Polychaetes from Intertidal Areas in Panama, with a Review of Previous Shallow-Water Records

KRISTIAN FAUCHALD

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ABSTRACT

Fauchald, Kristian. Polychaetes from Intertidal Areas in Panama, with a Review of Previous Shallow-Water Records. *Smithsonian Contributions to Zoology,* number 221, 81 pages, 13 figures, 2 tables, 1977.—A total of 180 species are listed from both coasts of Panama. The material includes specimens collected by the Smithsonian Tropical Research Institute and specimens previously reported by Monro and Hartman in a series of papers. Newly described species are *Aphrodita diplops, Eupanthalis perlae, Eunereis paitillae, Neanthes galetae, Neanthes pseudonoodti, Nereis panamensis, Marphysa amadae, Isolda bipinnata,* and *Euthelepus pascua.* The eastern Pacific Ocean appears to be more species-rich than the western Atlantic, and relatively fewer species appear widespread in the Pacific than in the Atlantic Ocean. This fact may be because most of the sampling has been done on hard substrates in the Atlantic, while more diverse areas have been sampled in the Pacific. Generally, hard-substrate polychaetes are more widely dispersed than soft-bottom forms.

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Contents

Polychaetes from Intertidal Areas in Panama, with a Review of Previous Shallow-Water Records

Kristian Fauchald

Introduction

Intertidal polychaetes were collected from Panamanian rocky shores in connection with a study of the effects of oil pollution at Galeta Reef in the Atlantic Ocean, and at Paitilla Beach on the Pacific side of Panama. A representative sample of the polychaetes were submitted to me for identification. This sample contains 90 species representing most of the common shallow-water families.

Polychaetes from Panama have been mainly reported by Hartman in a series of papers from the Allan Hancock Foundation and by Monro in four papers (1928a, 1928b, 1933a, 1933b). Very few of the species reported by Hartman and Monro were recovered in the recent collections, but other members of the same families or genera were found. This made a complete review of all available materials necessary.

At present, 180 species of polychaetes are known from Panama. An additional 18 taxa are identified as to genus, but are known to be different from the species already named from the area. Nine species are newly described.

The overall sampling is skewed since the recent sampling on rocky shores was quantitative and comprehensive, while samples from sandy and muddy bottoms taken between 1914 and 1937 consisted largely of dredge samples and informal shovel samples. The number of soft-bottom forms is underestimated and, especially, the smaller forms are missing. The rocky shores sampled on either side of the isthmus differ in physiography and algal coverage; they were sampled for ecological representation, not for comparative faunistic studies, so the samples give a relatively poor picture of the total polychaete fauna of the area. Nevertheless, a comparison between the fauna of the Atlantic and Pacific coastlines of Panama is instructive and is given below.

Sampling of the Rocky Shores.—The Atlantic site at Galeta Island reef flats has a dead coral substrate and offers five different zones. The Pacific site at Paitilla Beach has an andesite rock substrate and has several zones, of which only the lower and middle intertidal zones were sampled. Each sample covered a relatively small area but was quantitative, and sampling was repeated over a two-year period. An area of $\frac{1}{8}$ m^2 was sampled on each occasion in each zone, and a serious effort was made to sort out all macro-invertebrates, defined for this purpose as all animals more than 1 mm in one dimension.

The Atlantic samples were first subjected to live sorting, in which algal tufts were shaken over a tray of sea water. The samples were then refrigerated in water for several hours or overnight. This refrigeration brought out many of the polychaetes that were burrowed in the coral substrate. Finally the coral fragments were broken up into one-inch fragments, and this rubble was sorted through for the remainder of the animals.

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In the field, the Pacific samples were preserved in 10 percent formalin and sorted later in the laboratory under a dissecting microscope. The large barnacles often contained polychaetes; these were obtained by scraping the outer and inner surfaces of the tests so that the parietal canals of the barnacles were opened.

The samples are referred to in the systematic section without specific reference to the collector. The different zones and the collecting dates for the rocky intertidal samples are summarized below.

