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ONUPHIDAE (POLYCHAETA)  
FROM WESTERN MEXICO

BY

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# ONUPHIDAE (POLYCHAETA) FROM WESTERN MEXICO

by KRISTIAN FAUCHALD

## INTRODUCTION

Many new collections have been added to the holdings of the Allan Hancock Foundation since the onuphids were first published (Hartman, 1944). As a result of the present study, the number of known onuphids from the coast of western Mexico is now 42, of which all but nine are represented in the present materials. Six of the nine are deep water forms described by Chamberlin (1919), taken by the USS ALBATROSS expedition of 1891 from deep areas in the Gulf of California and offshore; these areas have not been re-explored.

The best represented genera in Mexico are *Onuphis* with 16 species of which 10 are present in the material, *Nothria* with 11 species all but one of which are present, and *Diopatra* with eight species all present in the material. *Hyalinoecia* is represented by four species of which two are present, *Rhizophranchium* by two and *Paronuphis* by one species.

Most of the collections studied were taken by the VELERO III and VELERO IV of the Allan Hancock Foundation. A complete list of stations to 1502-42 is found in Fraser (1943). Data for stations of the VELERO IV in western Mexico from 1688-49 to 7358-61 and separate lists for other collections in which onuphids have been found are given at the end of this report. All material of onuphids from western Mexico in the Allan Hancock Foundation were studied; the lists of new records include only those collections that were not reported on by Hartman (1944). The material is deposited in the collections of the Allan Hancock Foundation, University of Southern California, Los Angeles.

I am grateful to the Allan Hancock Foundation for making the collections available to me, and for material assistance. The work was supported by the National Science Foundation Grant no. B5-1780 to the Allan Hancock Foundation. Drs. Olga Hartman and Russel L. Zimmer gave me much valuable advice and Drs. Hartman and J. Savage critically read the manuscript. The results of this study will be used as the basis for a Ph. D. thesis at the University of Southern California.

## DISCUSSION OF SYSTEMATIC CHARACTERS

The large number of species represented in the collections gave an opportunity for a partial revision of the generic and specific characters.

The currently used subdivision of the family is arbitrary, especially as it concerns *Nothria* and *Onuphis*, but it seems best to retain these two genera because of their large size, with more than 80 species (Hartman, 1959, 1965a) of which over half are known only through imperfect original descriptions. Genera are now recognized for the presence or absence of modified anterior setigers, for the presence or absence of peristomial cirri and branchiae and for the character of the branchiae (Hartman, 1965b, pp. 101-102, p. 108 and pp. 110-111, and in key below).

Species are recognized mainly on the distribution of branchiae and of different types of setae and on the relative size and shape of the several soft structures.

The first parapodia are believed to participate in the formation of the tube. A direct relationship should therefore exist between the degree of complexity of the anterior parapodial lobes and the kind of tube built. Such a relationship is present, especially in *Diopatra* (see below), but also in other tubicolous onuphids. *Hyalinoecia* shows varying development of the parapodial lobes. The two species of *Hyalinoecia* (*H. juvenalis* and *H. stricta*) secrete translucent or semi-translucent tubes without foreign particles, and the variability in the development of the parapodial lobes may relate to the different mode of tube formation.

Different kinds of hooded hooks are limited to specific regions of the body. This is believed to be related to functions in locomotion, within the tube and in foraging activities when the animals are projecting from the tube. The exact occurrence and distribution of the different kinds of hooks are considered very important systematic characters.

The distribution of branchiae is also important; however, in most species examined there is some variation in the occurrence of the first branchiae (see *Onuphis nebulosa* and others below). Pectinate branchiae occur in certain forms, and especially in *Onuphis* the total number of lateral filaments and their length in relation to the branchial stem may be important (see *Onuphis microbranchiata* below).

The ceratophores of the occipital tentacles may be smooth or distinctly annulated. The number of annulations in forms with annulated ceratophores seems to vary within very narrow limits, but as little is known about the constancy of this character with age, with size, and with mode of fixation, its possible importance cannot be ascertained.

The length of the occipital tentacles, the shape of the prostomium and the relations between the peristomium and the first setigers have been used as important characters. These soft parts probably give as good systematic characters as the distributional features mentioned above, but they are all influenced by the mode of fixation and the preservatives used in storing the specimens, so it may be practically impossible to reconstruct the natural shape of the specimens.

#### Key to Genera from Western Mexico

- |   |                        |
|---|------------------------|
| 1. Peristomial cirri present.....                                   | 3                      |
| 1. Peristomial cirri absent.....                                    | 2                      |
| 2. Branchiae present .....  | <i>Hyalinoecia</i>     |
| 2. Branchiae absent.....  | <i>Paronuphis</i>      |
| 3. Two or three anterior setigers with basally prolonged setae..... |                        |
| .....   | <i>Rhamphobrachium</i> |
| 3. Anterior setigers without basally prolonged setae.....           | 4                      |
| 4. Branchiae in part spiraled.....                                  | <i>Diopatra</i>        |
| 4. Branchiae pectinate, simple or absent.....                       | 5                      |
| 5. Branchiae at least partly pectinate.....                         | <i>Onuphis</i>         |
| 5. All branchiae simple or absent.....                              | <i>Nothria</i>         |

#### DESCRIPTION OF SPECIES

##### Genus *Diopatra* Audouin and Milne Edwards, 1833

A review of all species of *Diopatra* from the western hemisphere was given by Hartman (1944), together with a survey of the characters used to separate them. The dentition of the anterior hooded hooks and the dentition and shape of the pectinate setae were considered to be of primary importance. Tube-construction and color pattern were considered to be of less importance since both features are easily lost in preserved material. For a complete discussion see Hartman (1944, pp. 49-53). The most recent survey of the genus was made by Day (1960) on the South African species. He used the same set of characters as Hartman (1944)

but added a discussion of the possible significance of the different parapodial lobes.

The presetal lobes in the prebranchial setigers are not developed in the South African species (Day, 1960, p. 340). Such lobes are present in all species from western Mexico and seem to be good specific characters. The degree of complexity of the presetal lobes is associated with the type of tube built by the worms: the species that build complex tubes with well organized outer coatings (*D. ornata*, *D. splendidissima*, *D. tridentata*) have better developed presetal lobes than do species that have poorly constructed tubes. The lobe may be equipped with a transverse fold near the base of the parapodium (*D. tridentata*, Pl. 2, Fig. k). This fold is low and continues round the dorsal and ventral margins of the parapodium to the posterior side, where it becomes indistinct near the base of the postsetal lobe. Only a few setae emerge from this fold, either near the ventral margin (*D. tridentata*, Pl. 2, Fig. k) or on the anterior face of the parapodium (*D. ornata*, Pl. 2, Fig. c). The distal end of the presetal lobe may be simple (*D. denticulata*, Pl. 1, Fig. f), more or less bilobed (*D. papillata*, Pl. 2, Fig. i and *D. obliqua*, Pl. 2, Fig. a), or may project like a collar (*D. splendidissima*, Pl. 2, Fig. j). The cross-sections of the collars are flattened ovate with well marked anterior and posterior faces. The superior portion of the posterior face is fused to the base of the postsetal lobe; the rest of the collar is free. The anterior face of the collar has a deep incision, either straight (*D. tridentata*, Pl. 2, Fig. k) or comma-shaped (*D. splendidissima*, Pl. 2, Fig. j). The edges of the collar may be equally high on both sides of the incision or the ventral margin may be lower than the dorsal.

Recognition of species is here based primarily on the distribution and occurrence of the different types of anterior hooded hooks and pectinate setae; of secondary importance are the shape of the different parapodial lobes in the first setigers and the character of the annulations of the ceratophores of the occipital tentacles.

#### Key to Species of *Diopatra* from Western Mexico

1. Ceratophores of some occipital tentacles with lateral projections ..... *papillata*
1. Ceratophores of occipital tentacles without lateral projections .... 2
2. All anterior hooded hooks tridentate ..... 4
2. Anterior hooded hooks partially or totally bidentate ..... 3



3. All anterior hooded hooks bidentate ..... 5  
 3. Anterior hooded hooks both bi- and tridentate .....*neotridens*  
 4. Presetal lobe of first setiger simple (Pl. 1, Fig. f) .....*denticulata*  
 4. Presetal lobe of first setiger with transverse fold and collar-shaped distal lobe (Pl. 2, Fig. k) .....*tridentata*  
 5. Pectinate setae oblique (Pl. 1, Fig. l) ..... 6  
 5. Pectinate setae straight (Pl. 1, Fig. g) ..... 7  
 6. Presetal lobe of first setiger with transverse fold, distally entire (Pl. 1, Fig. m) .....*farallonensis*  
 6. Presetal lobe of first setiger without transverse fold, distally bilobed (Pl. 2, Fig. a) .....*obliqua*  
 7. Pectinate setae with few coarse teeth only .....*splendidissima*  
 7. Pectinate setae with numerous fine teeth .....*ornata*

### *Diopatra denticulata*, new species

(Plate 1, Figs. a-g)

*Diopatra tridentata* Hartman, 1944, p. 61, *partim*.

*Records*: 273-34 (1, TYPE); 274-34 (3); 632-37 (1); 1743-49 (2).

*Description*: All specimens are incomplete; the largest (from 1743-49) has 70 setigers and is 13.5 mm long and 1.5 mm wide with setae. The color pattern consists of dark brown median spots on the prebranchial segments and dark brown oval spots on the dorsal edge of the parapodial bases on prebranchial and branchial setigers. The postbranchial region lacks color pattern.

The prostomium (Fig. a) is rounded anteriorly; the frontal antennae are short, triangular and directed ventrad. The occipital tentacles are long and slender; the inner lateral pair is the longest and reaches back to the twelfth setiger. The ceratophores of the occipital tentacles are smooth or irregularly wrinkled without distinct annulations. Eyes are absent. The peristomial cirri are short, slender, and situated dorsolaterally. The palpi are strictly ventral in position; they are short, globular and only a little larger than the frontal antennae.

The first setiger (Fig. f) has a rounded simple presetal lobe and a short, flattened, oblique postsetal lobe. The dorsal cirrus is stout, has a rounded tip, and is longer than the postsetal lobe. The ventral cirrus is similar but shorter. The following setigers are similar to the first, but

dorsal and ventral cirri and the postsetal lobes become gradually shorter than those in the first setiger. The ventral cirri are pad-shaped from setiger 5, and the postsetal lobe is reduced to a low ridge from the same setiger.

The branchiae are present from setigers 5 to 28. The first few pairs are long, with dense spirals of short filaments; the branchiae become reduced farther back and the last five pairs consist of the branchial stem only.

The hooded hooks in the first three pairs of parapodia (Fig. d) are tridentate. Each hook has a minute proximal tooth; the hood is long and pointed. Limbate setae occur in ventral positions in the first eight setigers. They are replaced by two large, bidentate subacicular hooks (Fig. c) from setiger 9. Three slender acicula with oblique finely drawn out tips (Fig. b) are present in each parapodium, including the first; they are serrated at the base of the filamentous tip on the convex side. Limbate setae (Fig. e) are present in each parapodium; they are finely serrated along one edge. Pectinate setae (Fig. g), present in median and posterior segments, are distally straight with slender teeth; each tooth is drawn out in a fine tip.

The pharyngeal apparatus consists of double mandibles free from each other along most of their length, and five pairs of maxillae. Each maxilla I is large and falcate; maxilla II has five teeth on each side; left maxilla III has five teeth; the combined right maxillae III+IV (cfr. Hartman, 1944, p. 43 for an interpretation of the jaws of the onuphids) have five teeth; left maxilla IV has two teeth; and both maxillae V lack teeth. All maxillary teeth are slender and well separated. The maxillary carriers and the base of the mandibles are about equally long; they are difficult to measure since the whole pharyngeal apparatus is very poorly chitinized.

The tube consists of a thick yellow, brittle chitinized base covered with detritus only near the opening.

*D. denticulata* has tridentate hooded hooks in the first setigers, as in only one other species, *D. tridentata* Hartman (1944, pp. 61-63, pl. 2, figs. 37-43). The hooks in *D. denticulata* differ from those in *D. tridentata* in that the lowermost teeth in the former are consistently less developed than in the latter. The two species also differ in the shape of the presetal lobe of the first setiger, which is rounded and simple in *D. denticulata* and collar-shaped with a transverse fold in *D. tridentata*

(Pl. 2, Fig. k). The ceratophores of the occipital tentacles are smooth or only irregularly wrinkled in *D. denticulata*, and clearly annulated in *D. tridentata*. The color pattern consists of separate spots in *D. denticulata*, whereas *D. tridentata* has two brown bands along the sides of the body. The tubes of the two species differ markedly; *D. denticulata* has a smooth yellow chitinized tube covered with detritus only near the opening. *D. tridentata* has a smooth double-layered tube of very fine chitin with a filling of mud particles between the two layers.

*Distribution:* *D. denticulata* is known from two localities in the southern end of the Gulf of California and from two in Tenacatita Bay further south, in depth between 23 and 50 fms. The type comes from: W of islands off Navidad Head, Tenacatita Bay, 19° 13' 40" N, 104° 50' 47" W, 45 fms, muddy sand, March 4, 1934, VELERO III sta. 273-34.

#### *Diopatra farallonensis*, new species

(Plate 1, Figs. h-n)

*Record:* P 54-59 (12, TYPE).

*Description:* The type is a complete specimen with 106 setigers, 27.5 mm long and 2.0 mm wide with setae; it is yellow and lacks color pattern.

The prostomium (Fig. n) is small and rounded; the frontal antennae are small, ovate and directed ventrally. The occipital tentacles have ceratophores with five or six annulations of which the distal annulation is nearly one-third of the length of the ceratophore. The styles of the median and inner lateral tentacles are very long and reach to the twelfth or thirteenth setiger. The outer lateral tentacles have short styles, only one-fifth of the length of the inner lateral ones. The peristomial cirri are short and slender and nearly lateral in position. The palpi are large, globular and strictly ventral in position.

The first setiger (Fig. m) has double presetal lobes; the proximal portion is a low transverse fold; only a few setae emerge from this fold on the ventral edge of the parapodium. The distal end of the presetal lobe is simple and rounded. The postsetal lobe is subulate. The dorsal and ventral cirri have short cirrophores; the dorsal cirrostyle is very long and slender, the ventral one is similar but shorter. The parapodia of the following setigers are similar to the first, but the cirri and the postsetal lobes are shorter and more slender. The ventral cirri are pad-shaped from setiger 5.

Branchiae are present from setiger 5; the first few pairs are very long with open and loose spirals of very long filaments. The branchiae decrease rapidly in size; only the first six pairs are longer than the width of the body. The branchial stem without any filaments is present from setiger 28 and the branchiae disappear at approximately setiger 50.

The hooded hooks (Figs. h and i) in the first setigers are weakly bidentate; the lower tooth, especially in the inferiormost hooks, is very poorly developed. The hood is long and pointed and in the superior hooks is equipped with filamentous prolongations. The limbate setae of the first setigers have a smooth cutting edge, but are finely serrated along one edge in median and posterior setigers. Two inferior limbate setae are replaced by stout bidentate subacicular hooks (Fig. k) after setiger 10. Pectinate setae (Fig. l) are present in median and posterior setigers; they are strongly oblique with few slender teeth. Three acicula (Fig. j) are present in each parapodium; each has a fine oblique tip and is serrated on the convex side at the base of the tip.

The pharyngeal apparatus is similar to that of *D. denticulata* but differs in that the combined right maxillae III + IV have six teeth instead of five. The jaws are better chitinized than those of the latter species.

The tube has a soft inner lining and is covered with a thick coat of loosely attached mud particles.

*D. farallonensis* resembles *D. obliqua* Hartman (1944, pp. 57-61, pl. 2, figs. 24-36) in that both possess oblique pectinate setae. It differs from *D. obliqua* in the lack of color pattern; *D. obliqua* has a complex pattern of dark and pale spots and bars on the anterior part of the body. *D. farallonensis* has a soft tube with a loose layer of detrital material on the outside; *D. obliqua* has a double-layered tube with sand particles between the two layers and with shell fragments attached to the outside.

*D. farallonensis* has a presetal lobe that consists of a transverse fold and a simple rounded distal lobe; *D. obliqua* lacks a transverse fold and has a bilobed distal lobe (Pl. 2, Fig. a). The limbate setae are serrated on one edge only in *D. farallonensis* and on both edges in *D. obliqua*.

*Distribution:* *D. farallonensis* is known from one locality at the head of Farallon submarine canyon in the Gulf of California; data are given in the station-list at the end of this report.

**Diopatra neotridens Hartman, 1944**

(Plate 2, Fig. b)

*Diopatra neotridens* Hartman, 1944, pp. 63-66, pl. 2, figs. 44-48, pl. 3, figs. 49-54, pl. 16, fig. 334.

*New Records*: 1688-49 (3); 1954-50 (2); P 184-60 (1); near Guadalupe Island, Sept. 1, 1908 (1); Puerto Peñasco, Dec. 24, 1947, coll. N. and G. E. MacGinitie (1).

*Earlier Records*: Hartman (1944, p. 63): 1030-40 (3); 1031-40 (4); 1057-40 (about 10); 1260-41 (1).

*Discussion*: *D. neotridens* was described in detail by Hartman (1944); here is given a description of the first setigers. The first setiger (Fig. b) has a bilobed presetal lobe; the superior part is rounded and is separated from the inferior part by a wide and shallow incision. The inferior part encircles the parapodium and becomes indistinct on the posterior side of the parapodium; it encloses the postsetal lobe. The postsetal lobe is long and obliquely triangular. Both dorsal and ventral cirri have well developed cirrophores with styles as long as the postsetal lobe, but both styles are stouter than that lobe.

*Distribution*: *D. neotridens* has been taken as far north as Colnett Bay, Baja California, and is known south to Panama. It occurs in waters shallower than 50 fms.

**Diopatra obliqua Hartman, 1944**

(Plate 2, Fig. a)

*Diopatra obliqua* Hartman, 1944, pp. 57-61, pl. 2, figs. 24-36, pl. 16, figs. 331-333.

*New Records*: 868-38 (tubes only); K 126 (7 juvs).

*Earlier Records*: Hartman (1944, p. 57): 259-34 (tubes and specimens); 264-34 (1); 1074-40 (1); 1078-40 (2); 1088-40 (1).

*Discussion*: The first setiger (Fig. a) has an obliquely bilobed presetal lobe; its inferior part is directed ventrad, and the postsetal lobe is conical. Both dorsal and ventral cirri have short cirrophores of which the ventral is somewhat shorter than the dorsal one. The cirrostyles are digitiform, the dorsal twice as long as the ventral one and more slender. The ventral cirri are pad-shaped from setiger 5.

*Distribution:* *D. obliqua* is found from the Gulf of California to Peru, but has never been recorded from the Pacific side of Baja California. It occurs in depths between 2 and 23 fms in western Mexico.

