Southern California Association of Marine Invertebrate Taxonomists

3720 Stephen White Drive
San Pedro, California 90731

February, 1992 Vol. 10, No. 10

NEXT MEETING:	Abranchiate Terebellids (Amphitritinae)
GUEST SPEAKER:	Leslie Harris Allan Hancock Foundation University of Southern California
DATE:	March 9, 1992 9:30am - 3:00pm
LOCATION:	Alan Hancock Foundation Building, Room 30 University of Southern California Los Angeles, California

MARCH 9 MEETING:

The genera that will be covered are Lanassa, Proclea, and Leaena. Remember to bring any problem specimens with you to the meeting.

MINUTES FROM MEETING ON FEBRUARY 10, 1992:

Ron Velarde began the meeting by disclosing a new record of Nymphon sp. (Pycnogonida-Nymphonidae) collected in an otter trawl off Point Loma in ≈300 ft. of water. He also passed on the following announcement from Eric Marshall of the Smithsonian, dated January 9, 1992.

> The Smithsonian Institution has recently prepared a CD-ROM which contains three bibliographies:

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

Literature on the Polychaeta - by L. A. Ware and K. Fauchald;
Interdisciplinary bibliography of freshwater crayfishes... through 1988 - by J. Clark and C. W. Hart Jr.;
Cephalopod computerized bibliographic system (CCBS) - by C. F. R. Roper.

This is marked as Smithsonian Institution CD-ROM No. 1. The CD runs on ROMWARE which is on the CD and does not have to be down loaded on to the your hard drive. Copies are available free of charge. Write to:

C. W. Hart, Jr.
NHB 163
Smithsonian Institution
Washington, DC 20560.

Thanks to Dave Vilas for the information.

Nominations for 1992-93 SCAMIT officers were taken at the meeting and were left open for rest of the week. The following names were entered for nomination:

Ron Velarde - President
Larry lovell - Vice President
Ann Martin - Treasurer
Don Cadien - Secretary
Diane O'Donohue - Secretary

Short biographies of all the nominees along with a ballot have been included with the newsletter. Ballots are due by March 16. They can be either mailed to Larry Lovell or bring them to the March meeting. See ballot for the mailing address.

Ophiuroidea Workshop: Dr. Gordon Hendler began the workshop with a brief review of the families of Ophiuroidea. He then discussed some work being done at SCCWRP on aboral disk regeneration. It seems that the pattern of scales depends on whether the disk has been regenerated or not. A regular pattern of scales is lost after regeneration.

On the subject of Amphiodia urtica verses A. digitata Dr. Hendler explained the A. digitata has scales with spines along the entire outer margin of the disk. A. urtica spines are clustered near the radial shields. A more complete explanation along with keys and illustrations have been included in the newsletter.

Dr. Hendler has ask all SCAMIT members to report to him any large populations of A. digitata that you may find.

FUTURE MEETINGS:

The April 13 meeting will be lead by Don Cadien of the Los Angeles County Sanitation District. The subject will be Thalassinoid shrimp. It will be held at the Cabrillo Marine Museum, San Pedro, California.

Amphipod workshop: Hard working Larry Lovell has confirmed Dr. E. L. Bousfield for the 1992 Amphipod Workshop tentatively scheduled for December 7 and 8.

SCAMIT OFFICERS:

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

President	Ron Velarde	(619)692-4903*
Vice-President	Larry Lovell	(619)945-1608
Secretary	Kelvin Barwick	(619)692-4900*
Treasurer	Ann Martin	(213)648-5317

* **Please make a note that these are new numbers.**

CANDIDATE BIOGRAPHIES

PRESIDENT

Ron Velarde

Ron is the current SCAMIT President and past Vice-President; he is a marine biologist with the Point Loma Wastewater Treatment Facility (City of Sand Diego) where he has worked since 1983. His taxonomic interests include poychaetes, particularly syllids, and nudibranch mollusks. He earned his B.S. degree in Marine Biology from California State University, Long Beach, in 1976, and did post-graduate research on the systematics and ecology of autolytid polychaetes.

VICE-PRESIDENT

Larry Lovell

Larry is currently a private consultant and Vice-President of SCAMIT. Prior to his independent status, he was employed at Point Loma Wastewater Treatment Facility (City of San Diego). He also worked MEC Analytical Systems for 12 years. Prior to that he worked under the guidance of Dr. Kristian Fauchald in the Worm Room at the Allan Hancock Foundation in 1975 and 1976 on the BLM project. He earned his B.S. in Biology from the University of South Carolina in 1973. His primary taxonomic interest is polychaetes.

SECRETARY

Diane O'Donohue

Diane is employed by the city of San Diego. Previously, from 1987 to 1991, she worked for the Southern California Coastal Water Research Project (SCCWRP) specializing in polychaete identification and data management. She did her post graduate work Long Beach State. Diane has been a member of SCAMIT since 1988 and received a B.S. in Biology from Old Dominion University in Norfolk, Va. in 1986. During her undergraduate training she worked as a student intern sorting samples from the Chesapeake Bay and Atlantic Ocean and she also participated in field sampling. Since 1986 Diane has maintained an interest in the study of marine invertebrates, particularly polychaetes.

Don Cadien

Don graduated with a B.S. in Zoology from California State University at Long Beach. He is presently employed by the County of Los Angeles Sanitation District as a Marine Biologist. From 1975-1989 he was Project Manager/Principal Investigator for MBC Applied Environmental Sciences. His

Order OPHIURIDA Müller & Troschel, 1840
in Mesophiuroida Matsumoto, 915

KEY TO THE SUBORDERS, FAMILIES AND SUBFAMILIES

1 (8) Disc and arms covered by thick skin which may contain a mosaic of granules but does not overlie a layer of plates or scales. Arm-spines point downwards. Arms roll into vertical coils. Vertebrae articulate by broad, hourglass-shaped surfaces . . . . Suborder EURYALAE M. & T. p. 7.)

2 (7) Vertebrae with a ventral furrow, so that the radial canal and nerve are not imbedded in stereom; distal arm-joints not long and slender.

3 (4) Hooks on dorsal side of arms; the hooks have no lamina and lack regularly arranged perforations; gonads restricted to disc. . . . (Family GORGONOCEPHALIDAE Ljungman, 1867, emend. Mortensen, 1933. p. 7.)

4 (3) No hooks on dorsal side of arms; but at distal end of arm the lateral arm-spines are transformed into hooks which lack a lamina and lack perforations.

5 (6) Gonads restricted to disc. (Fam. ASTERONYCHIDAE Verrill, 1899, emend. Mortensen, 1933. p. 11.)

6 (5) Gonads extending on at least midway along the arms. . . . (Fam. ASTEROSCHEMATIDAE Verrill, 1899, restr. Mrsan, 1953; non Matsumoto, 1915. p. 11.)

7 (2) Vertebrae with ventral furrow closed over, so that radial canal and nerve lie within the vertebrae; distal arm-joints long and slender; no hooks on dorsal side of arms, but at distal end of arm the lateral arm-spines are transformed into hooklets with a lamina perforated by serially arranged holes (Fam. EURYALIDAE Gray, 1840, emend. Mortensen, 1933, p. 10.)

8 (1) Disc and arms covered by scales or plates (sometimes invested by skin or granules). Arm-spines placed laterally on arms. Arms usually move horizontally (but in Fam. Hemieuryalidae they roll vertically). . . . (Suborder OPHIURAE Mueller & Troschel, p. 12.)

9 (10) Arms rolling vertically into tight coils. Vertebrae with broad, saddle-shaped articulations, like those of the Order Euryalae. Usually epizoic upon gorgonian corals . . . . (Fam. HEMIEURYALIDAE Verrill, 1899. p. 12.)

10 (9) Arms bending only sideways in the horizontal plane. Vertebrae with ball-and-socket joints, or with interlocking processes. Usually free-living, only very rarely epizoic.

11 (12) Disc without ventral interradial areas. Gonads arranged serially along the arms on either side, bulging visibly below the skin. Stomach sending a dorsal radial diverticulum into each arm. . . . (Fam. OPHIOCANOPIDAE Mortensen, 1933. p. 15.)

12 (11) Disc with conspicuous ventral interradial areas. Gonads and stomach confined to disc.

13 (16) Thick soft skin covers the plates of disc and arms, but the underlying plates and scales become visible after drying. Arm-spines erect. . . . . (Fam. OPHIOMYXIDAE Ljungman, 1866. p. 13.)

14 (15) Oral shields small. Adoral plates long and slender, lying between the oral shield and the first lateral arm-plates. Vertebrae long and slender, the articular peg well-developed . . . . (Subfam. OPHIOMYXINAE Ljungman, 1866, restr. Matsumoto, 1915, p. 13.)

15 (14) Oral shields and adoral plates fused together, massive. Adoral plates proximal to oral shield. Vertebrae short, thick, the articular peg rudimentary or lacking. . . . . (Subfam. OPHIOBYRSINAE Matsumoto, 1915, p. 15.)

16 (13) Disc and arms not covered by thick skin. Scales and plates easily visible, though they may carry spines or granules more or less concealing them on the disc.

17 (20) Spiniform tooth-papillae forming a cluster at the apex of each jaw.

18 (19) Oral papillae border each jaw. (Fam. OPHIOCOMIDAE Ljungman, 1867. p. 23.)

19 (18) No oral papillae. (Fam. OPHIOTRICHIDAE Ljungman, 1867. p. 23.)

20 (17) No tooth-papillae.

21 (22) Paired infradental papillae at the apex of each jaw. . . . . (Fam. AMPHIURIDAE Ljungman, 1867, p. 20.)

22 (21) An unpaired infradental papilla at the apex of each jaw.

23 (28) Arms inserted laterally into the disc and firmly fused to it.

24 (25) Granulation covers over the disc-scales of both upper and lower surfaces, often also covering the jaws. . . . (Fam. OPHIODERMATIDAE Ljungman, 1867. p. 26.)

25 (24) No granulation. . . . (Fam. OPHIURIDAE Lyman, 1865. p. 28.)

26 (27) Second oral tentacle-pore opens more or less entirely outside the oral slits. . . . (Subfam. OPHIURINAE Lyman, 1865, restr. Matsumoto, 1915, p. 28.)

27 (26) Second oral tentacle-pore opens entirely within the oral slit. (Subfam. OPHIOLEPIDINAE Matsumoto, 1915, p. 32.)

28 (23) Arms inserted ventrally below the disc and partly overlain by the disc, the arms and disc not firmly fused together.

29 (36) Free margins of jaw bear a continuous series of uniform oral papillae.

30 (35) No granulation or spinules on disc.

31 (32) Arms robust, not constricted at the nodes. A ventral keel on the midline of each ventral arm-plate, often also a similar keel on the dorsal arm-plates. Disc large, flat. . . . . (Fam. OPHIOCHITONIDAE Matsumoto, 1915, p. 26.)

32 (31) Arms slender, elongate, with no ventral or dorsal keels. Vertebrae long, slender, often divided longitudinally by a series of pores. . . . (Fam. OPHILEPTIDIDAE Matsumoto, 1915. p. 25.)

