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POLYCHAETOUS ANNELIDS
OF THE FAMILIES
EUNICIDAE, LUMBRINERIDAE,
IPHITIMIDAE, ARABELLIDAE,
LYSARETIDAE AND DORVILLEIDAE
FROM WESTERN MEXICO

BY

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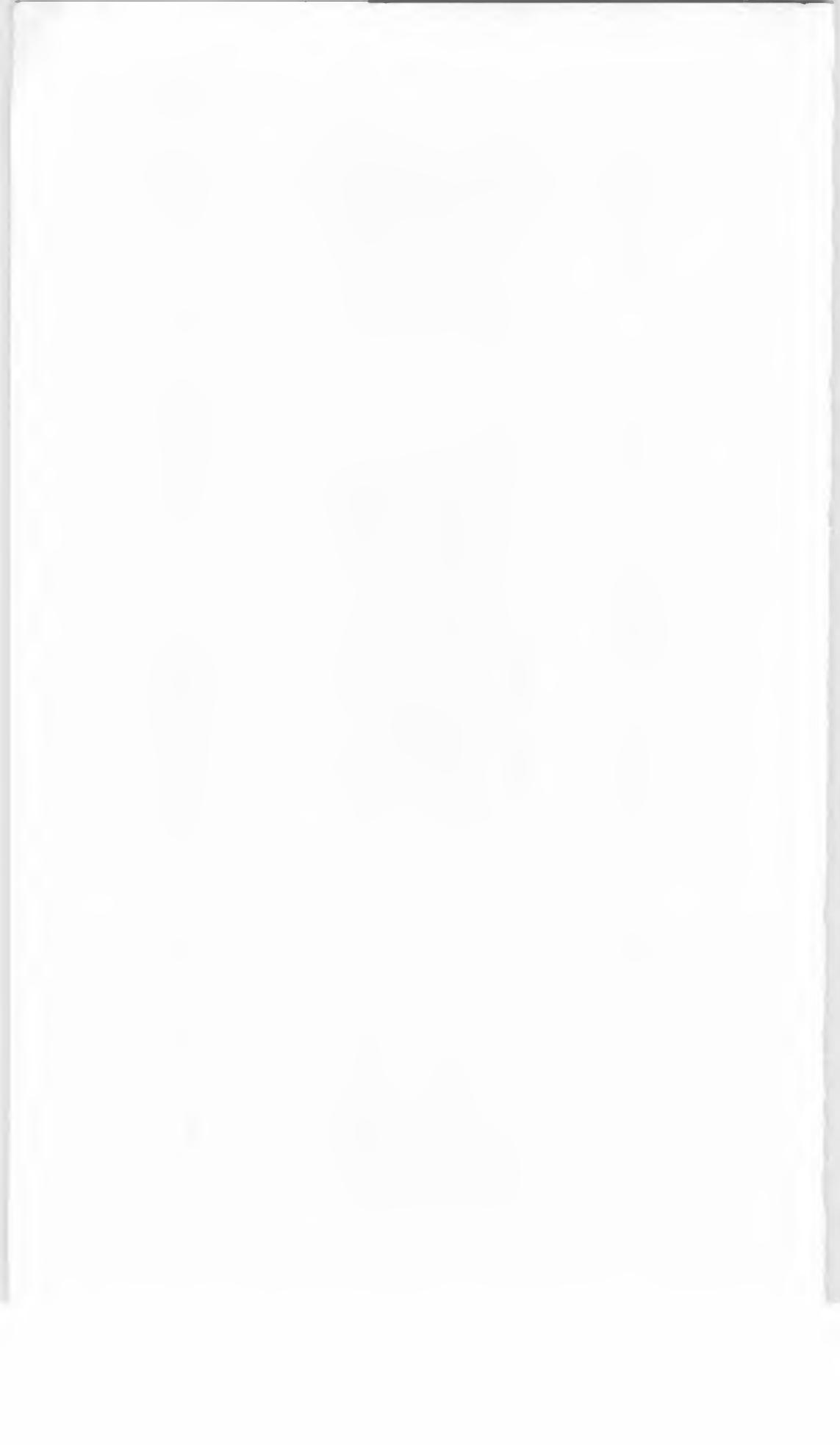
THE ALLAN HANCOCK FOUNDATION
UNIVERSITY OF SOUTHERN CALIFORNIA
LOS ANGELES, CALIFORNIA

*Dedicated
to
DR. OLGA HARTMAN
as a token of appreciation
for the impetus her many important contributions
to the knowledge of the polychaetous annelids
have given the study of benthic biology*



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LUMBRINERIDAE, IPHITIMIDAE, ARABELLIDAE,
LYSARETIDAE AND DORVILLEIDAE FROM WESTERN MEXICO

by Kristian Fauchald

INTRODUCTION

The superfamily EUNICEA is primarily characterized by the presence of a complex pharyngeal apparatus consisting of a pair of ventral mandibles and a varying number of paired dorsal maxillae. The highest number of maxillary pairs is five, which occurs in members of the ARABELLIDAE and LYSARETIDAE. The maxillary apparatus of the DORVILLEIDAE is here interpreted as composed of two or four maxillae with each maxilla separated into rows of denticles, rather than as two or four rows of numerous maxillae.

Maxillae I are often falcate and maxillae II, in most families, are larger and have more teeth than any other jaw-piece. The maxillae are supported posteriorly by paired maxillary carriers. A third median carrier is present in the ARABELLIDAE and LYSARETIDAE; an inferior paired carrier is present in certain DORVILLEIDAE.

The fully developed mandibles are similar in all members of the superfamily.

The parapodia are relatively simple in most species. Neuropodia are always well developed; the maximal development of notopodia is in the LYSARETIDAE, DORVILLEIDAE and ONUPHIDAE, where the notopodia are developed as long dorsal cirri with embedded acicula. EUNICIDAE, LUMBRINERIDAE and

ARABELLIDAE have notopodial rudiments without embedded acicula.

Simple, capillary or limbate setae are present in all families in dorsal fascicles. They often have serrated or dentate cutting edges. Composite setae are present in all families except ARABELLIDAE, LYSARETIDAE and some LUMBRINERIDAE. The composite setae are typically falcate and may have one to several teeth in addition to the falcate main fang. The distal end of each composite seta is covered with a long and pointed or short and blunt hood and the free margins are serrated or smooth. ONUPHIDAE, EUNICIDAE and LYSARETIDAE have enlarged, usually hooded, setae in subacicicular positions, called subacicicular hooks.

The families may be divided into three groups based on the structure of the pharyngeal apparatus. The first of these groups has paired, short maxillary carriers and at most five pairs of maxillae; this group includes ONUPHIDAE, EUNICIDAE, LUMBRINERIDAE and IPHITIMIDAE (new family). The second group has three prolonged maxillary carriers and at most five pairs of maxillae and includes ARABELLIDAE and LYSARETIDAE. The third group comprises the DORVILLEIDAE, which differs from the other families in that the maxillae are distally broken up in numerous separate denticles arranged in rows. The maximal number of rows of maxillae is four. One or two pairs of short maxillary carriers are present.

EUNICEA from western Mexico have been reported by Berkeley and Berkeley (1939), Fauvel (1943), Hartman (1944), Rioja (1941, 1947a, 1947b, 1962) and Treadwell (1914, 1923, 1941). The deep water species from the ALBATROSS cruise of 1891 were reported by Chamberlin (1919a). The ONUPHIDAE of the Allan Hancock Foundation collections were described by Fauchald (1968).

Most of the material studied was taken by the VELERO III and VELERO IV of the Allan Hancock Foundation, University of Southern California. A complete list of stations to 1502-42 has been published (Fraser, 1943). Data for later and additional collections in which EUNICEA have been found are given at the end of this paper. All material from western Mexico in the collections of the Allan Hancock Foundation were studied; the lists of new records include only those not earlier reported by Hartman (1944). Some of the material has been re-assigned to other species; this does not mean a change in definition of the different species except where this is specifically stated. All collections, with types, are deposited in the Allan Hancock Foundation, University of Southern California, Los Angeles.

I am grateful to the Administration of the Allan Hancock Foundation for making the material available to me and for considerable material support. The study was supported by the National Science Foundation grant no. B5-1780 to the Allan Hancock Foundation. Drs. Olga Hartman, Jay Savage and Russel Zimmer gave me much valuable advice; Mrs. Dorothy Halmos has critically read the manuscript.

Key to Families

1. Maxillae with numerous denticles in two or four rows (Pl. 27, Fig. i) DORVILLEIDAE
1. Maxillae three to five pairs in two rows 2
2. Maxillae III and IV fused on the right side 3
2. Maxillae III and IV (if present) never fused 4
3. Frontal antennae and five occipital tentacles present ONUPHIDAE
3. Frontal antennae absent, one to five occipital tentacles present (Pl. 2, Fig. a)
..... EUNICIDAE

- | | |
|---|---------------|
| 4. Three long maxillary carriers present (Pl. 20,
Fig. a) | 6 |
| 4. Two short maxillary carriers present (Pl. 18,
Fig. c) | 5 |
| 5. Four pairs of maxillae present; prostomium without
appendages | LUMBRINERIDAE |
| 5. Maximally three pairs of maxillae present; prostomium
usually with a pair of antennae ... | IPHITIMIDAE |
| 6. Notopodium a large, foliaceous lobe (Pl. 24, Fig. c);
prostomial antennae present | LYSARETIDAE |
| 6. Notopodium a small papilla (Pl. 20, Fig. c);
prostomium without appendages | ARABELLIDAE |

Family EUNICIDAE Savigny, 1818

This family is one of the largest of all polychaete families; more than 460 species have been named and approximately 225 of these are considered valid (Hartman, 1959, 1965a). Over half of the species were named before 1900; the original descriptions are incomplete and the type material lost in several instances, so there are taxonomic problems that cannot be solved except by inference.

The type genus Eunice has approximately 150 species, of which less than half can be considered well known; another 50 species belong to the genus Marpphysa and the remaining 25 species are divided between Euniphysa, Heteromarphysa, Lithognatha, Lysidice, Macduffia, Nematonereis, Palola and Paramarphysa. Charts 1a and 1b give a survey of the generic characters used to separate these genera and a reference to the author of each genus. The definitions of certain genera have changed since they were first erected; in such cases reference to the accepted revision has been included.

The absence of an anterior incision in the prostomium of Macduffia McIntosh (1885) was used to separate it from

Chart 1a

Survey of the genera and generic characters in the family
EUNICIDAE

Genus	Character			
	Number of occipital tentacles	Tentacular cirri present or absent	Branchiae present or absent	Subacicicular hooks present or absent
<u>Eunice</u>	5	+	+	+
<u>Uniphysa</u>	5	+	+	+
<u>Heteromorphysa</u>	5	-	-	+
<u>Lithognatha</u>	5	+	+	?
<u>Lysidice</u>	3	-	-	+
<u>Macduffia</u>	5	-	+	+
<u>Morphysa</u>	5	-	+	+
<u>Nematonereis</u>	1	-	-	+
<u>Palola</u>	5	+	+	-
<u>Paramorphysa</u>	5	-	-	+

Chart 1b

Survey of the original descriptions and current definitions
of genera of EUNICIDAE

Genus	Original description	Current definition
<u>Eunice</u>	Cuvier, 1817, p. 524	Ehlers, 1868, p. 303
<u>Euniphysa</u>	Wesenberg-Lund, 1949, p. 305	
<u>Heteromorphysa</u>	Verrill, 1900, p. 637	
<u>Lithognatha</u>	Stewart, 1881, p. 718	
<u>Lysidice</u>	Savigny, 1818, p. 324	Ehlers, 1868, p. 366
<u>Macduffia</u>	McIntosh, 1885, p. 303	
<u>Marpophysa</u>	Quatrefages, 1865, p. 303	
<u>Nematonereis</u>	Schmarda, 1861, p. 119	Ehlers, 1868, p. 373
<u>Palola</u>	Gray, 1847, p. 17	Hartman, 1944, p. 130
<u>Paramarphysa</u>	Ehlers, 1887, p. 99	

Morphysa Quatrefages (1865), which should contain only species with clearly incised prostomia. Several species with rounded prostomia have been described in Morphysa; Day (1962, p. 644) has shown that the degree of notching varies even within the same species, so the character seems to have no generic value and Macduffia is therefore considered a synonym of Morphysa. Paramorphysa Ehlers (1887) and Heteromorphysa Verrill (1900) are separated from each other by the same character; both genera are poorly known and are not represented in the present material.

Nicidion Kinberg (1865) has small, weakly branchiate or abranchiate species. It is here considered a subgenus of Eunice Cuvier (1817). Paramorphysa and Heteromorphysa are abranchiate forms of Morphysa; no weakly branchiate forms are known to link them to Morphysa and they are temporarily considered valid; the relationship between the three genera cannot presently be clarified.

Lithognatha Stewart (1881) was described from a single specimen with a remarkable pharyngeal apparatus; it is apparent from the original illustrations that the peculiarities were accidental. The shape of the mandibles suggests that the specimen belongs to a species of Palola Gray (1847).

Key to Genera and Subgenera from Western Mexico

1. Three occipital tentacles present .. Lysidice
1. Five occipital tentacles present 2
2. Tentacular cirri present 3
2. Tentacular cirri absent Morphysa
3. Subaciccular hooks and pectinate setae present 4
3. Subaciccular hooks and pectinate setae absent
..... Palola
4. Branchiae pectinate in at least some segments
..... Eunice s. str.

4. Branchiae absent, or if present with only one or
two filaments Eunice (Nicidion)

Genus Eunice Cuvier, 1817

Specific characters include the color and dentition of the subacicicular hooks, the occurrence and shape of the branchiae and the length and shape of the occipital tentacles. The shape of the hood of the composite hooded hooks, the shape of the distal end of the acicula, and the presence or absence of articulations on the dorsal cirri may also be important. The distribution and maximal development of the branchiae and subacicicular hooks vary with the size of the specimen; this is discussed below.

The genus was divided into four groups by Hartman (1944, pp. 100-101), depending on the color and dentition of the subacicicular hooks. These groups include:

- A. Flavus-bidentate: subacicicular hooks yellow and bidentate.
- B. Fuscus-bidentate: subacicicular hooks dark or black and bidentate.
- C. Flavus-tridentate: subacicicular hooks yellow and tridentate.
- D. Fuscus-unidentate: subacicicular hooks dark or black and simple falcate.

This scheme is here extended to include the following groups:

- E. Subgenus Nicidion.
- F. Subacicicular hooks known for one character only.
- G. Color and dentition of subacicicular hooks unknown.

The scheme was extended to include all described species of Eunice.

A survey of the original descriptions of species of Eunice showed that groups A-D could be further subdivided

by the occurrence of the branchiae. Original descriptions and revisions of type material were the only papers consulted for this survey. The literature contains a large number of suggested synonymies; most of these are based on material other than the types and may be erroneous. Important revisions by Crossland (1903), Fauvel (1919), Hartman (1944, 1956) and Day (1953, 1960) were consulted for the numerous synonyms of the common, usually circumtropical, species. The synonyms considered valid by these authors were removed from the list. Some twenty original descriptions are so incomplete that the species in question cannot be identified; species in this category were also removed from the survey. A total of 146 species is here considered valid; this is approximately the same number accepted by Hartman (1959, 1965a). These 146 species were surveyed for the character of the subacicicular hooks and the distribution of the branchiae.

The distribution of the branchiae follows a distinct pattern:

1. Branchiae first present before setiger 10; branchiae not present farther back than setiger 100.
2. Branchiae first present before setiger 10 and continued to the end of the body; included in this subdivision are also species in which the branchiae are strongly reduced in the 10 to 20 pre-anal setigers.
3. Branchiae first present after setiger 10 and not present farther back than setiger 100.
4. Branchiae first present after setiger 10 and continued to the end of the body.
5. Exact distribution of branchiae not known; this subdivision includes all species that were described from incomplete specimens and where branchiae were present on the last setiger in the fragment.

This subdivision of groups A-D was envisaged only as a practical tool for placing a given species in relation to similar species; a survey of the distribution of the different subdivisions in each group is given in Chart 2. It may be noted that species in groups A and B differ in the distribution of the branchiae; species tend to have branchiae limited to a short anterior region in group A; species in group B have branchiae from one of the first setigers to the end of the body. It is also noticeable that species in group C, as far as known, all have branchiae starting on one of the first setigers. Only 89 of the total 146 species could be placed in the scheme and the survey may contain several synonyms of some of the widespread species; on the other hand there are indications that some of the widespread species as presently accepted may conceal more than one distinct, though morphologically very similar, species. These uncertainties make any general conclusions about the distribution of the subdivisions and about the groups along the lines suggested above highly speculative at best at the present time.

A complete list of all species included in the survey with reference to the original description and type locality is given in Appendix A, where each species has also been assigned to group and subdivision.

The subgenus Nicidion (group E) can be placed in two subdivisions based on the different kinds of subacicicular hooks present:

1. Subacicicular hooks bidentate.
2. Subacicicular hooks tridentate.

As far as known, the subacicicular hooks are dark or black in all members of Nicidion. E. (N.) curticirris Knox (1960) is the only species in the subgenus with tridentate subacicicular hooks.

Chart 2

Survey of the distribution of species of Eunice in the different groups and subdivisions.

Groups/ Subdivisions	1	2	3	4	5	Sum
A	14	2	0	6	1	23
B	4	19	1	8	12	44
C	9	7	0	0	1	17
D	0	1	0	4	0	5
E	-	-	-	-	-	7
F	-	-	-	-	-	21
G	-	-	-	-	-	28
Sum	23	33	1	18	14	146

Twenty-two species of Eunice are known from western Mexico; these are marked with an asterisk in Appendix A.

Eunice hawaiiensis Treadwell (1906) was reported from La Aguada, Acapulco, and Mazatlán by Rioja (1941, p. 710); E. longisetis Webster (1884) was recorded by Treadwell (1941, p. 22) from Zihuantanejo and by Rioja (1941, p. 710) from La Aguada, Acapulco. E. unidentata was described by Rioja (1962) from Isla de San Roque and Isla de la Asunción, Baja California. These three species are not found in the present material.

The large number of specimens in the collections permitted a study of certain variable features. The first occurrence of branchiae has been used as a specific character. Where the first branchia is present on setiger 3, as in E. americana, E. biannulata, E. biannulata mexicana, E. cedrensis, E. megabranchia, E. segregata, E. vittata and E. vittatopsis, there is no variation in the first occurrence

of the branchiae, and E. reducta has branchiae constantly present from setiger 4; but in all other species examined the first occurrence of the branchiae varies with the size of the specimen. Smaller specimens tend to have branchiae present from earlier setigers than do larger ones. The first one to three pairs of branchiae in smaller specimens are simple; apparently larger specimens lose these first simple branchiae.

The total number of branchiae depends on the size of the specimen and the size is related to the number of segments present. It seems probable that the number of branchiae is related to the number of segments so that a given fraction of the segments should be branchiated. It is difficult to get accurate information on this since most specimens are incomplete posteriorly.