ATLANTIC OCEAN

Acanthophora Zone	*Laurencia* Zone	Mangrove Zone
20 Oct 70	1 Sep 70	23 Apr 71
22 Oct 70	8 Oct 70	
3 May 73	23 Oct 70	*Thalassia* Zone
8 Aug 73	26 Oct 70	7 Sep 70
	27 Oct 70	29 Sep 70
Coralline Zone	1 Feb 71	30 Sep 70
8 Sep 70	17 Feb 71	2 Oct 70
2 Oct 70	15 Jun 71	7 Apr 71
9 Oct 70	18 Jun 71	26 Jul 71
3 Mar 71	2 Oct 71	2 Oct 71
8 Aug 71	26 Oct 71	7 Jun 72
13 Jun 72	8 Feb 72	
14 Mar 73	21 Mar 72	*Zoanthus* Zone
	26 Mar 72	28 Oct 70
	27 Mar 72	30 Oct 70
	17 Apr 72	
	20 Jul 72	
	26 Mar 73	

PACIFIC OCEAN

Balanus Zone	Hydroid Zone	*Tetraclita* Zone
29 Jan 71	28 Oct 70	29 Jan 71
	29 Oct 70	31 Jan 71
	26 Apr 71	4 Jan 72
	26 Aug 71	

ACKNOWLEDGMENTS.—I would like to thank Dr. Amada A. Reimer, Pennsylvania State University, for placing this interesting material at my disposal, and Dr. Ira Rubinoff, Smithsonian Tropical Research Institute, Balboa, Canal Zone, for financial and other support during this study. The material was collected under Contract No. 14–12–874 from the Environmental Protection Agency to the Smithsonian Tropical Research Institute. Dr. J. David George at the British Museum (Natural History) (BMNH) and Dr. Jørgen Kirkegaard of the Zoological Museum, Copenhagen (ZMC), loaned me the material previously identified by Monro. I am very grateful to both for their help. Most of the writing of this paper was done at the Santa Catalina Marine Biological Laboratory, and I thank Dr. Russel L. Zimmer for making laboratory space and other facilities available to me. Mrs. Elaine Jahn did the typing and helped put the whole paper together, for which I am very grateful.

Type specimens deposited in the National Museum of Natural History, Smithsonian Institution, carry the catalog number of the former United States National Museum (USNM). Type specimens in the Hancock collections carry the designation "Poly."

Family APHRODITIDAE

Aphrodita diplops, new species

FIGURE 1*b–f*

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (2, holotype, USNM 53084; paratype, USNM 53085).

DESCRIPTION.—The type is a ripe female, 25 mm long and 5 mm wide with setae, with 36 setigers. The body is cylindrical and abruptly tapering at both ends. The ventrum is densely studded with small papillae. The thin dorsal felt is dull gray-colored.

The prostomium (Figure 1*e*) is more wide than long with two very prominent ocular peduncles; the facial tubercle is large. Each ocular peduncle has a pair of large eyes and a single smaller eye. The larger eyes are directed dorsally and laterally, and the small eyespots are dorsal. The ceratophore of the median antenna is densely studded with short papillae; the antennal style is about twice as long as the prostomium.

The first parapodia are directed forwards and are biacicular with small fascicles of setae. The posterior faces of both noto- and neuropodia are studded with small papillae. The dorsal and ventral cirri are of the same length and project forwards about as far as the tip of the median antenna. The palpi are about four times as long as the prostomium; they are evenly tapering and are covered with four rows of long, very thin cilia.

In all other parapodia, the notopodia are low, flattened projections; the neuropodia are conical and have cylindrical bases. The smooth elytrae are kidney-shaped and oriented in a long axis along the