33 (30) Granules or spinules present on disc. Arms slender, often constricted at the nodes. Mainly abyssal forms.

34 (35) Arm-spines numerous, long, conspicuous, erect. . . . (Fam. OPHIACANTHIDAE Perrier, 1891. p. 15.)

35 (34) Arm-spines few, small, inconspicuous, adpressed. . . . (Fam. OPHIOLEUCIDAE Matsumoto, 1915. p. 19.)

36 (29) Free margins of jaw do not bear a continuous series of uniform papillae; instead, there is a diastema separating the lateral oral papillae from the dissimilar infradental papillae at the apex of the jaw. . . . (Fam. OPHIACTIDAE Matsumoto, 1915. p. 23.)

C/SC Phrynophiurida (includes ophiomyxina and Euryalina)

C/SC Ophiurida (includes:
Chilophiurina
Ophiuridae
Ophiolepididae
Ophiocomidae
Ophiotrichidae
Ophiodermatidae
Laemophiurina
Hemieuryalidae
Ophiacanthidae
Gnathophiurina
Amphiuridae
(Amphilepididae
Ophiactidae
Ophiotrichidae

For higher order classification see:
Treatise on Invertebrate Paleontology
Part U
Echinodermata 3
Volume 1
ed. R.C. Moore

Fell, H.B. 1960 Synoptic keys to the Genera of Ophiuroidea. Zoology Publications from Victoria University of Wellington No. 26, 44 pp.

CONTRIBUTIONS IN SCIENCE is a series of miscellaneous technical papers in the fields of Biology, Geology and Anthropology, published at irregular intervals by the Los Angeles County Museum of Natural History. Issues are numbered separately, and numbers run consecutively regardless of subject matter. Number 1 was issued January 23, 1957. The series is available to scientific institutions on an exchange basis. Copies may also be purchased at a nominal price.

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MANUSCRIPT FORM.—(1) The 1960 AIBS Style Manual for Biological Journals is highly recommended as a guide. (2) Typewrite material, using double spacing throughout and leaving ample margins, on only one side of 8½ x 11 inch standard weight paper. (3) Place tables on separate pages. (4) footnotes should be avoided if possible. (5) Legends for figures and unavoidable footnotes should be typed on separate sheets. Several of one kind may be placed on a sheet. (6) Method of literature citation *must* conform to CONTRIBUTIONS style—see number 90 and later issues. Spell out in full the title of non-English serials and places of publication. (7) A factual summary is recommended for longer papers. (8) A brief abstract must be included for *all* papers. This will be published at the head of each paper.

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DAVID K. CALDWELL
Editor

A KEY TO THE SPECIES OF OPHIUROIDEA (BRITTLE STARS) OF THE SANTA MONICA BAY AND ADJACENT AREAS[1]

By RICHARD A. BOOLOOTIAN[2] AND DAVID LEIGHTON[3]

ABSTRACT: Thirty ophiuroid species occur off the coast of Southern California. The bathymetric range, color in life, habitat, and meristic characteristics are considered. A *dichotomous* key is presented.

Southern California ophiuroids are now well catalogued, although no key to the species existing in any geographically distinct region of the California shore and the continental shelf between La Jolla and Monterey has been previously published.

The pioneer work in the field of Pacific North American ophiuroids was done by Lyman (1861), who listed ten species and later increased the figure to sixteen. Nine species were added to the list by Clark (1911). Neilsen's (1932) résumé of the material collected during the Mortensen Pacific Expedition of 1914-1916 has been invaluable in the composition of this key.

Excellent work has been done on the Japanese ophiuroids by Matsumoto (1917); species occurring in the Nanaimo district were listed by Berkeley (1927); those found in the Philippine seas were presented by Koehler (1922). For those species occurring along the North American coast, Neilsen (1932) prepared a key considering the entire area from the Strait of Georgia to the Gulf of Panama, and Busch (1918, 1921) a key to the ophiuroids of Friday Harbor, Washington. Barnard and Ziesenhenne (1961) discussed the ophiuroid communities of Southern California coastal bottoms. The only works which are locally applicable are the keys of McClendon (1909) for the San Diego region and May (1924) for Monterey Bay. McClendon's key is the only one useful to investigators in Southern California.

Through the work of the investigators noted above, there are now 40 recognized species of ophiuroids from the North American Pacific coast. Thirty species of ophiuroids are included in this key, ten of which may be collected intertidally.

Materials used in this study were obtained by employing SCUBA for the subtidal forms. Some of the intertidal species were collected by the authors; others were provided by Fred Ziesenhenne of the Allan Hancock Foundation, University of Southern California.

In this key an attempt has been made to utilize ophiuroid characters which are least subject to variation and which can be observed externally with a hand

[1]Supported by National Science Foundation Grant G-9561.

[2]Department of Zoology, University of California, Los Angeles; and Research Associate in Marine Zoology, Los Angeles County Museum of Natural History.

[3]Scripps Institution of Oceanography, La Jolla, California.

Contributions in Science Natural History Museum of L.A. County No. 93 (1966)

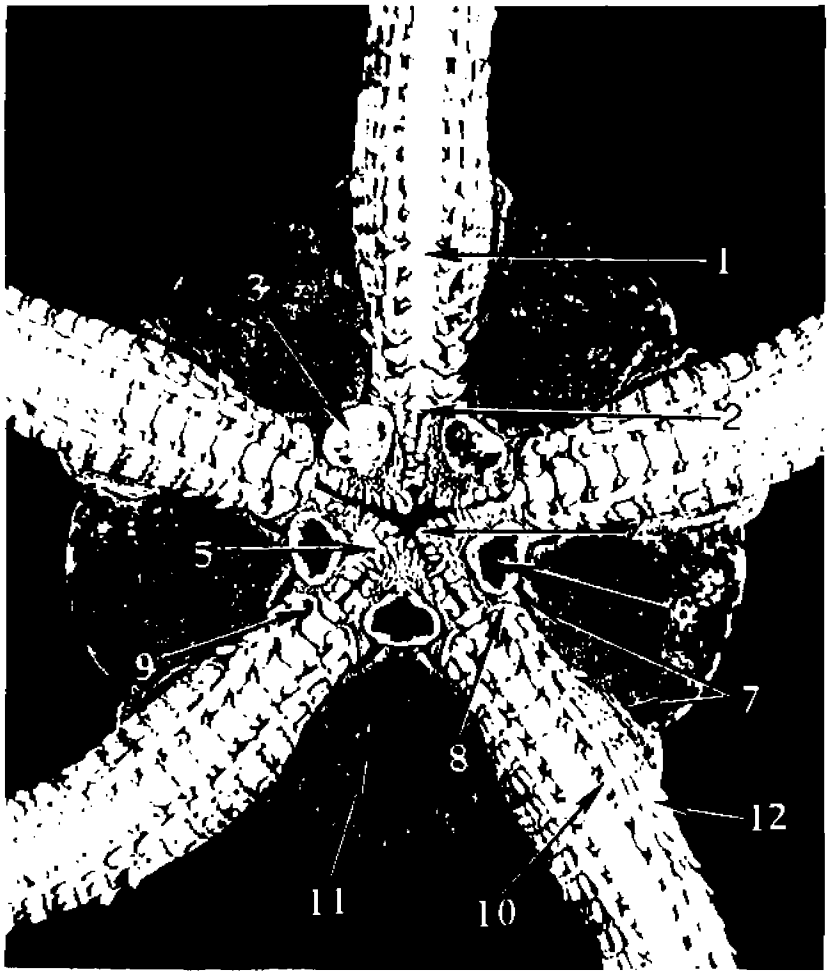

Figure 1. *Ophioderma panamense*, diagnostic parts

1. oral arm plate ventral arm plate
2. angle of mouth 1st ventral arm plate
3. madreporite
4. apex of jaw tip of jaw
5. oral papilla
6. oral shield
7. genital slit
8. side arm plate lateral arm plate
9. tentacle pore
10. tentacle scale
11. interbrachial area of disc ventral interradius
12. arm spine

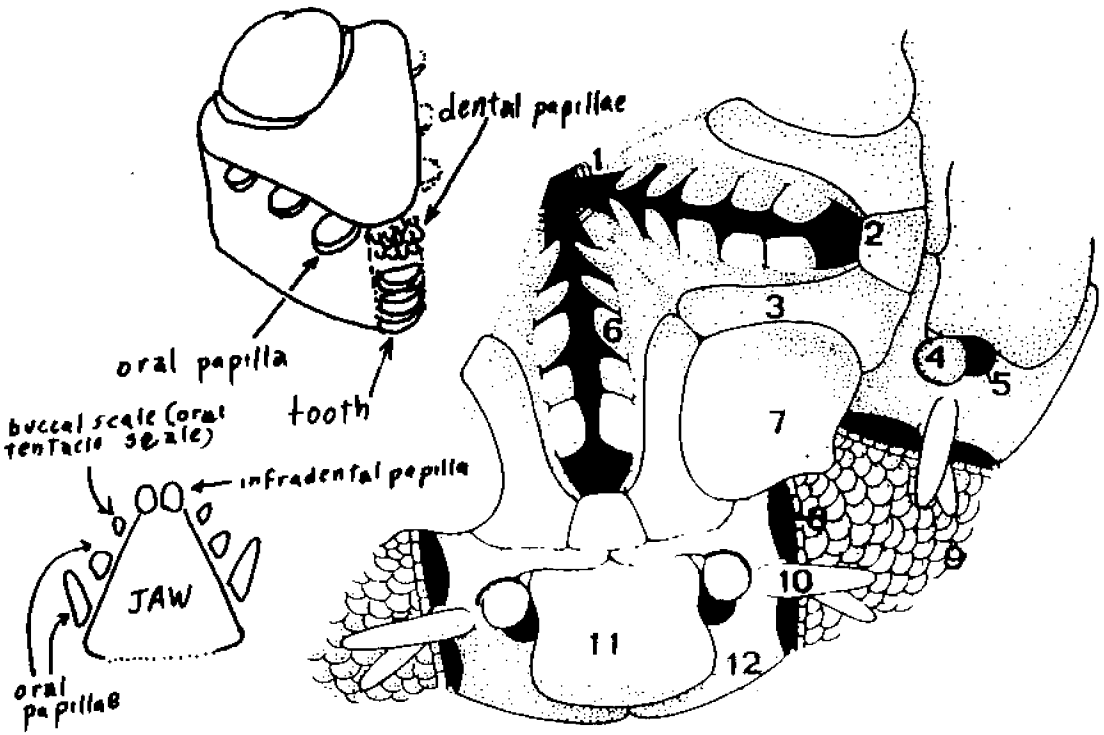

Figure 2. Two-fifths of oral aspect of a diagrammatic disc to show diagnostic parts

1. teeth
2. angle of mouth 1st ventral arm pl.
3. adoral plate adoral shield
4. tentacle scale
5. tentacular pit Tentacle pore
6. oral papilla
7. oral shield
8. genital slit
9. interradial portion of disc
10. arm spine
11. 1st oral arm plate 2nd ventral arm pl.
12. side arm plate lateral arm plate

lens, requiring no dissection of material. Disc-arm ratios, general shape, color, and other potentially ambiguous characters have been avoided.