The maximal number of branchial filaments varies within narrow limits in adults of each species; small specimens tend to have simple branchiae and in newly metamorphosed specimens the branchiae are normally simple filaments or rudimentary.

The first occurrence of the subacicular hooks varies, but appears to be less closely associated with the size of the specimens than is the occurrence of the first branchia. Larger specimens generally have the first subacicular hook on a later setiger than do smaller ones. The shape of the unworn hook is highly characteristic; but the hooks in posterior setigers are often worn. A series of hooks from one specimen of E. reducta is illustrated in Pl. 5, Figs. c-e.

Hooded, composite, bidentate hooks are found in all setigers in all species of the genus. They are usually very similar, with well developed teeth, but some species (E. americana and E. cedroensis) have strongly reduced proximal teeth. The hoods of the composite hooks are

usually blunt; some species (E. americana, E. cedroensis, E. megabranchia and E. vittata) have pointed hoods.

Acicula are usually a little darker than the subacicicular hooks in the same setiger, but the difference in color is slight. Species with radically different color in acicula and subacicicular hooks are not known. All species have the same color in the acicula and the subacicicular hooks throughout the geographical range of each species. Acicula in most species have conical tips; two species, E. antennata and E. filamentosa, have hammer-headed acicula in posterior setigers.

The occipital tentacles and the tentacular cirri may be smooth or articulated. The articulations, when present, may be cylindrical or moniliform. The inner articles are longer and less well developed in all species except E. antennata, where all articles are similar and moniliform. There are no indications that the kind of articulation varies within a species.

Most of the specimens in the present collections are incomplete so it was considered impractical to use the total length or the total number of segments present as an indication of the size of the specimens. The size is here measured as the length from the tip of the palpi to the posterior edge of the tenth setiger on the dorsal side. This was selected because the solid pharyngeal apparatus is situated in this part of the body and the chances of distortions due to fixation and preservation must be considered less in this than in any other region of the body.

The two peristomial segments were shown to be presegmental in origin by Åkesson (1967) in an embryological study of E. valens (called E. kobiensis by Åkesson, see Fauchald, 1969, p. 6). The peristomium has not been included in any of the segmental counts given in this paper.

The segmental counts are given exclusively in terms of numbers of setigers, i.e., setigerous segments. The terminology for the pre- and peristomial appendages follows Hartman (1944).

Key to Species of Eunice from Western Mexico

1. Subacicicular hooks black or dark brown 2
1. Subacicicular hooks yellow 3
2. Subacicicular hooks bidentate (Pl. 3, Fig. b) 4
2. Subacicicular hooks unidentate (Pl. 6, Fig. c)
..... sonorae
3. Subacicicular hooks bidentate (Pl. 1, Fig. f) 10
3. Subacicicular hooks tridentate (Pl. 1, Fig. a) 13
4. Branchiae simple filaments or absent
..... cariboea
4. Branchiae well developed and pectinate 5
5. Branchiae first present after setiger 10 6
5. Branchiae first present before setiger 10 7
6. Branchiae first present from setigers 18-21;
subacicicular hooks present from setigers 35-42
..... afra
6. Branchiae first present from setigers 21-26;
subacicicular hooks present from setigers 19-26
..... filamentosa
7. Occipital tentacles smooth or irregularly
wrinkled 8
7. Occipital tentacles articulated (Pl. 5, Fig. h) ... 9
8. Occipital tentacles twice as long as the pro-
stomium; branchiae stiffly erect
..... aphroditois
8. Occipital tentacles barely as long as the pro-
stomium; branchiae flaccid mutilata
9. Branchiae first present from setiger 4, composite

- hooded hooks with rudimentary proximal teeth
(Pl. 5, Fig. a) reducta
9. Branchiae first present from setigers 5-6; composite hooded hooks with well developed proximal teeth (Pl. 3, Fig. i) multipectinata
10. Occipital tentacles smooth or irregularly wrinkled; maximal number of branchial filaments approximately 45 (Pl. 4, Figs. c and e)
..... megabranchia
10. Occipital tentacles articulated; maximal number of branchial filaments less than 20 11
11. Occipital tentacles with cylindrical articles ...
..... segregata
11. Occipital tentacles with moniliform articles 12
12. Subaciccular hooks not present before setiger 34; maximal number of branchial filaments 10
..... biannulata
12. Subaciccular hooks first present not later than setiger 32; maximal number of branchial filaments 15 biannulata mexicana
13. Composite hooded hooks with long pointed hoods (Pl. 1, Fig. e) 14
13. Composite hooded hooks with blunt hoods (Pl. 1, Fig. b) 16
14. Occipital tentacles smooth; first pair of branchiae pectinate americana
14. Occipital tentacles articulated (Pl. 2, Fig. a); first pair of branchiae simple filaments 15
15. Proximal teeth of composite hooded hooks reduced; distal teeth only slightly curved (Pl. 2, Fig. b) cedroensis

15. Proximal teeth of composite hooded hooks well developed; distal teeth strongly curved (Pl. 3, Fig. 1) vittata
16. Occipital tentacles with cylindrical articles vittatopsis
16. Occipital tentacles with moniliform articles 17
17. Branchiae in far posterior setigers simple; subacicular hooks in ovigerous females present from setigers 25-40 antennata aedicificatrix
17. Branchiae in far posterior setigers with 3-5 lateral filaments; subacicular hooks in ovigerous females present from setigers 16-28
..... antennata

Eunice afra Peters, 1854

(Plate 1, Figs. h-i)

Eunice afra Peters, 1854, p. 611; Fauvel, 1932, p. 135;

Hartman, 1944, pp. 110-111, pl. 6, figs. 135-139;

Hartman, 1956, p. 282; Rioja, 1962, p. 174.

Eunice afra var. paupera Fauvel, 1943, p. 18.

New Records: 260-34(1); 1045-40(1); 1049-40(1); 1079-40(6); 1727-49(3); Point Lobos, Espiritu Santo Island, March 20, 1940, coll. E. F. Ricketts (1); Puerto Refugio, Angel de la Guardia Island, April 2, 1940, coll. E. F. Ricketts (2); Dawson 1946-47 sta. 85(1); K 111(1); Norse Beach, Puerto Penasco, rocky intertidal, Nov. 25, 1965, coll. V. A. Gallardo (1); Tastiota, Sonora, March 26, 1967, rocky intertidal, coll. P. Pickens (1).

Earlier Records: Fauvel (1943, p. 18): Gulf of California, 1904, 1905. Hartman (1944, p. 110): 634-37(4). Rioja (1962, p. 174): Bahía de La Paz, near Pichilingue.

Remarks: *E. afra* has been reviewed by Fauvel (1919, pp. 374-375, and 1932, p. 135) and Hartman (1944, pp. 110-111, and 1956, p. 282). According to Fauvel (1932), it has branchiae from setigers 13-20 with a maximum of 16 branchial filaments; according to Hartman (1956), the species has branchiae from setigers 11-20 with a maximum of nine branchial filaments. Fauvel (1932) considered *E. mutabilis* Gravier (1900) as a synonym of *E. afra* and the discrepancy in the maximal number of branchial filaments is partially due to this inclusion.

E. afra is here considered to include forms with branchia from setigers 11-20 and with a maximum of nine branchial filaments. Dark, bidentate subacicicular hooks are present from setigers 32-42. The subacicicular hooks have both teeth directed distally so they appear pronged rather than bidentate (Fig. h).

The number of branchial filaments varies between three and five in the present material; there are no distinct differences in other characters between specimens with few and many branchial filaments. This variability includes the specimens defined as var. *paupera* reported from the Gulf of California by Fauvel (1943).

E. mutabilis Gravier (1900) has branchiae from setiger 17 with a maximum of 12 branchial filaments and subacicicular hooks present from setiger 22. The shape of the subacicicular hooks is different from those in *E. afra* in that both teeth are distally rounded in *E. mutabilis*; both teeth are pointed in *E. afra*. The specimen described by Gravier (1900) was 106 mm long for 194 segments; this corresponds to the largest specimens in the present collections of *E. afra*. The early appearance of the subacicicular hooks in Gravier's specimen cannot be associated with the size of the specimen. *E. mutabilis* is therefore considered a valid

species distinct from E. afra.

The present concept of E. afra may conceal more than one species, even as restricted here. This is indicated by the very late start of the branchiae in all specimens from the eastern Pacific Ocean. Branchiae are present from setigers 19-20 according to Hartman (1944, p. 110) and from setiger 18 according to Rioja (1962, p. 174). Both authors had exclusively specimens from the eastern Pacific Ocean. Branchiae are present from setigers 17-21 in the present material (see Table 1). The maximal number of branchial filaments is two according to Hartman (1944) and three according to Rioja (1962); most specimens in the present collections have a maximal number of three branchial filaments, but one specimen with five filaments was found. The specimens from the eastern Pacific Ocean all have fewer branchiae and fewer branchial filaments than specimens from other areas. They correspond to the var. paupera as defined by Fauvel (1932, p. 135) in the number of branchial filaments, but branchiae should be present from setigers 23-27 in var. paupera and not from setigers 17-21 as in the present specimens. The available descriptions do not permit a correlation of the different patterns of branchial distribution with any other characters. An extensive collection of material from all areas in which E. afra has been reported is needed for such a revision. It is at present considered best to regard the specimens from the eastern Pacific Ocean as E. afra.

Distribution: E. afra as defined above is widely distributed in the Indo-Pacific area and in the West Indies in shallow water. It is common intertidally and in very shallow water from the upper end of the Gulf of California southwards; it has not been found on the Pacific side of Baja California.

Eunice americana Hartman, 1944

(Plate 1, Figs. d-e)

Eunice americana Hartman, 1944, pp. 118-121, pl. 8, figs. 164-174 and 189.

New Records: 1247-41(2); 1693-49(1); 1711-49(1).

Earlier Records: Hartman (1944, p. 118): 264-34(1); 1010-39(8); 1030-40(5); 1245-41(1); 1254-41(1).

Remarks: E. americana belongs to the small group of species that have tridentate subacicicular hooks and pointed hoods on the composite hooks (Figs. d-e). Other species in this group include E. cedroensis, new species (see below), and E. vittata (delle Chiaje, 1828). Branchiae are present from setiger 3 and limited to a short anterior region in all three species. E. americana differs from both the others in that it has completely smooth instead of articulated occipital tentacles. E. americana has two or three branchial filaments in the first branchia; both the others have single branchial filaments in the first one or two branchiae.

Subacicicular hooks are first present from setigers 19-28, depending on the size of the specimen; the first hook occurs singly, but farther back the subacicicular hooks occur in series of three or four in a parapodium. Acicula taper distally to a pointed, slightly bent tip. All setae, acicula and subacicicular hooks are clear yellow.

Distribution: E. americana is known from southern California to Santa Maria Bay on the Pacific side of Baja California; it is most common in 25-50 fms depth.

Eunice antennata (Savigny, 1818)

(Plate 1, Figs. a-c)

Eunice antennata Fauvel, 1917, pp. 225-228, fig. 20; Fauvel, 1919, pp. 377-378; Monro, 1933, pp. 59-60; Berkeley and Berkeley, 1939, pp. 334-335; Fauvel, 1943, p. 18; Hartman, 1944, pp. 115-117, pl. 7, figs. 154-156; Rioja, 1962, pp. 174-175.

Eunice enteles Rioja, 1941, p. 710.

New Records: 585-36(1); 608-37(1); 725-37(fragment); 870-39(1); 1081-40(fragment); 1517-46(1); 1718-49(1); 1736-49(4); 1737-49(3); 1749-49(1); 1920-49(1); 1927-49(1); 2022-51(2); 2024-51(2); 2064-51(1); 2596-54(10); Pulmo Reef, March 19, 1940, coll. E. F. Ricketts (1); Coronados Islands, March 27, 1940, coll. E. F. Ricketts (1); Concepcion Bay, March 29, 1940, coll. E. F. Ricketts (1); Dawson 1946-47 sta. 53(6); Dawson 1946-47 sta. 58(1); Dawson 1946-47 sta. 67(1); Dawson 1946-47 sta. 68(1); Dawson 1946-47 sta. 71 (1); Dawson 1946-47 sta. 94(1); Puerto Penasco, Dec. 26, 1947, coll. N. and G. E. MacGinitie (1); Hubbs sta. H50-65 (3); North Whale Island, San Ignacio Lagoon, Febr. 8, 1950, coll. M. W. Johnson (2); Old Whaling Station, San Ignacio Lagoon, from piling, Febr. 12, 1950, coll. M. W. Johnson (5); K 111(1); K 112(2); K 125(2); K 130(1); Puerto Penasco, Norse Beach, rocky intertidal, Nov. 25, 1965, coll. K. Fauchald (4).

Earlier Records: Berkeley and Berkeley (1939, p. 334): Tiburon Island. Rioja (1941, p. 710): La Aguada, Acapulco; Mazatlán. Fauvel (1943, p. 18): Gulf of California, 1901, 1905; La Paz Bay, 1895; Lagoon south of San Jose Island. Hartman (1944, p. 115): 127-33(3); 258-34(1); 264-34(1); 277-34(1); 279-34(1); 287-34(1); 498-36(1); 503-36(8);

525-36 (4); 530-36 (1); 533-36 (1); 542-36 (1); 549-36 (1); 563-36 (2); 596-36 (2); 618-37 (6); 633-37 (14); 639-37 (1); 643-37 (4); 662-37 (6); 683-37 (4); 708-37 (1); 918-39 (1); 928-39 (1); 970-39 (1); 971-39 (1); 1042-40 (1); 1045-40 (28); 1049-40 (3); 1072-40 (2); 1079-40 (2); 1092-40 (1); 1093-40 (2); 1101-40 (6); 1103-40 (2); 1105-40 (1); 1111-40 (1); 1256-41 (1). Rioja (1962, p. 175): El Mogote, La Paz; Isla del Carmen.

Remarks: *E. antennata* as presently defined appears to be one of the most commonly occurring species of *Eunice* in all warm water areas. The species may be defined as follows, based on material from western Mexico: All occipital tentacles are of the same length and distinctly articulated to the bases. Branchiae are present from setigers 4-6 to the end of the body; they are best developed in setigers 15-25. The maximal number of branchial filaments is ten; the branchiae are reduced to single filaments in the middle part of the body, but in posterior setigers the number of branchial filaments increases to a maximum of five. The yellow, tridentate subacicicular hooks are present from setigers 15-24; they may start as late as setigers 26-28 in very large specimens. The composite bidentate hooded hooks have blunt hoods.

E. antennata differs from *E. antennata aedicatrix* Monro (1933), which is also found in western Mexico, in that the number of branchial filaments is higher in posterior than in median setigers; in the latter the single branchial filaments occur over a long region of median and posterior segments with no increase in the number of filaments near the posterior end.

E. antennata, reported by Fauvel (1917, 1919) from the Persian Gulf and the western Indian Ocean, has composite, tridentate hooded hooks; tridentate composite hooks have not

been found in any specimens in the present material.

E. antennata Rioja (1941, p. 710 as E. enteles) has branchiae first present from setigers 8 or 9; such a late start of the branchiae has not been observed in any of the more than 150 specimens in the present material. Specimens from the vicinity of the stations reported by Rioja are well inside the normal range for this species.

Distribution: E. antennata is widespread in shallow warm water areas. It is the dominant species of Eunice in rocky intertidal and shallow subtidal areas in western Mexico.

Eunice antennata aedificatrix Monro, 1933

Eunice antennata aedificatrix Monro, 1933, pp. 60-61.

? Eunice aedificatrix Hartman, 1939, pp. 13-14.

New Records: 1596-49(1); 1706-49(1); 1912-49(7); 1915-49(2); 1923-49(4); 1928-49(1); 1945-50(3); 2066-51(3); Dawson 1946-47 sta. 53(16); Hubbs sta. H50-32(1); San Quintin Bay, shallow dredging, April 6, 1950, coll. D. J. Reish (1); Cedros Island, rocky intertidal, March 21, 1959 (6).

Earlier Records: ? Hartman (1939, p. 13): Magdalena Bay, 10-15 fms, sandy, weedy bottom, July 18, 1938, sta. 3-38(1); Cape San Lucas and vicinity, 6-10 fms, July 19, 1938, sta. 5-38(1). Hartman (1944, p. 115): 279-34(1); 287-34(2).

Remarks: E. antennata aedificatrix was described by Monro (1933, pp. 60-61) as different from E. antennata in that its branchiae were simple instead of pectinate in the posterior setigers, and in being a tube-builder.

A number of specimens from western Mexico are outside

the normal limits for the rest of the collection of E. antennata; after much hesitation they have been assigned to this subspecies. They agree with E. antennata aedificatrix in that they have simple branchiae in the posterior end of the body. Tubes have not been seen, but some specimens appear to have built loosely organized nests between algal material.

They differ from other specimens in several of the variable characters, but there is a large area of overlap in the range of the characters between the two groups. Branchiae are present from setigers 6-7 in E. a. aedificatrix and from setigers 4-6 in E. antennata. Subaciculae hooks are present from setigers 15-40 in E. a. aedificatrix and from setigers 16-28 in E. antennata. Ovigerous females, here considered fully grown, have subaciculae hooks from setigers 25-40 in E. a. aedificatrix and from setigers 19-28 in E. antennata. There seems to be a difference in habitat preference associated with these slight morphological differences. E. antennata is equally common on rocky shores and in shallow sandy subtidal areas. E. a. aedificatrix appears to be restricted to rocky areas.

The records of Hartman (1939) from western Mexico are doubtful; both specimens are incomplete and were assigned to E. a. aedificatrix because they show a reduction in the branchiae in the last setigers present. The specimens may well be E. antennata, which has a long median region with simple branchiae.

Distribution: E. antennata aedificatrix was originally described from Balboa, Panama; all other records are from western Mexico. It is found intertidally and in very shallow water on the Pacific side of Baja California and near Cabo San Lucas.

Eunice aphroditois (Pallas, 1788)

(Plate 3, Figs. a-b)

Eunice aphroditois Hartman, 1944, pp. 109-110; Fauvel, 1943, p. 17.

New Records: Mazatlan Bay, from estuary, intertidal, Febr. 19, 1939, coll. M. W. Johnson (2); Pulmo Reef, March 19, 1940, coll. E. F. Ricketts (2); Punta Trinidad, Dec. 31, 1953, coll. R. J. Menzies and G. Ewing (2).

Earlier Records: Fauvel (1943, p. 17): Gulf of California, 1900. Hartman (1944, p. 109): 530-36(6); 638-37(1); 662-37(1); 739-37(1); 1045-40(2); 1084-40(2).

Remarks: E. aphroditois as presently defined is one of the most widespread species of Eunice; it reaches great size and has been described under at least a dozen different names. An excellent study of the variability in this species was made by Fauvel (1917, pp. 215-225) who cleared up most of the synonyms; he indicated that E. tentaculata Quatrefages (1865) might represent the juveniles of this species, but he did not formally consider the two as synonymous. The original description of E. tentaculata does not prohibit such a conclusion; Grube (1870b, pp. 291-292) re-described the types in the Paris Museum and the description he gave fits E. aphroditois very well.