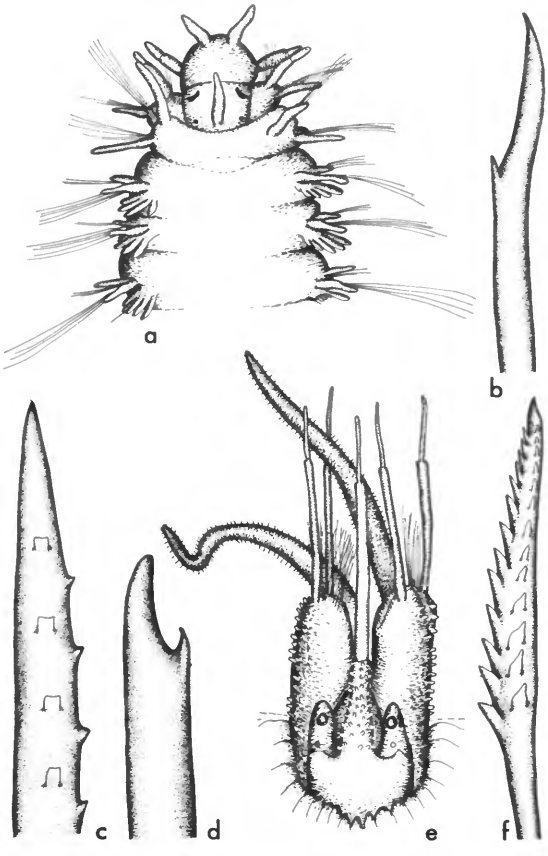

FIGURE 1.—*Linopherus canariensis* Langerhans: *a*, anterior end, dorsal view, × 25. *Aphrodita diplops*, new species: *b*, neurosetae, third setiger, × 160; *c*, notoseta, median setiger, × 160; *d*, neuroseta, median setiger, × 160; *e*, anterior end, dorsal view, × 25; *f*, notoseta, third setiger, × 385.

body of the specimens. A few dark pigment spots are present near the dorsal margin of each elytron; otherwise they are whitish.

Except for the first three pairs, each notopodium has 13 to 15 light golden or brassy setae arranged in a nearly closed crescent, with the opening to the crescent facing anteriorly; the median setae are longer than the others and project toward the mid-dorsum. All notosetae penetrate the felt, but do not project from it. Superior and inferior notosetae are smooth. Median notosetae (Figure 1*c*) in each fascicle have two rows of asperities; there is a 90° angle between the two rows with the asperities alternating in the two rows. Each asperity is shaped like a squared scale.

Each median and posterior neuropodium has four setae; each seta (Figure 1*d*) is distally falcate and has a slender subterminal tooth; this tooth may be worn so that the seta appears spurred rather than bidentate.

Setae in the first three setigers resemble those found further back, but differ in proportions; thus each neuroseta (Figure 1*b*) has a long, gently curved tip and a small spur situated considerably more basally than in the normal neurosetae. Except in the first setiger, the notosetae (Figure 1*f*) have double rows of triangular scales arranged at 90° angles to each other and alternating as in the normal notosetae. The notosetae of the first setiger are smooth, gently tapering capillaries.

Aphrodita diplops resembles *A. armifera* Moore (1910:371–375, pl. 31: figs. 65–66, pl. 32: figs. 67–75), *A. falcifera* Hartman (1939a:23–24, pl. 1: figs. 11–15, pl. 26: figs. 319–320), and *A. roulei* Horst (1917: 261–262, 3 unnumbered figs.) in that all four species have spurred or bidentate neurosetae and asperities on the notosetae.

The median antenna in *A. armifera* and *A. falcifera* is less than one-half the length of the prostomium; in *A. diplops*, it is twice the length of the prostomium. The eyes are small eyespots in both *A. armifera* and *A. falcifera;* the eyes in *A. diplops* are large and cover a large part of the large ocular peduncles.

Aphrodita roulei resembles *A. diplops* closely, but differs in that ocular peduncles and, apparently, eyes are absent in the former and prominently present in the latter.

Aphrodita diplops has been found in sand in one locality at Galeta Reef, Panama, in the western Atlantic Ocean.

Aphrodita japonica Marenzeller, 1879

Aphrodita japonica Marenzeller, 1879:111.—Hartman, 1939a:21–22, pl. 1: figs. 1–5; 1968:21–23, 5 figs. [unnumbered].

Aphrodita solitaria.—Monro, 1933a:12 [not Essenberg, 1917 = *A. refulgida* Moore, 1910].

MATERIAL EXAMINED.—St. Elmo Bay, Perlas Islands, Panama, dredging and trawling on the east side of the bay, 6–9 fm, sand and shell (1), coll. Mortensen.