Oral papillation is a fundamental key character, but whether enlarged oral tentacle scales should be included in the number of oral papillae per jaw in all cases is questionable. Where these structures are obvious, they have been included (see *Ophionereis annulata*). Together with the key we include a table indicating where the specimens may be found (Table 1), as well as a photograph (Fig. 1) and a diagram showing general diagnostic features (Fig. 2). An illustration showing the details of the oral papillae is included for each species.

The key is in no way a natural one, though for the most part, related genera fall closely together.

KEY

I. Both disc and arms covered by a leathery skin; aboral arm plates absent or rudimentary; arms branched (Fig. 3). . . . . *Gorgonocephalus eucnemis*

II. Arms never covered by a thickened skin; aboral arm plates present; arms never branched.

A. Aboral disc scaled, though scales may be discontinuous.

1. Oral papillae six or less than six per jaw.

a. Oral papillae two to four (rarely five) per jaw.

(1). Individuals often six-rayed; oral papillae blunt.

(a). Radial shields small, never joining with mate; four smooth spines on each side arm plate; two oral papillae per jaw (Fig. 4). . . . . *Ophiactis simplex**

(b). Radial shields large; mates joining distally; five (rarely six) spines with fine serration on each side arm plate; four or five oral papillae per jaw (Fig. 5). . . . . *Ophiactis savignyi**

(2). Individuals never six-rayed; oral papillae sharp, numbering two or three per jaw; one apical or subapical and two (occasionally three) distal oral papillae.

(a). One tentacle scale; disc strongly scaled (Fig. 6). . . . . *Amphiura diastata* = Amphiura diomedeae Lütken & Mtsn.

(b). Two tentacle scales; disc occasionally not scaled centrally (Fig. 7). . . . . *Amphiura arcystata*

b. Oral papillae six per jaw; three or occasionally four spines per side arm plate.

(1). Two proximal pairs of oral papillae small; distal pair broad and elongate.

(a). Interbrachial areas granular; radial shields separate or meeting only distally (Fig. 8). . . . *Amphichondrius granulosus*

(b). Interbrachial areas scaled; radial shields in solid contact.

i. Longest arm spines about 1½ times length of arm joint; arms markedly long and narrow (Fig. 9). . . . . *Amphipholis pugetana**

ii. Longest arm spines about 1 arm joint in length; arms relatively short (about four times the disc) (Fig. 10). . . . . *Amphipholis squamata**

(2). Oral papillae all subequal in size and shape.

(a). Some of the disc scales with free ends prolonged into fine points.

i. Scales of aboral disc few and large (Fig. 11). . . . . *Amphiodia (Amphispina) digitata*

ii. Scales of aboral disc numerous and small (Fig. 12). . . . . *Amphiodia (Amphispina) urtica*

(b). Disc scales never prolonged into fine points.

i. Disc with a rosette of large scales aborally; tentacle scales (2) unequal in size; plates about mouth inflated (Fig. 13) . . . . . *Amphiodia psara*

ii. Disc with fine scales; tentacle scales (2) equal in size; plates about mouth not inflated (Fig. 14). . . . . *Amphiodia occidentalis*

2. Oral papillae more than six per jaw.

a. Eight oral papillae per jaw (rarely nine).

(1). Spines on disc partially covering scales; oral papillae spinose and globose (Fig. 15). . . . . *Amphiacantha amphacantha* = Doublikia Amphiacantha

(2). No spines present on disc; most oral papillae heavy though a few are terete. Two tentacle scales in angle of mouth often considered to be oral papillae (10).

(a). Tentacle scales in angle of mouth separate from true oral papillae row; proximal oral papillae heavy and globose; other oral papillae heavy but tapered (Fig. 16). . . . . *Amphioplus strongyloplax*

(b). Tentacle scales in angle of mouth closely adjacent to row of true oral papillae; oral papillae tapered and not heavy (Fig. 17). . . . . *Amphioplus hexacanthus*

b. Nine or more than nine oral papillae per jaw.

(1). Oral papillae nine to ten; those in angle of mouth curved and pointed (actually tentacle scales). Tentacle scales large and saucer shaped; three arm spines on each side arm plate.

(a). Aboral arm plate large; accessory plates very small. Disc with scattered large scales of lighter pigmentation; arms mottled brown and cream (Fig. 18). . *Ophionereis eurybrachyplax*

(b). Aboral arm plates equaled in size by accessory plates; light spots scattered on disc incorporating several small scales; arms banded (Fig. 19) ..... *Ophionereis annulata**

(2). Oral papillae more than ten per jaw; tentacle scales often more than one, neither large nor saucer shaped.

(a). Arm spines sharp, about one arm joint in length; small notches in disc above arm base edged with small papillae; symmetrical scale situated centrally on aboral disc (Fig. 20). ..... *Ophiura lutkeni*

(b). Arm spines not sharp and considerably less than one arm joint in length; disc notches and symmetrical scale absent; oral papillae in even rows.

i. Oral papillae partially fused; tentacle pores only on first three oral arm plates; aboral arm plates not divided (Fig. 21). ..... *Ophiomusium jolliensis*

ii. Oral papillae not fused; aboral arm plates divided into many smaller plates; arms flattened (Fig. 22). ..... *Ophioplocus esmarki**

B. Scales or plates of aboral disc covered or partially obscured by superficial structures.

1. Disc covered by a thickened epidermis. ?

a. Velvet-like epidermis covering disc; oral papillae and arm spines small and numerous; adults often over twelve inches in diameter (Fig. 23) ..... *Ophioderma panamense** ← dorsal surface of disc granule-covered

b. Smooth or parchment-like epidermis covering disc in interradial areas; arm spines long, flattened, narrower at base than at end; tentacle scales similar to arm spines and usually held in crossed position on oral surface of arm (Fig. 24). ..... *Ophiopsila californica*

2. Disc covered with spines or short stumps.

a. Spines of arms held normally to arm axis (unless improperly preserved).

(1). Arm spines heavy and flattened; low rounded stumps cover disc; dorsal-most arm spine very short; dental papillae numerous (Fig. 25). ..... *Ophiopteris papillosa**

(2). Arm spines rather light and delicate; no oral papillae; disc covered by short spines.

(a). Arm and disc spines serrated; seven arm spines on each side arm plate (Fig. 26). ..... *Ophiothrix spiculata**

(b). Arm and disc spines rather smooth; five or six arm spines on each side arm plate (Fig. 27). ..... *Ophiothrix rudis**

b. Arm spines form small angles with arm axis.

(1). Arm spines short and blunt; disc fairly heavily covered with branched spines; small supplementary plates partially surround aboral arm plates (Fig. 28). ..... *Ophiopholis bakeri*

(2). Arm spines rather long and tapered; side arm plates nearly or completely meeting above and below; granules cover most of disc.

(a). Oral papillae twelve to fourteen per jaw; some fine scales in evidence on disc.

i. Spines of considerable size scattered on aboral disc; shorter stumps and granules cover most of balance of disc; oral arm plates well separated by side arm plates; longest arm spine about three arm joints in length (Fig. 29). ..... *Ophiacantha phragma*

ii. Small granules almost completely hiding scales of disc; oral arm plates not widely separated by side arm plates; longest arm spines about five arm joints in length (Fig. 30). ..... *Ophiacantha diplasia*

(b). Oral papillae seven to nine per jaw; short spines with fine points cover disc.

i. Longest arm spines about two arm joints in length; stumps on disc drawn out to fine (single) points; tentacle scales conical (few scales may show on disc) (Fig. 31). ..... *Ophiacantha normani*

ii. Longest arm spines about four arm joints in length; disc with short multi-fid spines; tentacle scales not conical; arm spines serrated (Fig. 32). . *Ophiacantha rhachophora*

*Specimens collected intertidally

TABLE 1

Various Ecological Aspects of Ophiuroids Discussed in this Paper

Species	*Bathymetric Range*	*Sample Location*	*Type of Bottom*	*Reference*	*Maximum disc diameter*	*Color*
Gorgonocephalus eucnemis	28-93 fathoms	Monterey Bay, California	Gray sand, shells, blue mud, sand (coarse), rock.	May	90 mm.	Reddish tones with brown markings.
Ophiothrix spiculata	lowtide—42 fathoms	Monterey Bay, California & Santa Monica Bay, California	Gray sand, shells, mud, and rock. Holdfasts of *Macrocystis*.	May & this paper	15 mm.	Variable: blue, green or tan with reddish bands on arms.
Ophiothrix rudis	lowtide—5 fathoms	Palos Verdes, California	Rock and coarse sand.	this paper	11 mm.	Variable: green or tan with reddish bands on arms.
Ophiacantha diplasia	46-80 fathoms	Monterey Bay, California	Coarse sand, green mud, and rock.	May	25 mm.	Disc brown, arms whiter, as dried from alcohol.
Ophiopholis bakeri	26-265 fathoms	Monterey Bay, California	Mud, rock, and sand.	May	10 mm.	Pink or white, dried from alcohol.
Amphiura arcystata	56-156 fathoms	Monterey Bay, California	Mud, rock, and sand.	May	8 mm.	Light orange, brown with white scales, dried from alcohol.
Amphiura diastata	244-253 fathom.	"	Sand and mud.	Clark	"	"
Amphiodia occidentalis	lowtide—15 fathoms	Monterey Bay, California	Sand.	May	11 mm.	Variable, but disc often gray with red markings. Arms yellowish or whitish and spines pink.
Amphiodia urtica	10-100 fathoms	La Jolla, California	Sand or mud.	Nielsen	9 mm.	Disc gray, arms white or straw colored.
Amphiodia digitata	10-100 fathoms	La Jolla, California	Packed sand to "coarse mud."	Nielsen	7 mm.	Whitish yellow, dried from alcohol.