Branchiae are present from setigers 5-7 to the posterior end in the present specimens; the maximal number of branchial filaments is 37. The black, bidentate subacicular hooks are present from setigers 15-54; their first occurrence is strongly dependent on the size of the specimen.

E. aphroditois can be distinguished from the similar E. mutilata and E. multipectinata by the shape of the branchiae and the length and shape of the occipital tentacles.

Branchiae in E. aphroditois have very strong branchial stems which hold the branchiae stiffly erect over the dorsum; the short branchial filaments are well organized in a pectinate pattern with every filament in place even in fixed specimens. The branchiae in both the other species are flaccid and the branchial filaments are irregular in length and orientation. The robust subaciccular hooks in E. aphroditois have both teeth of the same size and rounded at the tip (Fig. b); the subaciccular hooks in E. mutilata have strongly curved necks; the pointed proximal tooth is larger than the rounded distal one (Pl. 3, Fig. j). The subaciccular hooks in E. multipectinata have a long narrow neck that is only slightly curved; the proximal tooth is larger than the distal one and both teeth are pointed (Pl. 3, Fig. h).

The occipital tentacles in E. aphroditois and E. mutilata are smooth or irregularly wrinkled; they are articulated in E. multipectinata. They are twice as long as the prostomium in E. aphroditois and barely reach the anterior edge of the prostomium in E. mutilata.

Distribution: E. aphroditois is cosmopolitan in warm waters. It is found in western Mexico from the Gulf of California southwards in very shallow water.

Eunice biannulata Moore, 1904

Eunice biannulata Moore, 1904, pp. 487-490, pl. 37, figs.

10-18, pl. 38, fig. 42; ? Berkeley and Berkeley, 1939, p. 335; ? Hartman, 1939, p. 13; Fauchald, 1969, pp. 2-4, fig. 1.

Eunice longicirrata Hartman, 1944. pp. 104-107, pl. 6, figs. 118-122, partim (not Webster, 1884).

New Records: 264-34 (2); 1727-49 (3); 1742-49 (1); 2024-51 (1).

Earlier Records: ? Berkeley and Berkeley (1939, p. 335): Arena Point, 11 fms. ? Hartman (1939, p. 13): Isla Socorro, 7-8 fms. Hartman (1944, p. 104): Ensenada, Nov. 25, 1927 (2); El Morro Point, Todos Santos Bay, July 2, 1938, shore, coll. Burch (1).

Remarks: E. biannulata has been re-described and illustrated using specimens from near the type area (Fauchald, 1969). The distal part of each occipital tentacle has moniliform articles; the basal half has less well separated, short articles and the inner one-fourth of each tentacle is not articulated. Each of the outer lateral tentacles may have 5-8 articles; each of the inner lateral ones may have 8-15 and the median tentacle has 15-24 articles. The maximal number of branchial filaments varies between six and ten; originally the maximum number was described as six to eight. Branchiae are present from setiger 3 and the total number of pairs of branchiae varies between 45 and 78 in the present specimens; the type specimen had 50 pairs of branchiae.

Subacicicular hooks are present from setigers 34-48, depending on the size of the specimen.

The relationship between E. biannulata and other species with yellow, bidentate subacicicular hooks and branchiae from setiger 3, limited to a short anterior region, has been discussed elsewhere (Fauchald, 1969).

Distribution: E. biannulata is known from southern California south to Petatlan Bay, Mexico, in intertidal and shallow subtidal areas. The species may have a wider distribution, but it has been so confused with several similar species that the total distribution is not known.

Eunice biannulata mexicana, new subspecies
(Plate 1, Figs. f-g)

Leodice biannulata ? Treadwell, 1914, pp. 193-194.

Eunice longicirrata ? Berkeley and Berkeley, 1939, pp. 335-336; Hartman, 1944, pp. 104-107, pl. 6, figs. 118-122, partim; ? Rioja, 1962, pp. 172-173 (not Webster, 1884).

New Records: 264-34(1); 491-36(1); 918-39(1); 1051-40(1); 1110-40(1); 1743-49(1); 1965-50(1); off Lower California, 24° 58' 15" N, 115° 53' W, 36 fms, corallines, March 2, 1889, ALBATROSS (1); Knepper Shoal, Abreojos Point, 8 fms, in sea weed holdfasts, rocks etc., coll. D. Miller (1).

Earlier Records: ? Treadwell (1914, p. 194): off the Coronados Islands, 15 fms, fine gray sand, sta. LIX. ? Berkeley and Berkeley (1939, p. 335): Espiritu Santo Island. Hartman (1944, p. 104): 277-34(4); 498-36(1); 513-36(2); 533-36(4); 549-36(2); 628-37(1); 633-37(2); 642-37(1); 675-37(2); 704-37(1); 745-37(4); 747-37(6). ? Rioja (1962, p. 173): Isla de Montserrat, 60 fms, Sept. 1960.

Remarks: E. biannulata mexicana has less than 40 pairs of branchiae except for one very large specimen, which has 45. The first branchia is on setiger 3 and the maximal number of branchial filaments is fifteen. Yellow, bidentate subacicicular hooks are first present from setigers 20-32, but never later. All other structures are similar to those in E. biannulata.

E. biannulata mexicana differs from E. biannulata in that it has fewer branchiae but a higher number of branchial filaments. The subacicicular hooks are present in more setigers in E. b. mexicana than in E. biannulata. These slight morphological differences are associated with differences in habitat. E. biannulata is found on rocky

bottoms, often with algae in very shallow water; E. b. mexicana is more common in slightly deeper water in sandy or gravelly bottoms.

The record by Treadwell (1914, p. 194) is very doubtful; the material from those stations has been lost. Other specimens reported as E. biannulata from California by Treadwell (1914) include four different species of Eunice. The record is here associated with E. b. mexicana rather than with E. biannulata because of the ecological data given by Treadwell.

Berkeley and Berkeley (1939, pp. 335-336) distinguished E. biannulata from E. longicirrata by the number of articles on the dorsal cirri, which should be higher in the former than in the latter. Well documented records of E. longicirrata Webster (1884, name pre-occupied, new name E. websteri Fauchald, 1969) do not exist and the species should be considered as known only from Bermuda and the West Indies. E. biannulata tends to have more articles on the occipital tentacles than does E. b. mexicana, but the distinction is not sharp. The record by Berkeley and Berkeley (1939) must be considered doubtful.

E. longicirrata Rioja (1962, p. 173) is included in E. b. mexicana because of the reported depth. The description is not sufficiently detailed to assign the specimens to either E. biannulata or to E. b. mexicana.

Distribution: E. b. mexicana is known from Baja California to Petatlan Bay, Mexico; it is common in the Gulf of California.

Eunice cedroensis, new species

(Plate 2, Figs. a-e)

Records: 1245-41(1, TYPE); 6179-59(1); 1 mile off Cedros Island, 28° 6' N, 115° 11' W, brown sandy mud, May 13, 1946, coll. K. Kenyon and M. W. Williams (1).

Description: All three specimens are incomplete; the type has 32 setigers and is 10 mm long and 3.2 mm wide with setae. It is light yellow and lacks color pattern.

The prostomium (Fig. a) is shorter than wide, with a shallow anterior incision; the palpi are indistinct. A pair of reddish brown eyes are present at the bases of the inner lateral occipital tentacles. The slender median occipital tentacle reaches setiger 6 and has five cylindrical articles. The slender inner lateral occipital tentacles have the same number of articles as the median one, but are a little shorter. The outer lateral occipital tentacles barely reach the first setiger; each has four short articles. The cylindrical first peristomial segment is as long as the prostomium; the second peristomial segment is only half as long as the first one and slightly shorter than the first setiger. The smooth, slender peristomial cirri are as long as both peristomial segments together.

All parapodia are similar (Figs. d-e). The low presetal lobes are truncate; the short postsetal lobes are shorter than the setal lobes in all setigers. The setal lobes are obliquely truncate. Each of the digitiform dorsal cirri has two or three articles. The ventral cirri are stout and digitiform in the prebranchial region; they are swollen basally in the branchial and postbranchial region, but the digitiform tips are distinct in all segments present.

Branchiae are present from setiger 3; the last branchia is on setiger 27 in the type and on setiger 23 in one of the other specimens. The last specimen consists of 23 setigers and branchiae are present on the last of these. The maximal number of branchial filaments is ten.

The dorsal setal fascicles have numerous fine, long capillary setae and a few pectinate setae in all setigers. Each pectinate seta has twelve teeth and both margins are prolonged as fine filaments, with one longer than the other. The composite hooded hooks (Fig. b) have nearly straight shafts which are only slightly expanded near the distal end. The appendages of the composite hooks are long and slender; each has a long, sharply pointed hood; the acuminate distal tooth is slightly curved and the triangular proximal tooth is very poorly developed; it is visible only as a slight bulge on the side of the appendage in some hooks. The margins of the hoods and the upper ends of the shafts are finely serrated. Acicula are yellow, slender and have acuminate, slightly bent tips. Yellow, tridentate subacicular hooks (Fig. c) are present from setiger 20 in the type and from setigers 17 and 19 in the other specimens.

The pharyngeal apparatus is exposed in the type; maxilla I is falcate; maxilla II has seven teeth left and eight teeth right; left maxilla III has nine teeth; the combined right maxillae III+IV have ten teeth; left maxilla IV has eight teeth and each maxilla V has one tooth.

E. cedroensis is closely related to E. americana Hartman (1944), but differs from the latter in that it has articulated tentacles and dorsal cirri; tentacles and dorsal cirri are smooth in E. americana. The maximal number of branchial filaments is ten in E. cedroensis and twenty in E. americana. Branchiae are present from setiger 3 to 23-

27 in E. cedroensis and from setiger 3 to 30-35 in E. americana. Subacicicular hooks are first present from setigers 17-20 in E. cedroensis and from setigers 19-28 in E. americana. The pharyngeal apparatus is similar in both species.

Distribution: E. cedroensis is known from three localities from the vicinity of Cedros Island to Todos Santos Island on the Pacific side of Baja California. The type comes from 4 miles N of Todos Santos Island, $31^{\circ} 53' 20''$ N, $116^{\circ} 48' 15''$ W, 41 fms, shell, mud and gray sand, VELERO III sta. 1245-41.

Eunice filamentosa Grube, 1856

(Plate 3, Figs. c-g)

Eunice filamentosa Fauvel, 1943, pp. 19-20; Hartman, 1944, p. 107, pl. 6, figs. 123-126; Rioja, 1962, pp. 173-174 (not Hartman, 1956, p. 283).

Eunice spongicola Rioja, 1941, p. 711 (not Treadwell, 1921).

New Records: 1042-40(1); 1053-40(2); 2022-51(1); Norse Beach, Puerto Penasco, rocky intertidal, Nov. 25, 1965, coll. V. A. Gallardo (1).

Earlier Records: Rioja (1941, p. 711): Playa de Caleta, Acapulco. Fauvel (1943, p. 19): Baja (?) California. Hartman (1944, p. 107): 260-34(1); 1045-40(1); 1049-40(3); 1051-40(1); 1052-40(1); 1063-40(2); 1092-40(1). Rioja (1962, p. 174): Isla de San Roque.

Remarks: Reference to the complex synonymy of E. filamentosa is found in Hartman (1944). Branchiae are first present from setigers 21-32 and subacicicular hooks are present from setigers 18-26, both depending on the size of the specimen. Acicula (Fig. g) are hammer-headed in posterior

setigers. The dark, bidentate subacicicular hooks (Fig. c) are strongly beaked. The composite hooded hooks (Fig. e) have long, slender appendages in anterior setigers and shorter, thicker appendages in posterior setigers.

The color of the subacicicular hooks was not mentioned in the original description of E. spongicola (Treadwell, 1921); the type material of this species was re-examined by Hartman (1956, p. 283) and the subacicicular hooks were then described as yellow; it was considered synonymous with E. filamentosa. The subacicicular hooks are brown in all material known from the eastern Pacific Ocean (Hartman, 1944, p. 107; Rioja, 1941, p. 711, and 1962, p. 173) and all have the characteristic beaked structure. Because of the different color of the subacicicular hooks it is here suggested that E. spongicola (Treadwell, 1921) should be stricken from the synonyms of E. filamentosa.

E. spongicola Rioja (1941, p. 711) does not differ from the specimens here referred to E. filamentosa and the subacicicular hooks were described as brown.

E. filamentosa was recorded by Fauvel (1943, pp. 19-20) from "Californie"; most of the other material available to Fauvel was from Baja California and the Gulf of California. It is here suggested that the record must be considered to be from Baja California rather than from California, since E. filamentosa never has been found further north than the southern half of Baja California.

It will be noted that several specimens reported by Hartman (1944) are missing from Table 1; some of them have not been recovered in the collections, but most of the missing specimens have here been referred to E. afra.

Distribution: E. filamentosa is widely distributed in tropical west Atlantic areas in intertidal and shallow

subtidal waters. It is found intertidally and in the shallow subtidal areas from the southern end of Baja California to the Galapagos Islands in the eastern Pacific Ocean; it also enters the Gulf of California.

Eunice megabranchia, new species

(Plate 4, Figs. a-e)

Record: 27° 03' N, 112° 18' W, 894 m, coll. S. Calvert, sta. L-184(1, TYPE).

Description: The type is an incomplete specimen with 69 setigers and is 68 mm long and 9 mm wide with setae. It is pale salmon colored and lacks color pattern. The anterior part of the body is cylindrical and the posteriormost part is slightly flattened dorsally.

The prostomium (Fig. c) is half as long as wide and has a deep, sharp anterior incision; both halves are evenly rounded. A pair of black eyes is present posterior to the bases of the outer lateral occipital tentacles. The slender occipital tentacles form a crescent on the posterior half of the prostomium; all tentacles are smooth or irregularly wrinkled. The outer lateral pair reaches the first setiger; the inner lateral ones reach the seventh setiger and the long median tentacle reaches the twelfth setiger. The cylindrical first peristomial segment is longer than the prostomium; the second peristomial segment is only half as long as the first one and similar in length to the first setiger. The long, slender peristomial cirri reach the tip of the prostomium.

The first setiger has a low transverse presetal lobe; the rounded setal lobe is shorter than the postsetal lobe. The smooth dorsal cirri are long and slender in the pre-

branchial and branchial region (Fig. e); they are reduced to short, slender filaments in the postbranchial region. The ventral cirri are stout and digitiform in all setigers; basal swellings are absent. The postsetal lobes are reduced in the branchial region to low transverse folds. The setal lobes are pointed in the postbranchial region.

Branchiae are present from setiger 3-54; the last seven pairs are single filaments; all other branchiae, including the first one, are pectinate. The maximal number of branchial filaments counted is 47. The branchial stem is stout and is held erect or slightly curved over the dorsum; the branchial filaments are long and slender and arranged in a clearly organized pectinate pattern.

The dorsal setal fascicles have a varying number of slender, smooth capillary setae; pectinate setae are found in median and posterior setigers. Each pectinate seta (Fig. a) is long and narrow and only slightly expanded near the end; the edge is straight with eight or nine teeth and both margins are prolonged, with one margin longer than the other. Ventral fascicles have composite, bidentate hooded hooks (Fig. d); each has a slightly expanded shaft and an appendage with a nearly straight distal tooth and a small, triangular proximal tooth. The hoods are long and pointed; serrations on hoods and shafts are absent. The acicula and the subacicicular hooks are dark yellow; the slender acicula have conical, slightly bent tips and number two in a parapodium. Subacicicular hooks (Fig. b) are present from setiger 35; each is bidentate, with a large proximal tooth and a smaller, more pointed distal tooth; both teeth are directed distally. Subacicicular hooks occur singly in most parapodia, but two are sometimes present.

The pharyngeal apparatus was not dissected in the single specimen available.

E. megabranchia belongs to the group of species that has yellow, bidentate subacicicular hooks. Branchiae are first present from setiger 3 and are limited to a short anterior region. Other species in this group include E. biannulata Moore (1904), E. biannulata mexicana, new subspecies (see above), E. kobiensis McIntosh (1885), E. segregata (Chamberlin, 1919), E. semisegregata Fauchald (1969), E. valens (Chamberlin, 1918), E. validobranchiata Monro (1937), and E. websteri Fauchald (1969, new name for E. longicirrata Webster, 1884). Species in this group have been revised by Fauchald (1969). The only other species that have a corresponding development of the branchiae are E. semisegregata and E. validobranchiata. E. megabranchia differs from E. semisegregata in that it has pointed hoods on the composite hooded hooks; the hoods are blunt in E. semisegregata.

Branchiae are present from setiger 3 to 45-50 in E. validobranchiata and from setiger 3-54 in E. megabranchia. The maximal number of branchial filaments is 45 in E. validobranchiata and 47 or more in E. megabranchia. The composite setae of E. validobranchiata were said to have a "guard . . . [that] is continued to a point beyond the end of the hook. This is much more marked in some specimens than in others" (Monro, 1937, p. 289). There is no detailed illustration of the composite hooks in Monro (1937), but his Fig. 13b of a posterior parapodium shows the hoods as short and blunt. The hoods of all composite hooks are clearly long and pointed in E. megabranchia. The ventral cirri have basal swellings in E. validobranchiata; such swellings are absent in E. megabranchia. The median occipital tentacle reaches setiger 10 and the inner and outer lateral ones were said to be "a little shorter" in E. validobranchiata; the median tentacle reaches setiger 12, the inner lateral ones

setiger 7 and the outer lateral ones setiger 1 in E. megabranchia, so the relation between the occipital tentacles differs in the two species.

Distribution: E. megabranchia is known from one locality on the western slope of Guaymas Basin, Gulf of California.

Eunice multipectinata Moore, 1911

(Plate 3, Figs. h-i)

Eunice multipectinata Moore, 1911, pp. 248-251, pl. 15, figs. 20-23; ? Fauvel, 1943, p. 19; Hartman, 1944, pp. 112-113; Rioja, 1947b, p. 519.

New Record: 1264-41(5).

Earlier Records: ? Fauvel (1943, p. 19): Lower California, Gulf of California, coralline reefs. Hartman (1944, p. 112): 1246-41(3); 1252-41(1); 1253-41(2); 1256-41(1); 1261-41(1). Rioja (1947b, p. 519): Isla de la Asunción.

Remarks: E. multipectinata was originally described with branchiae first present from setigers 6-7 (Moore, 1911, p. 250). Specimens from central and southern California may have branchiae from setiger 3 (Hartman, 1944, p. 112). Branchiae are present from setigers 6-7 in all specimens from western Mexico; see Table 1 for a survey of the distribution of the variable characters.

The subaciccular hooks (Fig. h) may be present from setiger 28; they occur from setigers 34-42 in fully grown specimens. Each hook is dark and bidentate with the proximal tooth thicker than the distal one; both teeth are directed distally. The hooded composite hooks have short

appendages and rounded hoods (Fig. i).