### *Diopatra ornata* Moore, 1911

(Plate 2, Fig. c)

*Diopatra ornata* Moore, 1911, pp. 273-277, pl. 18, figs. 77-85; Berkeley and Berkeley, 1939, pp. 338-339; Treadwell, 1941, p. 22; Rioja, 1941, p. 716; Hartman, 1944, pp. 55-56, pl. 1, figs. 15-20.

*New Records:* 274-34 (3); 767-38 (2); 1031-40 (1); 1712-49 (1); 1717-49 (1); 1787-49 (2); 6179-59 (1); K 127 (18 juvs); P 263-60 (1).

*Earlier Records:* Berkeley and Berkeley (1939, p. 338): Las Animas Bay; Tenacatita Bay; Isle Grande Bay. Treadwell (1941, p. 22): Bahía Tangola-Tangola. Rioja (1941, p. 716): Mazatlán. Hartman (1944, p. 55): 283-34(1); 491-36(3).

*Discussion:* *D. ornata* was redescribed by Hartman (1944) to differentiate it from the closely related *D. cuprea* (Bosc) which is widespread in the Atlantic Ocean off the coasts of North and South America.

Some structural details in the first setigers are mentioned neither by Moore (1911) nor by Hartman (1944). The first setiger (Fig. c) has a presetal lobe that consists of a low transverse fold enclosing two obliquely rounded distal lobes. The two oblique lobes are placed *en echelon* so that the superior lobe is dorso-anterior to the inferior when seen from the anterior side. Setae emerge from the transverse fold and from the fold between the two oblique lobes. The postsetal lobe is digitiform, short and stout. Both dorsal and ventral cirri have well developed cirrophores; the dorsal is somewhat longer than the ventral one. The dorsal cirrostyle is digitiform and exceeds the postsetal lobe in length; the ventral cirrostyle is short and digitiform. Both cirri and the postsetal lobes diminish in length posteriorly. The ventral cirri are pad-shaped from setiger 5. The ventral cirri on setiger 4 may be short and truncate, but are still free from the body wall.

The early records of *D. ornata* from Mexican waters may be doubtful; Berkeley and Berkeley (1939), Treadwell (1941), and Rioja (1941) did not describe their specimens and one cannot be sure that they

distinguished between the several closely related species of *Diopatra* found in this area.

*Distribution:* *D. ornata* has been found from Vancouver Island, Canada, to Chacahua Bay, Mexico, in waters shallower than 50 fms.

### *Diopatra papillata*, new species

(Plate 2, Figs. d-i)

*Records:* P 71-59 (7, TYPE) ; P 211-60 (1).

*Description:* All specimens are incomplete; the largest (from P 71-59) is 15 mm long and 1.5 mm wide with setae, for 49 setigers; its basic color is yellow. The prostomium and the postbranchial region lack color patterns. The peristomium and the first ten setigers are covered with scattered brown punctations and there is double row of larger brown spots on the dorsal side of the parapodial bases in prebranchial and branchial setigers. The styles of the occipital tentacles have one or a few dark brown cross-bars.

The prostomium (Fig. d) is small and rounded; eyes are absent. The frontal antennae are large and triangular, but never fused with each other. The outer lateral pair of occipital tentacles has ceratophores with five or six annulations, of which the outermost is the longest. The inner lateral pair has the same number of annulations, but the median margins of the three middle annulations are produced into small projections (Fig. h). The median ceratophore has six (rarely seven) annulations, of which the four middle ones are produced into bilateral projections. The styles of all occipital tentacles are irregularly covered with large papillae. The inner lateral styles are the longest and reach to the ninth setiger. The peristomial cirri are short and slender and mediolateral in position.

The first setiger (Fig. i) has a weakly bilobed presetal lobe. The inferior part of the postsetal lobe is truncate and follows the setal lobe closely; the superior end is produced into a stout digitiform lobe that is directed dorsally. The dorsal and ventral cirri have well developed cirrophores. The dorsal cirrostyle is long and slender; the ventral cirrostyle is similar but shorter. The following setigers are similar to the first, but cirri and postsetal lobes are reduced. The ventral cirri are pad-shaped from setiger 5.

Branchiae are present from the fourth setiger; the first few are large with well developed dense spirals of filaments. The branchiae are re-

duced rapidly and from setiger 20 only the branchial stems are present; they disappear at setiger 35.

The hooded hooks (Fig. f) in the first three setigers are bidentate with short, pointed hoods. The first nine setigers have limbate setae in ventral positions, but from setiger 10 these are replaced by two very thick bidentate subacicular hooks (Fig. g). The acicula are slender with obliquely drawn out filamentous tips; they number three in a parapodium. Pectinate setae (Fig. e), which occur in median and posterior segments, are straight with comparatively few truncate teeth. The limbate setae have double rows of serrations on the cutting edges.

The pharyngeal apparatus is similar to the one in *D. denticulata* except that maxilla V has one tooth on each side instead of none.

The tube has a thin soft inner lining; it is covered with loose debris and algal fragments.

The only other species of *Diopatra* described with lateral projections on the ceratophores of the occipital tentacles is *D. dubia* Day (1960, pp. 348-350, figs. 10g-k). These projections are present only on the median and inner lateral ceratophores in *D. papillata*; they are present also on the outer lateral ceratophores in *D. dubia*. *D. dubia* has only a few, very weakly developed branchiae; the branchiae in *D. papillata* are few in number, but the first pairs are very strongly developed. The hoods of the hooded hooks in the first setigers are long in *D. dubia* and short in *D. papillata*. The frontal antennae of *D. dubia* were described as "spade-shaped" and sometimes fused; these antennae are triangular and never fused in *D. papillata*. The color pattern on the first setigers is also different in the two species.

*Distribution:* *D. papillata* is known from two localities in the upper end of the Gulf of California, in 40 to 60 fms.

### *Diopatra splendidissima* Kinberg, 1865

(Plate 2, Fig. j)

*Diopatra splendidissima* Kinberg, 1865, p. 560; Kinberg, 1910, p. 39, pl. 14, fig. 7; Hartman, 1944, pp. 56-57, pl. 1, figs. 21-23; Rioja, 1947a, p. 204.

*Diopatra californica* Treadwell, 1937, p. 152; Rioja, 1941, p. 716.

*New Records:* Estuario de Punta Banda, Dec. 19-20, 1930, coll. G. E. MacGinitie (2); Ensenada, in sands (littoral?), Dec. 1935, coll. W. Balamuth (1); Todos Santos Bay, between Estero and Ensenada,



1.5 fms, sand and mud, July 3, 1938, coll. Burch (1); Todos Santos Bay, 5 to 10 fms, mud, July 3, 1938, coll. Burch (1).

*Earlier Records:* Treadwell (1937, p. 152): 13 miles W of Mazatlán. Rioja (1941, p. 716): La Aguada and Caleta, Acapulco. Hartman (1944, p. 56): 616-37(1). Rioja (1947a, p. 204): La Paz, tubes; Topolobampo, tubes.

*Discussion:* *D. splendidissima* was redescribed by Hartman (1944) to distinguish it from other species with bidentate hooks in the first setigers. Here is added a description of the first setiger (Fig. j). The presetal lobe has a low transverse fold; the distal part of the lobe is collar-shaped with dorsal and ventral margins somewhat lower than the median anterior and posterior faces and with a deep comma-shaped incision in the anterior face. The superior part of the posterior face is fused to the base of the postsetal lobe. The postsetal lobe is short and digitiform. Setae emerge from the transverse fold and from the fold between the anterior and posterior faces of the collar. The dorsal and ventral cirri have well developed cirrophores. The dorsal cirrostyle is digitiform and longer than the postsetal lobe; the ventral cirrostyle is shorter and more fusiform than the dorsal one and a little shorter than the postsetal lobe.

*Distribution:* *D. splendidissima* has been found in Ecuador and in a few localities in Panama and southern California. In western Mexico it seems to be limited to very shallow water and has been found near Acapulco and in the northern part of Baja California on the Pacific side. The other records from these waters must be considered doubtful; Treadwell (1937) did not describe his specimen adequately and Rioja (1947a) based his records from La Paz and Topolobampo on tubes only.

### ***Diopatra tridentata* Hartman, 1944**

(Plate 2, Fig. k)

*Diopatra tridentata* Hartman, 1944, pp. 61-63, pl. 2, figs. 37-43, pl. 17, figs. 335-336; Rioja, 1947a, p. 204; Rioja, 1947b, p. 519.

*New Records:* 264-34(1); 1068-40(1); 1758-49(4); 1954-50 (tube); 2026-51(1); K 127(1); P 51-59(1); P 158-60 (tube); P 175-60(4); P 191-60 (fragment and tube); P 263-60(1).

*Earlier Records:* Hartman (1944, p. 61): 273-34 (fragm); 588-36(1); 1030-40 (tubes); 1069-40(2). Rioja (1947a, p. 204): near Topolobampo. Rioja (1947b, p. 519): La Paz.

*Discussion:* The first setiger (Fig. k) has a presetal lobe with a low transverse fold; the distal lobe projects like a collar with a deep notch on the dorsal edge of the collar. It has a semi-circular anterosuperior portion separated by a deep straight incision from the low and nearly straight-edged inferior portion. The superior portion of the posterior side of the collar is fused to the base of the postsetal lobe. Setae emerge from the transverse fold and from the fold between the anterior and posterior sides of the collar. The digitiform postsetal lobe is long and pointed. The dorsal and ventral cirri have long cirrophores. The slender dorsal cirrostyle is longer than the postsetal lobe; the ventral cirrostyle is similar but shorter.

*Distribution:* *D. tridentata* has been found from southern California to Colombia and has also been taken in the Caribbean Sea. It is widespread in western Mexico in depths shallower than 50 fms.

#### **Diopatra sp.**

*Records:* 538-36(tubes); 1031-40(tubes); 1265-41(1, in regeneration); P 194-60(fragment and tubes).

*Discussion:* This material is too fragmentary to permit closer identification.

#### **Genus Hyalinoecia Malmgren, 1867**

*H. juvenalis* Moore, 1911 is the only common species of this genus in shallow water in the eastern Pacific Ocean. *H. leucacra* and *H. tecton*, both from deep water off Mexico, are known only through the original account (Chamberlin, 1919). *H. tubicola stricta* Moore, 1911, comes from deep water off southern California. This subspecies is here elevated to specific rank.

#### Key to Species of *Hyalinoecia* from Western Mexico

1. Tube less than 100 mm long; outer lateral occipital tentacles with stout, often clavate styles.....*juvenalis*
2. Tube up to 300 mm long; outer lateral occipital tentacles with styles similar to the other tentacles.....*stricta*

#### ***Hyalinoecia juvenalis* Moore, 1911**

(Plate 3, Figs. a-e)

*Hyalinoecia juvenalis* Moore, 1911, pp. 277-280, pl. 18, figs. 86-95; Treadwell, 1937, p. 152; Hartman, 1944, pp. 46-47; Rioja, 1947b, p. 519.

*New Records:* 270-34(1); 281-34(2); 1031-40(6); 1057-40(2); 1113-40(11); 1251-41(18); 1259-41(3); 1692-49(1); 1693-49(15); 1694-49(40); 1711-49(1); 1715-49(3); 1733-49(3); 1743-49(4); 1948-50(12); 2026-51(4); 6177-59(4); P 71-59(1); P 174-60(6); P 201-60(5); P 211-60(16); P 212-60(10); Todos Santos Bay, 40-50 fms, July 4, 1938, coll. Burch (3); 32° 34.5'N, 117° 16.0-16.6'W, 35 to 38 fms, sand and mud, pipe-dredge, Oct. 9, 1946, coll. C. L. Hubbs, sta. H46-102.

*Earlier Records:* Treadwell (1937, p. 152); Banco Arena. Hartman (1944, pp. 46-47): 523-36(3); 541-36(4); 544-36(8); 546-36 (about 20); 701-37(1); 1037-40 (about 20); 1081-40(1); 1245-41(2); 1246-41(1); 1253-41(15); 1254-41(7); 1256-41(3); 1261-41(1). Rioja (1947b, p. 519): Bahía de La Paz; Topolobampo.

*Discussion:* *H. juvenalis* was described by Moore (1911) from fragmentary material. Illustrations are given here of the anterior part of the body (Fig. a) and of certain variable characters discussed below.

The outer lateral occipital tentacles have styles that vary in shape from digitiform to clavate, but they are always stouter than the other tentacular styles and they always have a dark line along the dorsal surface; the other styles are colorless.

The shape and size of the lobes and cirri of the first parapodia seem to vary; the postsetal lobe is usually shorter than the dorsal and ventral cirri (Fig. c), rarely it may be as long (Fig. e), but it is never longer than the cirri. The shape of the presetal lobe may vary from rounded triangular (Fig. c) to truncate (Fig. e).

The first branchiae are on setigers 17 to 20, but never later; each is straplike and usually as long as the body is wide.

The anterior hooded hooks usually have an evenly rounded distal tooth, but the tooth is sometimes clearly at an angle with the shaft (Fig. b). The number of teeth in the pectinate setae vary; in one group of specimens each seta has 15-18 teeth, in another group each has 25-30 teeth. Moore (1911, p. 279, pl. 18, fig. 92) stated in the text that the pectinate setae had 30 teeth, but his illustration shows only 17 or 18 teeth. The pectinate setae are semi-circular in cross-section; unless they are flattened, it is impossible to count the number of teeth accurately. The bidentate subacicular hooks are stout; a swelling at the base of the proximal tooth is often present (Fig. d).

The variations are slight and appear to be independent of each other, except for a tendency for the specimens with clavate outer lateral occipital tentacles to have more teeth in the pectinate setae than the other specimens. It has been impossible to correlate any variations with changes in the physical environment.

*Distribution:* *H. juvenalis* has been found from southern California to Panama and also in the West Indies. It is very common off western Mexico and prefers depths between 25 and 150 fms.

### *Hyalinoecia stricta* Moore, 1911

(Plate 3, Figs. f-k)

*Hyalinoecia tubicola stricta* Moore, 1911, pp. 280-282, pl. 18, figs. 96-97; Treadwell, 1923, p. 8.

*New Records:* P 137-60 (ca 100); P 274-60 (17).

*Earlier Records:* Treadwell (1923, p. 8) ALBATROSS stations D 5673; D 5683; D 5686; D 5687; D 5690; D 5691; D 5692, data for these stations have been published (U.S. Bur. Fish., Rpt., App. III, 1921, pp. 8-16).

*Discussion:* *H. stricta* was described as a subspecies of the widespread *H. tubicola* (O. F. Müller, 1788). It differs clearly from the latter in the structure of the setae and in attaining much greater size.

The anterior hooded hooks, which had been worn in the specimens described by Moore (1911, p. 281), have a very characteristic structure even in large specimens (Fig. f). The distal tooth is nearly globular in frontal view and drop-shaped in lateral view; the proximal tooth is very close to it and distally rounded. The hood is short and distally truncate (worn in the hook illustrated here). The pectinate setae (Fig. i) were described by Moore as having "very numerous denticulations"; each of the pectinate setae has 16-20 teeth in the present specimens.

The branchiae start on setigers 26 to 30 in the present specimens; the smaller specimens have more branchiae than the larger ones.

The prostomium and the first setigers were well described by Moore (1911), but without illustrations. Illustrations of the anterior end in dorsal view (Fig. g) and in right lateral view (Fig. j) and of the first parapodium in anterior view (Fig. k) are given here.

*H. stricta* differs most conspicuously from *H. tubicola* in that it is nearly three times as long, but also in the structure of the anterior

hooded hooks. *H. stricta* has large globular teeth on these hooks, whereas those in *H. tubicola* are conical with straight margins. The branchiae start on segments 22 to 26 in *H. tubicola* (Fauvel, 1923, p. 422), and on segments 28 to 31 in *H. stricta*. The characteristically nearly straight subacicular hooks were mentioned by Moore (1911, p. 281, fig. 97) and are shown here (Fig. h); there is some slight variation in the angle between the teeth and the shaft, but it is always clearly less than in *H. tubicola* (Fauvel, 1923, fig. 166 o).

*Distribution:* *H. stricta* has been found in deep water from southern California to Cape San Lucas at the southern end of Baja California. It appears to be common in waters deeper than 450 fms.

### Genus *Nothria* Malmgren, 1867

The genus was originally distinguished from the closely related *Onuphis* Audouin and Milne Edwards, 1833, by the character of the branchiae; *Nothria* has simple, straplike branchiae; *Onuphis* has pectinate branchiae. The definition of *Nothria* must be widened to include also onuphids with peristomial cirri but without branchiae. The presence of branchiae may be ecologically determined; the deep-water forms have less developed branchiae than shallow-water forms, so the distinction between *Onuphis* and *Nothria* may be artificial. The genera are retained here since they give a practical subdivision of what would otherwise have been a large and unwieldy group. Use of subgenera would imply an accuracy in taxonomic knowledge which is not present.

Species are recognized by the distribution of branchiae and the dentition of anterior hooded hooks (Hartman, 1944, pp. 83-84). The number of anterior setigers with cirriform ventral cirri and the distribution of subacicular hooks are also important characters. The presence of composite spinigers in some anterior setigers is important, but their presence or absence has rarely been noted.

The parapodial lobes in the first setigers are simpler than in *Diopatra*. The presetal lobes may have a transverse fold (*N. iridescens*, Pl. 7, Fig. a) or such a fold may be lacking (*N. similis*, Pl. 4, Fig. j). The distal part of the presetal lobe is always simple and more or less rounded; it is asymmetrically placed in some species (*N. conchylega*, Pl. 5, Figs. c, f, m and n and *N. mexicana*, Pl. 7, Fig. b). The setal lobe is truncate or rounded and the postsetal lobe is digitiform to clavate. The relation between the length of the postsetal lobe and the

dorsal and ventral cirri varies from one species to the next. The cirrophores of the dorsal and ventral cirri, if present, are never set off from the cirrostyle with a septum as in *Diopatra* (compare *D. tridentata*, Pl. 2, Fig. k, and *N. abyssalis*, Pl. 4, Fig. d), but can be recognized as a constriction of the cirri near the base.

Three subspecies of *N. stigmatis* (Treadwell, 1922) and a restriction of the main form were described from the eastern Pacific Ocean by Hartman (1944, pp. 89-95, pls. 11 and 15). Two of these four forms are present in western Mexico (*N. s. cirrata* and *N. stigmatis s. str.*). The differences between them are considered sufficient to characterize separate species and they are treated as such here. The other two subspecies (*N. s. intermedia* and *N. s. paradiopatra*) have not been found in western Mexico.