Species	*Bathymetric Range*	*Sample Location*	*Type of Bottom*	*Reference*	*Maximum disc diameter*	*Color*
Amphipholis squamata	lowtide—20 fathoms	La Jolla, California & Departure Bay, Nanaimo	Coralline algae and holdfasts.	Nielsen	8 mm.	"
Amphipholis pugetana	lowtide—44 fathoms	Monterey Bay, California	Mud, and sand or rock.	Clark	"	"
Ophiura lütkeni	11-357 fathoms	Monterey Bay, California	Soft or hard mud, sand or rock, and sandy areas.	Nielsen	7.5 mm.	Yellowish in alcohol.
Ophioplocus esmarki	"	Monterey Bay, California, Santa Monica Bay, California & La Jolla, California	Sand and rock.	Nielsen	9 mm.	White, dried from alcohol.
Ophionereis eurybrachyplax	54-80 fathoms	Monterey Bay, California	Sand and mud or rock.	Nielsen	34 mm.	Dark brown with lighter yellow or white mottlings; annulations on arms.
Ophionereis annulata	lowtide—5 fathoms	California & Panama	Sand and mud or rock.	Clark	21 mm.	"
Ophiopsteris papillosa	lowtide—40 fathoms	Monterey Bay, California	Sand and rock.	Ziesenhenne	"	"
Ophiactis savignyi	lowtide—5 fathoms	Panama	Among coralline algae and holdfasts of rock kelp, especially where sand has begun to accumulate.	Ziesenhenne	"	"
Ophiactis simplex	lowtide—5 fathoms	Panama & San Diego, California	Holdfasts of rock kelp.	Clark	"	"
Amphioplus strongyloplax	2-200 fathoms	La Jolla, California & Str. of Georgia	"	Clark	"	"

Species	Bathymetric Range	Sample Location	Type of Bottom	Reference	Maximum disc diameter	Color
Amphioplus hexacanthus	50-88 fathoms	*	Mud, sand, and broken shell.	Ziesenhenne	*	*
Amphiacantha amphacantha	90-100 fathoms	La Jolla, California	*	Nielsen	*	Whitish, dried from alcohol.
Amphichondrius granulosus	10-25 fathoms	La Jolla, California	*	May	4 mm.	Variable: disc reddish brown, pink, or gray; arms white with gray or blackish mottling.
Ophioderma panamense	lowtide—15 fathoms	La Jolla, California & Panama	*	May	22 mm.	Salmon red with darker markings.
Ophiomusium jolliensis	167-505 fathoms	La Jolla, California	Clay, mud, and sand.	this paper	30 mm.	Dark brown aborally; tan or yellow orally.
Ophiopsila californica	*	*	*	May	23 mm.	Light brown, arms with whitish or purplish markings.
Ophiacantha phragma	*	*	*	Nielsen	18 mm.	Tan or gray, dark annulation on arms.
Ophiacantha normani	40-987 fathoms	*	Green and brown mud and sand.	May	30 mm.	Light to dark brown. Young with darker annulations on arms.
Ophiacantha rhachophora	63-584 fathoms	*	Sand and broken shell.	Nielsen	7 mm.	Greenish with darker cross bands on arms; oral side yellow.
Amphiodia psara	*	*	*	Nielsen	5.5 mm.	Greenish or yellow with darker annulations on arms.

*No information available

DEFINITIONS OF TERMS

Aboral: side opposite the mouth; the dorsal aspect of the animal.

Aboral arm plates: superficial plates covering the dorsal portion of each arm joint.

Aboral plates: shields or plates situated on either side of an oral shield.

Angle of mouth: the distal portion of the slit formed by approximation of any two adjacent jaws.

Disc: the central body of an ophiuroid which is sharply marked off from the arms.

Distal: occupying a position away from the mouth or away from the center of the disc.

Genital scales: scales, usually in orderly rows, bordering the genital slits.

Genital slits: slits located interbrachially and orally on the disc (on either side of each arm base) indicating the position of the genital bursae.

Interbrachial areas: the oral disc lying between adjacent arms.

Jaws: five (or rarely six) triangular structures surrounding the mouth and usually bearing a number of oral papillae laterally and a vertical row of teeth apically.

Oral: the ventral surface as opposed to the aboral or dorsal surface; implying direction toward the mouth or on the same surface as the mouth.

Oral arm plates: those plates situated on the ventral surface of the arm joint through which pass the podia.

Oral papillae: modified spines usually found on the sides of each jaw and bordering the angle of the mouth.

Oral shield: a plate, usually comparatively large, situated on the mid-interbrachial line at the base of each jaw.

Podia: tube feet projecting through the tentacle pores of the oral arm plates.

Proximal: toward the oral-aboral axis; opposed to distal.

Radial shields: plates, often large, existing in pairs and located on or approaching the radius of the aboral disc.

Radius: an imaginary line drawn from the center of the disc to any arm tip.

Side arm plates: those plates covering the lateral aspect of each arm joint and supporting the arm spines.

Tentacle pores: a pair of openings in the oral arm plate through which pass the podia or tentacles.

Tentacle scales: scales found bordering the tentacle pores which, in some species, completely close the tentacle pore.

Tooth papillae: small papillae lying ventrally and about the teeth on the axis of the jaw. (Found in relatively few of the species considered in this key.)

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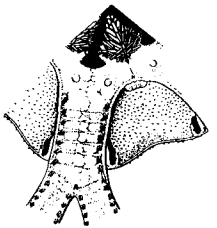


Figure 3. Gorgonocephalus eucnemis.

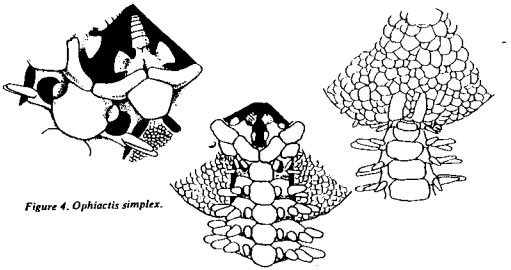


Figure 4. Ophiactis simplex.

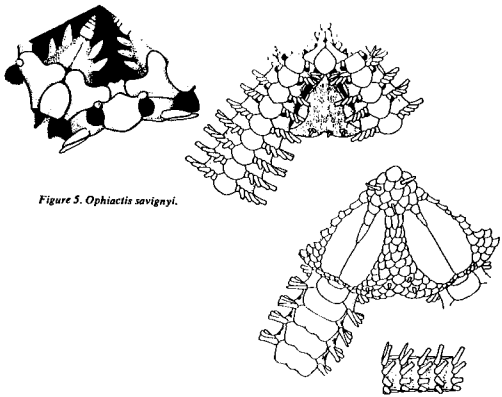


Figure 5. Ophiactis savignyi.

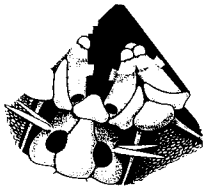


Figure 6. Amphiura diastata.

Figure 7. Amphiura arcystata.

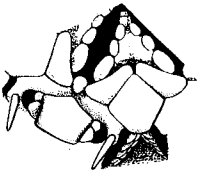
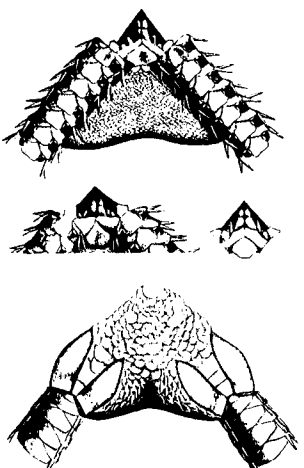
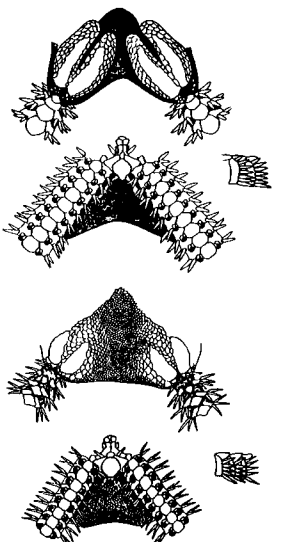
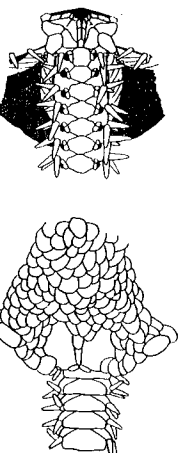


Figure 8. Amphichondrius granulosus.







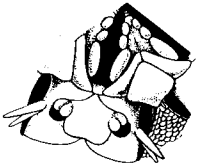


Figure 9. Amphipholis pugetana.

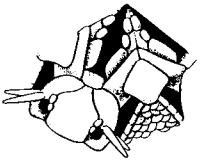


Figure 10. Amphipholis squamata.

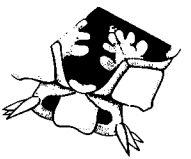
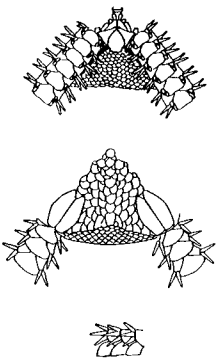
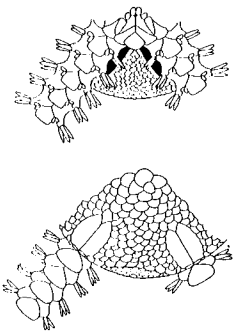
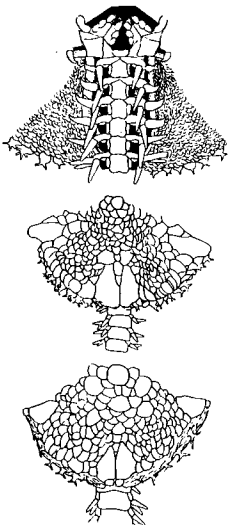


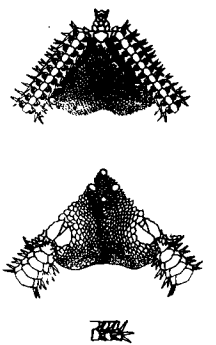
Figure 11. Amphiodia digitata.

Figure 12. Amphiodia urtica.









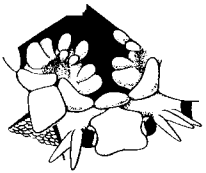


Figure 13. Amphiodia psara.

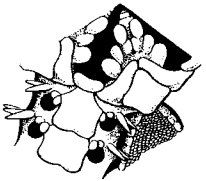


Figure 14. Amphiodia occidentalis.

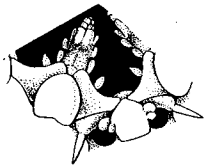


Figure 16. Amphioplus strongyloplax.

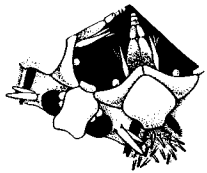
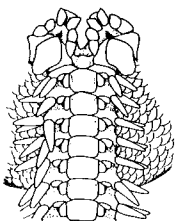
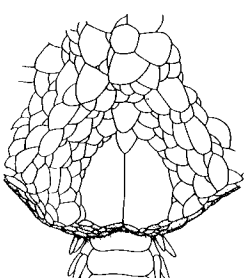
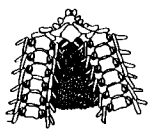
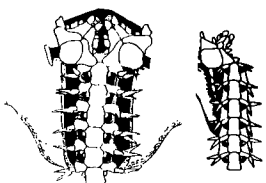


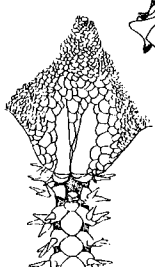
Figure 15. Amphiacantha amphacantha.











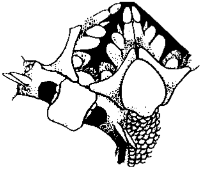


Figure 17. Amphioplus hexacanthus.

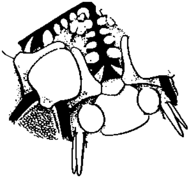


Figure 18. Ophionereis eurybrachyplax.