REMARKS.—The specimen examined is the one reported as *A. solitaria* by Monro. As indicated by

Hartman (1939a:23), this specimen is to be referred to *A. japonica* rather than to *A. refulgida,* to which *A. solitaria* Essenberg has been referred.

Aphrodita japonica is known from widely scattered areas in the north and east parts of the Pacific Ocean.

Family POLYNOIDAE

Key to the Species in the Present Collection

1. Prostomium with 2 antennae; body strongly flattened, completely covered by the chestnut-colored elytrae ..... ***Iphione ovata***
   Prostomium with 3 antennae; body and elytrae otherwise 2
2. Lateral antennae inserted ventrally; prostomial peaks present 3
   Lateral antennae inserted distally, prostomial peaks absent 4
3. Elytrae smooth with a black region posteriorly ..... ***Harmothoe balboensis***
   Elytrae strongly fringed, separated into polygonal field surmounted by large, forked spines ..... ***Harmothoe hirsuta***
4. With 12 pairs of elytrae 5
   With more than 12 pairs of elytrae 10
5. Elytrophores with branchiae ..... ***Chaetacanthus magnificus***
   Elytrophores smooth 6
6. Notopodia with smooth lancet-shaped setae in addition to setae with transverse rows of serrations 7
   All notosetae tapering smoothly with transverse rows of serrations 8
7. Antennae and dorsal cirri pilose ..... ***Thormora johnstoni***
   Antennae and dorsal cirri smooth ..... ***Thormora taeniata***
8. Notosetae much finer than neurosetae, elytrae with all papillae of the same size 9
   Notosetae resemble neurosetae in thickness, anterior elytrae with large spinose papillae in addition to the smaller papillae found on all elytrae ..... ***Lepidonotus nesophilus***
9. Elytrae densely fringed, with marmorated color pattern ..... ***Lepidonotus humilis***
   Elytrae sparsely fringed, with alveolated color pattern ..... ***Lepidonotus crosslandi***
10. Eighteen pairs of elytrae 11
    Numerous pairs of elytrae 12
11. Elytrae pale gray; except for the first, all elytrae with small, pointed spines only ..... ***Halosydna glabra***
    Elytrae black, except for one small pale ring; all elytrae with large pustulate tubercles in addition to the small spines ..... ***Halosydna leucohyba***
12. Neurosetae distally cleft ..... ***Lepidasthenia varius***
    Neurosetae distally entire, with small subterminal teeth ..... ***Lepidasthenia gigas***

Chaetacanthus magnificus (Grube, 1875)

Iphione magnifica Grube, 1875:51.
Chaetacanthus magnificus (Grube).—Monro, 1928b:558.—Hartman, 1939a:28–29.

MATERIAL EXAMINED.—Coiba Island, dredging off convict settlement in 5–10 fm, (1); Gorgona Island, dredging close to shore in 15 fm, shell, dead coral and gravel (1); both coll. Crossland.

REMARKS.—The species is here accepted as defined by the above-mentioned authors. The present material is under revision by Dr. Marian H. Pettibone of the Smithsonian Institution.

Chaetacanthus magnificus is considered widely distributed in warm waters.

Halosydna glabra Hartman, 1939

Halosydna glabra Hartman, 1939a:35–36, pl. 4: figs. 43–50.
Halosydna reticulata.—Monro, 1928b:563–565 [not Johnson, 1897 = *H. johnsoni* Darboux, 1899:246, as *Lepidonotus johnsoni,* new name for *Polynoë reticulata* Johnson].

MATERIAL EXAMINED.—Taboga Island, from floats of the stage at the end of the hotel pier (27), coll. Crossland.

REMARKS.—Hartman (1939a:34–35) indicated that she thought these specimens belonged to *H. johnsoni* or might represent more than one species. The present material from Taboga all belongs to one species, *H. glabra,* and fits very well with this species, originally described in part on Panamanian material.

Halosydna glabra is known from warm water areas in the eastern Pacific Ocean from Panama to Gulf of California, Mexico.