#### Key to Species of *Nothria* from Western Mexico

1. Branchiae absent.....*pygidialis*
1. Branchiae present..... 2
2. Cirriform ventral cirri on the first three setigers..... 3
2. Cirriform ventral cirri on more than the first three setigers..... 6
3. Branchiae first present after setiger 15..... 4
3. Branchiae first present on or before setiger 10 ..... 5
4. Ceratophores of occipital tentacles smooth.....*guadalupensis*
4. Ceratophores of occipital tentacles annulated.....*stigmatis*
5. All anterior hooded hooks bidentate.....*conchylega occidentalis*
5. Anterior hooded hooks both bi- and tridentate.....*abyssalis*
6. Branchiae present from setiger 1.....*iridescens*
6. Branchiae present from a later setiger..... 7
7. Branchiae present from setigers 17 to 18.....*cirrata*
7. Branchiae present from setigers 5 to 6..... 8
8. Ceratophores of occipital tentacles smooth.....*mexicana*
8. Ceratophores of occipital tentacles annulated..... 9
9. Without color pattern, branchiae from setiger 6, subacicular hooks from setiger 8.....*similis*
9. With dark brown transverse bars on anterior segments, branchiae from setiger 5, subacicular hooks from setiger 12.....*geophiliformis*

**Nothria abyssalis**, new species

(Plate 4, Figs. a-f)

*Record*: P 42-59(1, TYPE)

*Description*: The holotype is an incomplete specimen with 89 setigers; it is 47 mm long and 2 mm wide with setae and is pink without color pattern. The prebranchial region is clavate, the branchial region is subcylindrical with a flattened dorsum.

The prostomium (Fig. a) is rounded pentagonal and has large, triangular frontal antennae. The occipital tentacles have stout ceratophores which cover the middle part of the prostomium. Each of the outer lateral and median ceratophores has five annulations; the inner lateral ones have seven. The outer lateral and the median occipital styles barely reach the second setiger; the inner lateral ones reach the ninth setiger; all styles are slender. Two short, digitiform peristomial cirri are present; eyes are absent. The palpi are small, globular and ventral in position.

The first setiger (Fig. d) has an obliquely truncate setal lobe; the presetal lobe is shorter than the setal lobe and rounded. The long postsetal lobe is digitiform. The dorsal cirrus is digitate and has a distinct cirrophore; the ventral one is similar but sessile. The following setigers are similar to the first one, but cirri and postsetal lobes are reduced. The ventral cirri are pad-shaped from setiger 4.

Branchiae are present from setiger 7 to the end of the fragment; where fully developed they are longer than the dorsal cirri.

The anterior setigers have both bi- (Fig. c) and tridentate (Fig. b) pseudocomposite hooded hooks with small and pointed proximal teeth; the distal tooth is large and at a slight angle with the shaft; the hood is long and pointed. The limbate setae are serrated on the concave side in the first few setigers; they are serrated on both cutting edges in median and posterior setigers. Two thick, bidentate subacicular hooks (Fig. f) are present in each parapodium from setiger 8. Four acicula with fine oblique tips are present in all setigers, including the first. The pectinate setae (Fig. e) are slightly oblique distally; each has 15 to 16 truncate teeth.

The mandibles are calcified and have been poorly preserved; they seem to be of the triangular shape common in the genus. Each maxilla I is falcate; left maxilla II has nine teeth; right maxilla II has eight

teeth; left maxilla III has eight teeth; the combined right maxillae III+IV have four teeth; left maxilla IV has four teeth and both maxillae V lack teeth.

The tube is brittle and has a thin inner lining that is coated with a discrete thick layer of mud particles.

*N. abyssalis* resembles *N. lepta* (Chamberlin, 1919, pp. 290-295, pl. 45, figs. 1-7, pl. 46, figs. 3-12). Branchiae are found on setigers 6 to 53 in *N. lepta*, and from setiger 7 at least through setiger 89 in *N. abyssalis*. The anterior hooded hooks are both bi- and tridentate in *N. abyssalis*, and bidentate only in *N. lepta*. The frontal antennae are triangular in *N. abyssalis*, and ovate in *N. lepta*. Every jawpiece in *N. abyssalis* has fewer teeth than the corresponding ones in *N. lepta*.

*Distribution*: *N. abyssalis* has been found at one locality off the southern tip of Baja California in 1431 to 1490 fms.

#### ***Nothria cirrata* Hartman, 1944**

*Nothria stigmatis cirrata* Hartman, 1944, pp. 92-93, pl. 11, figs. 248-253.

*Earlier Record*: Hartman (1944, p. 92): 1048-40(1).

*Discussion*: *N. cirrata* was described as a subspecies of *N. stigmatis* (Treadwell, 1922). It differs from the latter in that the branchiae are present from setigers 17 to 18 in *N. cirrata* and from setiger 19 in *N. stigmatis*. Ventral cirri are cirriform on the first six setigers in *N. cirrata*, and on only three setigers in *N. stigmatis*. Subacicular hooks are present from setiger 16 in *N. cirrata* and from setiger 12 in *N. stigmatis*. *N. cirrata* is here elevated to specific rank.

*Distribution*: *N. cirrata* is known from the Gulf of California, from Colombia and from Ecuador in shallow water; the three original records are the only ones known.

#### ***Nothria conchylega occidentalis*, new subspecies**

(Plate 5, Figs. a-n)

*Nothria conchylega* Hartman, 1944, pp. 85-87, pl. 5, figs. 105-112, pl. 17, figs. 337-338.

*Records*: 1245-41(1, TYPE); 6176-59(15 juvs).

*Discussion*: *N. conchylega* (Sars, 1835, pp. 61-63, pl. 10, figs. 28a-e), originally described from Norway, has an isolated position in the



genus. It has a flat tube; the first parapodia are prolonged (Fig. e) and approach the modified condition found in other genera but lack the modified anterior setae found in those genera. The pectinate setae (Fig. b) are distally winged in contrast to all other species in the genus.

The different descriptions given of *N. conchylega* do not agree (cfr. among others Fauvel, 1923, pp. 415-417, fig. 164 and Hartman, 1944, pp. 85-87, pl. 5, figs. 105-112 and pl. 17, figs. 337-338) and it became necessary to examine material collected near the type locality on the west coast of Norway. I am indebted to the personnel of the Biological Station, Espesgrend, University of Bergen, for specimens from Norway, at Stavfjorden, by Varpenes, 120 to 150 m, gravel and muddy sand, Oct. 5, 1960, sta. no. 217-60(1), and from Raunefjorden, W of Raunane, 60° 15' 40" N, 05° 10' E, 60 m, shelly gravel and large numbers of *Modiolus phaseolinus*, July 22, 1963, sta. no. 287-63 (1). Illustrations are given here of the specimen from Stavfjorden (Figs. i - n).

The specimens from the eastern Pacific Ocean differ from the Norwegian ones in that the presetal lobes are auricular in both the first and the second setiger (Figs c and f) in the Pacific form and in the first setiger only in the Norwegian form (Figs. m and n). The Norwegian form has composite hooded hooks (Fig. i) in the second setiger; the Pacific form has only simple hooks (Fig. d).

These differences appear to be sufficient to establish a separate subspecies, *N. conchylega occidentalis*, for the specimens from the eastern Pacific Ocean.

All specimens from the eastern Pacific mentioned by Hartman (1944) belong to the new subspecies with one exception; the specimen from 1253-41 does not belong to *N. conchylega*, but is a mutilated *Hyalinoecia juvenalis* that has lost its tube.

*N. conchylega* from the Caribbean area (Hartman, 1944) may belong to a different species; the specimens were described with branchiae present from setigers 20 to 22. Branchiae are present from setigers 8 to 13 in specimens from the eastern Pacific Ocean and in specimens from Europe (Fauvel, 1923, p. 417, and the Norwegian material above).

*Distribution:* *N. conchylega* is widely distributed in the northern hemisphere. *N. conchylega occidentalis* occurs from southern California south to Colombia. It has been found in two localities on the Pacific side of Baja California, in 41 and 65 fms depth.

**Nothria geophiliformis** (Moore, 1903)

(Plate 6, Figs. a-d)

*Nothria geophiliformis* Moore, 1903, pp. 445-448, pl. 25, figs. 57-59.*Nothria geophiliformis* Hartman, 1944, pp. 83 and 85; Hartman, 1961, p. 22.*Onuphis geophiliformis* Berkeley and Berkeley, 1948, pp. 91-92, fig. 139.*Records*: 279-34(1); 6176-59 (ca 50 juvs).

*Discussion*: The present specimens agree with the description of Moore (1903) for specimens from northern Japan. Berkeley and Berkeley (1948) described some variation in the occurrence of branchiae and subacicular hooks in specimens from western Canada; it is possible that they had more than one species in their material.

The anterior end of the body is shown in Fig. a. The first setiger (Fig. d) has long and slender dorsal and ventral cirri with poorly marked cirrophores. The postsetal lobe is shorter than the cirri and has a broad base. The setal lobe is truncate and the presetal lobe is present as a low transverse fold only. The hooded hooks have a greatly prolonged distal tooth that projects beyond the proximal teeth (Fig. b). The stout subacicular hooks (Fig. c) are present from setiger 12.

*Distribution*: *N. geophiliformis*, originally described from Japan, has been found in the eastern Pacific Ocean between Alaska and southern California (Hartman, 1961, p. 22). The present records extend its distribution to the outer coast of Baja California, in 10 and 61 fms.

**Nothria guadalupensis**, new species

(Plate 6, Figs. e-l)

*Records*: 1912-49(4, TYPE); 1914-49(4); Cedros Island, March 21, 1959, rocky intertidal (1).

*Description*: The holotype is a complete specimen with 102 setigers; it is 21 mm long and 1.2 mm wide with setae and has a cylindrical body. The peristomium is dorsally covered with a dark brown band. Each of the first 15 setigers has two dark brown transverse bars; the anterior bar is between the bases of the parapodia. The posterior bar is near the segmental lines and is reduced to a short middorsal line in the last pigmented segments. The prostomium, the branchial region and the ventrum are pale pink; they lack color patterns.

The prostomium (Fig. j) is small, triangular and has a pair of large, ovate frontal antennae. The occipital tentacles have short, nearly smooth ceratophores and short, digitiform styles. A pair of eyes is present posterior to the frontal antennae. The peristomial cirri are short and slender; the palpi are small and globular.

The first setiger (Fig. l) is larger than, but similar to, the following ones. The setal lobe is truncate; the presetal lobe is narrower than the setal lobe and rounded. The postsetal lobe is large and clavate. The dorsal cirrus has a distinct cirrophore and a long, digitiform style. The large, fusiform ventral cirrus is sessile. Dorsal cirri and postsetal lobes are reduced in the following setigers; the ventral cirri are pad-shaped from setiger 4. The postsetal lobe is present as a low fold from setiger 10.

Straplike branchiae are present from setiger 22 to the end of the body; they are reduced in the last fifteen setigers.

The first three setigers have a superior fascicle of bi- (Fig. e) and tridentate (Fig. f) composite and pseudocomposite hooded hooks and a few limbate setae in an inferior fascicle. Setigers 4 to 11 have simple limbate setae in a superior fascicle and two or three composite spinigers (Fig. i) in an inferior fascicle; the appendage of the spinigers is serrated on the concave side. The spinigers are replaced by two bidentate sub-acicular hooks (Fig. g) from setiger 12. Pectinate setae (Fig. h) are found in all setigers except for the first three; each is straight and has a few coarse teeth. Two acicula (Fig. k) are found in all parapodia; each has a subdistal swelling and a finely drawn out tip. All limbate setae are serrated along one cutting edge.

The mandibles are bidentate and heavily calcified; their bases are as long as the maxillary carriers. Each maxilla I is falcate; left maxilla II has eight teeth; right maxilla II has seven teeth; left maxilla III has six teeth; the combined right maxillae III+IV have eight teeth; left maxilla IV has five teeth and both maxillae V lack teeth.

The tube is fragile with a thin inner lining that is covered with coarse sand and shell fragments; it appears to be temporary.

*N. guadalupensis* resembles *N. gorgonensis* Monro (1933, pp. 80-82, fig. 34a-f); both have bi- and tridentate hooded hooks in the first setigers and the first branchiae are found in the same area of the body (setiger 22 in *N. guadalupensis*, setiger 23 in *N. gorgonensis*). They

differ in most other characters. The occipital tentacles are long in *N. gorgonensis*, and barely reach the fourth setiger in *N. guadalupensis*. The peristomial cirri reach the tip of the frontal antennae in *N. gorgonensis*, and only the middle of the prostomium in *N. guadalupensis*. The ventral cirri are cirriform in six setigers in *N. gorgonensis*, and in only three in *N. guadalupensis*. Composite spinigers are absent in *N. gorgonensis*, and present in setigers 4 to 11 in *N. guadalupensis*. The pectinate setae are distally oblique in *N. gorgonensis*, and straight in *N. guadalupensis*.

*Distribution*: *N. guadalupensis* occurs intertidally at Guadalupe and Cedros islands, off Baja California, and in shallow subtidal waters at Guadalupe Island.

### *Nothria iridescens* (Johnson, 1901)

(Plate 7, Fig. a)

*Nothria iridescens* Johnson, 1901, p. 408, pl. 8, figs. 86-87.

*Nothria iridescens* Hartman, 1944, pp. 87-88, pl. 5, figs. 99-104.

*New Records*: Group I: 1693-49(2); 1694-49(1); 1925-49(1); 2018-51(7); 2019-51(1); Todos Santos Bay, July 2, 1938, coll. Burch (1). Group II: 7231-61(3); 7235-61(3); 7358-61(5).

*Earlier Records*: Hartman (1944, p. 87): 1245-41(2); 1251-41(4).

*Discussion*: The specimens in Group I agree with descriptions by Johnson (1901) and Hartman (1944). The specimens in Group II differ from the others in that they have a more cylindrical body with well marked parapodia, even in posterior setigers. Specimens in Group II are pale pink without any color pattern and the strongly iridescent epithelium appears to be pitted. These differences are not believed to be specific, but may characterize a deep-water form of the species, since all specimens in Group II are from deep water.

The first setiger (Fig. a) has a short, rounded setal lobe and double presetal lobes. The proximal part of the presetal lobe is a low transverse fold near the bases of the dorsal and ventral cirri; the free distal part of the lobe is rounded. The long postsetal lobe is clavate; the dorsal and ventral cirri are long and slender. The first branchia is inserted on the anterior face of the dorsal cirrus, but the cirrus is often twisted at the base so the insertion appears to be on the dorsal margin.

*Distribution*: *N. iridescens* has been reported from Canada to Baja California in the eastern Pacific Ocean. It appears to have two distinct

populations in western Mexico, one in shallow water on the shelf and one in deeper water on the continental slope.

**Nothria mexicana**, new species

(Plate 7, Figs. b-e)

*Record*: P 41-59(5, TYPE).

*Description*: The type is an incomplete specimen with 136 setigers; it is 65 mm long and 2.5 mm wide with setae; it is pink and lacks color pattern. The prebranchial region is cylindrical, the branchial region is subcylindrical with a flattened dorsum.

The small prostomium (Fig. d) is rounded and has ovate frontal antennae; eyes are absent. The occipital tentacles have very long, slender ceratophores which are slightly flaring distally. Each of the outer lateral ceratophores has 25 annulations; each of the inner lateral and median ones has 20 annulations; all annulations are indistinct and the ceratophores appear smooth. The outer lateral styles are short and clavate, whereas the median one is short and slender. Styles were missing from the inner lateral tentacles in all specimens. The peristomium is of the same length as the prostomium and has long and slender peristomial cirri. The palpi are globular and ventral in position.

The first setiger (Fig. b) has a truncate setal lobe and a simple, short oblique presetal lobe. The postsetal lobe is digitate. The dorsal cirrus has a distinct cirrophore and a digitiform cirrostyle; the sessile ventral cirrus is digitate and shorter than the dorsal one, but both cirri are longer than the postsetal lobe. The following setigers are similar to the first one, but the cirri become reduced; ventral cirri are pad-shaped from setiger 6. The postsetal lobe is reduced to a small protuberance by setiger 10 and is present as a low fold in median and posterior setigers.

Branchiae are present from setiger 5 to the end of the fragment. They are straplike and longer than the dorsal cirri where fully developed.

Pseudocomposite tridentate hooded hooks (Fig. e) and a few finely pilose capillary setae are present in the first three setigers. Two bidentate subacicular hooks (Fig. c) are present from setiger 12. Median and posterior setigers have a superior fascicle of pilose capillary setae and a few pectinate setae in addition to the two subacicular hooks. Pectinate

setae are distally straight; each has numerous fine teeth. Limbate setae and composite spinigers are absent.

The mandibles are bidentate. Each maxilla I is falcate; maxilla II has six teeth on each side; left maxilla III has eight teeth; the combined right maxillae III + IV have nine teeth; left maxilla IV has seven teeth; each maxilla V has one tooth.

Tubes were absent.

*N. mexicana* is related to *N. geophiliformis* (Moore, 1903, pp. 445-448, pl. 25, figs. 57-59) in the distribution of branchiae, ventral cirri and subacicular hooks. It can be distinguished from *N. geophiliformis* by the very prolonged and practically smooth ceratophores of the occipital tentacles and by the presence of pilose capillary setae instead of the limbate setae found in *N. geophiliformis*.

*Distribution*: *N. mexicana* is known from one locality off the southern end of Baja California, in 1500 fms.

### ***Nothria pygidialis*, new species**

(Plate 7, Figs. f-m)

*Record*: 1923-49 (1, TYPE)

*Description*: The type is a complete specimen with 87 setigers; it is 15 mm long and 0.7 mm wide with setae and has brown transverse bars on the dorsal side of the first nineteen setigers. The peristomium is covered dorsally by a dark brown band; the prostomium and the rest of the body are pink and lack color patterns. The pygidium (Fig. f) has one long ventral anal cirrus with bifid tip.

The prostomium (Fig. j) is rounded and has large, ovate frontal antennae. The occipital tentacles have smooth ceratophores; tentacular styles are stout. The outer lateral styles barely reach the third setiger; the inner lateral ones reach the fourth setiger and the median tentacle reaches the seventh setiger. A pair of eyes is present lateral to the inner occipital tentacles; the left eye consists of two small, confluent eyespots; a larger single eye is present on the right side. The peristomium is narrower than the first setiger; the peristomial cirri are as long as the peristomium is wide.

The first setiger (Fig. m) has a triangular presetal lobe; the setal lobe is truncate and the large postsetal lobe is clavate with a very broad

base. The long dorsal cirrus is slender and has a distinct cirrophore; the sessile ventral cirrus is shorter and stouter than the dorsal one. The following setigers are similar to the first one; the ventral cirri are pad-shaped from setiger 4. The postsetal lobe is present only as a low fold behind setiger 10.

Branchiae are absent.

The first five setigers have pseudocomposite tridentate hooded hooks (Figs. g and h) and a few simple setae. Setigers 6 to 16 have only simple limbate setae with serrated cutting edges. Two bidentate sub-acicular hooks (Fig. k) are present in each parapodium from setiger 17. Three acicula (Fig. i) are present in each parapodium; they are nearly straight with oblique fine tips; each free end is densely and finely pilose. Pectinate setae (Fig. l) are present in median and posterior setigers; each is distally straight and has a few coarse teeth. Composite spinigers are absent.

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

Tube was absent.