E. multipectinata was reported by Fauvel (1943, p. 19) from coralline reefs in the Gulf of California; the species has not been collected south of Isla de la Asunción on the Pacific side of Baja California and is exclusively found in silty and muddy bottoms on the middle and lower half of the shelf. Fauvel (1943) did not describe his specimens in sufficient detail to permit identification; the record is considered very doubtful.

Distribution: E. multipectinata is known from central California south to Asuncion Bay, south of Cedros Island on the Pacific side of Baja California.

Eunice mutilata Webster, 1884

(Plate 3, Figs. j-k)

Eunice mutilata Webster, 1884, pp. 315-316, pl. 9, figs. 36-40; Hartman, 1944, pp. 113-114, pl. 6, figs. 140-141.

New Records: 1252-41(1); 1734-49(13); Dawson 1946-47 sta. 85(1).

Earlier Records: Hartman (1944, p. 113): 129-33(1).

Remarks: E. mutilata resembles E. afra, but can be distinguished from the latter by the pigment pattern and by the distribution of the branchiae. E. mutilata has a red-dish background color with a reticulated pattern of white lines in the anterior end; the pattern may sometimes appear as a dense and regular punctation rather than as white lines. The posterior part of the body usually has more scattered and irregular white punctations on a solid red-dish brown background. E. afra is usually solid reddish

brown with a single white crossbar on one of the anterior setigers, usually setiger 4. It should be noted that a white crossbar may also be found in other species of Eunice.

Branchiae are first present from setigers 6-8 in E. mutilata and from setigers 18-21 in E. afra from western Mexico.

Subacicicular hooks (Fig. j) are present from setigers 22-29; each is dark and bidentate; both teeth are directed distally and the subdistal portion of the hook is narrowed and strongly curved. The composite hooded hooks (Fig. k) have blunt hoods.

Distribution: E. mutilata is common in the West Indies and on Bermuda. It is found from Cedros Island, Baja California, to the Galapagos Islands in the eastern Pacific Ocean.

Eunice (Nicidion) cariboea Grube, 1856

Eunice (Nicidion) cariboea Hartman, 1944, pp. 123-124, pl. 7, figs. 157-163, pl. 8, fig. 178.

Eunice cariboea Rioja, 1962, p. 178.

Nicidion kinbergi Webster, 1884, pp. 320-321, pl. 12, figs. 81-88; Rioja, 1941, p. 712.

Eunice (Nicidion) kinbergi Hartman, 1944, p. 124.

New Records: 591-36(1); 971-39(1); 1561-46(13); 1727-49(1); 2022-51(1); 2025-51(1); Norse Beach, Puerto Penasco, Nov. 26, 1965, rocky intertidal, coll. K. Fauchald (1).

Earlier Records: Rioja (1941, p. 712): La Aguada, Acapulco. Hartman (1944, p. 123): 633-37(1); 634-37(1). Rioja (1962, p. 178): Isla de Gaviota, La Paz; Isla de la Asunción.

Remarks: A survey of the occurrence of branchiae and subacicicular hooks in E. (N.) cariboea is found in Table 1. It is clear from this table that branchiate and abranchiate specimens may occur in the same sample. Most branchiate specimens have branchiae from setigers 15-20 except for two specimens, one from the Pacific side of Baja California and the other from the upper end of the Gulf of California, which have branchiae from approximately setiger 100. All branchiae found on setigers before setiger 100 are very small and erratic in occurrence; they may be missing from a number of setigers, without any clear pattern.

The first occurrence of the black, bidentate subacicicular hooks varies in the normal pattern with the size of the specimen; they are present from setigers 23-32.

Nicidion kinbergi Webster (1884) was originally described from an anterior fragment and differed from E. (N.) cariboea only in that branchiae were completely absent in the former and present in posterior setigers in the latter (Hartman, 1944, pp. 123-124). The variation in this character is so great that there seems to be no reason to retain the name N. kinbergi even at a subspecific level.

Distribution: E. (N.) cariboea is widely distributed in the West Indies and Bermuda. It is found from Cedros Island, Baja California, to Colombia in the eastern Pacific Ocean, and it also enters the Gulf of California in intertidal and shallow subtidal areas.

Eunice reducta, new species

(Plate 5, Figs. a-i)

Eunice tridentata Monro, 1933, pp. 63-64, fig. 26.

? Eunice tridentata Hartman, 1944, pp. 114-115, pl. 7,

figs. 145-150 (not E. tridentata Ehlers, 1905, or Augener, 1924, pp. 402-404).

Eunice tentaculata Fauvel, 1943, pp. 17-18 (not Quatrefages, 1865).

? Eunice coccinea Fauvel, 1943, p. 18 (not Grube, 1878b).

New Records: 1727-49(1); 1734-49(8, TYPE); Point Lobos, Espiritu Santo Island, March 20, 1940, coll. E. F. Ricketts (1).

Earlier Records: Fauvel (1943, pp. 17-18): Gulf of California, 1904, 1905; Lower California, 1897. Hartman (1944, p. 114): 970-39(1).

Description: The type is a complete specimen with 298 setigers; it is 318 mm long and 8.5 mm wide with setae. It is copper colored with a strong green iridescence; a color pattern is absent. The body is cylindrical and the anal cirri are short and digitiform.

The prostomium (Fig. h) is more than twice as wide as long and has a wide, shallow anterior incision; the palpi are distinct. The occipital tentacles are digitate; all are of approximately the same length and reach the anterior edge of the first setiger. Each tentacle has three to five articles; the median tentacle usually has more articles than the outer ones. A pair of eyes is present at the outer bases of the inner lateral occipital tentacles.

The cylindrical first peristomial segment is twice as long as the prostomium; the second peristomial segment is one-third as long as the first one and only half as long as the first setiger. The slender peristomial cirri are as long as both peristomial segments together; each has six or seven articles.

The first setigers (Fig. f) have rounded pre- and postsetal lobes which are a little shorter than the rounded

setal lobes. The setal lobes become somewhat longer in relation to the pre- and postsetal lobes in median and posterior setigers; they are truncate in the branchial region (Fig. i) and conical in the postbranchial region (Fig. g). The large dorsal cirri in the prebranchial setigers have one articulation each. They are shorter and more slender in median and posterior setigers and retain the articulation at least through the branchial region. The ventral cirri are similar in all setigers; each is thickset and blunt; a distinct basal swelling is absent.

Branchiae are present from setiger 4-131; all except the three last pairs are pectinate. The maximal number of branchial filaments in normal branchiae is 20-21; several branchiae have two or three extra filaments basally and some of the distal filaments may be bi- or trifid. The branchial stem is stiff and the branchiae are held erect over the dorsum. The first 30 pairs of branchiae are longer than the dorsal cirrus; the last 100 pairs are short and have only 3 to 4 branchial filaments.

The straight acicula have pointed tips; they are dark and number two in a parapodium. The dorsal setal fascicles have short, bilimbate setae with serrated cutting edges and straight pectinate setae in all setigers. Each pectinate seta (Fig. b) has 18-20 short teeth and one margin drawn out in a short tip. The ventral fascicles have composite, bidentate hooded hooks. Each hook (Fig. a) has a slender shaft without distal expansion. The appendage is triangular in outline; the distal tooth is nearly straight; the proximal tooth is visible only as a slight bulge on the side of the appendage; the hood is short and blunt. Dark, bidentate subacicicular hooks (Figs. c-e) are present from setigers 34-49. Usually only one hook is present in a parapodium; when two hooks are present, the inferior one has a

clear bidentate shape; the superior one is worn and appears unidentate.

The pharyngeal apparatus is strongly chitinized; the calcified cutting edge of the mandibles is triangular. Maxilla I is falcate; each maxilla II has four large teeth; left maxilla III has eight teeth; the combined maxillae III and IV have ten teeth; left maxilla IV has four teeth and each maxilla V has one tooth.

Eunice reducta was reported by Monro (1933) and Hartman (1944) as E. tridentata Ehlers (1905), which it resembles in the structure of the composite hooks. Ehlers (1905) and later Augener (1924, pp. 402-404), in a re-examination of the type of E. tridentata, both pointed out that the subacicular hooks and the acicula are light colored. Hartman (1944, p. 115) suggested that because of this difference in color the material from the eastern Pacific Ocean might differ specifically from the specimens of E. tridentata reported from New Zealand.

E. reducta differs from E. tridentata also in that the former has branchiae from setiger 4 to 131; the latter has branchiae from setiger 3 to 82. Basal swellings of the ventral cirri are present in E. tridentata and absent in E. reducta.

E. tridentata Monro (1933) from Panama agrees well with E. reducta except that the specimens are smaller and have fewer branchiae.

E. valens (Chamberlin, 1918) was suggested by Hartman (1944) to be the same as the present species; a re-examination of the type of E. valens published elsewhere (Fauchald, 1969, pp. 10-12, fig. 5) shows that it differs from E. reducta in several characters. The acicula and the subacicular hooks are clear yellow in E. valens and dark in E.

reducta. The composite hooded hooks are clearly bidentate with both teeth well developed in E. valens; the proximal tooth is reduced in E. reducta.

E. tentaculata Quatrefages (1865) and E. coccinea Grube (1878) were reported from Baja California and the Gulf of California by Fauvel (1943). His description of the specimens of the former and his remark that the composite hooded hooks resemble those in E. tridentata as described by Monro (1933) when worn, suggest that Fauvel had a specimen of E. reducta; this differs from E. tentaculata as re-described by Fauvel (1917, pp. 209-215, fig. 17) in that it has branchiae limited to the anterior half of the body, whereas they are present to the posterior end in E. tentaculata. The shape of the subacicicular hooks and the composite bidentate hooks is also different in the two species. The occipital tentacles have moniliform articles in E. tentaculata and cylindrical articles in E. reducta.

The specimen of E. coccinea reported by Fauvel (1943) was a posterior fragment only; it resembles E. reducta in the shape of the composite bidentate hooks and in the shape of the subacicicular hooks when they are worn. E. reducta differs from E. coccinea Grube (1878b) as re-described by Fauvel (1919, pp. 375-377, fig. 5) in that it has branchiae from setiger 4 instead of from setigers 6-15. The maximal number of branchial filaments is 20-21 in E. reducta and 5-6 in E. coccinea. Subacicicular hooks are present from setigers 34-49 in E. reducta and from setigers 21-22 in E. coccinea.

Distribution: E. reducta has been found from Ecuador (Hartman, 1944 as ? E. tridentata) to the Gulf of California in shallow water.

Eunice segregata (Chamberlin, 1919)

Leodice segregata Chamberlin, 1919b, pp. 237-240, pl. 54,
figs. 1-5, partim; Treadwell, 1923, p. 7, partim.

Eunice segregata Fauchald, 1969, pp. 6-8, fig. 3 (not Berkeley and Berkeley, 1939, p. 336, or Rioja, 1941, p. 710).

New Record: P 135-59(1).

Earlier Records: Treadwell (1923, p. 7): ALBATROSS stations D 5682 and D 5695.

Remarks: E. segregata contains two different species as originally described. The holotype of E. segregata has not been recovered; the specimen reported by Treadwell (1923) from ALBATROSS sta. D 5695 has been re-described elsewhere (Fauchald, 1969). Two paratypes of E. segregata from ALBATROSS sta. 3417 are all that remain of the original material; these differ markedly from E. segregata and have been described elsewhere as E. semisegregata Fauchald (1969).

E. segregata in the restricted sense has articulated occipital tentacles with cylindrical articles. The peristomial cirri reach the middle of the prostomium. Branchiae are present from setiger 3 to 39 and the first two and the last pair are single filaments. Maximal number of branchial filaments is 12-15. Yellow, bidentate subacicicular hooks are present from setiger 36. The dorsal cirri are articulated.

E. segregata has been reported from depths greater than 450 fms. Several species with the same general characters, differing only in minor details, are known from western Mexico; the two shallow water records of E. segregata by Berkeley and Berkeley (1939) and Rioja (1941) are

here considered to belong to one of these species rather than to E. segregata. The specimens were not described in sufficient detail to permit further identification.

Two specimens of E. segregata were reported by Treadwell (1923, p. 7) from the ALBATROSS collections; both have been re-examined. The specimen from station D 5682 is an onuphid and the other one forms the basis for a re-definition of E. segregata as mentioned above.

Distribution: E. segregata is known from two localities off Panama, from one locality off northern Baja California and from one locality off southern California, in depths between 450 and 650 fms.

Eunice sonorae, new species

(Plate 6, Figs. a-g)

Record: Puerto Penasco, rocky intertidal, April 8, 1967, coll. P. Pickens (1, TYPE).

Description: The type is a complete specimen with 586 setigers; it is 345 mm long and 12.1 mm wide with setae. It is reddish brown with numerous white dots scattered irregularly; the ventrum is somewhat paler than the dorsum. The prostomium is light brown without any color pattern; the occipital tentacles are white with reddish brown cerato-phores. The fourth setiger has a broad white dorsal cross-bar. The parapodia have light brown anterior and posterior sides near the bases; they are colorless elsewhere. The anterior part of the body is cylindrical; the branchial and postbranchial region is somewhat flattened dorsally. The short anal cirri are digitiform.

The prostomium (Fig. a) is shorter than wide and has a deep, narrow incision. The ventral parts of the palpi are

short and rounded. The smooth occipital tentacles are more than twice as long as the prostomium; the median and inner lateral ones are of the same length; the outer lateral pair is a little shorter. The occipital ceratophores are raised above the surface of the prostomium and not flush with the prostomium as is usual in this genus. The first peristomial segment is more than twice as long as the prostomium; it is cylindrical with an anterior dorsolateral notch on each side. The second peristomial segment is as long as the first setiger and one-third as long as the first peristomial segment. The smooth peristomial cirri are short and slender.

The first setigers (Fig. g) have short parapodia; each has an obliquely truncate setal lobe and a short, straight presetal lobe which is continuous with the high, rounded postsetal lobe. The dorsal cirri are long and digitiform; they are similar in all setigers. The ventral cirri are thick and somewhat swollen basally; the basal swelling is more distinct in the late prebranchial setigers; but the digitiform tip is retained in all segments. All parapodia are similar in the long prebranchial region except that the postsetal lobes are reduced to low, transverse folds similar to the presetal lobes from the first branchial setiger (Fig. f).

Branchiae are present from setiger 41 to approximately 480; the first pair is simple; the second pair has three lateral filaments. Where fully developed, each branchia has five or six lateral filaments in a pectinate arrangement; each filament is long and slender and the branchiae of a pair cover the dorsum completely through most of the branchial region.

Each of the dorsal setal fascicles has 10-20 straight capillary setae and a varying number of pectinate setae.

Each pectinate seta (Fig. b) is straight and has nine to ten teeth; both margins are drawn out in fine filaments with one longer than the other. The ventral fascicles have composite bidentate hooded hooks (Figs. d-e). Each hook has a rounded hood and both teeth are large and blunt in anterior hooks. The hooded hooks in posterior setigers are smaller than the anterior ones and both teeth are pointed; the two kinds of hooks intergrade in the middle part of the body. The hoods and the distal ends of the shafts of the hooks are finely serrated. Dark subacicicular hooks (Fig. c) are present from setiger 54 to the end of the body. Each is clearly unidentate and slightly curved; they occur singly in a parapodium. The black, acuminate acicula are slightly bent near the tip; they number four in a parapodium in the anterior end; the number is reduced in the first branchial segments; only one aciculum is present in segments with subacicicular hooks.

The pharyngeal apparatus was not dissected in the single specimen available.

E. sonorae belongs to the small group of species that has unidentate, black subacicicular hooks; other species in this group include E. fauveli Gravier (1900), E. marenzelleri Gravier (1900), E. schemacephala Schmarda (1861) and E. unidentata Rioja (1962).

E. schemacephala differs from all other species in this group in that it has branchiae from setiger 4; none of the others have branchiae present before setiger 10. E. marenzelleri is unique in that it has only simple branchiae and might be referred to the subgenus Nicidion except for the obvious close relationship to other species in this group.

Branchiae are present from setiger 17 to the end of

the body with a maximal number of at least 14 branchial filaments in E. fauveli, and from setiger 41 with 5-6 branchial filaments in E. sonorae. Subacicicular hooks are present from setiger 39 in E. fauveli and from setiger 54 in E. sonorae. The type specimens are of the same size in both species.

Branchiae are present from setiger 28 and subacicicular hooks from setiger 20-25 in E. unidentata. The occipital tentacles have strongly articulated ceratophores in E. unidentata and smooth ceratophores in E. sonorae. The subacicicular hooks are thickset with a short, sharply tapered tip in E. unidentata (Rioja, 1962, pp. 176-177, figs. 80-81) and slender and evenly tapered in E. sonorae.

The species in this group have a rather disjunct distribution. E. fauveli and E. marenzelleri are known from the Red Sea only; E. schemacephala from the West Indies; E. unidentata from one locality on the Pacific side of Baja California.

Distribution: E. sonorae is known from one intertidal locality in the upper end of the Gulf of California.

Eunice vittata (delle Chiaje, 1828)

(Plate 3, Figs. 1-m)

Eunice vittata Fauvel, 1923, pp. 404-405, fig. 158h-n;

Rioja, 1941, p. 710; Hartman, 1944, p. 118; Rioja, 1947a, p. 204.

? Eunice indica Fauvel, 1943, pp. 18-19 (not Kinberg, 1865).

New Records: 277-34(1); 533-36(1); 544-36(1); 618-37(7); 633-37(1); 1008-39(1); 1035-40(1); 1078-40(1); 1093-40(1); 1251-41(2); 1253-41(2); 1256-41(1); 1694-49(1); 1711-49(2); 1729-49(2); 1920-49(2); 1921-49(fragment); 1924-49

(10); 2022-51(1); 2030-51(1); 6177-59(15 juveniles); P 58-59(1); P 72-59(3); P 191-60(1); P 196-60(14); P 212-60(1); K 127(2); K 130(1).

Earlier Records: Rioja (1941, p. 710): La Aguada, Acapulco. ? Fauvel (1943, p. 18): the lagoon south of San Jose Island, Gulf of California, 1904. Hartman (1944, p. 118): 264-34(1); 532-36(1); 549-36(1); 739-37(1); 926-39(1); 1246-41(1); 1259-41(2). Rioja (1947a, p. 204): El Mogote, La Paz.

Remarks: *E. vittata* from western Mexico has yellow, tridentate subacicular hooks (Fig. m) present from setigers 16-24; one large specimen had hooks from setiger 34. The bidentate composite hooded hooks (Fig. 1) have a large gap between the proximal and distal teeth; they have sharply pointed hoods. Branchiae are present from setiger 3 through the anterior third of the body; the total number of branchial pairs varies with the size of the specimen, but branchiae are in all cases absent from the posterior two-thirds of the body. The maximal number of branchial filaments is 10-12. The occipital tentacles are articulated; each articule is long and cylindrical.