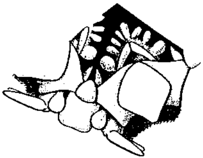


Figure 19. Ophionereis annulata.

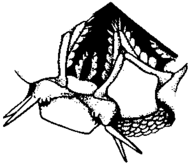
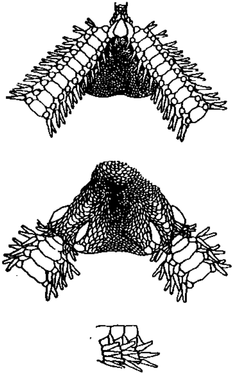
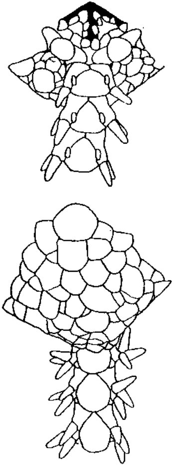


Figure 20. Ophiura lutkeni.

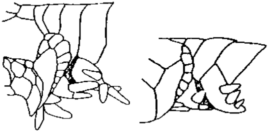
AMPHIOPLUS HEXACANTHUS, new species.

Disk lacking. Upper arm plates broadly hexagonal, with rounded corners, twice as wide as long. Arm spines six, about equal to joint; middle ones shortest and one or more terminated by a minute, glassy crossbar. Oral shields oval, longer than wide. Adoral plates large, meeting broadly within. Oral papillæ, four on a side, subequal or apical one largest. Under arm plates squarish or slightly pentagonal, rather wider than long. Tentacle scales, two.





juvenile



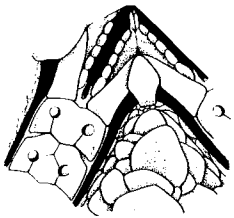
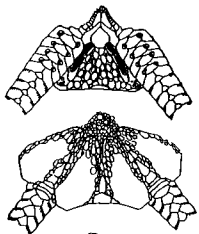
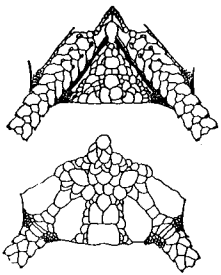


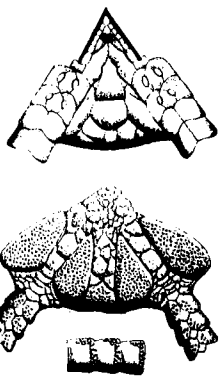
Figure 21. Ophiomusium jolliensis.

ophiosphalma glabrum



(=ophiomusium multispinum)





Ophiomusium lymani

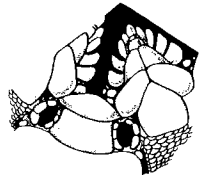


Figure 22. Ophioplocus esmarki.

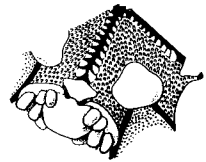
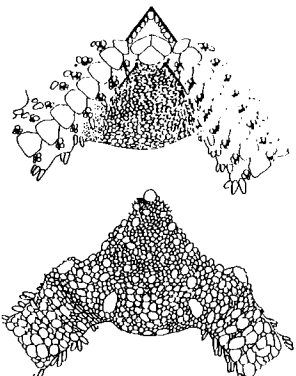
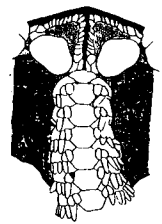


Figure 23. Ophioderma panamense.





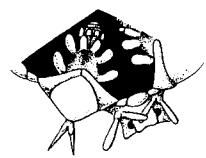


Figure 24. Ophiopsila californica.

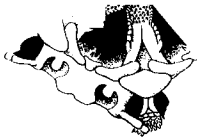


Figure 25. Ophiopteris papillosa.

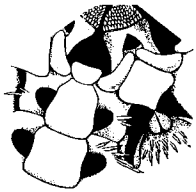


Figure 26. Ophiothrix spiculata.

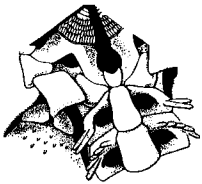
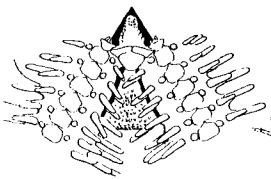
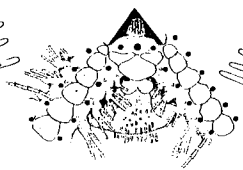
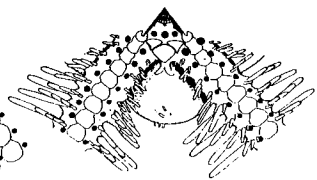


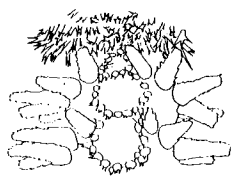
Figure 27. Ophiothrix rudis.

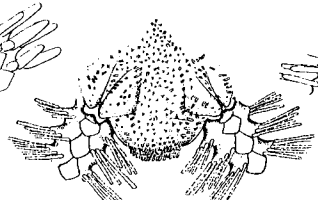
Figure 28. Ophiopholis bakeri.

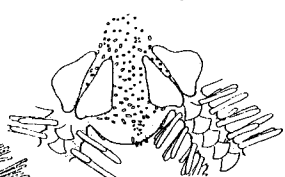












See key in
H.L. Clark (1911)
North Pacific Ophiurans
p. 116

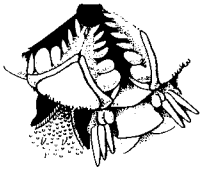


Figure 29. Ophiacantha phragma.

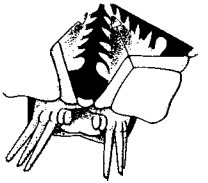


Figure 30. Ophiacantha diplasia.

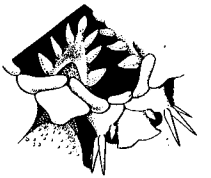


Figure 31. Ophiacantha normani.

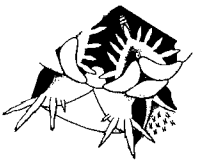
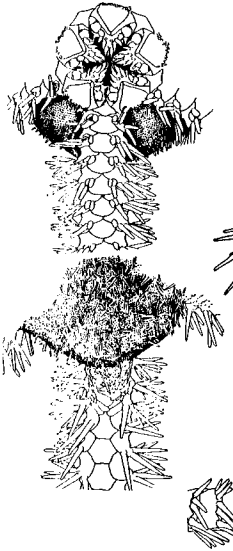
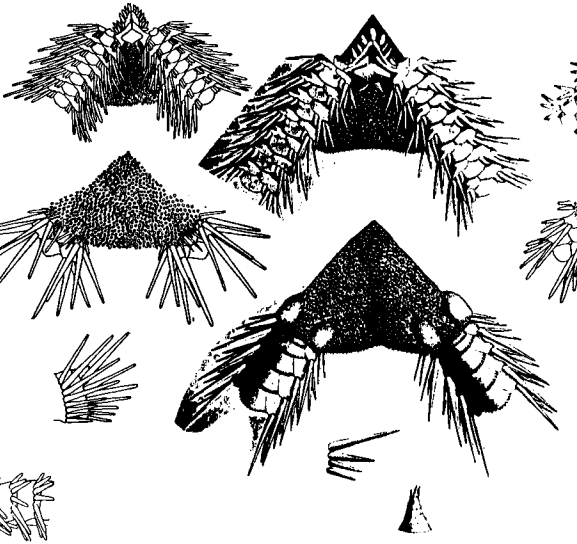
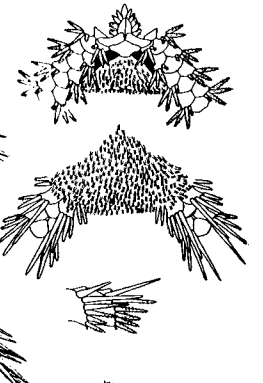
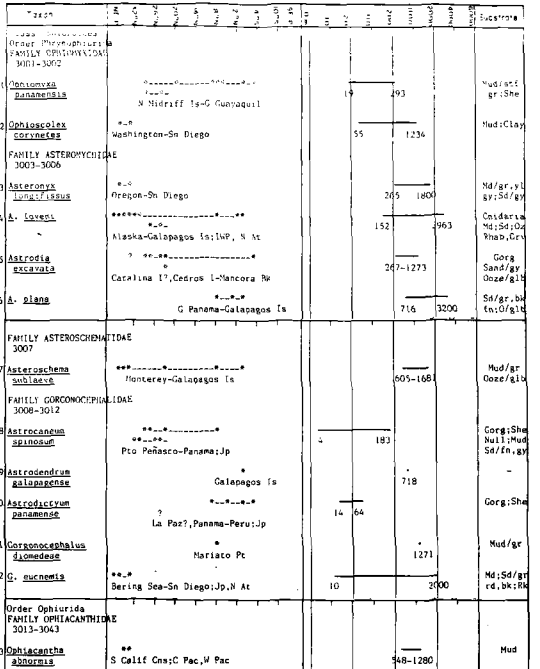


Figure 32. Ophiacantha rhachophora.