*N. pygidialis* belongs to the small group of species that lack branchiae. This group includes: *N. atlantisa* Hartman (1965b, pp. 102-104, pl. 17a-c), *N. abbranchiata* McIntosh (1885, pp. 314-317, pl. 40, figs. 10-12, pl. 21a, fig. 27 and pl. 22a, figs. 1-3), *N. fragosa* (Ehlers, 1887, pp. 75-76, pl. 20, figs. 7-14 and pl. 21, figs. 1-4), *N. notialis* (Monro, 1930, pp. 129-131, fig. 48) and *N. solenotecton* (Chamberlin, 1919, pp. 306-310, pl. 39, figs. 3-8 and pl. 40, figs. 1-2). These species can be grouped by the dentition of the hooded hooks in the anterior setigers—Unidentate: *N. atlantisa*; bidentate: *N. abbranchiata*, *N. fragosa* and *N. solenotecton*; tridentate: *N. notialis* and *N. pygidialis*.

*N. notialis* (Monro), redescribed by Hartman (1967, pp. 91-92, pl. 29), can be separated from *N. pygidialis* by the different shape of the tridentate hooks; in *N. notialis* the second tooth is longer than both the distal and the proximal teeth; the teeth decrease evenly in size from the distal one in *N. pygidialis*. The acicula are smooth in *N. notialis* and densely pilose in *N. pygidialis*.

*Distribution*: *N. pygidialis* is known only from Guadalupe Island, off Baja California, in rocky intertidal areas.

**Nothria similis**, new species

(Plate 4, Figs. g-j)

*Record*: 1251-41 (3, TYPE).

*Description*: The type is an incomplete specimen with 77 setigers; it is 30 mm long and 1.5 mm wide with setae; it is pink and lacks color pattern.

The prostomium (Fig. g) is rounded triangular and has large, ovate frontal antennae. The occipital tentacles have strongly developed ceratophores; in all ceratophores the distalmost annulation is twice as long as any of the others. Each of the outer lateral ceratophores has ten annulations; their styles are slender and reach the second setiger. Each of the inner lateral ceratophores has eight or nine annulations and the styles reach setiger 7. The median ceratophore has seven annulations and the style reaches setiger 6. Eyes are absent. The slender peristomial cirri have a dorsolateral position. The palpi are ovate and ventrolateral in position.

The first setiger (Fig. j) has short, rounded setal and presetal lobes; the long postsetal lobe is clavate. The dorsal cirrus has a distinct cirrophore and a clavate cirrostyle that is longer than the postsetal lobe. The ventral cirrus is nearly sessile; the cirrostyle is similar to the dorsal one. The postsetal lobes and the dorsal cirri are reduced in the first setigers of the branchial region; the postsetal lobe is present as a low fold from setiger 10. Ventral cirri are pad-shaped from setiger 7.

The short and straplike branchiae are present from setiger 6 to the end of the fragment.

Pseudocomposite tridentate hooded hooks (Fig. h) are present in the anterior setigers. The distal tooth is the longest but does not project beyond the other teeth. A few limbate setae with smooth cutting edges are also present in the first setiger; those in median and posterior setigers are serrated along one cutting edge. Two stout, bidentate subacicular hooks (Fig. i) are present from setiger 8; and two acicula with fine tips are present in all setigers. Pectinate setae, present in median and posterior setigers, are distally straight; each has a few slender teeth.

The mandibles are poorly preserved, but seem to be like those commonly found in the genus. The short maxillary carriers are triangular. Each maxilla I is falcate; left maxilla II has five teeth; right maxilla II has seven teeth; left maxilla III has seven teeth; the combined



right maxillae III+IV have eight teeth; left maxilla IV has five teeth; each maxilla V has one tooth.

Tubes were absent.

*N. similis* is closely related to *N. geophiliformis* (Moore, 1903, pp. 445-448, pl. 25, figs. 57-59), hence the specific name. *N. similis* differs from *N. geophiliformis* in lacking color pattern and in the distribution of branchiae, ventral cirri and subacicular hooks. Branchiae are present from setiger 6 in *N. similis* and from setiger 5 in *N. geophiliformis*. Ventral cirri are cirriform on six setigers in *N. similis* and on five in *N. geophiliformis*. Subacicular hooks are present from setiger 8 in *N. similis* and from setiger 12 in *N. geophiliformis*. The anterior hooded hooks have the distal tooth projecting beyond the proximal teeth in *N. geophiliformis*; this is not the case in *N. similis*.

*Distribution*: *N. similis* has been found at one locality just west of Cedros Island, Baja California, in 81 to 66 fms, from 28° 13' 00" N, 115° 33' 30" W to 28° 13' 18" N, 115° 33' 15" W, fine green and grey sand, VELERO III sta. 1251-41.

#### *Nothria stigmatis* (Treadwell, 1922)

*Onuphis stigmatis* Treadwell, 1922, pp. 176-178, figs. 22-34.

*Nothria stigmatis* Hartman, 1944, pp. 89-90, pl. 11, figs. 240-247.

*New Record*: El Descanso, Baja California, from coralline algae, April 8, 1950, coll. D. J. Reish (2).

*Earlier Record*: Hartman (1944, p. 89): 285-34(2).

*Discussion*: The species is accepted as restricted by Hartman (1944).

*Distribution*: *N. stigmatis* has been found from Washington to Baja California. The two records from western Mexico are in 30 fms and intertidal, respectively.

#### *Nothria* sp.

*Records*: 2624-54(1); 6177-59(1); K 127(1).

*Discussion*: These three specimens are indeterminable juveniles.

#### Genus *Onuphis* Audouin and Milne Edwards, 1833

Species recognition in *Onuphis* is based on the presence or absence of simple tridentate hooks in anterior setigers, on the dentition of the

anterior hooded hooks, and on the number and distribution of the pectinate branchiae (see Hartman, 1944, pp. 66-69, for a review).

Simple, tridentate, hooded hooks called simple acicular hooks in Hartman (1944) are the simple or pseudocomposite hooks that occur centrally in the parapodia in association with the embedded acicula. They occur with the anterior hooded hooks in the first setigers, but continue farther back than the anterior hooded hooks. The simple tridentate hooks are with few exceptions stouter than the anterior hooded hooks and the teeth are much thicker and more erect than in the hooded hooks (Pl. 11, Figs. b, c and i). Setigers 8 to 10 may be investigated for the presence of the simple tridentate hooks; in the species from western Mexico the anterior hooded hooks are absent from these setigers, but the simple tridentate hooks continue at least through setiger 10.

The first setigers are similar to those in *Nothria*. The presetal lobe may have a transverse fold (*O. parva*, Pl. 9, Fig. d) or may lack such a fold (*O. pigmentata*, Pl. 9, Fig. m). The distal part of the presetal lobe is usually simple and rounded, but *O. vermillionensis* has double distal lobes (Pl. 11, Fig. a). The setal lobe is usually truncate, but *O. vermillionensis* (Pl. 11, Fig. a) has a bifid setal lobe. The postsetal lobe is clavate or triangular in shape.

The dorsal and ventral cirri have cirrophores resembling those in *Nothria* in that they lack septa separating cirrophores from cirrostyles; those of the dorsal cirri in the first three setigers of *O. profundus* (Pl. 10, Fig. a) are the only exception known, in that they have a distinct septum.

#### Key to Species of *Onuphis* from Western Mexico

- |  |                   |
|--|-------------------|
| 1. Branchiae present from setiger 1.....   | <i>eremita</i>    |
| 1. Branchiae first present from a later setiger.....   | 2                 |
| 2. Simple tridentate hooks (Pl. 11, Fig. i and Pl. 8, Fig. i) present in some anterior setigers..... | 5                 |
| 2. Simple tridentate hooks absent.....   | 3                 |
| 3. Anterior hooded hooks bidentate.....  | <i>parva</i>      |
| 3. Anterior hooded hooks tridentate.....   | 4                 |
| 4. Cirriform ventral cirri on the first four setigers.....   | <i>cedroensis</i> |
| 4. Cirriform ventral cirri on the first eight setigers.....  | <i>profundus</i>  |

5. Cirriform ventral cirri on the first two setigers..... 6  
 5. Cirriform ventral cirri cirriform on more than the first two setigers ..... 7  
 6. All anterior hooded hooks tridentate.....*microcephala*  
 6. Both bi- and tridentate hooded hooks present.....*pigmentata*  
 7. Composite spinigers present..... 8  
 7. Composite spinigers absent..... 9  
 8. Branchiae first present from setigers 6 to 8.....*nebulosa*  
 8. Branchiae first present from setiger 13.....*microbranchiata*  
 9. Subacicular hooks present from setiger 12.....*vermillionensis*  
 9. Subacicular hooks present from setiger 19.....*vexillaria*

### *Onuphis cedroensis*, new species

(Plate 8, Figs. a-g)

*Record*: 1256-41 (1, TYPE)

*Description*: The type is an incomplete specimen with 33 setigers; it is 9 mm long and 1.2 mm wide with setae; it has brown transverse bars on all segments including the peristomium, in which the pigment covers the whole dorsum. The ventrum is pink and lacks color pattern.

The prostomium (Fig. a) is small and ovate; it has two black eyes dorsal to the base of the outer lateral occipital tentacles. The large frontal antennae are elongated ovate. The stout occipital tentacles are short; the median one is the longest and reaches the fifth setiger. The ceratophores are short and each has three or four annulations; the outer annulations make up as much as four-fifths of the total length of the ceratophores. The peristomial cirri are as long as the peristomium is wide and dorsolateral in position.

The first setiger (Fig. e) is short and directed laterally. The presetal lobe consists of a low transverse fold and a small rounded distal lobe superior to the axis of the parapodium. The truncate setal lobe is shorter than the presetal lobe; the short postsetal lobe is clavate. The dorsal cirrus has a distinct cirrophore and a long, digitate style. The sessile ventral cirrus resembles the postsetal lobe, but is less clavate. Ventral cirri are pad-shaped from setiger 5; the dorsal cirri are more elongate in later setigers (Fig. g) and the postsetal lobes become triangular. The postsetal lobe is present as a low fold posterior to setiger 15.

Branchiae are present from setiger 6 to the end of the fragment. The number of filaments in the pectinate branchiae increases slowly to setiger 20, where each branchia has five or six filaments.

The first three setigers have pseudocomposite tridentate hooded hooks (Figs. b and c); the hoods are short and pointed; the teeth of the hooks are directed distally. The first setigers have in addition a few limbate setae in a superior fascicle. Simple tridentate hooks and composite spinigers are absent; setigers 4 to 13 have only limbate setae. Two bidentate subacicular hooks (Fig. f) are present in each parapodium from setiger 14. Each parapodium, including the first one, has two straight, slender acicula with fine straight tips. Pectinate setae (Fig. d) are present in median and posterior setigers; each is distally oblique and has nine or ten coarse teeth.

The pharyngeal apparatus is delicate and soft; the mandibles are slender with a narrow calcified cutting edge; they are of the usual triangular shape and have long, slender bases. The bluntly triangular maxillary carriers are of the same length as the mandibular bases. Each maxilla I is falcate; maxilla II has eight teeth on each side; left maxilla III has eleven teeth; the combined right maxillae III + IV have six teeth; left maxilla IV has five teeth; each maxilla V has one tooth.

The tube is limp and has a thin inner lining that is covered sparsely with organic debris.

*O. cedroensis* belongs to the large group of species that have the first branchia on setiger 6. Table I gives a survey of certain characters of all species known to belong to this group; the table is based on a survey of all species named in *Nothria* and *Onuphis* (Hartman, 1959, 1965a). Some information has been inferred from illustrations rather than from specific statements in the text, where the original descriptions were too brief to contain all information necessary. It appears that in order to complete the table certain type specimens should be re-examined or new material from the type localities should be collected. Appendix I at the end of this paper gives a survey of the sources used in compiling the table.

*O. striata* Ushakov (1950, p. 193, fig. 25) is the only species known, besides *O. cedroensis*, that has branchiae from setiger 6 and cirriform ventral cirri on four setigers. *O. cedroensis* differs from *O. striata* in that it has tridentate instead of bidentate hooded hooks.

Table I. Survey of *Onuphis* spp. with the first branchiae on setiger 6

	number of anterior setigers with cirriform ventral cirri	first sub-acicular hook present from setiger number	Presence of: spinigers	simple hooks	Dentition of hooded hooks	Remarks
<i>acapulcensis</i>	6 or more	15-18	not known	absent	tri	new species
<i>cedroensis</i>	4	14	absent	absent	tri	
<i>dorsalis</i>	6	6	present	absent	uni-bi	
<i>investigatoris</i>	6-7	not known	not known	absent	bi-tri	branchiae from setigers 5-6
<i>magna</i>	5	17	absent	absent	tri	
<i>microcephala</i>	2	26	absent	present	tri	
<i>nebulosa</i>	8 (10)	20	present	present	tri	branchiae from setigers 6-8
<i>pigmentata</i>	2	25	absent	present	bi-tri	new species
<i>proalopus</i>	7	not known	absent	present	tri	
<i>quadricuspsis</i>	5	10-17	absent	not known	tri	branchiae from setigers 6-9
<i>striata</i>	4	not known	not known	not known	bi	
<i>tenuis</i>	2 or more	not known	not known	not known	tri	
<i>teres</i>	9	not known	not known	not known	not known	
<i>vexillaria</i>	8	19	absent	present	tri	
<i>zebra</i>	9	21	absent	absent	tri	

*Distribution:* *O. cedroensis* is known from one locality south of Cedros Island, Baja California, in 55-52 fms; from 27° 55' 20" N, 115° 21' 32" W to 27° 54' 58" N, 115° 21' 05" W, fine green-gray mud, small shells, VELERO III sta. 1256-41.

### ***Onuphis eremita* Audouin and Milne Edwards, 1833**

*Onuphis eremita* Fauvel, 1923, pp. 414-415, fig. 163; Hartman, 1944, p. 75; Rioja, 1947b, p. 519.

*New Records:* 1248-41(1); 1705-49(3); 6176-59(6).

*Earlier Records:* Hartman (1944, p. 75): 927-39(2); 1031-40(1); 1249-41(1); 1250-41(1). Rioja (1947b, p. 519): Bahía de Ouhuirá, Topolobampo.

*Discussion:* The hooded hooks in the first setigers were described as bi- tri- and even quadridentate by Fauvel (1923, p. 415). These hooks are all clearly tridentate in the present specimens; there is no indication that any other kind of hook occurs in specimens from the eastern Pacific Ocean.

*Distribution:* *O. eremita* may be widespread in warm waters; it is at present impossible to distinguish this species from several others with which it has been confused. *O. eremita* is found on the Pacific side of Baja California, in shallow water.

### ***Onuphis microbranchiata*, new species**

(Plate 8, Figs. h-q)

*Record:* 1914-49(2, TYPE).

*Description:* The type is an incomplete specimen with 80 setigers; it is 20 mm long and 1.1 mm wide with setae; it is pink and lacks color pattern.

The prostomium (Fig. k) is ovate and has small, ovate frontal antennae. Each of the ceratophores of the occipital tentacles has three short annulations close to the base. The short outer lateral styles are clavate; the inner lateral and the median styles are slender and reach the fourth or fifth setiger. A pair of eyes is present median to the outer lateral tentacles.

The first setiger (Fig. o) has a double presetal lobe; the proximal part is a low transverse fold; the distal part is a rounded free lobe

superior to the parapodial axis. The setal lobe is truncate and the short postsetal lobe is clavate. The dorsal cirrus has a distinct cirrophore and a short, clavate style. The sessile ventral cirrus has a cirrostyle that resembles the dorsal one. The following setigers are similar to the first one (Fig. q), except that the distal portion of the presetal lobes diminishes in size and shifts to a more central position. The ventral cirri are pad-shaped from setiger 8.

Branchiae are present from setiger 13 to the end of the fragment. The first seven or eight pairs are simple and straplike; each branchia has one or two very short lateral filaments from setigers 22 to 23 (Fig. p); each filament appears as a small button on the side of the heavy branchial stem.

The first seven setigers have pseudocomposite tridentate hooded hooks (Figs. h and j). Strong, simple tridentate hooks (Fig. i) and composite spinigers with short appendages are present in setigers 4 to 11. Two stout, bidentate subacicular hooks (Fig. l) are present in each parapodium from setiger 21. Short pectinate setae (Fig. n) with coarse teeth occur in median and posterior setigers.

The mandibles are triangular and each has a long, slender base. The maxillary carriers are bluntly triangular. Each maxilla I is falcate; left maxilla II has seven teeth; right maxilla II has ten teeth; left maxilla III has eight teeth; the combined right maxillae III+IV have six teeth; left maxilla IV has five teeth; each maxilla V has one tooth.

Tubes were absent.

*O. microbranchiata* can be separated from *O. nebulosa* Moore (1911, pp. 269-273, pl. 17, figs. 58-68) by the very short branchial filaments. Branchiae are present from setiger 13 in *O. microbranchiata*, and from setigers 6 to 8 in *O. nebulosa*. Cirriform ventral cirri are found on the first eight setigers in *O. microbranchiata*, and on the first seven in *O. nebulosa*. Subacicular hooks are present from setiger 21 in *O. microbranchiata*, and from setiger 20 in *O. nebulosa*. The pectinate setae are short and distally straight in *O. microbranchiata*; they are elongate and distally oblique in *O. nebulosa*.

*Distribution:* *O. microbranchiata* has been found at one locality, Melpomene Cove, Guadalupe Island, in shallow water.

***Onuphis microcephala*, Hartman, 1944**

*Onuphis microcephala* Hartman, 1944, pp. 78-80, pl. 3, figs. 67-75, pl. 18, fig. 339; ? Reish, 1963, p. 425.

*New Record*: P 51-59(2).

*Earlier Records*: Hartman (1944, p. 78): Punta Cholla, Sonora, Mexico, intertidal (1). ? Reish (1963, p. 425): San Quintin Bay, Baja California, several localities.

*Discussion*: The records from San Quintin Bay may be of this species or the very closely related *O. pigmentata* (see below).

*Distribution*: *O. microcephala* is known from two localities in the Gulf of California, from some localities in southern California, and from North Carolina. All localities are in shallow water.

***Onuphis nebulosa* Moore, 1911**

*Onuphis nebulosa* Moore, 1911, pp. 269-273, pl. 17, figs. 58-68; Hartman, 1944, pp. 75-78, pl. 4, figs. 76-85.

*New Records*: 767-38(3); 1031-40(1); 1694-49(2); 1703-49(2); 1923-49(1); 1924-49(11); 1928-49(12); 1948-50(10); 1954-50(6); 6177-59(6); 6179-59(199); K 127(1); P 71-59(2).

*Earlier Records*: Hartman (1944, p. 75): 1078-40(1); 1245-41 (about 30); 1256-41(2, and tubes).

*Discussion*: The first occurrence of branchiae varies in this species; they are always present on setiger 8, but not anterior to setiger 6 in the specimens from western Mexico. This is much less than the variation from setigers 4 to 12 found by Hartman (1944, pp. 76-77). The first branchia is usually a small, easily overlooked, single filament on setiger 6; the next few pairs are also single, but they increase rapidly in size; it can thus appear that branchiae start on a later setiger than is actually the case.

The ventral cirri are pad-shaped from setiger 8; very rarely one or two more setigers may have cirriform ventral cirri.

