, to the Gulf of California, Mexico.



Sinum keratium Dall 1919

Sinum keratium Dall 1919

DISTRIBUTION

From Oldroyd 1927: Santa Catalina Island, California (known from type locality only).



Sinum scopulosum (Conrad 1849)

Sinum scopulosum (Conrad 1849)

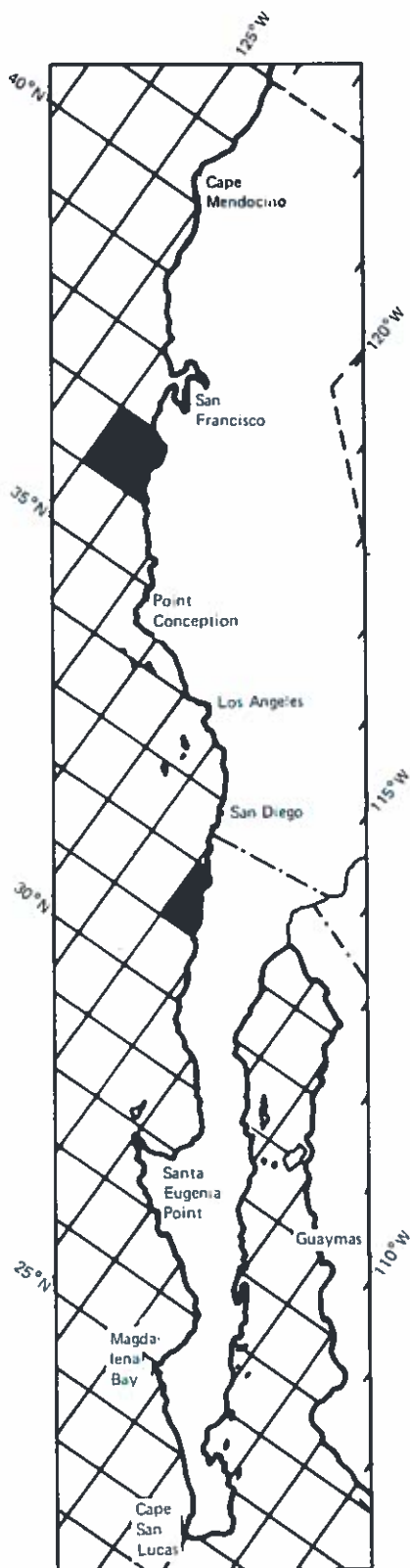
SYNONYMS

Sigaretus scopulosus Conrad 1849; Catinus scopulosus Meek 1864; Stomatia scopulosa Meek 1864; Sinum planicostum Gabb 1868-69; Sigaretus planicostum Cooper 1896; Sinum californicum Oldroyd 1917; ?Sinum (Sigaretus) trigenarium Trask 1922; Sinum scopulosum (Conrad) Meek 1864; Gabb 1868-69; Dall 1909; Arnold and Hannibal 1913; English 1914; Clark 1915, 1918; Trask 1922; Kew 1924; Stewart 1927.

DISTRIBUTION

From Oldroyd 1927: Ranges from Monterey, California to Todos Santos Bay, Baja California.

From Smith and Gordon 1948: Monterey, found below low tide.



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INFORMATION ON SPECIMENS  
ILLUSTRATED IN THIS VOLUME

CANCER<sup>1</sup>

Cancer productus, whole; Palos Verdes, California (60 m); female, 128 mm.

Cancer productus, rostrum; Palos Verdes, California (23 m); male, 53 mm, juvenile.

Cancer gracilis, Palos Verdes, California (23 m); female, 68 mm.

Cancer oregonensis, Palos Verdes, California (23 m); female, 19 mm.

Cancer antennarius, male, 63 mm.

Cancer jordani, carapace; Orange County, California (15 m); female, 13 mm.

Cancer jordani, fronto-orbital teeth; San Clemente Island, California (5-8 m); male, 5 mm.

Cancer amphioetus, carapace; female, 22 mm.

Cancer amphioetus, cheliped; female, 16 mm.

Cancer branneri, San Francisco, California (18 m); male, 15 mm.

Cancer anthonyi, Palos Verdes, California (55 m); female, 130 mm.

XANTHIDAE<sup>1</sup>

Pilumnus spinohirsutus, Palos Verdes, California; female, 19 mm.

Heteractea lunata, Pinas Bay, Allan Hancock Foundation, Catalog No. 437-85.

Cycloxanthops novemdentatus, San Pedro, California; Allan Hancock Foundation, Acc 190.

Paraxanthias taylori, Palos Verdes, California; female, 26 mm.

Lophopanopeus leucomanus, Portuguese Bend, California; male, 12 mm.

Lophopanopeus bellus, Dana Point, California (85-86 m); female, 11 mm.

Lophopanopeus frontalis, pleopod; Mission Bay, California.

LOXORHYNCHUS<sup>2</sup>

Loxorhynchus grandis, Santa Monica Bay, California; male, 135/165 mm.

Loxorhynchus crispatus; female, 60/83 mm.

1. The size measurements for all crab specimens refer to the greatest width of the carapace.

2. The first size measurement for each Loxorhynchus specimen refers to the greatest carapace width; the second measurement refers to the greatest length.

### ASTROPECTEN<sup>3</sup>

Astropecten braziliensis, Santa Catalina Island, California (23 m);  
28 mm.

### PISASTER<sup>3</sup>

Pisaster ochraceus, Paradise Cove, California (intertidal); 34 mm.

Pisaster brevispinus; 47 mm.

Pisaster giganteus, Malibu Pier, California; 39 mm.

### REGULAR URCHINS<sup>4</sup>

Centrostephanus coronatus

Lytechinus pictus, Mission Bay, California (subtidal; bay form);  
38 mm; Allan Hancock Foundation Catalog No. 13.44.

Lytechinus anamesus, Santa Catalina Island, California (23 m);  
21 mm.

Allocentrotus fragilis, Santa Monica Bay, California (23 m); 32 mm.

Strongylocentrotus purpuratus, Paradise Cove, California (inter-  
tidal); 21 mm.

Strongylocentrotus franciscanus, Palos Verdes, California (sub-  
tidal); 72 mm.

### IRREGULAR URCHINS<sup>5</sup>

Brisaster latifrons, Santa Monica, California (185 m); 47/42 mm.

Lovenia cordiformis; 26/32 mm.

Spatangus californicus, Santa Catalina Island, California (130 m);  
58/65 mm.

Brissopsis pacifica, Coronado Island, Mexico (512 m); 45/60 mm;  
Allan Hancock Foundation Catalog No. 50.76

Seal Beach, California (106-200 m); 29/33 mm.

Gonimaretia laevis, Angel de la Buardia Island, Gulf of California  
(114-120 m); 21/26 mm; Allan Hancock Foundation Catalog  
No. 56.11

### NATICIDAE<sup>6</sup>

Polinices draconis, Palos Verdes, California (138 m); 58 mm.

Neverita reclusiana, Seal Beach, California (beach drift); 21 mm.

Neverita alta, San Diego, California; 17 mm.

Polinices lewisii, Balboa Island, California (-0.3 m); 125 mm.

Calinaticina oldroydii, Palos Verdes, California (138 m); 56 mm.

3. The size measurements for all starfish specimens refer to the diameter of the disk.

4. The size measurements for all regular urchin specimens refer to the diameter of the test.

5. The first size measurement for each irregular urchin refers to the greatest width of the test; the second measurement is the greatest length.

6. The size measurements for all naticid specimens refers to the length from apex to the lowest point of the body whorl.

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