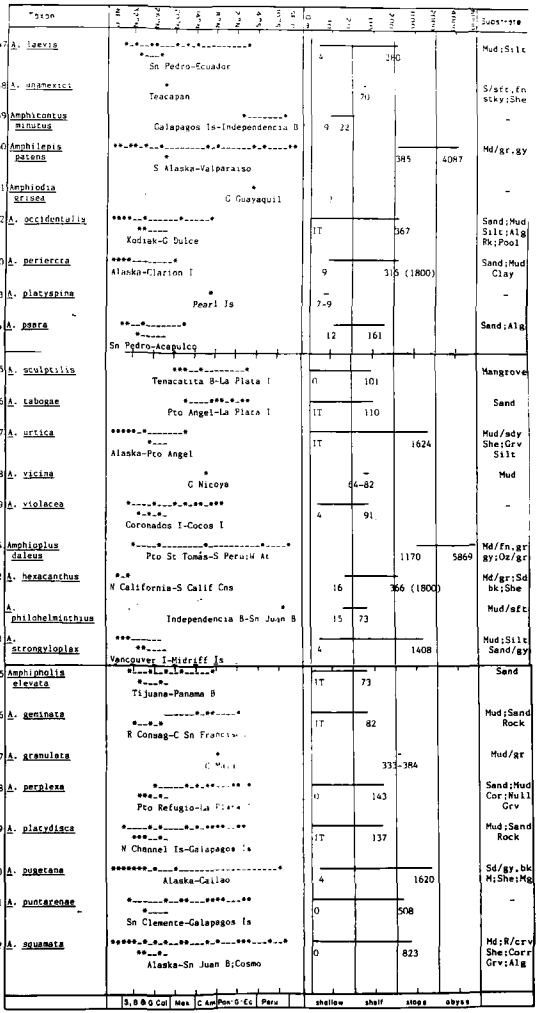


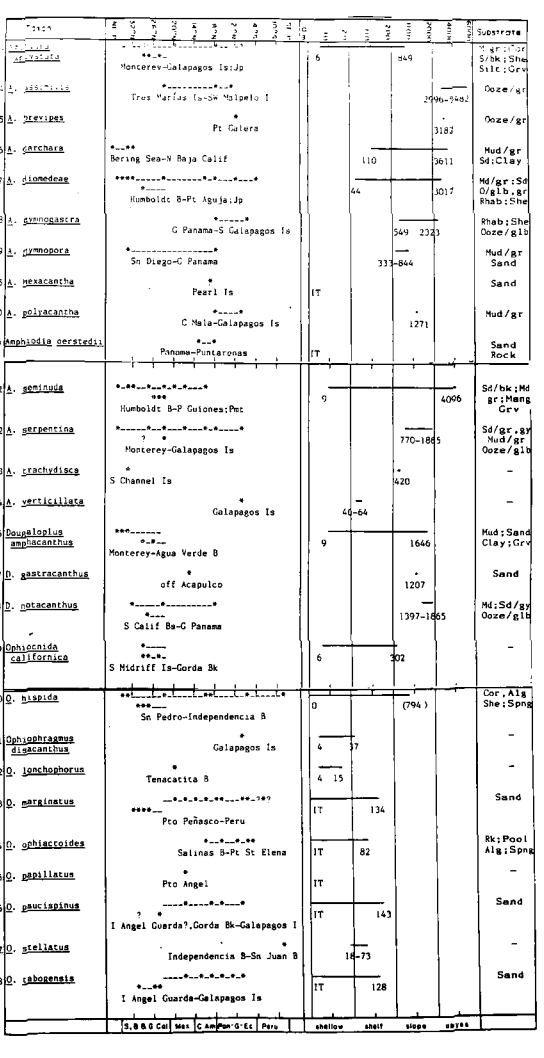
From: Maluf, L.Y. (1988) Composition and Distribution of the Central Eastern Pacific Echinoderms

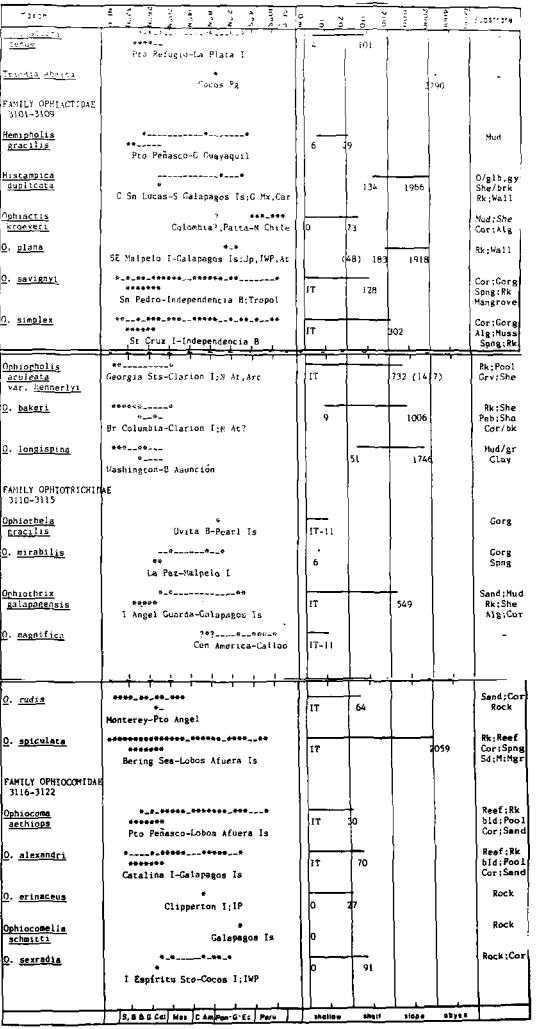
Central Eastern Pacific 68 genera 188 species (Pt. Conception to Peru)

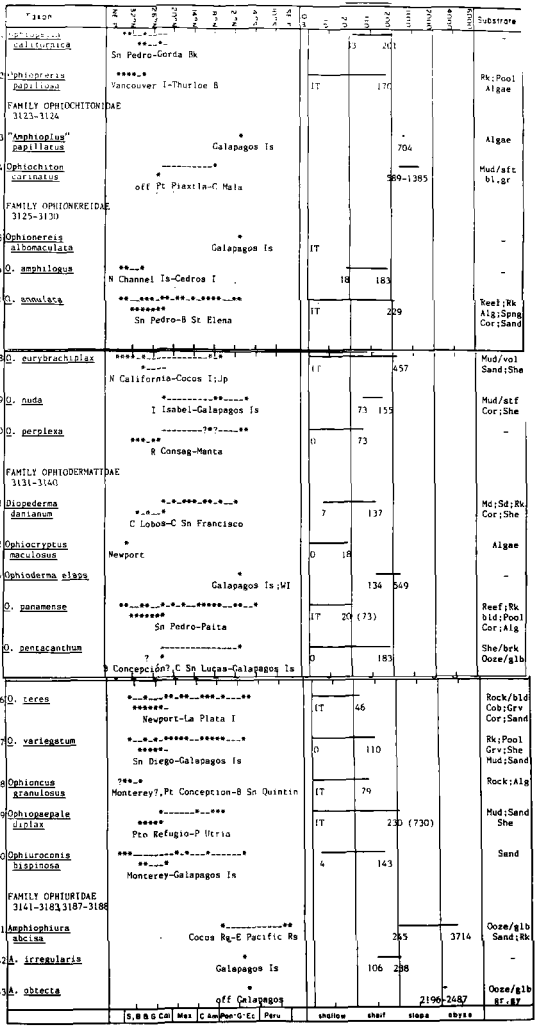
World 188 2000

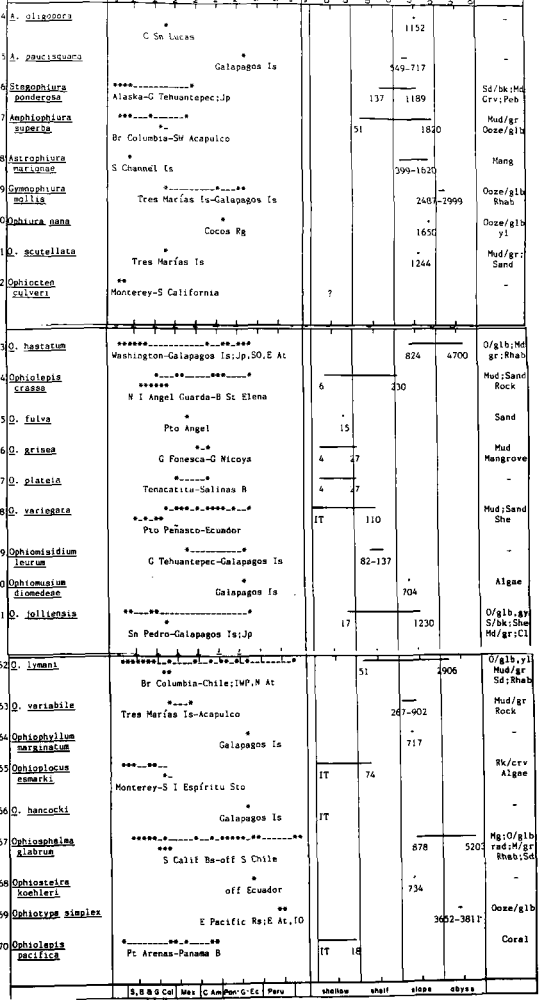
	Taxon	Geographic range	Depth (m)	Substrate
[illegible]	[illegible]	Alaska-[illegible] Baja Calif	1041-2471	[illegible]
3022	O. eurythyra	* Newport	13-27	Sand
3023	O. hirta	* * Mazatlán-Tres Marías Is	1244-1598	Sand/bk Mud/gr
3024	O. inconspicua	*----* G Panama-[illegible]agos Is	37 1869	Sd/gr;Md gr;O/glb
3025	O. moniliformis	*--*--* SW Sn Cristóbal B-Acapulco	519-1244	Md/gr;Sd Ooze/glb
3026	O. pacifica	*-------------------*-* S Calif Cns-off Ecuador	362 2877	Ooze/gr Mud;Sand
3027	O. parasema	* St Cruz I	?	-
3028	O. phragma	**--*-----------**---** *--*- N Channel Is-La Plata I	13 644	Grv;Corr Sand
3029	O. pyriformis	* Clarion I	37	Coral
3030	O. quadrispina	*-------------------* **--*- C Tepoca-Galapagos Is	183-549	Ooze/glb She/brk
3031	O. rhacophora	*-**------ * Bering Sea-C Sn Lucas;Jp	115 1152	Md/gr,gy Sand;She Peb
3032	O. sentosa	*-------------------------*--* N Baja Calif-off Valparaiso	2067-5203	Md/fn,dk O/red;Cl
3033	O. similis	* Galapagos Is	717	-
3034	O. spinifera	* G Panama	998-1865	Md/bl,gr sft
3035	O. valenciennesi	* ? Pto Escondido?,Galapagos Is;Car	236-549	Mud;Ooze glb;She brk
3036	Ophiolebes mortenseni	* Galapagos Is	717	-
3037	Ophiolimna bairdi	*--*--*-----------* *-- Bering Sea-P Guiones;NW At	578 2949	Md/gr;Sd fn,gy;Oz glb;Rock
3038	Ophiomyces multispinus	* Galapagos Is	134 717	-
3039	Ophiopthalmus normani	****------ ****- Bering Sea-Farallón Bs;Jp	51 2600	Md/gr,bl Sd/bk;Rk Ooze/glb
3040	Ophioplinthaca granifera	*-----* Pto Sn Tomás-Tres Marías Is	267 2086	Ooze/glb Sd/gy;Rk
3041	O. partida	*-----* S Calif Bs-Tres Marías Is	1263-1866	Sand/gy Ooze/glb
3042	Ophiothamnus laevis	* Galapagos Is	1008	-
3043	Ophiotoma paucispina	*-**-----* Guatemala Bs-N Peru	2149-4082	O/glb,gr M/gr;S;R
	FAMILY HEMIEURYALIDAE 3044-3045			
3044	Sigsbeia laevis	* B Honda	55-91	Cor/rd
3045	S. lineata	**---* Hannibal Bk-Galapagos Is	46 183	Cor;Alg She
	FAMILY AMPHIURIDAE 3046-3100,3186			
3046	Amphichondrius granulosus	***----***-*--------*-**** *-**- Pds Blancas Pt-La Plata I	0 186 (730)	Mud;Silt Sand;Cl Rock
		S,B & G Cal / Mex / C Am / Pan-G-Ec / Peru	shallow / shelf / slope / abyss	