The large sample from 6179-59 includes 190 specimens with branchiae from setiger 6 and ventral cirri pad-shaped from setiger 8; the other nine specimens have branchiae from setiger 8; five of these have ventral cirri pad-shaped from setiger 8, the remaining four have ventral cirri pad-shaped from setiger 10.



*Distribution:* *O. nebulosa* occurs from central California to Panama. It is common in western Mexico in shallow sublittoral waters.

### *Onuphis parva* Moore, 1911

(Plate 9, Figs. a-e)

*Onuphis parva* Moore, 1911, pp. 263-266, pl. 17, figs. 51-57, pl. 18, figs. 98-99; Hartman, 1944, pp. 70-71.

*New Records:* 1251-41(1); 1253-41(1); 1746-49(1); 2017-51(15); 2030-51(4); 6176-59(120); 6177-59(9); P 65-59(1); P 201-60(65).

*Earlier Record:* Hartman (1944, p. 70): 1256-41(3).

*Discussion:* Branchiae are present from the second setigers with at least two lateral filaments in addition to the stout branchial stem, and composite hooded hooks are present on only three setigers in the specimens from western Mexico. Specimens from central and southern California have the first branchiae as single filaments on setigers 2 to 4 (Moore, 1911, p. 264 and Hartman, 1944, p. 70) and in specimens from southern California the fourth setiger may have composite hooded hooks (Hartman, 1944, p. 70). These differences may represent geographical variation.

The prostomial region (Fig. a), the first and seventh parapodium (Figs. d and e), the hooded hooks from the first setigers (Fig. c) and the subacicular hooks (Fig. b) are illustrated here.

Ushakov (1950, p. 193, fig. 25) described *O. parva striata* from waters off Kamchatka. It differs from *O. parva* in the distribution of branchiae and in the total number of branchial filaments. The shape of the teeth in the hooded hooks is also different in the two forms. *O. parva* has large, rounded terminal teeth and small, acuminate proximal teeth and *O. parva striata* was shown by Ushakov (1950, fig. 25) to have both teeth of the same size and with the same rounded shape. These differences are sufficient to characterize separate species and it is here proposed that *O. striata* be given rank as a species.

*Distribution:* *O. parva* is known from central and southern California south to Cape San Lucas, Baja California, and from the Gulf of California. It is common on the shelf in depths greater than 25 fms.

***Onuphis pigmentata*, new species**

(Plate 9, Figs. f-n)

*Record*: San Quintin Bay, April 7, 1950, mud-flats, coll. D. J. Reish (2, TYPE).

*Description*: The type is a complete specimen broken into several pieces; the total number of setigers and the length could not be measured. The anterior fragment consists of 101 setigers and is 31 mm long and 3.5 mm wide with setae. It has prominent dark brown transverse bars on the posterior half of the first five setigers; the peristomium has dorsally a dark brown band. The prostomium has one large dark area anterior to the crescent of occipital tentacles and two small ventral spots at the bases of the frontal antennae. The ceratophores of the occipital tentacles have scattered brown spots and each of the tentacular styles has a dark brown, well defined band at the base.

The prostomium (Fig. 1) is rounded and has small, triangular frontal antennae; no eyes were visible, but they could have been obscured by the dark pigmentation. Each of the ceratophores of the occipital tentacles has three or four annulations, of which the outermost is only a little longer than the others. The tentacular styles are short and slender; the inner lateral ones are the longest and reach setiger 4; the median one reaches setiger 2; the outer lateral styles barely reach the anterior edge of the peristomium. The peritomial cirri are twice as long as the peristomium is wide and as stout as the occipital styles.

The first setiger (Fig. m) has a short, rounded presetal lobe and a broadly truncate setal lobe. The short postsetal lobe is clavate. Dorsal and ventral cirri are both sessile; the long dorsal cirrus is clavate; the ventral cirrus resembles the postsetal lobe in shape and length. Ventral cirri are pad-shaped from setiger 3. The postsetal lobe increases in length in the first seven setigers and becomes more slender; it decreases rapidly in length from setiger 9 and is present as a low fold posterior to setiger 20. The presetal lobe increases in size in the first setigers so that by setiger 7 (Fig. n) it extends beyond the setal lobe; farther back it becomes reduced to a low fold closely following the outline of the setal lobe. Dorsal cirri are present to the last setigers; they decrease gradually in size posteriorly.

Branchiae are present from setiger 7 and lacking in the last 100 setigers. The first branchiae are bifid; the number of filaments in-

creases slowly to a maximum of six or seven at setiger 30. The last 15 to 20 pairs of branchiae are reduced to simple filaments.

The first setigers have several kinds of hooded hooks. Two bidentate hooks (Fig. f) are found superior to the acicula. Two weakly pseudocomposite tridentate hooks (Fig. g) are found between and slightly ventral to the acicula; they are precursors to the simple tridentate hooks found farther back. One bidentate and one tridentate hook (Fig. h) are found clearly ventral to the acicula. The anterior hooded hooks are found only in the first three setigers; one or two simple tridentate hooks (Fig. j) continue through setiger 24. Two stout, bidentate subacicular hooks (Fig. i) are present in each parapodium from setiger 25. Several slender, pilose capillary setae occur in all parapodia; they are straight in the first few setigers and slightly geniculate farther back. Three straight acicula with fine, long tips occur in each parapodium. Pectinate setae (Fig. k) are distally oblique; each has 12 to 14 slender teeth. Limbate setae and composite spinigers are absent.

The pharyngeal apparatus is well chitinized; the mandibles are of the usual shape and have calcified cutting edges. Each maxilla I is falcate; left maxilla II has ten teeth; right maxilla II has six teeth; left maxilla III has eleven teeth; the combined right maxillae III+IV have ten teeth; left maxilla IV has six teeth; both maxillae V lack teeth.

The tube is limp, has a soft inner lining, and is covered with a thin layer of mud particles.

*O. pigmentata* is closely related to *O. microcephala* Hartman (1944, pp. 78-80, pl. 3, figs. 67-75). It differs from *O. microcephala* in the following respects (cfr. also Table I): *O. pigmentata* has pilose capillary setae; all simple setae in *O. microcephala* are smooth and limbate. The simple tridentate hooks occur in *O. pigmentata* back to setiger 24 and there is no gap between the occurrence of the simple tridentate hooks and the subacicular hooks. Simple tridentate hooks occur back to setiger 10 in *O. microcephala* and there is a gap of fifteen setigers between the last simple hook and the first subacicular hook. The hooded hooks are both bi- and tridentate in *O. pigmentata*, and exclusively tridentate in *O. microcephala*.

*Distribution:* *O. pigmentata* is known from a littoral mudflat in San Quintin Bay, Baja California.

***Onuphis profundī*, new species**

(Plate 10)

*Record*: P 41-59(7, TYPE).

*Description*: All specimens are incomplete; the type has 79 setigers and is 64 mm long and 3.8 mm wide with setae; it is pink and lacks color pattern.

The short prostomium (Fig. g) is ovate and has large, ovate frontal antennae directed ventrally. The ceratophores of the occipital tentacles are short; each of the outer lateral ceratophores has seven annulations; each of the inner lateral and median ones has five. The outermost annulations are one-half to two-thirds of the total length of each of the ceratophores. The slender outer lateral styles reach the fifth setiger; the inner lateral and the median styles are similar and reach the tenth setiger. Eyes are absent. The slender peristomial cirri are twice as long as the length of the peristomium.

The first setiger (Fig. a) has truncate presetal and setal lobes of similar length. The postsetal lobe is nearly triangular. The dorsal cirrus has a distinct cirrophore and a clavate style similar in length to the postsetal lobe. The sessile ventral cirrus is similar in shape and length to the dorsal cirrostyle and the postsetal lobe. Both the dorsal cirrus and the postsetal lobe increase in length and become more slender in the first eight or nine setigers (Fig. e). The ventral cirri are pad-shaped from setiger 8. The dorsal cirrus is reduced farther back, but is present to the end of the fragment. The postsetal lobe is reduced to a low fold by setiger 15.

Branchiae are present from setiger 7 to the end of the fragment. The first two pairs are simple filaments; the maximal number of filaments does not exceed four in at least the first 79 setigers.

Each of the first three setigers has four tridentate hooded hooks; the three superior hooks have very small proximal teeth (Fig. d), but in the inferiormost hook the median and the proximal teeth are of the same size and shape (Fig. b). Setigers 4 to 19 have only slender capillary smooth setae in two fascicles; those in the superior fascicles are straight, the inferior ones are geniculate. Two stout, bidentate subacicular hooks (Fig. f) are found in each parapodium from setiger 20. Pectinate setae (Fig. c) are found only posterior to setiger 50; each is very long and slender with a slightly flaring, oblique distal end and a few coarse teeth. Composite spinigers and limbate setae are absent.

The pharyngeal apparatus is very poorly chitinized and calcified cutting edges on the mandibles are lacking. Each maxilla I is falcate; left maxilla II has eight teeth; right maxilla II has nine teeth; left maxilla III has seven teeth; the combined right maxillae III+IV have seven teeth; left maxilla IV has eight very small teeth; each maxilla V has one tooth.

The tube has a thick inner lining covered with a thick, stiff layer of mud particles.

*O. profundi* is related to *O. pauli* Annenkova (1952, pp. 150-151, fig. 4) from the Bering Sea, to *O. pourtalesii* (Ehlers, 1887, pp. 74-75, pl. 19, figs. 6-10, pl. 20, figs. 1-6) from the West Indies and to *O. vermillionensis*, new species (see below). *O. profundi* differs from *O. pauli* in that it has tridentate hooded hooks with short, blunt hoods, whereas *O. pauli* has bidentate hooded hooks with very long, pointed hoods (Annenkova, 1952, fig. 4-4). *O. profundi* differs from *O. pourtalesii* and from *O. vermillionensis* in that it has cirriform ventral cirri on seven setigers; such cirri are found on only three setigers in *O. pourtalesii* and on nine setigers in *O. vermillionensis*. Subacicular hooks are present from setiger 20 in *O. profundi* and from setiger 12 in *O. vermillionensis*.

*Distribution:* *O. profundi* has been taken at one locality off the southern end of Baja California, in 1500 fms.

### ***Onuphis vermillionensis*, new species**

(Plate 11)

*Record:* P 83-59(2, TYPE).

*Description:* The type is a complete specimen with 383 setigers; it is 128 mm long and 2.3 mm wide with setae; each of the first fifteen setigers has two short dorsolateral brown transverse bars and irregular dark spots on the dorsal side of the parapodial bases. The prostomium, peristomium and ventrum are pink and lack color patterns.

The prostomium (Fig. e) is ovate and has a pair of inconspicuous eyes between the bases of the inner and outer lateral occipital tentacles. The triangular frontal antennae are very large. The occipital tentacles have short, digitiform styles; all are similar and reach the third setiger. Each of the outer and inner lateral ceratophores has five annulations, of which the outer is as long as all others combined. The median ceratophore has four annulations, of which the outer one is nearly two-

thirds of the total length of the ceratophore. The peristomial cirri are twice as long as the length of the peristomium.

The first setiger (Fig. a) has a double presetal lobe that consists of a proximal transverse fold and two free rounded distal lobes. The superior distal lobe is slightly bilobed at the tip and more than twice as long as the inferior one. The setal lobe is bifid; the superior part is rounded and separated by an incision from the small, digitiform inferior part. The triangular postsetal lobe is twice as long as the setal lobe. The sessile dorsal cirrus is slender and digitiform. The ventral cirrus is fusiform with a thick base and only half as long as the dorsal one. Both cirri and the postsetal lobes increase in length posteriorly; they are long and slender by setiger 7 (Fig. f). They are reduced after that setiger; the dorsal cirrus is smaller than the branchial stem from setigers 12 to 13 but continues to the end of the body. Ventral cirri are pad-shaped from setiger 10. The postsetal lobe is reduced to a low fold from setiger 16.

Branchiae are present from setiger 7 as simple filaments; they have two filaments from setiger 22 and three or four filaments where best developed. Branchiae are absent in the last 125 setigers.

Each of the first eight setigers has slender, pseudocomposite tridentate hooded hooks (Figs. b and c) with short pointed hoods. Simple tridentate hooks (Fig. i) are present to setiger 10; hooks are absent in setiger 11. Two bidentate subacicular hooks (Fig. g) are present in each parapodium from setiger 12. Pectinate setae (Fig. h) are present in median and posterior setigers; each is strongly oblique and has 12 to 13 coarse teeth. Simple limbate setae with serrated cutting edges are present in all parapodia. Two acicula are present in each parapodium; in the first ten parapodia they are straight; but farther back they are clearly geniculate (Fig. d) with a thickening at the bend; they are serrated on the convex side near the bend.

Each maxilla I is falcate; left maxilla II has fourteen teeth; right maxilla II has twelve teeth; left maxilla III has eight teeth; the combined right maxillae III+IV have ten teeth; left maxilla IV has five teeth; each maxilla V has one tooth.

The tube is about 150 mm long; it has a thick inner lining covered with coarse sand and large shell fragments in a trim layer. Several specimens of *Polycirrus* sp. were attached near the mouth of the tube, indicating that the outer end of the tube projects out of the sediment.

The only other species known to reach the size of *O. vermillionensis* in the eastern Pacific Ocean is *O. microcephala*. The first has cirriform ventral cirri on nine setigers; such cirri are present on only two setigers in the second. The distribution of the different types of hooks is believed to be unique.

*Distribution*: *O. vermillionensis* is known from one locality west of Tiburon Island, Gulf of California, in 70 fms.

### **Onuphis vexillaria Moore, 1911**

*Onuphis vexillaria* Moore, 1911, pp. 266-269, pl. 17, figs. 69-76;  
?Treadwell, 1923, p. 8; Hartman, 1944, pp. 80-83, pl. 5 figs. 90-98.

*New Records*: 259-34(1); 1069-40(1); 2026-51(6); 2598-54(1); 7235-61(1); K 126 and K 127(35); P 68-59(1); One mile off Cedros Island, 28°6' N, 115° 11' W, May 13, 1946, brown sandy mud, coll. K. Kenyon and M. Woodridge Williams (2).

*Earlier Records*: ?Treadwell (1923, p. 8, station data in U.S. Bur. Fish. 1921): ALBATROSS sta. D 5690 (+). Hartman (1944, p. 80): 767-38(4); 1074-40(1); 1256-41(1).

*Discussion*: The record by Treadwell (1923) remains doubtful. The only other record from deep water is the present record from 7235-61 and it was with great hesitance that this specimen was assigned to *O. vexillaria*. It has the same aberrant characters mentioned by Treadwell, i.e. few branchial filaments and the frontal antennae close together. These minute differences are not considered sufficient to warrant specific status, but it is possible that when more material becomes available, this specimen and those reported by Treadwell should be separated from *O. vexillaria*.

*Distribution*: *O. vexillaria* is known in southern California and western Mexico from shelf and basin depths; it also enters the Gulf of California.

### **Onuphis sp.**

*Record*: 7229-60(2).

*Discussion*: These two specimens are indeterminable juveniles.

### **Genus Paronuphis Ehlers, 1887**

The genus is accepted as emended in Hartman (1965b, pp. 110-111).

**Paronuphis abyssorum** (Chamberlin, 1919)

(Plate 12, Fig. a)

*Leptoecia abyssorum* Chamberlin, 1919, pp. 320-323, pl. 36, figs. 1-6, pl. 37, figs. 1-8; Monro, 1939, p. 121, fig. 12.

*Paronuphis abyssorum* Hartman, 1964, pp. 115-116, pl. 34, figs. 10-12.

*Record*: 7229-60(4).

*Discussion*: The illustration of the hooded hook (Chamberlin, 1919, pl. 37, fig. 8) indicates that these hooks were worn in the single specimen available to Chamberlin. The unworn hooks in the present specimens (Fig. a) are bidentate and weakly pseudocomposite.

Specimens from Antarctic areas have a cirriform extension on the postsetal lobe in the first setiger (Monro, 1939, p. 121). Such extensions were not mentioned by Chamberlin and have not been found in the present specimens.

The tube resembles small *Hyalinoecia* tubes, but is thinner and more conical.

*Distribution*: *P. abyssorum* has been found between Peru and the Galapagos Islands, in the Antarctic and off western Mexico in deep water.

**Genus Rhamphobrachium** Ehlers, 1887, emended

The genus is here emended to include all onuphids with long, slender recurved setae in two or more modified anterior setigers. Each of the recurved setae has a double row of fine thorns or spines. Both species from the eastern Pacific Ocean have the recurved setae prolonged through the anterior end of the body.

**Rhamphobrachium cristobalensis**, new species

(Plate 12, Figs. b-i)

*Record*: 6179-59(2, TYPE).

*Description*: The type is a complete specimen with 63 setigers; it is 7 mm long and 1.2 mm wide with setae; it is white and lacks color pattern. The body is evenly tapering to the pygidium, which is equipped with two short dorsal and two long ventral anal cirri. The longer anal cirri are as long as the last seven setigers.

The large prostomium (Fig. b) is quadrangular and has large, ovate frontal antennae situated slightly dorsal to the frontal margin



and directed forwards. The occipital tentacles are short; nearly half their length is in the ceratophores, which are irregularly divided in two or three annulations. A pair of small, black eyes are present posterolateral to the frontal antennae. The peristomium is very narrow dorsally, but more expanded laterally and ventrally; it has two large, digitiform peristomial cirri inserted near the postectal margins. The large palpi are globular.

The first two setigers are very narrow dorsally and broad ventrally, resulting in an upturned anterior end. The first two pairs of parapodia are greatly prolonged; the first pair is longer and stouter than the second. The third setiger has much smaller parapodia, which are directed laterally; all following setigers are similar except for reductions in lobes and cirri.

The first setiger (Fig. g) has a rounded setal lobe with a digitiform cirrus at the inferodistal corner. The setae emerge from small mounds; one of these mounds is distal, the other two are on the anterior face of the parapodium. Each mound has a small rounded papilla posterior to the emerging seta. The large dorsal cirrus is digitiform, the ventral one is similar but smaller. The second setiger has similar parapodia, but the distal digitiform cirrus is smaller and slenderer.

The third and the following setigers (Fig. h) have rounded pre- and postsetal lobes; the postsetal one is longer than the presetal. The long dorsal cirrus is digitiform, the ventral one is similar but smaller. Ventral cirri are pad-shaped from setiger 4.

Branchiae are present from setiger 4; the first pairs are simple and straplike. They are bifid from setigers 18 to 32; the last ten pairs are again simple and straplike. The branchiae disappear at setiger 43.