Halosydna leucohyba (Schmarda, 1861)

Polynoe leucohyba Schmarda, 1861:153–154, pl. 36: fig. 308.
Halosydna leucohyba (Schmarda).—Hartman, 1944a:9.
Halosydna fuscomarmorata.—Monro, 1928b:566–567 [not Grube, 1875].

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (9); Colon, coral flat near Limón Bay (4), coll. Crossland.

REMARKS.—The present specimens fit very well with material collected in other parts of the western tropical Atlantic Ocean and with the descriptions of *Polynoe pustulata* McIntosh (1855) and *P. granulata* Ehlers (1887), both of which were considered synonymous with *H. leucohyba* (Schmarda) by Hartman (1944a).

Halosydna leucohyba appears to be one of the most common intertidal scaleworms in the tropical western Atlantic Ocean; it has not been found on the Pacific side of the Isthmus.

Harmothoe balboensis Monro, 1928

Harmothoe balboensis Monro, 1928b:560–561, figs. 9–11.

MATERIAL EXAMINED.—Balboa, Panama, rocks and rock-pools (1, holotype, BMNH), coll. Crossland.

REMARKS.—The holotype and only known specimen of this species is as described by Monro.

Harmothoe hirsuta Johnson, 1897

Harmothoe hirsuta Johnson, 1897:182–183, pl. 6: figs. 27–29, pl. 7: fig. 38, pl. 8: figs. 53A–C.—Monro, 1928b:558–559, fig. 8.—Hartman, 1968:77–78, 6 figs. [unnumbered].

MATERIAL EXAMINED.—Balboa, rocks and rock-pools, low tide (2); Gorgona Island, coral (4); Taboga Island, from floats at the stage at the end of the hotel pier (1); all coll. Crossland.

REMARKS.—Monro indicated that his specimens had simple, pointed spines (Monro, 1928b, fig. 8). A reexamination of his specimens shows that the elytral spines are covered with small spinelets; and, especially on smaller specimens, the spines may be multifid or at least bifid. On larger specimens the spinelets are small in relation to the main spine, all of which may thus appear as a single spine in low magnification.

Harmothoe hirsuta is known from the eastern Pacific Ocean between southern California and Panama.

Harmothoe species indeterminate

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (1); Balboa, low tide (1); coll. Crossland.

REMARKS.—The present specimens are both incomplete and lack elytrae. They have been assigned to the genus *Harmothoe* because they resemble members of this genus in setal structures and in the structure of the prostomium.

Harmothoe lunulata var. *pacifica* Monro (1928b: 559–560) reported from Taboga is not a polynoid but belongs to the family Hesionidae (see *Gyptis* species indeterminate, p. 16). Specimens reported by Monro (1933a) from the Galapagos Islands have not been reexamined.

Iphione ovata Kinberg, 1855

Iphione ovata Kinberg, 1855:383.—Monro, 1928b:557–558.—Hartman, 1939a:27, pl. 3: figs. 31–32.

MATERIAL EXAMINED.—Taboga, shore (4, 2 in BMNH, 2 in ZMC); Tortolla, 3–5 fm, shell bottom, 14 Dec 1915 (1); Taboguilla, under rocks at low tide, 11 Nov 1915 (3), all coll. Mortensen. Coiba Island, volcanic rocks and boulders (2); Gorgona Island, coral (3), both coll. Crossland.

REMARKS.—All specimens reported above were identified by Monro and reported in 1928b. They fit very well with the specimens reported from other areas of the eastern Pacific Ocean by Hartman (1939a).

Iphione ovata is known from the eastern Pacific Ocean in tropical waters.

Lepidasthenia gigas (Johnson, 1897)

Polynoë gigas Johnson, 1897:172–175, pl. 7: figs. 33, 42, 42a, pl. 8: figs. 48, 48a, 48b, 49.
Lepidasthenia gigas (Johnson).—Hartman, 1968:113–114, 5 figs. [unnumbered].
Lepidametria virens.—Monro, 1928b:562–563 [not Blanchard, 1849].

MATERIAL EXAMINED.—Paitilla Beach, Hydroid

Zone (1). Balboa, rocks and rock-pools at low tide (31); Coiba Island, dead coral and sand (4); coll. Crossland.