E. indica was reported from the Gulf of California by Fauvel (1943, p. 18) with one specimen; the species is not known from the eastern Pacific Ocean, and the record is here referred to *E. vittata*, which is very similar to *E. indica* and very common in western Mexico.

Distribution: *E. vittata* is widespread in tropical and subtropical waters. It is common in western Mexico in depths between 10 and 50 fms.

Eunice vittatopsis, new species

(Plate 7, Figs. a-d)

Records: 633-37(8); 739-37(1, TYPE); 1101-40(2); 1103-40(1); Norse Beach, Puerto Penasco, sandy intertidal, Nov. 25, 1965, coll. K. Fauchald (1).

Description: The type is an incomplete specimen with 85 setigers; it is 38 mm long and 2.4 mm wide with setae and is pale yellow without any color pattern. All specimens are strongly iridescent.

The prostomium is shorter than wide and has a deep anterior incision and well marked palpi. A pair of black eyes is present posterior to the bases of the outer lateral occipital tentacles. The outer lateral occipital tentacles reach the first setiger; each has six articles of which the basal ones are long and cylindrical and the two distalmost shorter, but all articles are longer than wide. The median and the inner lateral occipital tentacles reach the sixth setiger; each of the inner lateral ones has nine articles and the median one has five; all articles are long and cylindrical. The cylindrical first peristomial segment is as long as the prostomium; the second peristomial segment is half as long as the first one and similar in length to the first setiger. The slender peristomial cirri reach the tip of the prostomium; each has six long, cylindrical articles.

The first parapodia (Fig. a) have truncate pre- and postsetal lobes which are continuous around the setal lobe; the postsetal lobe is a little longer than the presetal one. The setal lobe is rounded. The presetal lobes become strongly oblique farther back (Fig. d); the postsetal lobes retain the straight, truncate shape in all setigers. The setal lobes are obliquely rounded in median and posterior

setigers. The dorsal cirri are very large in all setigers; each is digitate and has two or three articles. The ventral cirri are thickset and digitate in the prebranchial setigers; they have large basal swellings in branchial and postbranchial setigers, but retain the digitate tips.

Branchiae are present from setiger 3; the type has branchiae continued to setiger 85, which is the last segment present. The lowest known number of pairs of branchiae is 43, but several specimens are incomplete and the number may be lower. The number of pairs of branchiae appears to be strongly dependent on the size of the specimen. The first and the two last pairs of branchiae are single filaments; all others are pectinate. The maximal number of branchial filaments is ten; the branchiae are flaccid and do not cover the dorsum even where they are best developed.

Composite hooded hooks, pectinate setae and capillary setae are present in all setigers. The composite, bidentate hooded hooks (Fig. c) have blunt hoods; the hoods and the upper ends of the shafts are smooth. The pectinate setae are straight; each has ten or eleven teeth and both margins drawn out in fine tips with one longer than the other. The capillary setae are straight. Yellow subacicular hooks (Fig. b) occur singly in each parapodium from setiger 25-39; each is tridentate, but the distal tooth is always poorly developed and appears in most hooks as a small knob only.

The jaws are well chitinized; maxilla I is falcate; maxilla II has eight teeth left and nine right; left maxilla III has nine teeth; the combined right maxillae III+IV have thirteen teeth; left maxilla IV has six teeth and each maxilla V has one tooth.

E. vittatopsis resembles E. vittata (delle Chiaje,

1828) but differs in that it has short, blunt hoods on the hooded hooks; the latter has sharply pointed hoods. Branchiae are present in at least 40 segments in E. vittatopsis; specimens of E. vittata of corresponding size have only 22-25 pairs of branchiae. Subaciccular hooks are present from setigers 25-39 in E. vittatopsis and from setigers 16-24 in E. vittata. Both species have tridentate subaciccular hooks; all three teeth are well developed in the hooks of E. vittata, whereas the distal tooth is rudimentary in hooks of E. vittatopsis.

Other species in the same group may be closely related to E. vittatopsis, but the descriptions available are not sufficiently detailed to tell.

Distribution: E. vittatopsis is known from five localities in the Gulf of California in intertidal and shallow subtidal areas. The type comes from Ensenada de San Francisco, Sonora, 27° 57' 05" N, 111° 03' 20" W, shore, shingle, March 30, 1937, VELERO III sta. 739-37.

Genus Lysidice Savigny, 1818

The genus was re-defined by Ehlers (1868, p. 366) to include species with three occipital tentacles and without peristomial cirri and branchiae. One species is known from western Mexico.

Lysidice ninetta Audouin and Milne Edwards, 1833

Lysidice ninetta Fauvel, 1923, p. 411, fig. 162; Rioja, 1941, pp. 715-716; Hartman, 1944, p. 125.

Lysidice collaris Grube, 1870c, p. 495; Fauvel, 1932, p. 143; Rioja, 1941, p. 715; Hartman, 1944, p. 125.

New Records: 124-33(1); 260-34(1); 633-37(1); 1053-40(1); 1264-41(1); 1539-46(3); 1919-49(1); 1965-50(1); 300 yards off Cargo Island, Febr. 27, 1939, coll. M. W. Johnson (2); Cape San Lucas, on tubes of Spirobranchus sp., March 18, 1940, coll. E. F. Ricketts (1); Guadalupe Island, Dec. 8, 1946, coll. C. L. Hubbs (1); Hubbs sta. H50-32(5); K 130 (1); Clipperton Island, Aug. 23, 1958, coll. E. S. Reese (1).

Earlier Records: Rioja (1941, pp. 715-716): Playa de Caleta and La Aguada, Acapulco.

Remarks: L. ninetta was separated from L. collaris on the shape of the eyes, which should be oval in the former and reniform in the latter (Fauvel, 1932, p. 143; Hartman, 1944, p. 125). The present material shows that the degree of pigmentation of the eyes changes with the size of the specimen. The smallest specimens have only a narrow crescentic area of the eye pigmented with a weak reddish pigment; the larger specimens show an increasing pigmentation and the largest specimens have the whole eye pigmented. The outline of the eye does not seem to change, but is always smoothly oval. The shape of the pigmented area of the eye was compared with the start of the subacicular hooks; the latter are present from setigers 14-21 depending on the size of the specimen. The two characters are correlated in a general way so that a high degree of pigmentation of the eye is associated with a late start of the subacicular hooks and with the larger specimens. It is impossible to make any sharp distinction between the two named species and they are here considered synonymous.

Distribution: L. ninetta is cosmopolitan in warm waters; it is common in western Mexico in shallow subtidal areas and in the rocky intertidal.

Genus Morphysa Quatrefages, 1865

Species of Morphysa have five occipital tentacles and no peristomial cirri; branchiae are present.

Most species have composite setae in ventral positions; a review of all species in the genus shows that the species can be grouped according to the type of composite setae present. Some species are so poorly known that they have been included in a temporary group.

The groups include A: no composite setae present; B: only composite spinigers present; C: only composite falcigers present; D: both composite falcigers and spinigers present; and E: composite setae not known.

Groups A-D can be subdivided by the distribution of the branchiae. Some species have branchiae limited to a short anterior region (subdivision 1); others have branchiae scattered over a long region of the body (subdivision 2).

A survey of all species of Morphysa considered valid by Hartman (1959, 1965a) is given in Appendix B. Some species are very poorly known and may be synonymous with others in the same group. The affiliation of M. languida Treadwell (1921) is doubtful; it was described with both composite spinigers and falcigers in anterior setigers, but Hartman (1956, p. 286), in a re-examination of the type material, did not note the presence of any spinigers.

M. quadrioculata (Grube, 1856), described from a drawing by Oersted, was said to lack branchiae; no type specimen or any other material has been found and the species must be considered indeterminable.

The subacicular hooks are usually somewhat lighter in color than the acicula in species of this genus; they are bidentate in most species, but some species with unidentate

hooks are known (M. capensis, fide Day, 1953, p. 434, and M. macintoshii, fide Crossland, 1903, p. 137, and Day, 1962, p. 644). Subaciculae hooks occur very irregularly and may sometimes be absent in M. sanguinea; no subaciculae hooks have been found in M. brevitentaculata.

Branchiae have been described as being pectinate or palmate (Hartman, 1961, p. 80), and in M. bifurcata Kott (1951) the branchial filaments arise independently from a low dorsal ridge above the dorsal cirrus (Kott, 1951, p. 122, fig. 7e, and Day, 1957, p. 91, fig. 6b-c). These different descriptions reflect a varying development of the branchial stem in the genus. Most species have a well developed branchial stem which is held more or less erect over the dorsum and have the branchial filaments arranged uniserially along the stem. The branchial stem may be shortened in other species and the branchial filaments will be crowded on the short stem so that they appear to be palmately arranged. M. mortenseni (Pl. 7, Fig. e) has the branchial filaments attached to a short, button-shaped branchial stem superior to the dorsal cirrus; this arrangement resembles the one found in M. bifurcata except that the branchial stem has been elongated to a low ridge in the latter. The two last-mentioned species are the only ones known to have thickset, bifurcated dorsal cirri.

Key to Species of Marphysa from Western Mexico

1. Only composite spinigers present 2
1. Some composite falcigers present 3
2. 15 pairs of branchiae present in a short anterior region disjuncta
2. Branchiae present over a long posterior region
..... sanguinea

- 3. All composite setae falcigers 4
- 3. Both composite spinigers and falcigers present 6
- 4. Branchiae present over a long region 5
- 4. Branchiae limited to a short anterior region
..... conferta
- 5. Dorsal cirri in median and posterior setigers bifurcated mortensenii
- 5. All dorsal cirri simple aenea
- 6. Branchiae present from setiger 11; occipital tentacles do not reach beyond the prostomium
..... angelensis
- 6. Branchiae present from setiger 28 or later;
occipital tentacles twice as long as the prostomium mixta

Marphysa aenea (Blanchard, 1849)

Marphysa aenea Hartman, 1944, pp. 128-129, pl. 8, figs. 184-188.

New Record: Norse Beach, Puerto Penasco, Nov. 25, 1965, coll. V. A. Gallardo (1).

Earlier Record: Hartman (1944, p. 128): 634-37(1).

Remarks: M. aenea has falcate composite setae; branchiae are present from setigers 16-23. Acicula and subaciccular hooks are dark; the bidentate subaciccular hooks are present from setigers 50-57 in the present specimens. The specimen from Sta. 4-33 mentioned by Hartman (1944, p. 128) has here been referred to M. mixta, new species.

Distribution: M. aenea is known from Chile north to western Mexico. Both specimens come from the Gulf of California in intertidal and shallow subtidal respectively.

Marphysa angelensis, new species

(Plate 8, Figs. a-h)

Record: 1048-40(1 and fragments, TYPE).

Description: The type is a complete specimen with 94 setigers, 17 mm long and 2.2 mm wide with setae. It is evenly olive colored; distinct color patterns are absent, but the prostomium and the lateral lips are somewhat lighter in color than the rest of the specimen.

The anterior part of the body is cylindrical; the posterior end is wide and strongly flattened, with crowded setigers. The body is of the same width throughout most of its length; there is a slight attenuation in the anterior end and a more marked one in the last ten setigers. Two pairs of anal cirri are present ventral to the anus; the dorsalmost pair is the longest; each is as long as the last five setigers. The short ventral pair is digitiform.

The prostomium (Fig. a) is wider than long and evenly rounded, with a short anterior incision that is continued as a median line on the prostomium. The five occipital tentacles are short and do not reach the anterior margin of the prostomium. All tentacles are smooth; the outer lateral pair is a little shorter and stouter than the others. The two peristomial segments together are as long as the prostomium; the first one is twice as long as the second, which is similar in length to the first setiger.

The first setiger (Fig. c) has a low transverse presetal lobe. The setal lobe is weakly bilobed; the superior part is longer than the inferior one. The triangular postsetal lobe is twice as long as the other parapodial lobes. The slender dorsal cirrus is longer than the postsetal lobe; the thickset ventral cirrus has a constricted base. The presetal lobes are similar in all setigers; the setal lobes

are conical in the last prebranchial setigers and pointed in the posterior setigers (Fig. d). The postsetal lobes are reduced in the last prebranchial setigers to low, transverse folds similar to the presetal lobes. The dorsal cirri are somewhat smaller in the branchial region than in the prebranchial region. The ventral cirri have a marked basal swelling in the branchial region, but retain the digitiform tip in all setigers.

Branchiae are present from setiger 11 to the end of the body, where they are strongly reduced. The maximal number of branchial filaments is three, but most branchiae have only two filaments, even in setigers 25-35 where the branchiae are best developed. All other branchiae are single, straplike filaments.

Composite spinigers (Fig. b) and falcigers (Figs. f-g) are present in ventral fascicles in all setigers; most composite setae in the anterior end are spinigers. Very few setae are present in posterior setigers; falcigers are more common than spinigers, but the latter are present even in the last setigers. Dorsal fascicles contain long, slender capillary setae with serrated cutting edges and pectinate setae. Slender pectinate setae with both margins drawn out in fine filaments are present in all but the last 10-15 setigers; each has 25 teeth. The last setigers have coarse pectinate setae (Fig. h); each has 12 teeth. Brown subacicular hooks (Fig. e) are present from setiger 17 to the end of the body; each is bidentate with the proximal tooth set at right angles to the distal one; the hood is short and rounded.

The pharyngeal apparatus was not dissected in the single specimen available.

M. angelensis belongs to the group of species that

have both composite spinigers and falcigers. Other species that have branchiae first present before setiger 20 include M. chevalensis Willey (1905) and M. fallax Marion and Bo-bretzky (1875). M. angelensis differs from both in the distribution of the composite setae. M. chevalensis has only spinigers and M. fallax only falcigers (*fide* Fauvel, 1923, p. 411) in posterior setigers. M. angelensis has both kinds of composite setae in all setigers.

M. fallax was reported from Hawaii by Hartmann-Schroeder (1965b, p. 137). The description of the specimens is incomplete and the identification with M. fallax appears doubtful. The ecological information given by Hartmann-Schroeder indicates that more than one species may be concealed in the present concept of M. fallax.

Distribution: M. angelensis is known from Puerto Refugio, Angel de la Guardia Island, $29^{\circ} 32' 33''$ N, $113^{\circ} 33' 57''$ W, 11-22 fms, sand, Jan. 26, 1940, VELERO III sta. 1048-40.

Marphysa conferta Moore, 1911

Marphysa conferta Moore, 1911, pp. 252-254, pl. 16, figs. 29-34; Hartman, 1944, p. 129; Hartman, 1961, p. 83.

Record: 1257-41(1).

Remarks: M. conferta from southern California has been described with branchiae from setiger 7 to 18 (Moore, 1911; Hartman, 1961); the present specimen has branchiae from setiger 9 to 22 and has fourteen instead of twelve pairs of branchiae. Yellow, bidentate subacicicular hooks are present from setiger 28.

Distribution: M. conferta is known from rocky bottoms in slope depths in southern California (Moore, 1911; Hartman, 1944, 1961). The present record extends the distribution of the species to include a similar habitat in the northern part of Baja California.

Marphysa disjuncta Hartman, 1961

Marphysa disjuncta Hartman, 1961, pp. 81-83, pl. 10, figs. 1-3.

Record: 6176-59(1).

Remarks: M. disjuncta is related to M. kinbergi McIntosh (1910) from Cape Finisterre in the Atlantic Ocean. These two species are the only ones known to have branchiae limited to a short anterior region, combined with exclusively spinigerous composite setae. Branchiae are present from setigers 13 to 16 numbering 15 pairs in M. disjuncta, and from setiger 16 numbering 20 pairs in M. kinbergi. The maximal number of branchial filaments is 20 in M. disjuncta and 25 in M. kinbergi. The upper end of the shaft of the composite setae is smooth in M. disjuncta and distinctly serrated in M. kinbergi. The appendage of the composite setae is smooth and comparatively short in M. disjuncta and long and serrated in M. kinbergi.

The present specimen fits the original description well; branchiae are present from setiger 16 instead of from setigers 13-14 as described by Hartman (1961). Subacicicular hooks are present from setiger 30; they should be present in the postbranchial segments, according to Hartman (1961, p. 82).

Distribution: M. disjuncta is known from southern

California in shallow soft bottoms; the present record is from San Cristobal Bay, Baja California, in a similar habitat.

Marpphysa mixta, new species
(Plate 9, Figs. a-h)

Records: 4-33(1, TYPE); Dawson 1946-47 sta. 123(1).

Description: Both specimens are complete; the type has 379 setigers and is approximately 120 mm long and 3.5 mm wide with setae. It is salmon colored and lacks color pattern. The body is cylindrical and has no flattening in the posterior end.

The prostomium (Fig. a) is shorter than wide, with a shallow, very wide anterior incision. The smooth occipital tentacles are digitiform; the outer lateral pair reaches the second peristomial segment; the inner lateral ones reach the first setiger and the median tentacle reaches the second setiger. A pair of eyes is present posterior to the outer lateral occipital tentacles. The palpi are poorly marked both dorsally and ventrally. The first peristomial segment is twice as long as the second one and clearly wider than the prostomium. The second peristomial segment is a little shorter than the first setiger.

The first setigers (Fig. b) have short, transverse presetal lobes and short, triangular setal lobes. The rounded postsetal lobes are as long as the setal lobe. The long dorsal cirri are slender; the thick ventral cirri are blunt. The dorsal cirri retain the same shape through the prebranchial region and are short and digitiform in the branchial region. The ventral cirri are basally strongly swollen in late prebranchial setigers, but retain the digitiform tip in all setigers. The setal lobes are conical

in the branchial region (Fig. d) and both pre- and postsetal lobes are transverse folds.

Branchiae are present from setiger 35 in the type and from setiger 28 in the other specimen; they are present to the end of the body in both specimens. The first two and the last two or three pairs of branchiae are single and straplike; all others are pectinate. The thick branchial stems are short; the branchiae are displaced so that the dorsal cirri and the branchiae are separated. The maximal number of branchial filaments is six; each filament is long and thick.

Numerous serrated composite spinigers (Fig. c) and a few composite falcigers (Fig. g) with blunt hoods are present ventrally in anterior setigers; posterior setigers have a few composite falcigers only. Dorsal fascicles have a varying number of fine capillary setae in all setigers; pectinate setae are present in dorsal fascicles from setiger 21 and are of two kinds. Those in all but the last 40 setigers are slender with straight edges; each (Fig. e) has 17-20 teeth and one margin drawn out in a fine tip. Pectinate setae in the last 40 setigers (Fig. f) are twice as large as the other kind; each has twelve coarse teeth and the margins are not prolonged. The bluntly conical acicula number two in a parapodium and are straight. The bidentate subacicicular hooks (Fig. h) are light brown and have short, blunt hoods. They are present from setiger 37 in the type and from setiger 33 in the other specimen.

M. mixta belongs to the same group of species as M. angelensis; both have two kinds of composite setae and branchiae over a long region of the body, but the first branchia is found farther back in M. mixta and related species than in M. angelensis. Species similar to M. mixta

include M. dartevellei Monro (1936), M. depressa (Schmarda, 1861), M. digitibranchia Hoagland (1920) and possibly M. languida Treadwell (1921).