Each of the first two setigers has three slender, distally recurved and basally prolonged setae (Figs. c and d) which continue through at least 35 setigers. These setae are pseudocomposite and the shaft has widely spaced heavy thorns in two rows; each thorn is movably jointed to the shaft. The third setiger has limbate setae in a supra-acicular fascicle; each seta has one cutting edge finely serrated. The subacicular fascicle has two kinds of composite setae. Several spinigers (Fig. e) with smooth shafts and finely serrated appendages are found in the upper end of the fascicle; three bidentate hooded hooks (Fig. f) are inferiormost. Setigers 4 to 7 have limbate setae in supra-acicular fascicles and composite spinigers in subacicular fascicles. Two bidentate suba-

cicular hooks (Fig. i) are present in each parapodium from setiger 8. Each of the median and posterior setigers has numerous limbate setae with serrated cutting edges, and one or two pectinate setae, in addition to the subacicular hooks. Two acicula are present in each parapodium except in the first two pairs. The acicula are rounded and only slightly oblique in setigers 3 and 4 and obliquely pointed in the other setigers.

The triangular mandibles are very small; in the type the cutting edge is calcified, in the other specimen the calcified part has been dissolved. Maxilla I is large and falcate on each side; left maxilla II has nine large teeth; right maxilla II lacks teeth; left maxilla III has five teeth; the combined right maxillae III + IV have five teeth; left maxilla IV and both maxillae V lack teeth. The maxillary carriers are long and triangular.

Tubes are absent.

*R. cristobalensis* and *R. bipes* Monro (1937, pp. 293-295, fig. 16a-h) from the Arabian Sea are the only two species in the genus with two modified anterior setigers. *R. cristobalensis* differs from *R. bipes* in that it has two acicula in each parapodium instead of four. Branchiae are present from setiger 4 in *P. cristobalensis* and the total number of branchial filaments is two; they are present from setiger 7 in *P. bipes* and the total number of branchial filaments is five.

*Distribution*: *P. cristobalensis* is known from one locality in San Cristobal Bay, Baja California, in 41 fms.

### **Rhamphobranchium longisetosum Berkeley and Berkeley, 1938**

*Rhamphobranchium longisetosum* Berkeley and Berkeley, 1938, pp.428-435, figs. 1-8; Hartman, 1944, pp. 48-49, pl. 1, figs. 1-8.

*New Record*: 1729-49(1).

*Earlier Records*: Hartman (1944, p. 48): 1008-39(3); 1010-39(23); 1245-41(1); 1251-41(1); 1264-41(1); 1265-41(2).

*Discussion*: Complete specimens have not been recovered; the total number of setigers and the posterior end therefore remain unknown.

*Distribution*: *R. longisetosum* is known from southern California to the Galapagos Islands. It occurs in western Mexico only on the Pacific side of Baja California, in depths between 10 and 70 fms.

## STATION DATA

## A. Collections made by the VELERO IV.

- 1688-49. March 2, 1949, Colnett Bay, from  $30^{\circ} 57' 23''$  N,  $116^{\circ} 17' 50''$  W, to  $30^{\circ} 57' 18''$  N,  $116^{\circ} 16' 39''$  W, 6 to 5 fms, dredge, *Eisenia*, *Dendraster*, *Pugettia*.
- 1692-49. March 3, 1949,  $7\frac{3}{4}$  mi NW of San Martin Island, from  $30^{\circ} 35' 25''$  N,  $116^{\circ} 12' 04''$  W, to  $30^{\circ} 35' 05''$  N,  $116^{\circ} 11' 49''$  W, 37 fms, sea stars, sand, dredge.
- 1693-49. March 3, 1949,  $6\frac{3}{4}$  mi NW of San Martin Island, from  $30^{\circ} 34' 32''$  N,  $116^{\circ} 11' 40''$  W, to  $30^{\circ} 33' 56''$  N,  $116^{\circ} 11' 07''$  W, 37 fms, dredge, sea stars, sand.
- 1694-49. March 3, 1949,  $3\frac{3}{4}$  mi NW of San Martin Island, from  $30^{\circ} 31' 00''$  N,  $116^{\circ} 10' 15''$  W, to  $30^{\circ} 00' 10''$  N,  $116^{\circ} 09' 52''$  W, 41 fms, dredge, sea urchins, sand.
- 1703-49. March 5, 1949, South Bay, Cedros Island, from  $28^{\circ} 04' 25''$  N,  $115^{\circ} 17' 58''$  W, to  $28^{\circ} 04' 21''$  N,  $115^{\circ} 17' 50''$  W, 16 fms, dredge, sand and mud, *Lovenia*, sponges.
- 1705-49. March 6, 1949,  $8\frac{3}{4}$  mi S of Cape St. Agustin, from  $27^{\circ} 56' 57''$  N,  $115^{\circ} 17' 23''$  W, to  $27^{\circ} 56' 28''$  N,  $115^{\circ} 17' 18''$  W, 28 fms, dredge, sand, *Lovenia*.
- 1711-49. March 7, 1949,  $29\frac{3}{4}$  mi S of Abreojos Point, from  $26^{\circ} 15' 56''$  N,  $113^{\circ} 40' 30''$  W, to  $26^{\circ} 15' 16''$  N,  $113^{\circ} 39' 59''$  W, 52 fms, dredge, coarse sand, broken shells, shale, alcyonarians, brachiopods.
- 1712-49. March 8, 1949,  $3\frac{1}{2}$  mi W of Entrada Point, Magdalena Bay, from  $24^{\circ} 32' 50''$  N,  $112^{\circ} 07' 52''$  W, to  $24^{\circ} 32' 38''$  N,  $113^{\circ} 07' 28''$  W, 35 fms, dredge, sand and broken shells.
- 1715-49. March 8, 1949, 5 mi NE of Entrada Point, Magdalena Bay, from  $24^{\circ} 36' 03''$  N,  $112^{\circ} 00' 21''$  W, to  $24^{\circ} 36' 08''$  N,  $111^{\circ} 59' 57''$  W, 13 fms, dredge, sand, sand dollars and shrimp.
- 1717-49. March 8, 1949,  $4\frac{1}{4}$  mi NE of Redondo Pt light, from  $24^{\circ} 34' 12''$  N,  $111^{\circ} 57' 30''$  W, to  $24^{\circ} 34' 15''$  N,  $111^{\circ} 57' 20''$  W, 9 fms, dredge, sand, sand dollars.
- 1729-49. March 12, 1949, Outer Gorda Bank, from  $23^{\circ} 01' 14''$  N,  $109^{\circ} 28' 45''$  W, to  $23^{\circ} 01' 53''$  N,  $109^{\circ} 28' 15''$  W, 70 fms, dredge, sand, shells, rock, mollusks.

- 1733-49. March 13, 1949,  $2\frac{1}{4}$  mi SE of Cape Pulmo, from  $23^{\circ} 24' 07''$  N,  $109^{\circ} 24' 15''$  W, to  $23^{\circ} 23' 50''$  N,  $109^{\circ} 24' 30''$  W, 18 to 21 fms, dredge.
- 1743-49. March 17, 1949, Entrance to Agua Verde Bay, from  $25^{\circ} 31' 36''$  N,  $111^{\circ} 03' 15''$  W, to  $25^{\circ} 31' 40''$  N,  $111^{\circ} 04' 13''$  W, 23 to 26 fms, dredge, sand, mollusks and crabs.
- 1746-49. March 18, 1949,  $\frac{3}{4}$  mi SW of Pta Arena, Carmen Island, from  $25^{\circ} 46' 00''$  N,  $111^{\circ} 15' 00''$  W, to  $25^{\circ} 49' 40''$  N,  $111^{\circ} 15' 30''$  W, 115 to 95 fms, dredge, sand, mud and pebbles, annelids.
- 1758-49. March 21, 1949,  $\frac{3}{4}$  mi WSW of Perico Pt, Carmen Island, from  $25^{\circ} 57' 18''$  N,  $111^{\circ} 06' 06''$  W, to  $25^{\circ} 57' 32''$  N,  $111^{\circ} 05' 54''$  W, 18 to 15 fms, dredge, coarse sand, crabs.
- 1787-49. April 4, 1949,  $\frac{1}{2}$  mi SE of Hughes Pt, from  $24^{\circ} 44' 45''$  N,  $112^{\circ} 15' 25''$  W, to  $24^{\circ} 44' 16''$  N,  $112^{\circ} 14' 23''$  W, 5 to 18 fms, dredge, Gorgonians, *Hepatus*.
- 1912-49. Dec. 17, 1949, Melpomene Cove, Guadalupe Island,  $28^{\circ} 52' 05''$  N,  $118^{\circ} 19' 05''$  W, shore, rocky, *Eisenia*.
- 1914-49. Dec. 18, 1949, Between Melpomene Cove and Inner Island,  $28^{\circ} 52' 05''$  N,  $118^{\circ} 19' 05''$  W, 5 to 15 fms, dredge, rock, sand.
- 1923-49. Dec. 19, 1949,  $2\frac{1}{4}$  mi N of South Bluff,  $28^{\circ} 54' 00''$  N,  $118^{\circ} 16' 12''$  W, shore, rocky, tidepools, *Eisenia* and *Codium*.
- 1924-49. Dec. 20, 1949,  $1\frac{1}{4}$  mi from Sandstone Point, from  $28^{\circ} 54' 08''$  N,  $118^{\circ} 15' 36''$  W, to  $28^{\circ} 53' 57''$  N,  $118^{\circ} 15' 41''$  W, 25 to 30 fms, dredge, sand, *Eisenia*.
- 1925-49. Dec. 20, 1949,  $2\frac{1}{4}$  mi from South Bluff, from  $28^{\circ} 53' 48''$  N,  $118^{\circ} 15' 35''$  W, to  $28^{\circ} 53' 41''$  N,  $118^{\circ} 15' 31''$  W, 35 to 40 fms, dredge, sand.
- 1928-49. Dec. 20, 1949,  $2\frac{1}{4}$  mi N of South Bluff,  $28^{\circ} 54' 00''$  N,  $118^{\circ} 16' 10''$  W, shore, rocky, boulders and crevices.
- 1948-50. April 26, 1950, 8 mi WSW of Cedros Island, from  $28^{\circ} 01' 45''$  N,  $115^{\circ} 29' 45''$  W, to  $28^{\circ} 01' 02''$  N,  $115^{\circ} 29' 30''$  W, 63 to 60 fms, dredge, mud, fine sand.
- 1954-50. April 29, 1950, 6.5 mi SSE of Abreojos Point, from  $26^{\circ} 36' 00''$  N,  $113^{\circ} 32' 38''$  W, to  $26^{\circ} 35' 27''$  N,  $113^{\circ} 31' 45''$  W, 32 to 28 fms, dredge, sand.

- 2017-51. April 15, 1951, 14.2 mi SSE of Geronimo Point,  $29^{\circ} 34' 15''$  N,  $115^{\circ} 43' 00''$  W, 53 to 54 fms, dredge, green mud, worms, brittle stars.
- 2018-51. April 15, 1951, Blanca Bay, from  $29^{\circ} 05' 41''$  N,  $114^{\circ} 41' 56''$  W, to  $29^{\circ} 05' 47''$  N,  $114^{\circ} 41' 23''$  W, 12 to 8 fms, dredge, fine sand, crabs, sea stars.
- 2019-51. April 15, 1951, Blanca Bay, from  $29^{\circ} 05' 59''$  N,  $114^{\circ} 41' 15''$  W, to  $29^{\circ} 06' 15''$  N,  $114^{\circ} 40' 57''$  W, 8 to 6 fms, dredge, sand, *Encope*.
- 2026-51. April 19, 1951, South Bay, Cedros Island, from  $28^{\circ} 05' 00''$  N,  $115^{\circ} 19' 45''$  W, to  $28^{\circ} 04' 49''$  N,  $115^{\circ} 19' 24''$  W, 16 to 19 fms, dredge, mud, sand, sponges and amphipods.
- 2030-51. April 20, 1951, 5.4 mi E of Morro Redondo Pt, Cedros Island, from  $28^{\circ} 02' 23''$  N,  $115^{\circ} 06' 08''$  W, to  $28^{\circ} 02' 27''$  N,  $115^{\circ} 05' 36''$  W, 40 to 41 fms, trawl, green mud, sea pens.
- 2598-54. Febr. 3, 1954, Off Acapulco, 1.6 mi ENE of Roqueta Island light,  $16^{\circ} 49' 56''$  N,  $99^{\circ} 54' 12''$  W, 24 fms, grab, gray sandy mud, scaphopods, pelecypods.
- 2624-54. April 13-14, 1954, San Felipe Bay, shore, beach, S of town, mud and sand flats.
- 6176-59. March 22, 1959, San Cristobal Bay, 12.5 mi  $186^{\circ}$ T Morro Hermosa Pt,  $27^{\circ} 19' 25''$  N,  $114^{\circ} 45' 40''$  W, 65 fms, orange peel grab, medium to coarse shelly sand.
- 6177-59. March 22, 1959, San Cristobal Bay, 11 mi  $178.5^{\circ}$ T from Morro Hermosa Pt,  $27^{\circ} 20' 38''$  N,  $114^{\circ} 43' 55''$  W, 51 fms, orange peel grab, glauconite silty sand.
- 6179-59. March 22, 1959, San Cristobal Bay, 9 mi  $159^{\circ}$ T from Morro Hermosa Pt,  $27^{\circ} 23' 15''$  N,  $114^{\circ} 40' 45''$  W, 41 fms, orange peel grab, glauconite shelly sand.
- 7229-60. Dec. 31, 1960, 26.3 mi  $273.5^{\circ}$ T from Natividad Island light,  $27^{\circ} 54' 25''$  N,  $115^{\circ} 40' 00''$  W, 957 to 942 fms, dredge, green mud, foraminifera, crustaceans, polychaetes.
- 7231-61. Jan. 1, 1961, 29 mi  $180.5^{\circ}$ T from Natividad Island light, from  $27^{\circ} 24' 00''$  N,  $115^{\circ} 12' 15''$  W, to  $27^{\circ} 23' 17''$  N,  $115^{\circ} 13' 45''$  W, 1355 to 1312 fms, dredge, green mud, benthic forams, worms, crustaceans and scaphopods.

- 7235-61. Jan. 2, 1961, 16.45 mi 233.5°T from Natividad Island Light, from 27° 42' 30" N, 115° 25' 55" W, to 27° 42' 25" N, 115° 25' 30" W, 709 to 683 fms, Menzies small dredge, green mud.
- 7358-61. April 21, 1961, 19 mi 170°T from Natividad Island light, from 27° 35' 45" N, 115° 08' 30" W, to 27° 32' 15" N, 115° 05' 00" W, 660 to 600 fms, Menzies small dredge, very rich foram sand. *Psolus*, scaphopods, bivalves.

#### B. Other collections.

- a. Collected by Dr. Jens Knudsen, 1955.
- K 126. Jan. 25, 1955, Agua Verde Bay, 16.4 fms, bottom sample, grey mud with shell.
- K 127. Jan. 25, 1955, Agua Verde Bay, 16.4 fms, bottom sample, grey mud with shell.
- b. Collected by Dr. Robert H. Parker, 1959 to 1961.
- P 41-59. March 22, 1959, from 22° 32.2' N, 109° 43.0' W, to 22° 35.8' N, 109° 47.9' W, 1520 to 1535 fms, deep diving dredge, silty clay.
- P 42-59. March 26, 1959, from 22° 35.6' N, 110° 06.5' W, to 22° 38.6' N, 110° 01.0' W, 1431 to 1490 fms, deep diving dredge, silty clay.
- P 51-59. April 1, 1959, 25° 31.5' N, 109° 13.5' W, 9 fms, Petersen grab, sand.
- P 54-59. April 2, 1959, 25° 29.3' N, 109° 24.3' W, to 25° 31.9' N, 109° 25.2' W, 90 to 75 fms, shell dredge, silty clay.
- P 65-59. April 9, 1959, 29° 28.0' N, 113° 02.0' W, 175 fms, deep diving dredge, mud.
- P 68-59. April 9, 1959, 29° 24.3' N, 113° 19.0' W, 65 fms, shell dredge, sand.
- P 71-59. April 10, 1959, 29° 20.0' N, 113° 00.2' W, 40 fms, shell dredge, shelly sand.
- P 72-59. April 10, 1959, 29° 24.6' N, 113° 19.0' W, 72 fms, shell dredge, shelly sand.
- P 83-59. April 28, 1959, 29° 21.0' N, 112° 42.0' W, 71 fms, rock dredge, sand.

- P 137-60. Febr. 13, 1960,  $31^{\circ} 16.4' N$ ,  $117^{\circ} 34.3' W$ , 1130 to 1140 fms, otter trawl, silty clay and rock.
- P 158-60. March 10, 1960, from  $22^{\circ} 09.0' N$ ,  $106^{\circ} 08.0' W$ , to  $22^{\circ} 00.3' N$ ,  $106^{\circ} 01.8' W$ , 29.1 to 33.3 fms, otter trawl, shelly sand.
- P 174-60. March 23, 1960,  $28^{\circ} 11.3' N$ ,  $111^{\circ} 37.0' W$ , 33.5 fms, shell dredge, sand.
- P 175-60. March 23, 1960,  $28^{\circ} 31.0' N$ ,  $112^{\circ} 04.2' W$ , 13.8 fms, shell dredge, muddy sand.
- P 184-60. March 25, 1960,  $28^{\circ} 26.0' N$ ,  $111^{\circ} 55.4' W$ , 8.3 fms, shell dredge, shelly sand.
- P 191-60. March 25, 1960, from  $28^{\circ} 41.0' N$ ,  $112^{\circ} 06.0' W$ , to  $28^{\circ} 43.8' N$ ,  $112^{\circ} 06.8' W$ , 18.3 to 14 fms, otter trawl, mud.
- P 201-60. March 27, 1960,  $28^{\circ} 30.0' N$ ,  $112^{\circ} 22.0' W$ , 125 fms, shell dredge, mud.
- P 211-60. March 30, 1960, from  $29^{\circ} 54.3' N$ ,  $113^{\circ} 03.2' W$ , to  $29^{\circ} 56.0' N$ ,  $113^{\circ} 04.0' W$ , 60 to 59 fms, otter trawl, sand.
- P 212-60. March 31, 1960, from  $30^{\circ} 20.5' N$ ,  $113^{\circ} 20.5' W$ , to  $30^{\circ} 24.2' N$ ,  $113^{\circ} 08.0' W$ , 36.6 to 30.8 fms, otter trawl, silty sand.
- P 263-60. Dec. 2, 1960,  $26^{\circ} 24.8' N$ ,  $113^{\circ} 00.5' W$ , 23 fms, otter trawl, mud.
- P 274-61. April 28, 1961, from  $30^{\circ} 52.0' N$ ,  $116^{\circ} 53.0' W$ , to  $30^{\circ} 42.3' N$ ,  $116^{\circ} 50.7' W$ , 1086 to 1081 fms, otter trawl, mud.

## Appendix I.

## Sources of information for Table I.

The original descriptions are mentioned first.