Taxon
Substrate
3047 A. laevis
Sn Pedro-Ecuador
4
140
Mud;Silt
3048 A. unamexici
Teacapan
70
S/sft,fn sdy;Shc
3049 Amphicontus minutus
Galapagos Is-Independencia B
9
22
-
3050 Amphilepis patens
S Alaska-Valparaiso
385
4087
Md/gr,gy
3051 Amphiodia grisea
G Guayaquil
?
-
3052 A. occidentalis
Kodiak-C Dulce
IT
367
Sand;Mud Silt;Alg Rk;Pool
3060 A. periercta
Alaska-Clarion I
9
315 (1800)
Sand;Mud Clay
3053 A. platyspina
Pearl Is
7-9
-
3054 A. psara
Sn Pedro-Acapulco
12
161
Sand;Alg
3055 A. sculptilis
Tenacatita B-La Plata I
0
101
Mangrove
3056 A. tabogae
Pto Angel-La Plata I
IT
110
Sand
3057 A. urtica
Alaska-Pto Angel
IT
1624
Mud/sdy Shc;Grv Silt
3058 A. vicina
C Nicoya
64-82
Mud
3059 A. violacea
Coronados I-Cocos I
4
91
-
3064 Amphioplus daleus
Pto St Tomás-S Peru;W At
1170
5869
Md/fn,gr gy;Gr/gr
3062 A. hexacanthus
N California-S Calif Cns
16
366 (1800)
Md/gr;Sd bk;Shc
3061 A. philohelminthius
Independencia B-Sn Juan B
15
73
Mud/sft
3063 A. strongyloplax
Vancouver I-Midriff Is
4
1408
Mud;Silt Sand/gy
3065 Amphipholis elevata
Tijuana-Panama B
IT
73
Sand
3066 A. geminata
R Consag-C Sn Francisco
IT
82
Mud;Sand Rock
3067 A. granulata
C Mala
333-384
Mud/gr
3068 A. perplexa
Pto Refugio-La Plata
0
143
Sand;Mud Cor;Mud Grv
3069 A. placydisca
N Channel Is-Galapagos Is
IT
137
Mud;Sand Rock
3070 A. pugetana
Alaska-Callao
4
1620
Sd/gr,bk Mi;Shc;Mg
3071 A. puntarenae
Sn Clemente-Galapagos Is
0
508
-
3072 A. squamata
Alaska-Sn Juan B;Cosmo
0
823
Md;R/crv Shc;Corr Grv;Alg
S, B & Q Cal
Mex
C Am
Pan-G-Cc
Peru
shallow
shelf
slope
abyss


Taxon
Substrate
A. californica
Monterey-Galapagos Is;Jp
6
849
Ooze/gr
A. assimilis
Tres Marias Is-SW Malpelo I
2096-3482
Ooze/gr
3075 A. brevipes
Pt Galera
3182
Ooze/gr
3076 A. carchara
Bering Sea-N Baja Calif
110
3611
Mud/gr Sd;Clay
3077 A. diomedeae
Humboldt B-Pt Aguja;Jp
44
3017
Md/gr;Sd O/glb.gr Rhab;She
3078 A. gymnogastra
G Panama-S Galapagos Is
549 2323
Rhab;She Ooze/glb
3079 A. nymnopora
Sn Diego-G Panama
333-844
Mud/gr Sand
3085 A. hexacantha
Pearl Is
IT
Sand
3080 A. polyacantha
C Mala-Galapagos Is
1271
Mud/gr
3186 Amphiodia gerstedti
Panama-Puntarenas
IT
Sand Rock
3081 A. geminata
Humboldt B-P Guiones;Pmt
9
4096
Sd/bk;Md gr;Mang Grv
3082 A. serpentina
Monterey-Galapagos Is
770-1865
Sd/gr.gy Mud/gr Ooze/glb
3083 A. crachydisca
S Channel Is
420
3084 A. verticillata
Galapagos Is
44-64
Dougaloplus amphacanthus
Monterey-Agua Verde B
9
1646
Mud;Sand Clay;Grv
3087 D. gastracanthus
off Acapulco
1207
Sand
3088 D. notacanthus
S Calif Ba-C Panama
1397-1865
Md;Sd/gy Ooze/glb
3089 Ophiocnida californica
S Midriff Is-Gorda Bk
6
302
3090 O. hispida
Sn Pedro-Independencia B
0
(794)
Cor,Alg She;Spng
3091 Ophiophragmus diacanthus
Galapagos Is
4
37
3092 O. lonchophorus
Tenacatita B
4
15
3093 O. marginatus
Pto Peñasco-Peru
IT
134
Sand
3094 O. ophiactoides
Salinas B-Pt St Elena
IT
82
Bk;Pool Alg;Spng
3095 O. papillatus
Pto Angel
IT
3096 O. paucispinus
I Angel Guarda?,Gorda Bk-Galapagos I
IT
143
Sand
3097 O. stellatus
Independencia B-Sn Juan B
18-73
3098 O. tabogensis
I Angel Guarda-Galapagos Is
IT
128
Sand
S, B & G Cal
Mex
C Am
Pan-G-Ec
Peru
shallow
shelf
slope
abyss

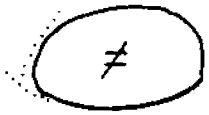

Pto Refugio-La Plata I
Cocos Ba
FAMILY OPHIACTIDAE
3101-3109
Pto Peñasco-G Guayaquil
C San Lucas-S Galapagos Is;C Mx,Car
Colombia?,Patta-N Chile
SE Malpelo I-Galapagos Is;Jp,IWP,At
Sn Pedro-Independencia B;Tropol
St Cruz I-Independencia B
Georgia Sts-Clarion I;N At,Arc
Br Columbia-Clarion I;N At?
Washington-B Asunción
FAMILY OPHIOTRICHIDAE
3110-3115
Uvita B-Pearl Is
La Paz-Malpelo I
I Angel Guarda-Galapagos Is
Cen America-Callao
Monterey-Pto Angel
Bering Sea-Lobos Afuera Is
FAMILY OPHIOCOMIDAE
3116-3122
Pto Peñasco-Lobos Afuera Is
Catalina I-Galapagos Is
Clipperton I;IP
Galapagos Is
I Espíritu Sto-Cocos I;IWP
S,B&BCal Mex C Am Pan-G-Ec Peru
shallow shelf slope abyss

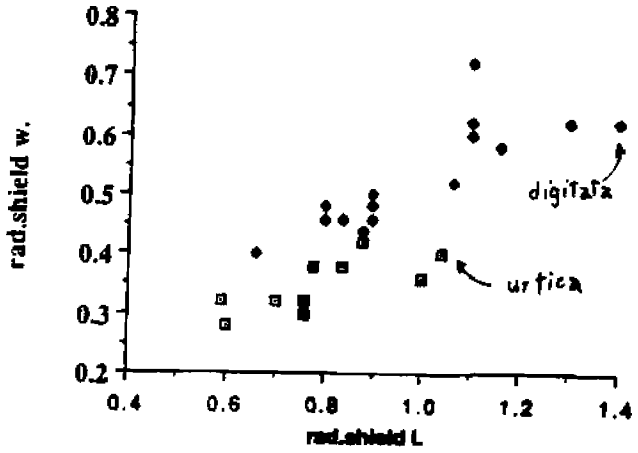

Taxon
Substrate
Ophiothrix californica
Sn Pedro-Gorda Bk
13
201
Ophiopteris papillosa
Vancouver I-Thurloe B
IT
170
Rk;Pool Algae
FAMILY OPHIOCHITONIDAE 3123-3124
"Amphioplus" papillatus
Galapagos Is
704
Algae
Ophiochiton carinatus
off Pt Piaxtla-C Mala
589-1385
Mud/sft bl.gr
FAMILY OPHIONEREIDAE 3125-3130
Ophionereis albomaculata
Galapagos Is
IT
Ophiopholis aculeata
N Channel Is-Cedros I
18
183
Ophiopholis aculeata
Sn Pedro-B St Elena
IT
229
Reef;Rk Alg;Spng Cor;Sand
Ophiocoma eurybrachiplax
N California-Cocos I;Jp
IT
457
Mud/vol Sand;She
Ophiocoma nuda
I Isabel-Galapagos Is
73
155
Mud/sft Cor;She
Ophiocoma perplexa
R Consag-Manta
0
73
FAMILY OPHIODERMATIDAE 3131-3140
Diopederma dannanum
C Lobos-C Sn Francisco
7
137
Md;Sd;Rk Cor;She
Ophiocryptus maculosus
Newport
0
18
Algae
Ophioderma elapsoides
Galapagos Is;WI
134
549
Ophiocoma panamense
Sn Pedro-Paita
IT
20 (73)
Reef;Rk bld;Pool Cor;Alg
Ophiocoma pentacanthum
B Concepción?,C Sn Lucas-Galapagos Is
0
183
She/brk Ooze/glb
Ophiocoma teres
Newport-La Plata I
IT
46
Rock/bld Cob;Grv Cor;Sand
Ophiocoma variegatum
Sn Diego-Galapagos Is
0
110
Rk;Pool Grv;She Mud;Sand
Ophioncus granulosus
Monterey?,Pt Conception-B Sn Quintin
IT
79
Rock;Alg
Ophiopsepale duplax
Pto Refugio-P Utria
IT
230 (730)
Mud;Sand She
Ophiuroconis hispinosa
Monterey-Galapagos Is
4
143
Sand
FAMILY OPHIURIDAE 3141-3183,3187-3188
Amphiophiura abcisa
Cocos Rg-E Pacific Rs
265
3714
Ooze/glb Sand;Rk
Amphiura irregularis
Galapagos Is
106
238
Amphiura obtecta
off Galapagos
2196-2487
Ooze/glb
S,B&G Cal
Mex
C Am
Pan-G-Ec
Peru
shallow
shelf
slope
abyss