Both kinds of composite setae are present in anterior setigers and composite falcigers only in posterior setigers in M. mixta; M. dartevellei has composite spinigers only in the first 30 setigers and M. digitibranchia has composite spinigers in the posterior setigers. M. languida, which may belong to another group (see above), has branchiae from setiger 60; branchiae are present from setigers 28-35 in M. mixta. M. languida was reported from western Mexico by Rioja (1941, pp. 712-715) who gave a detailed description of his specimens, but did not mention the presence of two kinds of composite seta; Rioja's specimens may belong to another species.

M. depressa was re-described by Ehlers (1904, p. 33) after a re-examination of the type; it has also been discussed by Augener (1924, pp. 409-410, fig. 9). It differs from M. mixta in that it has composite spinigers in posterior setigers. The maximal number of branchial filaments is 3-4 in M. depressa and six in M. mixta.

Distribution: M. mixta is known from two localities in southwestern Mexico. The type comes from Tangola Tangola Bay, 15° 45' N. 96° 06' W., shore collecting, Jan. 6, 1933, VELERO III sta. 4-33.

Marphysa mortensenii Monro, 1928

(Plate 7, Fig. e)

Marphysa mortensenii Monro, 1928, pp. 86-88, figs. 9-12;
Hartman, 1961, pp. 83-84.

Record: Off Tijuana River, 14 fms. coll. C. L. Hubbs
(1).

Remarks: M. mortenseni resembles M. bifurcata Kott (1951) from Point Peron, Western Australia. Both have rounded prostomia without anterior incisions and bifurcated dorsal cirri. Branchiae are present from setiger 22 in M. bifurcata according to Kott (1951) and Day (1957), who reported it from South Africa; branchiae are present from setiger 25 in M. mortenseni according to Monro (1928) and Hartman (1961). The present specimen has branchiae from setiger 32. The bifurcation of the dorsal cirri is visible from setigers 17-19 in M. bifurcata and from setiger 10 in M. mortenseni.

Subaciculae hooks are present from setiger 30 in M. bifurcata (Day, 1957, p. 91) and from setiger 35 in M. mortenseni. The composite setae in M. mortenseni are more elongated and have smaller teeth than those in M. bifurcata. The clearcut differences in the insertion of the branchiae have been discussed above.

Distribution: M. mortenseni is known from the Pacific side of Panama and from southern California. The present record is at the border between Mexico and the United States.

Marphysa sanguinea (Montagu, 1807)

Marphysa sanguinea Fauvel, 1923, pp. 408-409, fig. 161a-h;
Hartman, 1944, pp. 127-128, pl. 8, figs. 179-183;
Rioja, 1947b, p. 519; Rioja, 1962, p. 179; Reish, 1963,
p. 425.

Marphysa californica Rioja, 1941, p. 712.

Marphysa sanguinea americana Monro, 1933, pp. 68-69, fig. 28.

New Records: 1040-40(1); 1713-49(1); 1976-50(2); 2025-51(4); 2064-51(3); 2066-51(1); 2603-54(3); 2623-54(2); 8 miles N of Ensenada in rocky littoral, coll. E. F. Ricketts (1); Ensenada, Nov. 25, 1927 (1); El Mogote, at base of mangrove, March 22, 1940, coll. E. F. Ricketts (1); N. Whale Island, San Ignacio Lagoon, Febr. 9-11, 1950, coll. C. L. Hubbs, M. W. Johnson and A. A. Allanson (1); Old Whaling Station, San Ignacio Lagoon, from piling at low tide, Febr. 12, 1950, coll. M. W. Johnson (1); San Quintin Bay, screened from sand, April 7, 1950, coll. D. J. Reish (1); San Quintin Bay, mudflats, April 7, 1950, coll. D. J. Reish (3); Norse Beach, Puerto Penasco, rocky intertidal, Nov. 25, 1965, coll. V. A. Gallardo (2); Tastiota, Sonora, granite rocks, March 26, 1967, coll. P. Pickens (7).

Earlier Records: Rioja (1941, p. 712): La Aguada, Acapulco. Hartman (1944, p. 127): 1048-40(1); 1075-40(1). Rioja (1947b, p. 519): El Mogote, La Paz. Rioja (1962, p. 179): Mazatlán; Bahía de Ouhira, Topolobampo; Isla Ballena; Isla Espíritu Santo. Reish (1963, p. 425): 8 localities in San Quintin Bay.

Remarks: M. sanguinea reaches considerable size and has been described under at least a dozen different names. References to the early descriptions can be found in Fauvel (1923) and Hartman (1944). M. sanguinea americana Monroe (1933) was separated from the main form because of the better development of branchiae in the posterior end of the body. The present specimens, especially the larger ones, show varying degrees of development of the branchiae in posterior setigers. The number of branchial filaments tends to be constant over large numbers of setigers in most specimens, but in others the number of filaments may fluctuate between four and ten on adjacent segments. The specimens

with a constant number of branchial filaments may have many (10-11) or few (4-5) filaments. The development of the branchial stems is also variable; some specimens have well developed, long branchial stems and others have the branchial stems reduced to short, thick projections. There is no relation between the length of the branchial stem and the number of branchial filaments.

Subaciccular hooks may sometimes be completely absent (Fauvel, 1923, p. 409). Smaller specimens, less than 6 mm for 10 anterior setigers, have subaciccular hooks from setigers 24-35; but as the specimens increase in size, the first occurrence of the subaciccular hooks becomes irregular and in large specimens they may be completely absent. When hooks are present in large specimens, they are often missing in numerous segments without any discernible pattern; a survey of the variable features is found in Table 1.

Branchiae are first present from setigers 17-34 and continue to the end of the body.

M. sanguinea as presently accepted is the most variable species in the genus. The list of species in Group A. 2. (see Appendix B) may contain several named species that are synonymous with M. sanguinea, but in most instances the overlap of characters appears to be marginal, judging from the original descriptions. The types of these species will have to be re-examined in order to establish the variability of this and other species.

Distribution: M. sanguinea is cosmopolitan in warm waters except for an area in the Indian Ocean where it is absent (Day, 1962, p. 644). It is common in western Mexico in intertidal and shallow subtidal areas.

Genus Palola Gray, 1847

The genus is accepted as defined in Hartman (1944, p. 130). Two species of this genus are found in western Mexico, P. palolooides (Moore, 1909) and P. siciliensis (Grube, 1840). These two can be separated only on the dentition of the right maxilla II, which has two teeth in P. siciliensis and two large and one small, distal denticle in P. palolooides. The separation is very difficult on large specimens where the teeth have been worn and attempts have been made to correlate the dentition of the right maxilla II with other variable characters without success. The two species are retained as separate species here because they show differences in geographical and ecological distribution.

Palola palolooides (Moore, 1909)

Eunice (Eriphyle) palolooides Moore, 1909, pp. 246-249, pl. 7, figs. 5-7.

Palola palolooides Rioja, 1941, p. 711; Hartman, 1944, pp. 131-132; Rioja, 1947a, p. 204; Rioja, 1962, p. 179.

Leodice palolooides Treadwell, 1941, p. 22.

New Records: 972-39(2); 1093-40(1); 1101-40(1); 1112-40(1); 1257-41(2); 1260-41(1); 1561-46(2); 1759-49(1); 1915-49(2); 1923-49(1); 1928-49(1); 1944-50(1); 2022-51(1); 2603-54(1); Hubbs sta. H50-32(2); KG sta. 7(1); K 143(1); Boulder beach near the church, Puerto Penasco, Nov. 26, 1965, coll. K. Fauchald (1).

Earlier Records: Treadwell (1941, p. 22): Zihuantejo, Nov. 24, 1937, in coral. Rioja (1941, p. 711): La Aguada, Acapulco; Mazatlán. Hartman (1944, p. 131): Rocky Point, Ensenada. Rioja (1947a, p. 204): La Paz; Topolo-

bampo. Rioja (1962, p. 179): Bahía de Todos los Santos; Isla de la Asunción; Isla San Roque.

Remarks: As mentioned above, the differentiation between P. palolooides and P. siciliensis is difficult. The table shows that branchiae tend to be present on more segments in P. palolooides than in P. siciliensis but there is a wide overlap in the range of the first occurrence of branchiae in the two species.

Distribution: P. palolooides has been found from southern California to Acapulco, Mexico, but it is most frequent north of Cedros Island. Ecological data indicate that it is an intertidal species on rocky shores and coral reefs.

Palola siciliensis (Grube, 1840)

Eunice siciliensis Fauvel, 1923, pp. 405-408, fig. 159.

Eunice (Palola) siciliensis Hartman, 1939, p. 15.

Palola siciliensis Hartman, 1944, p. 131; Rioja, 1962, p. 178.

New Records: 500-36(1); 637-37(1); 1077-40(1); 1734-49(2); 2588-54(1); Pulmo Reef, March 19, 1940, coll. E. F. Ricketts (3); Puerto Refugio, April 2, 1940, coll. E. F. Ricketts (1); Punta Cholla, May 9, 1941, intertidal, coll. S. A. Glassell (2); Dawson 1946-47 sta. 53(3); Dawson 1946-47 sta. 67(1); K 116(1); K 130(1); Norse Beach, Puerto Penasco, May 1, 1965, coll. P. Pickens (1); Tastiota, Sonora, granite rocks, March 26, 1967, coll. P. Pickens (1).

Earlier Records: Hartman (1939, p. 15): Clipperton Island, shore collecting on rocks, July 21, 1938, sta. 9-38 (2). Hartman (1944, p. 131): 127-33(1); 501-36(1); 633-37

(1); 634-37(2); 739-37(2); 970-39(1); 972-39(4); 1049-40(4); 1053-40(8); 1072-40(1); 1091-40(2); 1092-40(2); 1093-40(1); 1110-40(2); 1112-40(2). Rioja (1962, p. 178): Salina Cruz, May, 1951.

Remarks: It will be noted from the tables that part of the material earlier reported as P. siciliensis by Hartman (1944) now has been transferred to P. palolooides. This does not imply a change in the concept of the two species.

Distribution: P. siciliensis is cosmopolitan in warm waters. It is found in western Mexico from the Gulf of California and the southern end of Baja California southwards in intertidal and shallow subtidal areas. It has never been found as far north as Cedros Island and seems to be equally common on hard as in sandy bottoms.

Palola species indeterminable

Records: 1706-49(fragments); 1749-49(fragments); 1752-49(fragments); 2600-54(fragments); Puerto Escondido, March 25-26, 1940, coll. E. F. Ricketts (fragments); Puerto Peñasco, Dec. 26, 1947, coll. N. and G. E. MacGinitie (fragments).

Remarks: These samples contain fragments of median and posterior ends of Palola sp. that cannot be further identified.

Family LUMBRINERIDAE Malmgren, 1867

Members of this family have paired mandibles, four pairs of maxillae and short maxillary carriers. The prostomium lacks appendages. A nuchal organ is present at the

junction of the pro- and peristomium on the dorsal side; it may be developed as bilateral pouches with short, saclike eversible processes or as a single, centrally placed nuchal pocket which may have one to three nuchal tentacles. Eyes may be present. Two peristomial segments are present. Parapodia are usually considered uniramous, but a short cirrus is often present on the dorsal side of each parapodium; this cirrus has no acicula or setae, but despite these missing features is here considered a notopodial rudiment. Bilimbate or capillary simple setae and hooded hooks are present in most species. The hooks are bidentate or multidentate and may be composite in a number of anterior setigers.

Genera include Augeneria Monro (1930), Cenogenus Chamberlin (1919), Lumbrineris Blainville (1828), Ninoe Kinberg (1865) and Ophiuricola Ludwig (1905). Ophiuricola was described with one species (O. cynips) from an ophiuroid in deep water off Peru. It was based on two poorly preserved specimens and was said to lack pharyngeal apparatus (Ludwig, 1905, p. 398). It has not been reported from any other area and the affiliation with the LUMBRINERIDAE is considered doubtful.

Cenogenus is also known only from the original description (Chamberlin, 1919b, pp. 333-334); it has edentate maxillae III and IV and a single, centrally placed nuchal organ. Edentate maxillae III and IV are known from certain species of Lumbrineris, L. bidens Ehlers (1887, see Appendix C for full references), L. crassicephala Hartman (1965b), L. flabelllicola Fage (1936) and L. paucidentata Treadwell (1921), species which otherwise have little in common with each other. Centrally placed nuchal organs are known in species of Lumbrineris (e.g., L. eugeniae, new species) which have dentate maxillae III and IV. Cenogenus

is here considered a synonym of Lumbrineris.

Augeneria was separated from Lumbrineris on the presence of three small tentacles in a pocket at the posterior margin of the prostomium. Some species of Lumbrineris and Ninoe from western Mexico have slender, tentacular nuchal papillae. Lumbrineris eugeniae, new species, has one centrally placed nuchal papilla in the nuchal pocket and Ninoe dolichognatha Rioja (1941) has three tentacles similar to those found in the genotype of Augeneria (A. tentaculata, Monro, 1930; see Pl. 19, Fig. f, and Monro, 1930, fig. 52a). Ninoe simpla and N. gemmea have single nuchal papillae according to the original descriptions (Moore, 1905, p. 547, and 1911, p. 283, Pl. 19, fig. 110). The nuchal papillae are always small and may be eversible even when they are tentaculiform; it is here assumed that they are present in more species than is presently known.

Nuchal tentacles are present in species with and without branchiae and in species with and without composite setae. The character is not considered of generic value and the genus Augeneria is therefore treated as a synonym of Lumbrineris.

Branchiae are present in Ninoe and absent in Lumbrineris. They may be simple or branched. They are situated on the postsetal lobes in some species and directly on the ventrolateral body wall in others. They may be present in a limited anterior region only (N. gemmea, see below) or on a large number of posterior setigers (N. dolichognatha, see below). All lumbrinerids with branchial structures are here referred to Ninoe. According to Fauvel (1943, pp. 23-24), species with branchiae on the parapodia are Ninoe and those with branchiae on the ventrolateral body wall are Lumbrineris. Some setigers in Ninoe dolichognatha, for example, may have the superiormost branchiae on the ventral

edge of the parapodium, while in others all branchiae are clearly separated from the parapodia; so this separation cannot be made. Branchial structures are identified by having vascular loops in cirri or projecting folds of tissue.

Key to Genera of LUMBRINERIDAE

- | | |
|---------------------------------------|--------------------|
| 1. Pharyngeal apparatus absent | <u>Ophiuricola</u> |
| 1. Pharyngeal apparatus present | 2 |
| 2. Branchiae present | <u>Ninoe</u> |
| 2. Branchiae absent | <u>Lumbrineris</u> |

Genus Lumbrineris Blainville, 1828

The genus is represented by 22 species in western Mexico; eight of these are newly described. The large number of species made it necessary to review all species hitherto described in the genus. Approximately 200 original descriptions were reviewed, based on the listings in Hartman (1959, 1965a) and newer publications. Species characterized as "indeterminable" or "incompletely known" by Hartman (1959, 1965a) have not been further considered. Synonyms have been accepted only when the types have been directly compared, or when one type was compared with a species the author in question knew well from the type area. The remaining 152 species have been subdivided into several groups.

The grouping used here is an extension of the system set up by Hartman (1944, p. 137), but some groups have had to be subdivided because of the large number of species involved.

The principal groups include I: composite hooks

present; II: only simple hooks present; III: hooks absent; and IV: structure of hooks unknown. Groups III and IV are small and have not been further subdivided.

The subdivisions of Groups I and II are based on several structures. Composite spinigers may be present (A) or absent (B) in species of Group I. The dentition of the posterior hooded hooks shows two clear patterns in both groups; they may be bidentate (a) or multidentate (b). Species where the presence of spinigers has not been specifically mentioned have been included in subgroup B, and species where the dentition of the posterior hooded hooks have not been mentioned have been included in subgroup b.

Bidentate posterior hooks are sometimes, as in L. mucronata Ehlers (1908), L. paradoxa Saint-Joseph (1888, see also Fauvel, 1914b, p. 157) and L. platypygos, new species, associated with the presence of a fan-shaped pygidium without anal cirri. As the shape of the pygidium is unknown in most species of the genus, the value of this character cannot be ascertained.

The dentition of the maxillae has been suggested as a possible diagnostic character to divide the large genus. The dentition of maxillae III was first suggested by Kinnberg (1865, p. 565). The subdivisions used here include 1: maxillae III edentate or unidentate; 2: maxillae III bi- or multidentate; and 3: the structure of maxillae III unknown.

A complete scheme of the groups and subdivisions is found in Appendix C, which lists all species of Lumbrineris here considered valid with reference to the original description, revisions of the type material and type locality.

This subdivision is intended exclusively as a practical tool to facilitate identification of any given species.

Pharyngeal and setal structures have been used in the

subdivisions proposed above. Soft structures, such as the presence or shape of the different parapodial lobes and the shape of the peristomial segments, are probably valid taxonomically, but have been too poorly described; the present material was insufficient to establish the variability of these structures.

The distribution of the different kinds of hooks is a conservative specific character. Composite hooks are always present from the first setiger; the number of setigers with such hooks is somewhat dependent on the size of the specimens in that the number of setigers with composite hooks increases with increasing size. The variation in the number of setigers with composite hooks never exceeds five to ten setigers in any of the species investigated. Simple hooks may occur anywhere along the body. Species with simple hooks from the first setiger have hooks present in all setigers independent of the size of the specimens. Species with hooks from setigers 3-5 tend to lose the hooks in the anteriormost setigers with increasing size, but in specimens of the same size the variation in the first occurrence of the simple hooks never exceeds five to ten setigers.

The shape of the hooded hooks is also highly characteristic. Posterior hooks are usually larger than anterior ones and usually have well marked fangs and a smaller crest of teeth distal to the main fang. Some species have the main fang continuous with the apex of the hook without a marked separation (e.g., *L. zonata*, Pl. 18, Fig. e). The size of the teeth in the crest usually decreases apically (e.g., *L. penascensis*, Pl. 17, Fig. b), but in some species this is reversed (e.g., *L. erecta*, Pl. 13, Fig. a). Most species have simple, smooth tips on the main fangs, but some species (e.g., *L. cedroensis*, Pl. 11, Fig. a) have the tip subdivided into several small teeth.

The posterior parapodial lobes are prolonged in some species (e.g., L. tetraura, Pl. 19, Fig. d). All species of Lumbrineris here examined have the postsetal lobes longer than the presetal ones in all setigers; the prolonged postsetal lobes are clearly longer in relation to the setal lobes in posterior parapodia than they are in the anterior ones. Similarly, certain species have prolonged presetal lobes in posterior parapodia (e.g., L. californiensis, Pl. 10, Fig. b).