- O. acapulcensis* Rioja, 1944, pp. 139-143, fig. 1.
- O. cedroensis*, new species, see description above.
- O. dorsalis* Ehlers, 1897, pp. 71-74, pl. 5, figs. 108-118.
- O. investigatoris* Fauvel, 1932, pp. 147-148, pl. 6, figs. 1-6, textfig. 21.
- O. magna* Andrews, 1891, p. 121, pl. 2, figs. 1-7; Hartman, 1944, p. 70.
- O. microcephala* Hartman, 1944, pp. 78-80, pl. 3, figs. 67-75.
- O. nebulosa* Moore, 1911, pp. 269-273, pl. 17, figs. 56-68; Hartman, 1944, pp. 75-78, pl. 4, figs. 76-85; see also comments above.
- O. pigmentata*, new species, see description above.
- O. proalopus* Chamberlin, 1919, pp. 265-269, pl. 40, figs. 3-8, pl. 41, figs. 1-10.
- O. quadricuspis* M. Sars, 1872, pp. 407-408; Fauvel, 1923, pp. 418-419, fig. 165f-p.
- O. striata* Ushakov, 1950, p. 193, fig. 25; see also comment above.
- O. tenuis* Hansen, 1882, p. 10, pl. 3, figs. 15-22.
- O. teres* Ehlers, 1868, pp. 293-295.
- O. vexillaria* Moore, 1911, pp. 266-269, pl. 17, figs. 69-76; Hartman, 1944, pp. 80-82, pl. 5, figs. 90-98.
- O. zebra* Berkeley and Berkeley, 1939, pp. 337-338, figs. 9-10; Hartman, 1944, pp. 71-72, pl. 3, figs. 55-60.



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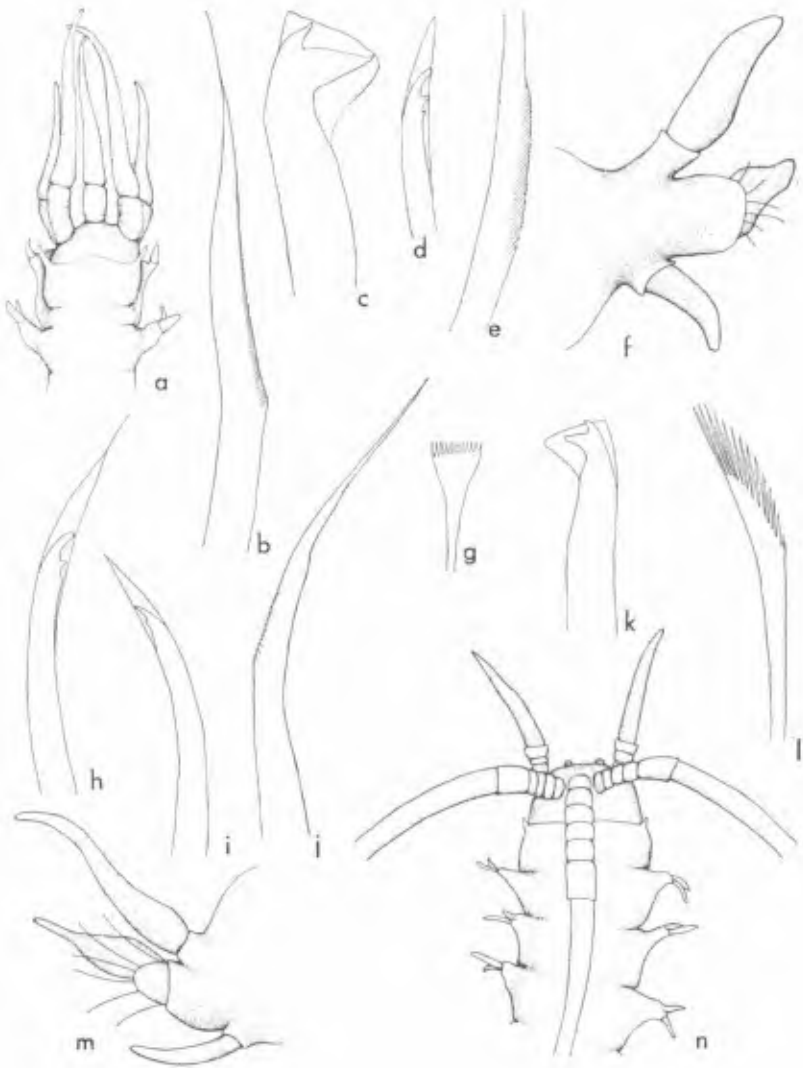
## PLATE 1

*Diopatra denticulata* (a and f: 273-34, b-e and g: 1743-49)

- a. Anterior end, x 25.
- b. Middle aciculum, median parapodium, x 570.
- c. Subacicular hook, median parapodium, x 570.
- d. Hooded hook, second parapodium, x 570.
- e. Portion of limbate seta, median parapodium, x 570.
- f. First parapodium, anterior view, x 125.
- g. Pectinate seta, median parapodium, x 570.

*Diopatra farallonensis* (P 54-59)

- h. Superior hooded hook, first parapodium, x 570.
- i. Inferior hooded hook, first parapodium, x 570.
- j. Middle aciculum, median parapodium, x 570.
- k. Subacicular hook, median parapodium, x 285.
- l. Pectinate seta, median parapodium, x 570.
- m. First parapodium, anterior view, x 75.
- n. Anterior end, x 25.



## PLATE 2

*Diopatra obliqua* (1074-40)

- a. First parapodium, anterior view, x 25.

*Diopatra neotridens* (1031-40)

- b. First parapodium, anterior view, x 14.

*Diopatra ornata* (283-34)

- c. First parapodium, anterior view, x 25.

*Diopatra papillata* (P 71-59)

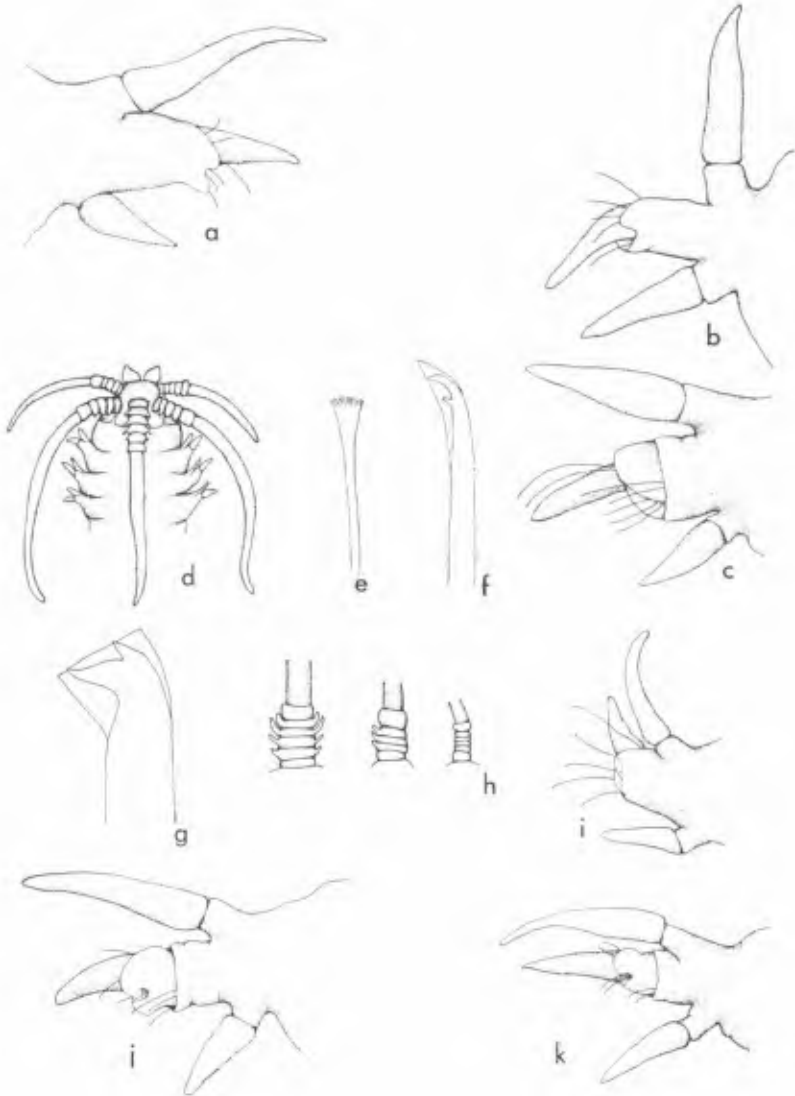
- d. Anterior end, x 25.  
e. Pectinate seta, median parapodium, x 570.  
f. Hooded hook, first parapodium, x 570.  
g. Subacicular hook, median parapodium, x 480.  
h. Median, inner lateral and outer lateral ceratophore of occipital tentacles, x 50.  
i. First parapodium, anterior view, x 50.

*Diopatra splendidissima* (616-36)

- j. First parapodium, anterior view, x 25.

*Diopatra tridentata* (588-36)

- k. First parapodium, anterior view, x 25.



## PLATE 3

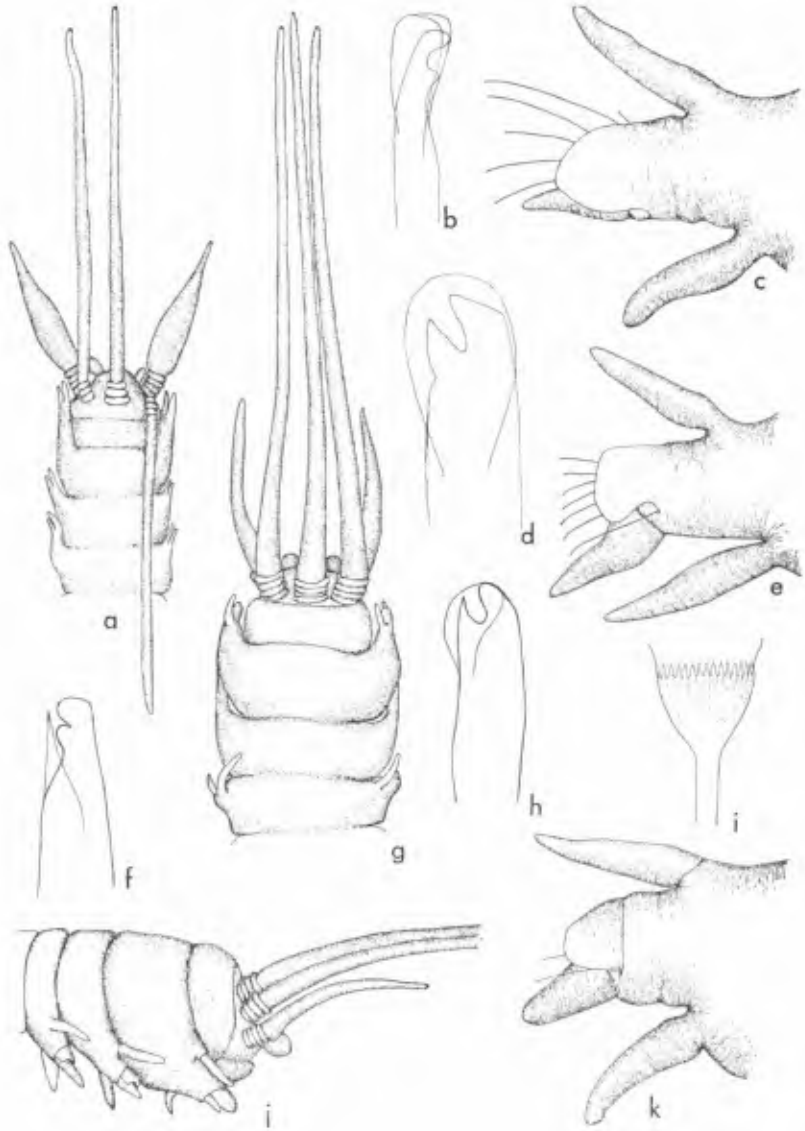
*Hyalinoecia juvenalis* (a, b, d and e: 1113-40; c: H46-102)

- a. Anterior end, x 25.
- b. Hooded hook, second parapodium, x 570.
- c. First setiger, anterior view, x 50.
- d. Subacicular hook, 30th parapodium, x 570.
- e. First setiger, anterior view, x 38.5.

*Hyalinoecia stricta* (P 137-60)

- f. Hooded hook, second parapodium, x 570.
- g. Anterior end, x 5.
- h. Subacicular hook, median parapodium, x 285.
- i. Pectinate seta, median parapodium, x 570.
- j. Anterior end, right lateral view, x 5.
- k. First setiger, anterior view, x 17.5.





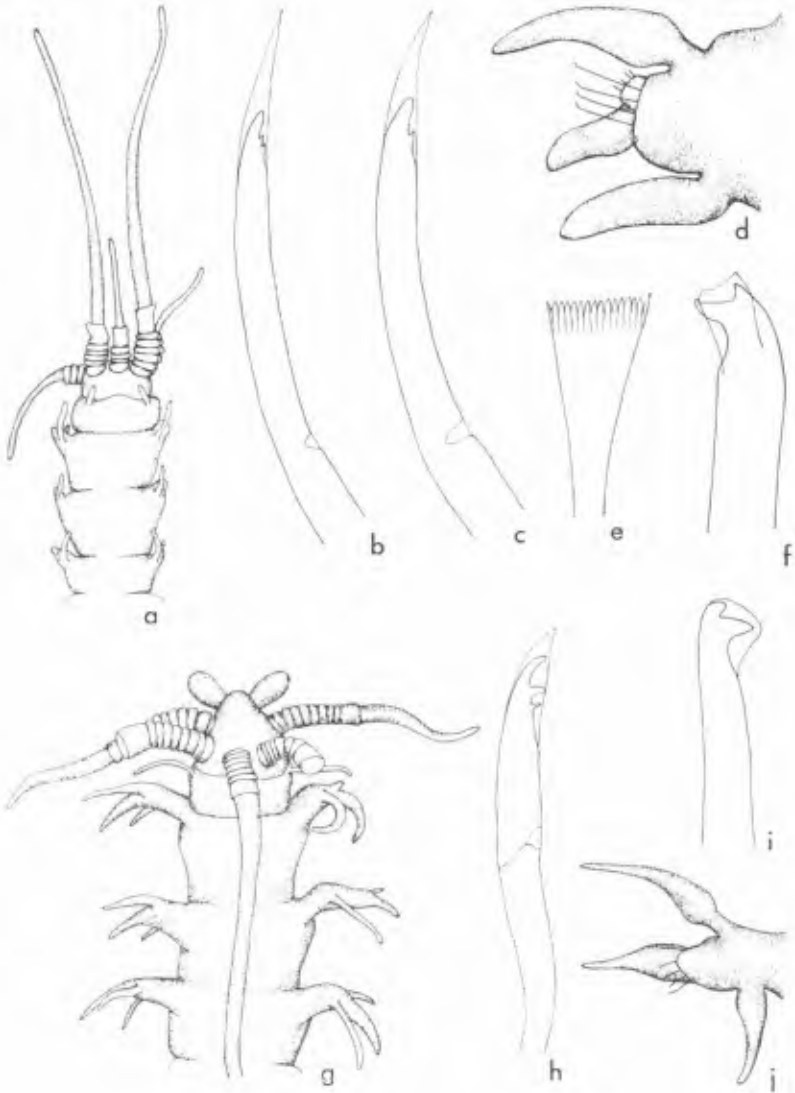
## PLATE 4

*Nothria abyssalis* (P 42-59)

- a. Anterior end, x 10.
- b. Superior hooded hook, first parapodium, x 570.
- c. Inferior hooded hook, first parapodium, x 570.
- d. First parapodium, anterior view, x 50.
- e. Pectinate seta, median parapodium, x 570.
- f. Subacicular hook, median parapodium, x 285.

*Nothria similis* (1251-41)

- g. Anterior end, x 25.
- h. Hooded hook, second parapodium, x 570.
- i. Subacicular hook, median parapodium, x 285.
- j. Second parapodium, anterior view, x 50.



## PLATE 5

*Nothria conchylega occidentalis* (1245-41)

- a. Subacicular hook, median parapodium, x 285.
- b. Pectinate seta, median parapodium, x 570.
- c. First parapodium, anterior view, x 50.
- d. Simple hook, second parapodium, x 570.
- e. Anterior end, x 50.
- f. Second parapodium, anterior view, x 50.
- g. Superior hook, first parapodium, x 285.
- h. Inferior hook, first parapodium, x 285.

*Nothria conchylega* s. str. (Stavfjorden, Norway, Biol. St., Espegrend sta. 217-60)

- i. Composite hook, second parapodium, x 570.
- j. Simple hook, second parapodium, x 570.
- k. Subacicular hook, median parapodium, x 570.
- l. Simple hook, first parapodium, x 570.
- m. First parapodium, anterior view, x 50.
- n. Second parapodium, anterior view, x 50.



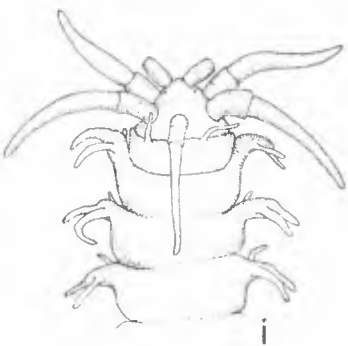
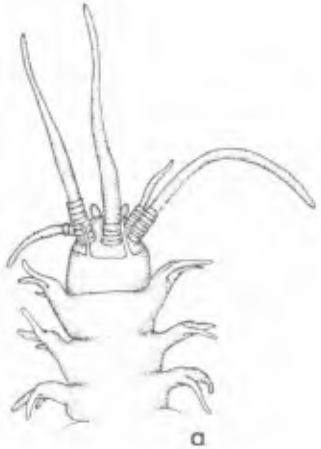
## PLATE 6

*Nothria geophiliformis* (279-34)

- a. Anterior end, x 10.
- b. Hooded hook, second parapodium, x 570.
- c. Subacicular hook, median parapodium, x 570.
- d. First parapodium, anterior view, x 25.

*Nothria guadalupensis* (1912-49)

- e. Bidentate hooded hook, first parapodium, x 570.
- f. Tridentate hooded hook, first parapodium, x 570.
- g. Subacicular hook, median parapodium, x 570.
- h. Pectinate seta, median parapodium, x 570.
- i. Composite spiniger, seventh parapodium, x 570.
- j. Anterior end, x 25.
- k. Aciculum, seventh setiger, x 570.
- l. First parapodium, anterior view, x 65.



## PLATE 7

*Nothria iridescens* (1251-41)

- a. First parapodium, anterior view, x 50.