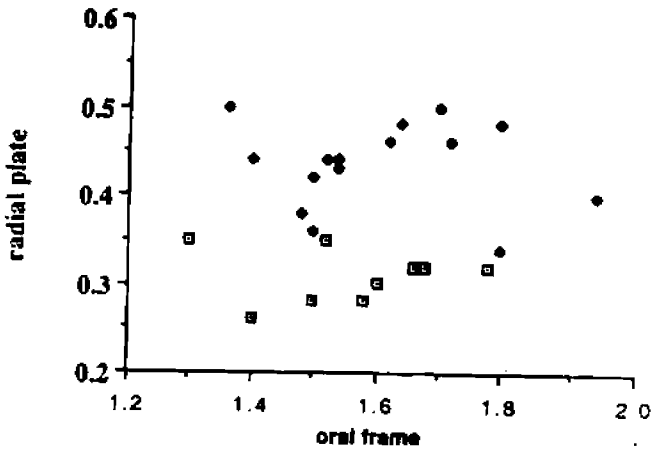

Taxon
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
0
250
500
750
1000
1250
1500
1750
2000
2250
Substrate
3144 A. oligospora
C Sn Lucas
1152
3145 A. paucispaquara
Galapagos Is
549-717
3146 Stegophiura ponderosa
Alaska-C Tehuantepec;Jp
137
1189
Sd/bk;Md Crv;Peb
3147 Amphiophiura superba
Br Columbia-SW Acapulco
51
1820
Mud/gr Ooze/glb
3148 Astrophiura marionae
S Channel Is
399-1620
Mang
3149 Gymnophiura mollis
Tres Marías Is-Galapagos Is
2487-2999
Ooze/glb Rhab
3150 Ophiura nana
Cocos Rg
1650
Ooze/glb yl
3151 O. scutellata
Tres Marías Is
1244
Mud/gr; Sand
3152 Ophiocten sulveri
Monterey-S California
?
3153 O. hastatum
Washington-Galapagos Is;Jp,SO,E At
824
4700
O/glb;Md gr;Rhab
3154 Ophiolepis crassa
N I Angel Guarda-B St Elena
6
230
Mud;Sand Rock
3155 O. fulva
Pto Angel
15
Sand
3156 O. grisea
G Fonesca-G Nicoya
4
47
Mud Mangrove
3157 O. platela
Tenacatita-Salinas B
4
47
3158 O. variegata
Pto Peñasco-Ecuador
IT
110
Mud;Sand She
3159 Ophiomisidium teurum
G Tehuantepec-Galapagos Is
82-137
3160 Ophiomusium diomedeae
Galapagos Is
704
Algae
3161 O. jolliensis
Sn Pedro-Galapagos Is;Jp
17
1230
O/glb,gr S/bk;She Md/gr;Cl
3162 O. lymani
Br Columbia-Chile;IWP,N At
51
2906
O/glb,yl Mud/gr Sd;Rhab
3163 O. variabile
Tres Marías Is-Acapulco
267-902
Mud/gr Rock
3164 Ophiophyllum marginatum
Galapagos Is
717
3165 Ophioplocus esmarki
Monterey-S I Espíritu Sto
IT
74
Rk/crv Algae
3166 O. hancocki
Galapagos Is
IT
3167 Ophiosphalma glabrum
S Calif Ba-off S Chile
878
5205
Mg;O/glb rad;M/gr Rhab;Sd
3168 Ophioteaira koehleri
off Ecuador
734
3169 Ophiotypa simplex
E Pacific Rs;E At,IO
3652-3817
Ooze/glb
3170 Ophiolepis pacifica
Pt Arenas-Panama B
IT
18
Coral
S,B B G Cal
Mex
C Am
Pan G Ec
Peru
shallow
shelf
slope
abyss

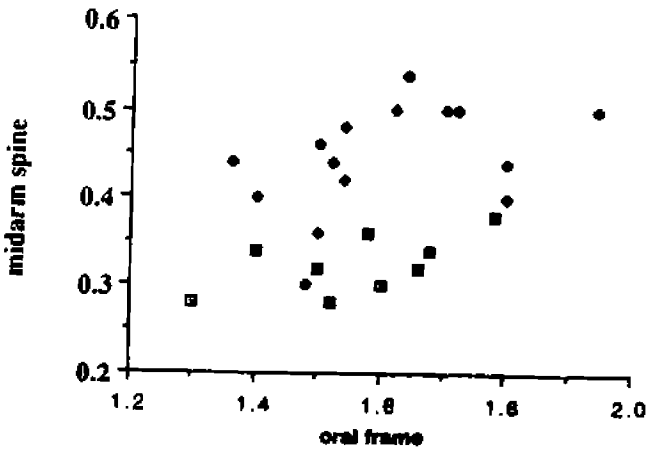
No.	Taxon	Distribution	Depth (m)	Substrate
3171	Ophiozonella alba	*---* Cocos I-Galapagos Is	1408-2487	O/glb;Md gr;Sd;Rk
3172	O. clypeata	* S Galapagos:Car	161-549	Ooze/glb She/brk
3173	O. contigua	* Galapagos Is	2418-2487	Ooze/glb gy.gr
3174	Ophiura bathybia	*---**** Bering Sea-Cedros Tr	2869-4425	Oz/bl.gy Clay/bl
3175	O. flagellata	*--------*----------------* ** Aleutian Is-Galapagos Is;W Pac,N Pac	128 2014	M/gr.sdy Ooze/glb
3176	O. irrorata	*----**----*--*--*****--------* ** Bering Sea-S Peru;IP,At	405 5869	O/glb.gr M/gr;Sd Mg.Rhab
3177	O. kofoidi	** Channel Is	146 1350	Mud/gr Sand
3178	O. leptoctenia	***** Bering Sea-S Calif Cns;Jp	27 3239	Md/gr.bk Sd;O/glb
3179	O. luetkeni	*******--- *---*- Alaska-Gorda Pt	0 1097	Sd/gr.gy fn;M;Grv She/brk
3180	O. plana	*-*-**** Guatemala Bs-E Galapagos	1430 4082	Md/gr;Sd fn;O/glb
3181	O. sarsi	**-** Alaska-Cortez Bk	100 1898	-
3182	O. stenobrachia	* off N Peru	3667	Ooze/glb
3183	Ophiurolepis inornata	* Galapagos Is;W Pac	240 3385	Ooze/glb yl.gr
3187	Amphiophiura vemae	*--* Peru-Chile	3739-4124	-
3188	Homophiura nexila	*--* Costa Rica-Panama	1749 5690	-
	FAMILY OPHIOLEUCIDAE 3184-3185			
3184	Ophiernus adspersus annectens	*-*---*------*-----* * Sn Juanico B-S Galapagos	770-1245	Md/bl,gr sft;Sand Ooze/glb
3185	O. seminudus	*-*-*---**---*----* G Tehuantepec-Cen Peru	840 4082	Sd/fn;Oz glb;Clay Mud/gr
		S,B & G Cal / Mex / C Am / Pan G Ec / Peru	shallow / shelf / slope / abyss	

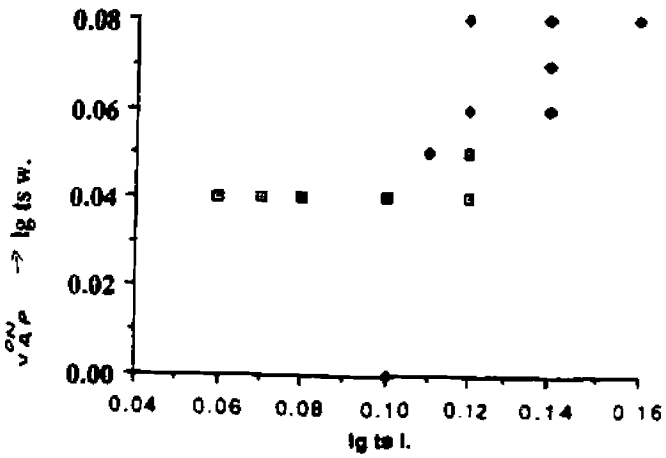
Differences between *Amphiodia urtica* and *A. digitata* — based on preliminary results of Gordon Hendler and Lulu Wang.

	Amphiodia digitata	*Amphiodia urtica*
Angles of dorsal arm plates equal?	≠ 	= 
Gap between dorsal arm plate and lateral arm plate?	 NO	 YES
Marginal spined scales continuous in interradii?	yes	sometimes
Number of marginal scale from middle interradial scale to Radial shield	3-5	7-9
gap between tentacle scales on first five arm segments?	No	YES









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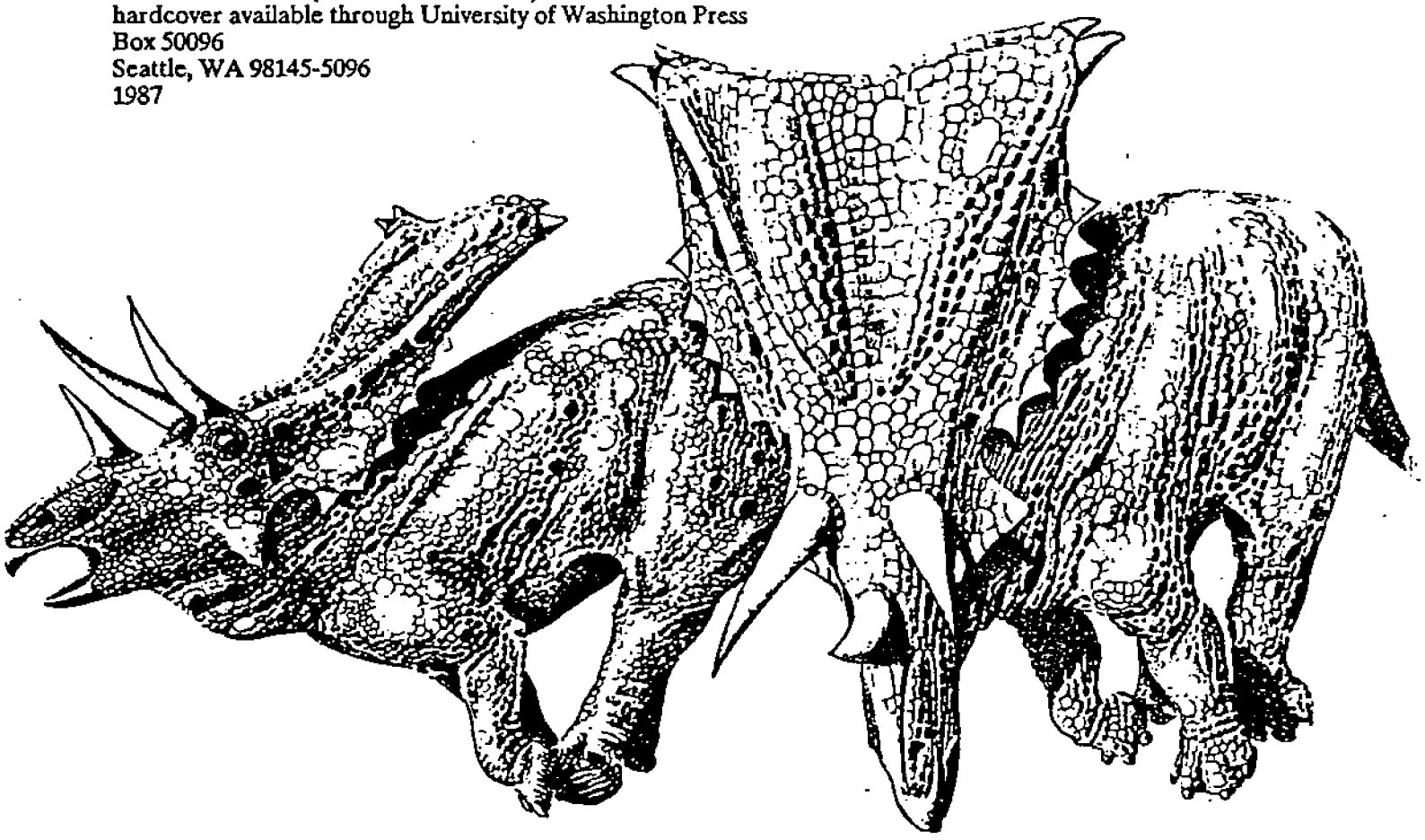

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