REMARKS.—*Lepidasthenia gigas* usually has dark, often greenish blotches on the elytrae, and the general body color is light yellowish. The superior neurosetae are as thick as, or thicker than, the inferior ones. The inferior neurosetae usually have distinct subterminal teeth, but these teeth may be worn and visible only in a few setae or as small protuberances on the side of the setae.

Setal structures in the specimens reported as *Lepidametria virens* by Monro (1928b) agree with those of *Lepidasthenia gigas* rather than with those of *L. virens,* as the latter are characterized by Hartman (1939a:46–47, pl. 8: figs. 105–110).

Lepidasthenia gigas has been reported as a commensal of terebellid polychaetes from southern California and the Galapagos Islands.

Lepidasthenia varius Treadwell, 1917

Lepidasthenia varius Treadwell, 1917a:259–260, pl. 1: figs. 11–16.—Hartman, 1956:271.

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (1).

REMARKS.—*Lepidasthenia varius* is characterized by the deeply incised neurosetae in all setigers.

Lepidasthenia varius is known from the Galapagos Islands and from various areas in the tropical western Atlantic Ocean.

Lepidonotus crosslandi Monro, 1928

Lepidonotus crosslandi Monro, 1928b:553–555, figs. 1–4.—Hartman, 1939a:42–43, pl. 5: figs. 63–69.

MATERIAL EXAMINED.—Paitilla Beach, Hydroid Zone (1); *Tetraclita* Zone (4). Balboa, rocks and rock-pools (1); Taboga, 5 fm, coral fragments (3, syntypes, BMNH); coll. Crossland.

REMARKS.—There is little to add to the original description. The neurosetae are distinctly unidentate in median setigers; the tips are often thicker than illustrated by Monro (1928b), perhaps due to wear. The nearly smooth elytrae have poorly developed fringes, and the low tubercles are of two size-classes as indicated by Hartman (1939a:43). The syntypic material of Monro has been reexamined.

Lepidonotus crosslandi has been found in shallow water in Panama and off Peru.

Lepidonotus humilis Augener, 1922

Lepidonotus humilis Augener, 1922:40; 1933:194–195.—Hartman, 1944a:9–10.

Lepidonotus carinulatus.—Monro, 1928b:553 [not Grube, 1878].

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (2); Galeta Reef, *Laurencia* Zone (1). Balboa, scrapings from buoy at Canal entrance (2); Taboga, 5 fm (19); Taboga, from dead and broken coral, 1–2 fm, and from the hotel pier (8, reported as *Thormora johnstoni* by Monro, 1928b, reidentified as *L. humilis* by Dr. Marian H. Pettibone (pers. comm., Smithsonian Institution); coll. Crossland.

REMARKS.—*Lepidonotus humilis* is a small intertidal species. The marmorated elytrae have a strongly developed fringe. The neurosetae are bifid, even if the secondary tooth sometimes is lost; it is, however, usually visible in at least some setae in each neuropodium. Notosetae are fine and nearly hair-like.

Lepidonotus humilis has been reported from intertidal areas on both sides of the Isthmus of Panama and is more widely distributed in the Caribbean Sea.

Lepidonotus nesophilus Chamberlin, 1919

Lepidonotus nesophilus Chamberlin, 1919:75–78, pl. 4: figs. 1–7, pl. 5: fig. 13.—Hartman, 1939a:38–39, pl. 7: figs. 83–95.

MATERIAL EXAMINED.—Paitilla Beach, Hydroid Zone (5). Taboga, from dead coral, 1–2 fm, or from the hotel pier (1, reported by Monro, 1928b as *Thormora johnstoni;* reidentified by Dr. Marian H. Pettibone, Smithsonian Institution), coll. Crossland.

REMARKS.—*Lepidonotus nesophilus* has large spinose macrotubercles on anterior elytrae and small, sharply pointed microtubercles on all elytrae. The elytral fringe consists of very short papillae.

Lepidonotus nesophilus is known from the eastern Pacific Ocean in warm waters.