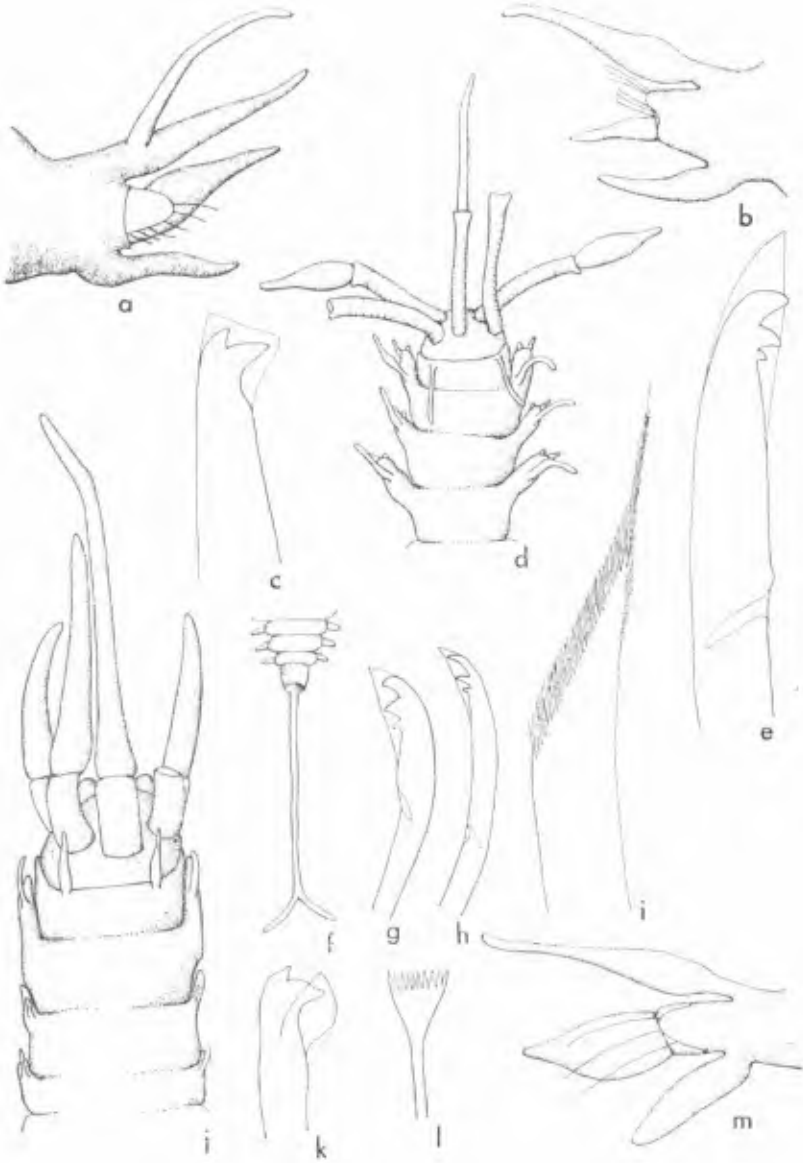
*Nothria mexicana* (P 41-59)

- b. First parapodium, anterior view, x 32.
- c. Subacicular hook, median parapodium, x 285.
- d. Anterior end, x 10.
- e. Hooded hook, first parapodium, x 570.

*Nothria pygidialis* (1923-49)

- f. Pygidium with anal cirrus, x 50.
- g. Median hooded hook, first parapodium, x 570.
- h. Inferior hooded hook, first parapodium, x 570.
- i. Aciculum, median parapodium, x 1350.
- j. Anterior end, x 50.
- k. Subacicular hook, median parapodium, x 570.
- l. Pectinate seta, median parapodium, x 570.
- m. First parapodium, anterior view, x 144.5.





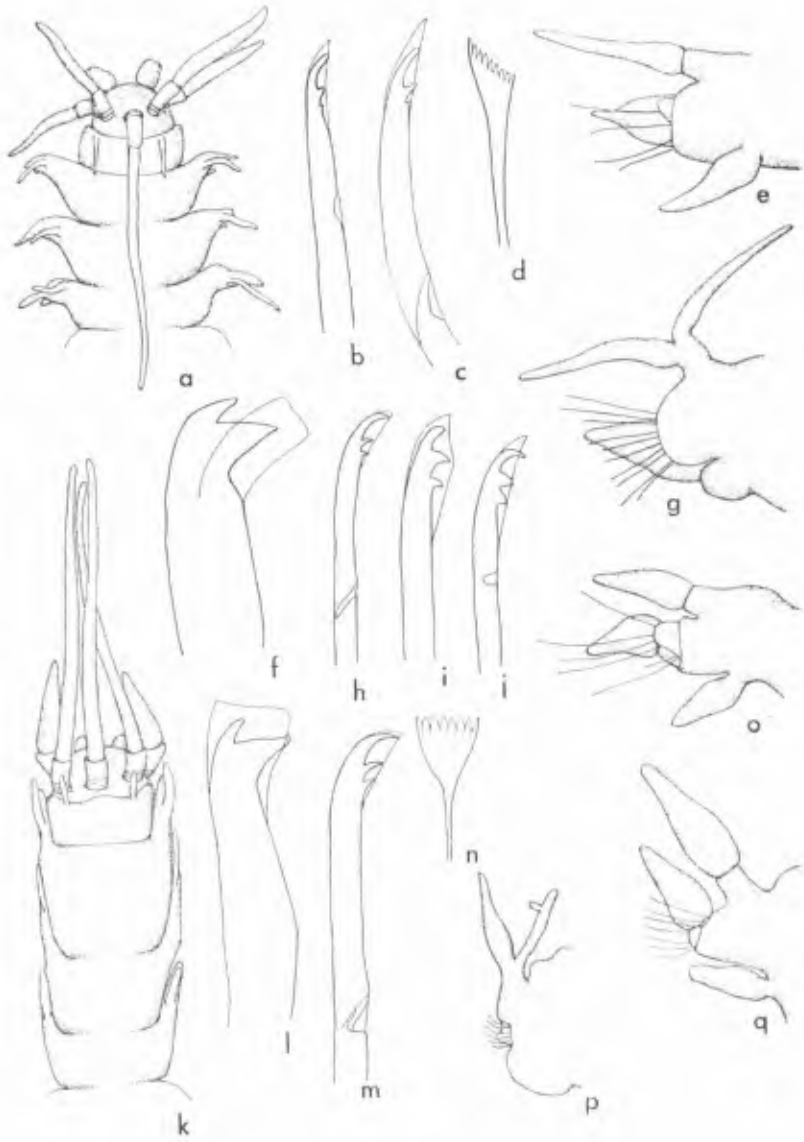
## PLATE 8

*Onuphis cedraensis* (1256-41)

- a. Anterior end, x 25.
- b. Superior hooded hook, first parapodium, x 570.
- c. Inferior hooded hook, first parapodium, x 570.
- d. Pectinate seta, median parapodium, x 570.
- e. First parapodium, anterior view, x 65.
- f. Subacicular hook, median parapodium, x 570.
- g. Seventh parapodium, anterior view, x 65.

*Onuphis microbranchiata* (1914-49)

- h. Superior hooded hook, seventh parapodium, x 570.
- i. Simple tridentate hook, seventh parapodium, x 570.
- j. Median hooded hook, seventh parapodium, x 570.
- k. Anterior end, x 32.
- l. Subacicular hook, median parapodium, x 570.
- m. Hooded hook, first parapodium, x 570.
- n. Pectinate seta, median parapodium, x 570.
- o. First parapodium, anterior view, x 65.
- p. 35th parapodium, anterior view, x 130.
- q. Seventh parapodium, anterior view, x 65.



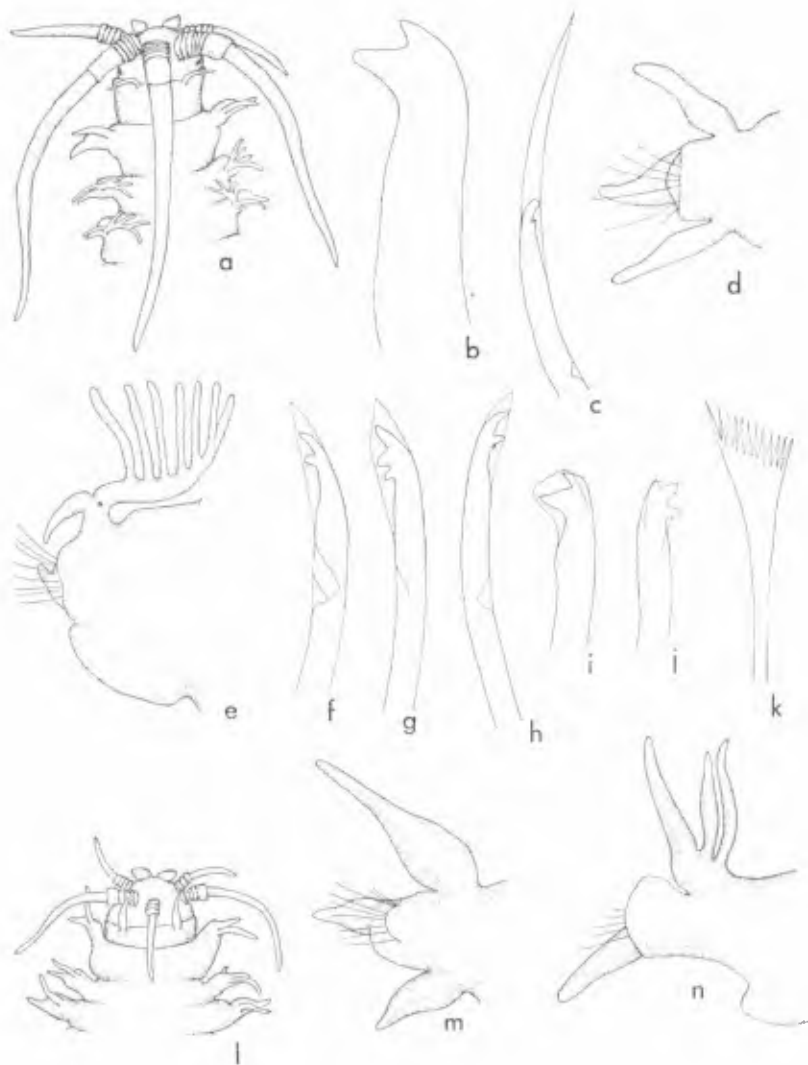
## PLATE 9

*Onuphis parva* (6176-59)

- a. Anterior end, x 25.
- b. Subacicular hook, median parapodium, x 570.
- c. Hooded hook, first parapodium, x 1350.
- d. First parapodium, anterior view, x 130.
- e. Seventh parapodium, anterior view, x 130.

*Onuphis pigmentata* (San Quintin Bay)

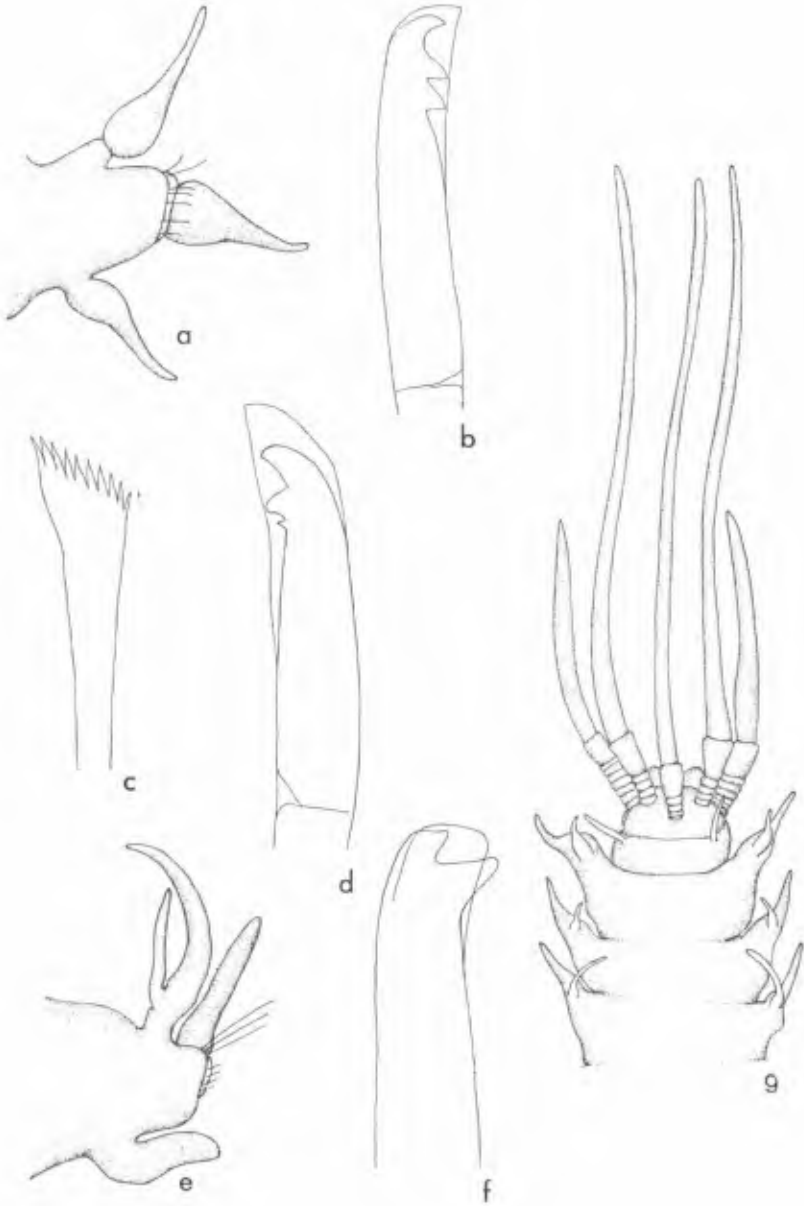
- f. Superior hooded hook, first parapodium, x 285.
- g. Median hooded hook (precursor to simple tridentate hook),  
first parapodium, x 285.
- h. Inferior hooded hook, first parapodium, x 285.
- i. Subacicular hook, median parapodium, x 285.
- j. Simple tridentate hook, seventh parapodium, x 285.
- k. Pectinate seta, median parapodium, x 625.
- l. Anterior end, x 10.
- m. First parapodium, anterior view, x 102.
- n. Seventh parapodium, anterior view, x 102.



## PLATE 10

*Onuphis profundus* (P 41-59)

- a. First parapodium, anterior view, x 25.
- b. Inferior hooded hook, second parapodium, x 1350.
- c. Pectinate seta, posterior parapodium, x 1350.
- d. Superior hooded hook, second parapodium, x 1350.
- e. Seventh parapodium, anterior view, x 25.
- f. Subacicular hook, median parapodium, x 1350.
- g. Anterior end, x 10.

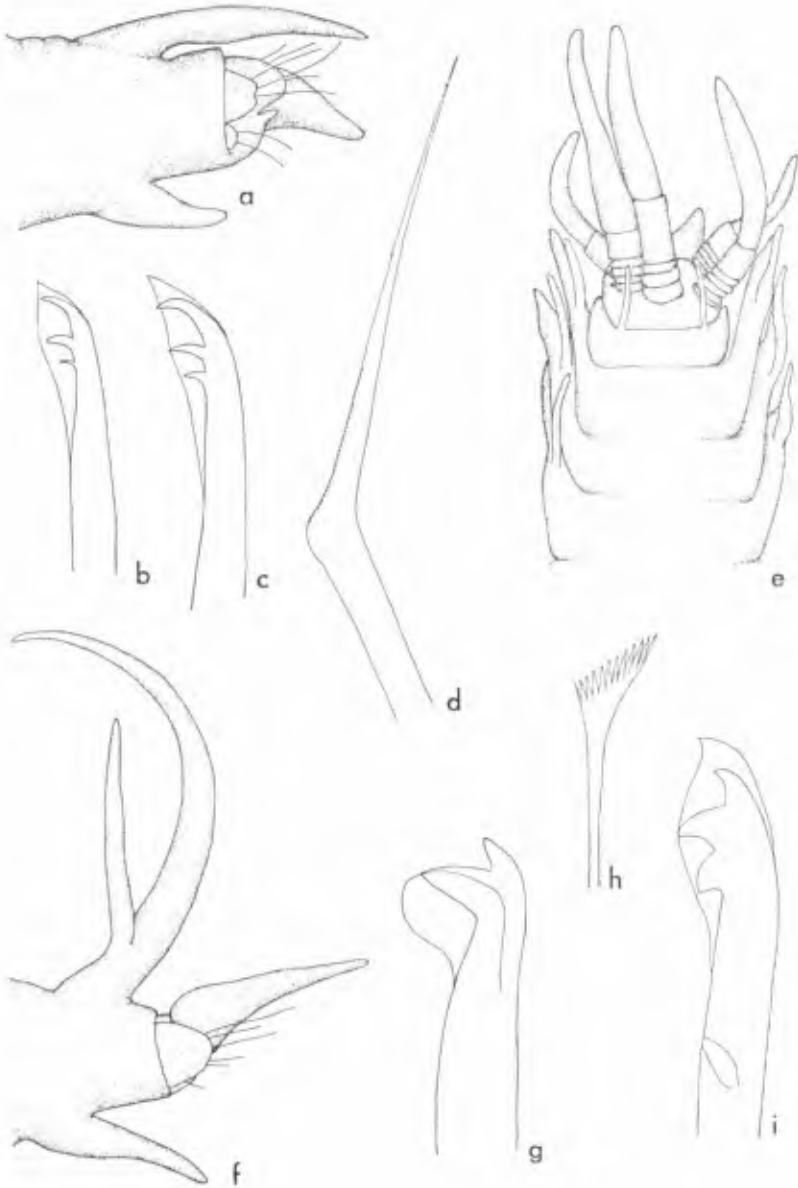


## PLATE 11

*Onuphis vermillionensis* (P 83-59)

- a. First parapodium, anterior view, x 50.
- b. Hooded hook, seventh parapodium, x 570.
- c. Hooded hook, first parapodium, x 570.
- d. Aciculum, 25th parapodium, x 570.
- e. Anterior end, x 20.
- f. Seventh parapodium, anterior view, x 50.
- g. Subacicular hook, median parapodium, x 570.
- h. Pectinate seta, 25th parapodium, x 570.
- i. Simple tridentate hook, seventh parapodium, x 570.





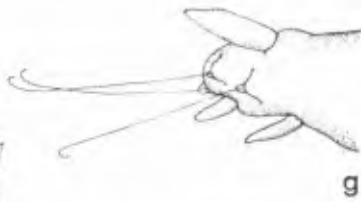
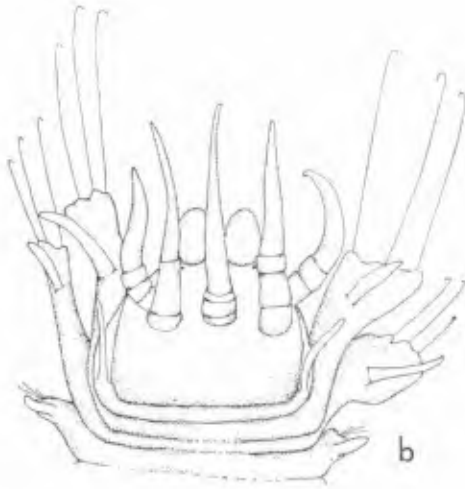
## PLATE 12

*Paronuphis abyssorum* (7229-60)

- a. Hooded hook, first parapodium, x 1350.

*Rhamphobrachium cristobalensis* (6179-59)

- b. Anterior end, x 100.
- c. Distal end of seta from first parapodium, x 427.5.
- d. Proximal end of shaft, seta from first parapodium, x 570.
- e. Composite spiniger, third parapodium, x 570.
- f. Composite hook, third parapodium, x 570.
- g. First parapodium, anterior view, x 50.
- h. Third parapodium, anterior view, x 92.5.
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