Key to Species of Lumbrineris from Western Mexico

1. Posterior hooded hooks bidentate (Pl. 18, Fig. b)
..... platypygos
1. Posterior hooded hooks multidentate (Pl. 16,
Figs. f-g) 2
2. Composite hooded hooks (Pl. 14, Figs. d-e) present
in some anterior setigers 14
2. Composite hooded hooks absent 3
3. Acicula black 4
3. Acicula yellow 6
4. Prolonged simple setae present in some setigers
(Pl. 14, Fig. j) 5
4. Simple setae not prolonged in any setiger
..... bicirrata
5. Hooded hooks present from the first setiger
..... longensis
5. Hooded hooks present from setigers 25-27
..... moorei
6. Hooded hooks present from the first setiger 7
6. Hooded hooks first present posterior to setiger 7 . 10
7. Posterior postsetal lobes prolonged (Pl. 19,
Fig. d) 8

7.	Posterior postsetal lobes not prolonged (Pl. 18, Fig. f)	9
8.	Both pre- and postsetal lobes prolonged in poste- rior setigers (Pl. 15, Fig. e) ..	<u>lagunae</u>
8.	Presetal lobes not prolonged in any setiger (Pl. 18, Fig. f)	<u>tetraura</u>
9.	Hooded hooks in median setigers with a few coarse teeth each (Pl. 12, Fig. a)	<u>crassidentata</u>
9.	Hooded hooks in median setigers with numerous small teeth each (Pl. 18, Fig. e)	<u>zonata</u>
10.	Hooded hooks present from setigers 7-10, max- illae III unidentate	<u>platylobata</u>
10.	Hooded hooks first present posterior to setiger 18, maxillae III bidentate	11
11.	Posterior postsetal lobes prolonged	
	.....	<u>erecta</u>
11.	Posterior postsetal lobes not prolonged	12
12.	Hooded hooks first present from setiger 40	
	.....	<u>simplicis</u>
12.	Hooded hooks first present anterior to setiger 30	13
13.	Prostomium short and blunt (Pl. 17, Fig. a)	
	.....	<u>penascensis</u>
13.	Prostomium conical (Pl. 16, Fig. i)	
	.....	<u>monroi</u>
14.	Acicula black	15
14.	Acicula yellow	18
15.	Posterior postsetal lobes prolonged (Pl. 10, Fig. b)	16
15.	Posterior postsetal lobes not prolonged	17
16.	One nuchal tentacle present (Pl. 13, Fig. d)	
	.....	<u>eugeniae</u>
16.	Nuchal tentacles absent	<u>californiensis</u>

17. Maxillae III unidentate pallida
17. Maxillae III bidentate japonica
18. Prolonged setae in median setigers
..... cedroensis
18. Setae not prolonged in any setigers 19
19. Posterior postsetal lobes prolonged (Pl. I4,
Fig. b) 20
19. Posterior postsetal lobes not prolonged
..... latreilli
20. Both pre- and postsetal lobes prolonged in poste-
rior setigers cruzensis
20. Presetal lobes not prolonged in any setiger 21
21. Maxillae III with three teeth, maxillae IV with
two teeth each inflata
21. Maxillae III with two teeth, maxillae IV with
one tooth each limicola

Lumbrineris bicirrata Treadwell, 1929

(Plate 10, Figs. e-g)

Lumbrineris bicirrata Treadwell, 1929b, pp. 1-3, figs. 1-7.

Lumbrineris bicirrata Hartman, 1944, pp. 156-158, pl. 9,
figs. 207-212.

New Records: 1030-40(1); 77231-61(1).

Earlier Records: Hartman (1944, p. 156): 1010-39(1);
1253-41(1); 1265-41(1).

Remarks: L. bicirrata was re-described by Hartman
(1944) from material from California and western Mexico.

The anterior parapodia (Fig. f) have distinct noto-
podial rudiments on the dorsal side of the parapodia; the
posterior parapodia (Fig. g) have strongly prolonged pre-

and postsetal lobes. The simple hooded hooks (Fig. e) are present from setigers 7 to 9 in the present material; each is thick and has nine to ten teeth that decrease evenly in size from the main fang. The small irregularities on the main fang of the hook illustrated are considered accidental; such irregularities were not present in other hooks examined.

The maxillary formula is 1-4(5)-1-1; maxilla II is symmetrical in all specimens. L. bicirrata belongs to group II. b. l.; relations to other similar species are not clear and must await a re-examination of type material.

The identification of the specimen from 7231-61 is doubtful; it is a short anterior fragment and the characteristic prolonged posterior pre- and postsetal lobes have not been observed; it agrees with this species in other characters.

Distribution: L. bicirrata is known from Washington to western Mexico in subtidal areas down to 200 fms depth. The record from 7231-61 is in 1350 fms depth. The species has been found only on the Pacific side of Baja California in western Mexico.

Lumbrineris californiensis Hartman, 1944

(Plate 10, Figs. a-d)

Lumbrineris californiensis Hartman, 1944, pp. 163-165, pl. 12, figs. 257-262.

Records: 1694-49(5); Gulf of California, E. W. SCRIPPS Position GC 26, March 3, 1939, 1248 m, coll. M. W. Johnson (1).

Remarks: L. californiensis has very short anterior

parapodia. The low presetal lobe (Fig. d) is obliquely truncate; the postsetal lobe has a small, rounded inferior accessory lobe; the main part of the postsetal lobe is nearly twice as long as the setal lobe and evenly rounded. The notopodial rudiment is distinct. Posterior parapodia (Fig. b) have a presetal lobe that consists of a low, evenly rounded inferior, and a long, slender digitiform superior part. The setal lobe is evenly rounded. The postsetal lobe is long, digitiform and ventrally located.

Composite hooks are present in the first twenty-five to twenty-six setigers. Each hook (Fig. a) has eight or nine similar teeth. The simple hooks (Fig. c) in more posterior setigers have approximately the same number of teeth, but the size of the teeth decreases evenly from the main fang.

L. californiensis belongs to group I. B. b. l. Other species in this group with both pre- and postsetal lobes prolonged in posterior setigers include L. albidentata (Ehlers, 1908), L. a. sadko (Annenkova, 1952), L. cruzensis Hartman (1944), L. ligulata Berkeley and Berkeley (1941) and L. meteorana (Augener, 1931). L. albidentata and L. a. sadko have only two teeth on each maxilla II, L. californiensis has constantly four teeth on each. L. cruzensis has yellow and L. californiensis has black acicula. L. ligulata is very similar to L. californiensis, but appears to differ in the dentition of maxilla II; L. ligulata has three, or asymmetrically three and four teeth, on each maxilla II, L. californiensis has constantly four teeth. L. meteorana is also very similar to L. californiensis but appears to differ in that it has five teeth on maxilla II, and in the proportions of the posterior pre- and postsetal lobes.

Distribution: *L. californiensis* is known from central California to western Mexico; localities in western Mexico include one in deep water in the Gulf of California.

Lumbrineris cedroensis, new species

(Plate 11, Figs. a-e)

Records: 7231-61(1); 7358-61(2); P 137-61(2, TYPE).

Description: The type is an incomplete specimen with 109 setigers, 55 mm long and 3.4 mm wide with setae. It is salmon colored and lacks color pattern.

The prostomium (Fig. e) is bluntly conical; the two cylindrical peristomial segments are similar in width to the first setiger. The first peristomial segment is as long as the first setiger; the second one is a little shorter. A single centrally placed nuchal organ is present at the junction of the pro- and peristomium; nuchal tentacles are absent.

Anterior parapodia are very short; they increase evenly in length posteriad to setiger 50, where they are nearly as long as the body is wide; they remain the same size in the remainder of the body. The low presetal lobe in anterior parapodia (Fig. d) is evenly rounded superiorly; the inferior part is truncate. The low setal lobe is obliquely rounded so that it is visible behind the presetal lobe at the superior edge of the parapodium. The postsetal lobe is more than twice as long as the setal lobe and obliquely triangular. The low presetal lobe in the posterior parapodia (Fig. c) is obliquely rounded; the setal lobe is rounded and the short postsetal lobe is nearly spherical. The postsetal lobes are shorter in the posterior than in the anterior parapodia.

Three kinds of setae are present; the first nine or ten setigers have composite hooded hooks; each hook (Fig. b) is slender and has nine to ten similar teeth. The slender limbate setae which are found in superior positions in all setigers have greatly prolonged whiplike tips which are especially prominent in median setigers. Simple hooks (Fig. a) are present in all parapodia posterior to setigers 10-11; each is more than twice the size of the composite hooks and has a main fang and six or seven smaller teeth in a crest. The main fang is distally divided into three to five teeth in all hooks examined; these teeth may be so well developed in some hooks that the main fang appears to be split into several teeth. Acicula number three to five in a parapodium; each is yellow or light brown in posterior setigers.

The pharyngeal apparatus is well developed; the maxillary formula is 1-4-1-1; and maxillae IV are large. The maxillary carriers are short and triangular. The mandibles are fused along half their length; the anterior cutting edges are flaring and the two posterior free ends diverge.

L. cedroensis belongs to group I. B. b. 1. The only other species in this group that has prolonged setae is L. eugeniae, new species. The pre- and postsetal lobes in posterior setigers are prolonged in L. eugeniae and shorter than in anterior setigers in L. cedroensis. A nuchal tentacle is present in L. eugeniae and absent in L. cedroensis.

Distribution: L. cedroensis is known from three localities between Cedros Island and the Coronados Islands off Baja California, in depths ranging from 600 to 1355 fms.

Lumbrineris crassidentata, new species

(Plate 12, Figs. a-f)

Records: 2624-54(21, TYPE); K 110(1).

Description: The type is a complete specimen with 215 setigers, 43 mm long and 0.8 mm wide with setae. It is white and lacks color pattern.

The prostomium (Fig. b) is acorn-shaped. The first peristomial segment is as long as the first setiger; the second one is somewhat shorter.

The body is very slender; setigers in the anterior part of the body are wider than long. Setigers in the median and posterior part of the body are nearly twice as long as wide; the fifteen to twenty pre-anal setigers are again wider than long. There are four short anal cirri.

The rounded presetal and setal lobes in the first setigers (Fig. e) are short; the flattened postsetal lobes are rounded. The median setigers have rounded setal lobes and rudimentary pre- and postsetal lobes. The postsetal lobes are well developed and digitate in the thirty to forty pre-anal setigers (Fig. f).

Hooded hooks are present in all setigers; those in the anterior 15-20 setigers (Fig. c) have five or six teeth, of which the lowermost is only slightly larger than the others. The median setigers have a few coarse hooks only; each hook (Fig. a) has six or seven teeth of which the four lower ones are very large and thick. The posterior setigers have slightly smaller hooks; each hook (Fig. d) has a large main fang and a crest of seven or eight smaller teeth which decrease evenly in size apically; the median and posterior hooks appear pointed under low magnification. The acicula are yellow and straight; they number two in a parapodium in the anterior end, and only one in posterior setigers.

The pharyngeal apparatus is well developed; the maxillary carriers are short and pointed with well marked lateral incisions. Maxilla I is falcate; each maxilla II has four blunt teeth; each maxillae III and IV has one tooth. The mandibles are short and narrow and fused for less than half their total length.

Fragments of loosely organized tubes are associated with both samples.

L. crassidentata belongs to group II. b. l. Other species in this group with prolonged posterior postsetal lobes include L. bassi Hartman (1944), L. brevipes (McIn-tosh, 1903!) and L. zonata (Johnson, 1901). L. brevipes and L. bassi have the first hooded hooks on setigers 40 and 16 respectively; hooded hooks are present from the first setiger in L. crassidentata and L. zonata. L. crassidentata differs from L. zonata in that it has very large hooded hooks with a few coarse teeth in median setigers; such hooks are absent in L. zonata, where all median and posterior hooded hooks have crests with numerous teeth. The two species also differ in body proportions; L. crassidentata is a slender, delicate species whereas L. zonata is robust. The prolonged posterior postsetal lobes are triangular and directed dorsally in L. zonata; they are digitate and directed laterally in L. crassidentata.

Distribution: L. crassidentata is known from two localities in a few fathoms depth in the Gulf of California.

Lumbrineris cruzensis Hartman, 1944
(Plate 12, Figs. g-j)

Lumbrineris cruzensis Hartman, 1944, pp. 165-166, pl. 12,
figs. 263-269.

Lumbrinereis crucensis Rioja, 1962, p. 180.

New Records: 964-39(1); 1703-49(1); 6179-59(8); K 126(1).

Earlier Record: Rioja (1962, p. 180): Embudo, Isla del Espíritu Santo, 4-15 m.

Remarks: L. cruzensis resembles L. californiensis but differs from it in that it is much smaller and has yellow instead of black acicula.

The prostomium (Fig. h) is short and the first peristomial segment is more than twice as long as the second one. The anterior parapodia have short and triangular presetal and setal lobes (Fig. g); the postsetal lobes are large and ear-shaped. The notopodial rudiment is prominent.

Composite hooks (Fig. j) are present in the first fifteen to sixteen setigers; each has eight teeth of the same size. Each of the simple hooks (Fig. i) has ten or eleven teeth; the teeth decrease evenly in size from the main fang.

Other species that resemble L. cruzensis include those discussed under L. californiensis. L. cruzensis has four teeth whereas L. albidentata and L. a. sadko have two teeth on each maxilla II. L. ligulata has three, or asymmetrically three and four, and L. meteorana has five teeth on each maxilla II. The differences are slight, and a revision of the type material is needed to establish the number of species involved in this group.

Distribution: L. cruzensis is known from British Columbia (Berkeley and Berkeley, 1948, p. 98) to western Mexico. The present records include localities on the Pacific side of Baja California and one locality in the Gulf of California.

Lumbrineris erecta (Moore, 1904)

(Plate 13, Figs. a-b)

Lumbriconereis erecta Moore, 1904, pp. 490-492, pl. 37,
figs. 19-22, pl. 38, figs. 23-25.

Lumbrinereis erecta Rioja, 1941, p. 716; Rioja, 1962, pp.
179-180.

Lumbrineris erecta Hartman, 1944, pp. 149-150; Reish, 1963,
p. 425.

New Records: 1517-46(1); 1596-47(2); 1597-47(6); 1976-
50(2); 2066-51(4); 2603-54(16); Rocky Point, Ensenada, Nov.
23, 1927 (1); Estuario del Punta Banda, Dec. 19-20, 1930,
coll. G. E. MacGinitie (2); El Descanso, June 1, 1938, coll.
O. Hartman (5); Hassler Cove, San Martin Island, May 23,
1946, intertidal, coll. M. W. Williams (1); Dawson 1946-47
sta. 9(1); El Descanso, intertidal, April 8, 1950, coll.
D. J. Reish (1).

Earlier Records: Rioja (1941, p. 716): La Aguada,
Acapulco; Mazatlán. Hartman (1944, p. 149): 616-37(frag-
ment); 634-37(1); 724-37(1); 738-37(1); 1045-40(2). Rioja
(1962, p. 180): Isla San Roque; Isla de la Asunción. Reish
(1963, p. 425): 3 localities in Bahía de San Quintin.

Remarks: The maxillary formula of L. erecta is 1-4
(5)-2-1; simple hooded hooks are present from setigers 21-
45 depending on the size of the specimens; most specimens
have hooks from setigers 33-36. The hooks (Fig. a) have a
large main fang and a crest of fifteen to sixteen small
teeth which increase in size apically. Anterior parapodia
(Fig. b) have short, rounded presetal and setal lobes; the
conical postsetal lobes are nearly twice as long as the
setal lobes. Posterior parapodia have obliquely rounded
presetal and setal lobes, and erect postsetal lobes that

are more than three times as long as the setal lobes.

L. erecta belongs to group II. b. 2; other species that have prolonged posterior postsetal lobes and hooded hooks from setigers 20-40 include L. aciculatum Webster and Benedict (1887), L. duebeni (Kinberg, 1865), L. frauenfeldi (Grube, 1879), L. heteropoda (Marenzeller, 1879), L. heteropoda difficilis Day (1962), L. lobata Hartmann-Schroeder (1960) and L. polydesma Southern (1921).

L. polydesma has only slightly prolonged posterior postsetal lobes and thus differs from the other species in the group, which all have strongly prolonged and often erect posterior postsetal lobes. L. heteropoda difficilis has black acicula; in all the other species mentioned, the acicula are yellow.

L. frauenfeldi differs from the other species in that it has asymmetrical maxillae II with nine teeth left and seven right; none of the other species has more than seven teeth.

L. erecta and L. heteropoda were differentiated by Hartman (1942a, pp. 120-123, fig. 10e-g). They differ in that L. erecta has long postsetal lobes in all setigers with an increasing prolongation from the anterior to the posterior end; L. heteropoda has long postsetal lobes in anterior and posterior ends; those in the posterior end are clearly longer than those in the anterior end, but the lobes are reduced to short processes in the median region of the body. L. erecta and L. heteropoda are apparently very closely related; they can be separated only with difficulty.

L. lobata is also very similar to L. erecta, but differs in that maxilla II has seven teeth instead of four or five as in the latter (Hartmann-Schroeder, 1960, pp. 29-30); other differences may be found in the structure of the

hooded hooks.

The original description of L. acicularum is incomplete; it is possible that this species has black acicula and only one tooth on each maxilla III, despite the illustration in the original description (Webster and Benedict, 1887, pl. 4, fig. 55); Pettibone (1963, p. 262) referred it to L. fragilis.

L. duebeni differs from L. erecta only in details of the pharyngeal apparatus; maxillae II have four teeth each and each maxilla III has one large and one small tooth, according to Hartman (1948, p. 96). L. duebeni differs from L. heteropoda in that it has long postsetal lobes in the median setigers also.

These species appear to be closely related to each other; only a direct comparison of types or material from the type localities will make it possible to decide how many species are involved.

Distribution: L. erecta is known from southern California to Acapulco, Mexico. It is found in intertidal and shallow subtidal areas.

Lumbrineris eugeniae, new species

(Plate 13, Figs. c-f)

Record: 7235-61(1, TYPE).

Description: The type is an incomplete specimen with 54 setigers; it is 20 mm long and 3.5 mm wide with setae. The anterior end is salmon colored and lacks color pattern; the posterior part of the fragment has dark pigmentation in the intersegmental grooves.

The prostomium is incomplete anteriorly, but appears to have been elongated. The nuchal organ (Fig. d) is single

and centrally placed in a depressed area at the junction of the prostomium and the first peristomial segment. It has one slender nuchal tentacle and two sets of laterally placed mounds; the inner set is large and oval; the outer one is a pair of narrow folds.

Both peristomial segments are as wide as the first setiger and nearly twice as wide as the prostomium. The first peristomial segment is as long as the first setiger; the second one is somewhat shorter.

The first parapodia have rounded setal lobes; the pre- and postsetal lobes are similar in length and rounded. Posterior setigers (Fig. e) have prolonged, digitate pre- and postsetal lobes; a posterior fragment has pre- and postsetal lobes that are nearly twice as long as the setal lobes.

Three kinds of setae are present. Anterior parapodia have dorsal fascicles of limbate setae which are strongly prolonged. Ventral fascicles in the first 13 setigers have composite hooded hooks; each hook (Fig. c) is slender and the distal end of the appendage has seven or eight equal teeth. The number of setae in the dorsal fascicles diminishes from setiger 10; in the last setigers only one or two limbate setae are present in a parapodium. Ventral fascicles from setiger 14 have simple hooded hooks; all are similar in size; each hook (Fig. f) has nine or ten teeth; the main fang is only slightly larger than the other teeth.

The pharyngeal apparatus is well developed and partly calcified. Maxilla I is falcate; each maxilla II has three teeth; each maxilla III and IV has one tooth. The maxillary carriers are narrow and pointed. The mandibles are triangular and fused along most of their length.

L. eugeniae belongs to group I. B. b. l.; it differs

from other species which have pre- and postsetal lobes prolonged in posterior setigers (see listing under L. californiensis) in that it has a centrally placed nuchal organ with a slender tentacle. It resembles L. cedroensis in that it has strongly prolonged simple setae and a single centrally placed nuchal organ. The two species differ in that L. eugeniae has a nuchal tentacle and prolonged pre- and postsetal lobes in posterior setigers; L. cedroensis has postsetal lobes shorter in posterior than in anterior setigers and lacks a nuchal tentacle.

Distribution: L. eugeniae is known from one locality off Punta Eugenia, Baja California, in approximately 700 fms depth.

Lumbrineris inflata Moore. 1911

(Plate 14, Figs. a-d)

Lumbrineris inflata Moore, 1911, pp. 289-291, pl. 19, figs. 128-132, pl. 20, figs. 133-134; Hartman, 1944, pp. 160-161.

Lumbriconereis albifrons Fauvel, 1943, p. 22 (not Crossland, 1924).

New Records: 125-33(1); 1260-41(2); 1711-49(1).

Earlier Records: Fauvel (1943, p. 22): Gulf of California, 1905. Hartman (1944, p. 160): 559-36(1).

Remarks: Each maxilla III has three or four teeth and each maxilla IV has two. The postsetal lobes are long in all setigers (Figs. a-b); they are slightly prolonged and erect in posterior setigers. They are less prolonged than corresponding lobes in other species examined, including L. erecta and L. zonata (Pl. 19, Fig. d).

Composite hooded hooks are present in the anterior twenty setigers; each hook (Fig. d) has seven or eight teeth and the main fang is distinctly larger than the other teeth. The simple hooks (Fig. c) have a large main fang and a crest of ten or eleven smaller teeth each.

Other species in group I. B. b. 2. that have two teeth on each maxilla IV include L. albifrons (Crossland, 1924), L. caledonica (Pruvot, 1930), L. floridana polygnatha Monroe (1933, but not the stem L. floridana Ehlers, 1887), L. gurjanovae (Annenkova, 1934) and L. obtusa (Kinberg, 1865). Most of these species have at one time or another been considered synonyms of some of the others: L. albifrons was referred to L. inflata by Hartman (1944, p. 160); L. caledonica to L. albifrons by Fauvel (in Pruvot, 1930, p. 75); thus by extension L. caledonica should be synonymous with L. inflata. L. gurjanovae was referred to L. cervicalis Treadwell (1922) by Ushakov (1955, p. 239). The types of L. cervicalis and L. inflata were compared by Hartman (1956, p. 288) and were considered synonymous; thus again by extension, L. gurjanovae should be synonymous with L. inflata. The only synonym of L. inflata accepted here is L. cervicalis, since this is the only one that has been based on a comparison of the types.

L. obtusa differs from all the other species in that it has strongly prolonged posterior postsetal lobes. The other species have prolonged postsetal lobes, but these are less obvious since the postsetal lobes are long in all setigers.

L. albifrons is very similar to L. inflata but differs in the structure of the composite hooded hooks (see Fig. d and Crossland, 1924, text-fig. 72). The two species also differ in that the second has much longer and more inflated postsetal lobes in all setigers than does the first.

L. caledonica was described with short postsetal lobes; it may be synonymous with L. albifrons, but it appears to differ from the latter in that it has only one aciculum in a parapodium, whereas L. albifrons has two.

L. gurjanovae differs from L. inflata in the structure of the hooded hooks; the composite hooks have five and the simple hooks four teeth each in L. gurjanovae; the composite hooks have seven and the simple ones eleven teeth in L. inflata. The description of L. floridana polygnatha is too incomplete to permit comparison with the other species in this group.

Distribution: L. inflata is known from western Mexico to British Columbia in shallow water. It has been found in all parts of western Mexico in shallow subtidal areas.

Lumbrineris japonica (Marenzeller, 1879)

(Plate 14, Figs. e-f)

Lumbriconereis japonica Marenzeller, 1879, pp. 137-138, pl. 5, fig. 3-3D.

Lumbrineris latreilli japonica Hartman, 1944, pp. 159-160.

Lumbrineris japonica Imajima and Hartman, 1964, pp. 263-264.

New Records: 1924-49(4); El Descanso, April 8, 1950, coll. D. J. Reish (3); 1 mile N of El Descanso, intertidal, April 8, 1950, coll. D. J. Reish (16); 1 mile N of Ensenada, April 8, 1950, coll. D. J. Reish (1).

Earlier Record: Hartman (1944, p. 159): 533-36(1).

Remarks: The complex synonyms of this species have been summarized by Imajima and Hartman (1964).

Composite hooded hooks are present in the first seven to fifteen setigers, depending on the size of the specimens;

each hook (Fig. e) has eight or nine teeth; the main fang is distinctly larger than the other teeth. The simple hooks (Fig. f) are recurved and have large main fangs and crests of seven or eight smaller teeth.

L. japonica belongs to group I. B. b. 2.; other species with black acicula in this group include L. grandis (Treadwell, 1906) and L. index (Moore, 1911). L. japonica differs from L. index in that it has short postsetal lobes in all setigers; the posterior postsetal lobes are prolonged in L. index. The maxillary formula of L. japonica is 1-5-2-1 and no variation has been observed in the number of teeth of maxilla II. The maxillary formula of L. grandis is 1-4-2-1. L. grandis appears to have composite hooks in more setigers than does L. japonica, but the variability of this character is not well established.

Distribution: L. japonica is known from western Canada to western Mexico in the eastern Pacific Ocean. It is known from the northern end of the Baja California peninsula in western Mexico; the specimen reported from the Gulf of California by Hartman (1944) has not been located and no additional material from the Gulf of California has been found.

Lumbrineris lagunae, new species

(Plate 15, Figs. a-e)

Lumbrineris bifilaris Hartman, 1944, pp. 153-155, pl. 9, figs. 196-206 (not Ehlers, 1901).

Type locality: 1130-40(1).

Earlier Records: Hartman (1944, p. 153): 497-35(1); 915-39(1); 1254-41(1); 1264-41(1).

Description: The material from western Mexico is fragmentary; a specimen from off Laguna Beach, southern California, has been selected as type. This is an incomplete specimen with 107 setigers and is 85 mm long and 3.8 mm wide with setae. It is salmon colored and lacks color pattern. The anterior part of the body has short and wide setigers; posterior to setiger 45 each setiger is as long as wide.

The prostomium (Fig. b) is short and conical; a paired nuchal organ is visible at the dorsolateral junction between the prostomium and the first peristomial segment. The two peristomial segments are similar in length; the second is somewhat wider than the first.

The first setigers have very short parapodia; the setal lobe (Fig. a) is obliquely truncate; the obliquely rounded presetal lobe has a marked dorsal notch. The flattened postsetal lobe is high and obliquely truncate. The notopodial rudiment is distinct in all setigers. Both pre- and postsetal lobes are reduced in median setigers posterior to setiger 40; the setal lobes are symmetrical in median setigers. Posterior to setiger 70 the pre- and postsetal lobes (Fig. e) are prolonged and slender; they project beyond the setae in far posterior setigers.

The yellow acicula occur singly in a parapodium. Two kinds of setae are present; anterior setigers have broadly limbate setae; simple hooded hooks are present from the first setiger. Each of the anterior hooks (Fig. d) has seven or eight teeth. Hooks in the posterior setigers (Fig. c) have large main fangs and irregular crests with ten to fourteen teeth in a crest.

The pharyngeal apparatus is well chitinized and has calcified cutting edges. The maxillary carriers are short and wide. Maxilla I is falcate; maxilla II is asymmetrical with five teeth left and four right; each maxilla III and

IV has one tooth. The mandibles are long and slender and are fused along half their length.

L. lagunae belongs to group II. b. 1. Other species in this group that have both pre- and postsetal lobes prolonged in posterior setigers include L. bicirrata Treadwell (1929), L. bifurcata (McIntosh, 1885) and L. longensis Hartman (1960). L. lagunae differs from the other three in that it has yellow instead of black acicula.

L. bifilaris has been reported from western Mexico by Moore (1911, p. 294), Treadwell (1923, p. 9), Rioja (1941, p. 716) and Rioja (1947a, p. 205). These reports may refer to this species or to L. bicirrata as noted by Hartman (1944, pp. 154-155). It is also possible that other species with both pre- and postsetal lobes prolonged have been confused with the present species. The records of L. bifilaris (Ehlers, 1901) from the northeastern Pacific Ocean are here considered very doubtful.

Distribution: L. lagunae is known from southern California and western Mexico; it may be found as far north as western Canada (Berkeley and Berkeley, 1954, p. 459). It has been taken in shallow subtidal areas on the Pacific side of Baja California and near Clarion Island in western Mexico. The type comes from off Abalone Point, Laguna Beach, from $33^{\circ} 32' 15''$ N, $117^{\circ} 48' 10''$ W to $33^{\circ} 32' 50''$ N, $117^{\circ} 49' 00''$ W, 25-27 fms, mud, VELERO III sta. 1130-40, D-1.

Lumbrineris latreilli Audouin and Milne Edwards, 1834
(Plate 15, Figs. f-h)

Lumbrineris latreilli Audouin and Milne Edwards, 1834, pp. 168-170, pl. 3B, figs. 13-15; Hartman, 1944, pp. 158-

159, pl. 9, figs. 213-216.

Lumbrinereis latreilli Rioja, 1947b, p. 521.

Lumbriconereis latreilli Fauvel, 1923, pp. 431-432, fig.

171m-r.

New Records: 1561-47(1); 1713-49(1); 1914-49(1); 2030-51(1); 2596-54(1); Dawson 1946-47 sta. 57(1); Dawson 1946-47 sta. 68(1); Dawson 1946-47 sta. 85(3); near N. Whale Island, Abreojos Lagoon, Febr. 11, 1950, 2 m, sand, mud, coll. M. W. Johnson (1); Hubbs sta. H50-71(1); 1 mile N of Ensenada, April 8, 1950, coll. D. J. Reish (1); reef 2 miles N of Mazatlán, rock, little algae, July 2, 1952, coll. E. Y. Dawson (1); K 112(4); K 133(1); P 196-59(1).

Earlier Records: Hartman (1944, p. 158): 259-34(1); 533-36(1); 563-36(1); 745-37(1); 747-37(1); 1075-40(8); 1078-40(2); 1093-40(1); 1264-41(1). Rioja (1947b, p. 521): El Mogote, La Paz; Bahía de San Ignacio, Sinaloa.

Remarks: L. latreilli belongs to group I. B. b. 2.; the specimens from western Mexico have a remarkably constant maxillary formula of 1-5-2-1; one specimen had an asymmetrical maxilla II with six teeth left and five right and two specimens had six teeth in both maxillae II.

The postsetal lobes (Fig. f) are longer than the pre-setal ones in all setigers, but are not prolonged in any setiger. Composite hooded hooks are present in the anterior end; the last composite hook is on setiger 11 to 24, depending on the size of the specimens. Fully grown specimens have the last composite hook on setiger 20 to 24. Each hook (Fig. f) has nine teeth that decrease evenly in size from the main fang, which is only slightly larger than the following tooth. Each simple hook (Fig. i) in posterior setigers is more than twice the size of the composite ones; it has a large main fang and nine or ten smaller

teeth in a crest; the teeth decrease in size apically.

Five other species in group I. B. b. 2. have long, but not prolonged postsetal lobes; these include L. annulata Hartmann-Schroeder (1960), L. limbata Hartmann-Schroeder (1965), L. magalhaensis (Kinberg, 1865), L. patagonica Hartmann-Schroeder (1962) and L. striata Hartmann-Schroeder (1962).

These five species differ from L. latreilli in having only four teeth on each maxilla II instead of five or six, as in L. latreilli.

L. annulata has only four teeth in each composite hook instead of nine, as in L. latreilli. L. patagonica has four to five teeth in the crests of the simple hooks; L. latreilli has nine or ten. L. limbata and L. patagonica also differ from L. latreilli in the shape of the composite hooks. L. limbata has composite hooks in fourteen setigers only, but this is within the range of variability for small specimens of L. latreilli; the type of L. limbata was immature. L. magalhaensis, on the other hand, may have composite hooks in only 15-17 setigers even in fully grown specimens. It was re-described by Hartman (1948, p. 93, pl. 14, figs. 1-3), but a revision based on material from the type locality is needed since the type is in very poor condition.

All the five species mentioned above are from shallow water areas in South America; it is apparent that the differences between the species are slight and a large amount of material should be examined in order to establish the variability of the different characters used. It is possible that all these species differ more in characters of the soft parts than in jaw structures and setal distribution.

Distribution: Although L. latreilli is considered

cosmopolitan, it may have been confused in the present definition with several similar species. As currently defined, it is common in western Mexico in shallow shelf and intertidal depths.

Lumbrineris limicola Hartman, 1944

(Plate 16, Figs. a-d)

Lumbrineris limicola Hartman, 1944, pp. 161-162, pl. 11,
figs. 230-237.

Records: 2750-37(1); 6177-59(1); 6179-59(2); 6197-59
(8); P 68-59(1).

Remarks: L. limicola belongs to group I. B. b. 2.; the second tooth of maxillae III is reduced and is visible only as a small knob in most specimens.

The anterior parapodia (Fig. d) have very short postsetal lobes; the presetal lobes have a distinct notch. The digitiform posterior postsetal lobes are prolonged (Fig. b); the presetal lobes are truncate in posterior setigers. Composite hooks are present in more than twenty-five setigers in fully grown specimens; each hook (Fig. c) has eight teeth; the main fang is distinctly larger than the other teeth. Each simple hook (Fig. b) has a well marked, large fang and a crest of eight similar teeth.

Other species in group I. B. b. 2. that resemble L. limicola in having prolonged posterior postsetal lobes include L. coccinea (Renier, 1804), L. floridana (Ehlers, 1887), L. nuchalis Treadwell (1921) and L. sphaerocephala (Schmarda, 1861).

Both L. coccinea and L. sphaerocephala have globular prostomia; the prostomium in L. limicola is conical.

L. sphaerocephala has brown, L. limicola has yellow

acicula. Both teeth on maxilla III are well developed in L. coccinea and L. floridana; the second tooth is rudimentary in L. limicola. L. floridana appears to have fewer teeth on both kinds of hooks than does L. limicola.

L. nuchalis resembles L. limicola closely, but has long, thick postsetal lobes in all setigers; both teeth on maxillae II are well developed. The distribution of the two kinds of hooks is not known in L. nuchalis.

Distribution: L. limicola is known from southern California and western Mexico in shallow subtidal areas. It occurs on both sides of the Baja California peninsula.

Lumbrineris longensis Hartman, 1960

(Plate 14, Figs. g-j)

Lumbrineris longensis Hartman, 1960, pp. 103-104.

Record: P 41-59(1).

Remarks: L. longensis was originally described by Hartman (1960) without any illustrations. Here are illustrations of the anterior end (Fig. j), a median parapodium and median and anterior hooks. The median parapodium (Fig. i) has short, triangular pre- and postsetal lobes. The posterior parapodia have prolonged pre- and postsetal lobes. Each anterior hooded hook (Fig. h) has six or seven teeth; the main fang is slightly larger than the other teeth. The median hooded hooks are more than three times as large as the anterior ones; each hook (Fig. g) has a short, blunt main fang and seven short teeth in the crest. Acicula are basally black and have slender translucent tips. The maxillary formula is 1-5-1-1.

L. longensis belongs to group II. b. 1.; other species

with prolonged limbate setae include L. abyssorum (McIntosh, 1885), L. ehlersii tenuisetis (McIntosh, 1885), L. moorei Hartman (1942), L. neozealandiae (McIntosh, 1885) and L. punctata (McIntosh, 1885).

L. punctata and L. abyssorum have yellow, L. longensis has black acicula. L. moorei has simple hooks from approximately setiger 25, L. longensis has hooks from the first setiger. L. ehlersii tenuisetis has short pre- and post-setal lobes in posterior setigers; these lobes are prolonged in L. longensis.

At least two different species are involved in the original description of L. neozealandiae; it cannot be clearly defined without a re-examination of the type material.

Distribution: L. longensis is known from one locality off southern California in 916 fms and from one locality off the southern tip of Baja California in 1520-1535 fms.

Lumbrineris monroi, new species

(Plate 16, Figs. e-i)

Lumbrineris africana Monro, 1933, p. 86 (not Augener, 1918).

Lumbrineris africana (*sensu* Monro) Hartman, 1944, pp. 138 and 144.

Records: 2603-54(5, TYPE); ?K 116(1 juvenile).

Description: The type is an incomplete specimen with 84 setigers and is 23 mm long and 3.5 mm wide with setae. It is salmon colored and lacks color pattern.

The prostomium (Fig. i) is rounded conical; the first peristomial segment is as long as the first setiger and more than twice as long as the second one. The nuchal organ is a pair of dorsolateral pockets at the junction

between the pro- and the peristomium.

The first setigers have rounded setal lobes (Fig. h); the rounded presetal lobes are longer than the setal lobes. The digitate postsetal lobes are twice as long as the presetal ones. Parapodia in the posterior end (Fig. e) are similar to the anterior ones except that the presetal lobes are shorter and follow the outline of the setal lobes closely; the posterior postsetal lobes have thick bases.

The first parapodia have only slightly geniculate limbate setae with very wide fans. Simple hooded hooks are present in central and inferior positions from setigers 18 to 25. Each hook (Figs. f-g) has a large main fang and a crest of nine to eleven small teeth. The hoods have slightly dentate margins. The anterior hooks have sharply pointed teeth that are directed toward the main fang; posterior hooks have rounded, more erect teeth. Each anterior parapodium has two straight, yellow acicula; one aciculum is found in a parapodium in posterior setigers.

The pharyngeal apparatus is well developed; the mandibles are fused along most of their length and have straight cutting edges. The maxillary carriers are short and triangular. Maxilla I is falcate; each maxilla II has four or five teeth; all specimens except one are symmetrical with four teeth on each side; one is asymmetrical with four teeth left and five right. Each maxilla III has two teeth and each maxilla IV has one.

L. monroi, which belongs to group II. b. 2., was originally mentioned by Monro (1933, p. 86) from the Galapagos Islands as *L. africana*; this record was repeated by Hartman (1944, pp. 138 and 144) as *L. africana sensu* Monro.

Other species in group II. b. 2. that have hooded hooks from a median setiger and no prolongation of the