Thormora johnstoni (Kinberg, 1855)

Lepidonotus johnstoni Kinberg, 1855:384.

Thormora johnstoni (Kinberg).—Monro, 1928b:556–557, figs. 5–7 [in part].—Hartman, 1939a:50–51, pl. 7: figs. 96–98; 1968:139–140, 5 figs. [unnumbered].

MATERIAL EXAMINED.—Taboga, 4–5 fm, sand and

stones, 8 Feb 1916 (1); Taboguilla, approximately 5 fm, shell bottom, 5 Jan 1916 (1), both coll. Mortensen. Taboga, from dead and broken coral, 1–2 fm or from the hotel pier (13), coll. Crossland.

REMARKS.—*Thormora johnstoni* is well known from warm waters in the eastern Pacific Ocean. It is easily identifiable as one of the two local lepidonotins with two different kinds of notosetae: smooth lancet-shaped ones and ones with transverse rows of serrations. It differs from the closely similar *T. taeniata,* which has similar kinds of setae, in that the antennae and tentacular cirri are smooth; these structures are hirsute in *T. taeniata.* Crossland's material from Taboga has been reexamined by Dr. Pettibone.

Thormora taeniata (Ehlers, 1887)

Polynoe taeniata Ehlers, 1887:51–52, pl. 10: figs. 1–8.
Thormora taeniata (Ehlers).—Seidler, 1924:92–94.

MATERIAL EXAMINED.—Taboga, from dead and broken coral and from the hotel pier (39, identified as *T. johnstoni* by Monro, 1928b, reidentified by Dr. Marian H. Pettibone, Smithsonian Institution); Taboguilla, 5 fm, shell (2).

REMARKS.—The differences between this and the closely related *T. johnstoni* have been mentioned above. This material has been reexamined by Marian H. Pettibone and will be the subject of a future publication by Dr. Pettibone.

Thormora taeniata has previously been reported from the western Atlantic Ocean.

Family POLYODONTIDAE

Key to the Species from Panama

1. Prostomium with large paired ocular peduncles 2
   Prostomium without ocular peduncles (eyes small) ..... ***Eupanthalis perlae,*** new species
2. Superior neurosetae hastate ..... ***Polyodontes oculea***
   Superior neurosetae pencillate 3
3. Superior neurosetae with distal tuft ..... ***Panthalis pacifica***
   Superior neurosetae with long, slender tip extending beyond the pencillate portion ..... ***Panthalis mortenseni***

Eupanthalis perlae, new species

FIGURE 2

Eupanthalis kinbergi.—Monro, 1928b:568 [not McIntosh, 1876].

MATERIAL EXAMINED.—San José Island, Perlas Islands, 25 fm, mud and shells (1 holotype, ZMC), coll. Mortensen.

DESCRIPTION.—The type and only specimen is an anterior fragment that is 18 mm long and 6 mm wide without setae, with 46 setigers. The body is thick and color patterns are absent.

The prostomium (Figure 2*b*) consists of two hemispherical lobes separated by a deep median fissure. Two pairs of eyes are present; one is just posterior to the widest part of the head and the second is near the posterior margin of the head. A pair of frontal antennae is on the anterior margin; each is long and slender and about one-half times longer than the length of the prostomium. Posterior to the prostomium proper is a thick, folded nuchal organ, which is anteriorly produced into a low ceratophore fused to the dorsal surface of the prostomium. The median antenna is attached to this ceratophore; it starts at the level of the anterior pair of eyes. Posteriorly the nuchal organ has a small, medial transverse fold.

The palps are about three times as long as the length of the prostomium; each is thick and is distally covered with long, slender papillae in a scattered arrangement. A pair of smooth, tentacular cirri are ventroposterior to the palps; each is about the same length as the palps; setae are absent in this tentacular segment.

All parapodia are bluntly truncate and have long, subulate ventral cirri; dorsal cirri are similar in size and shape.

Setae are of several different kinds. In the anterior end of the body, anterior to setiger 17, a series of short, slender setae with two or three whorls of short, slender teeth is found in the anterior fascicles (Figure 2*f*); each seta is subdistally inflated. The posterior fascicles in these anterior

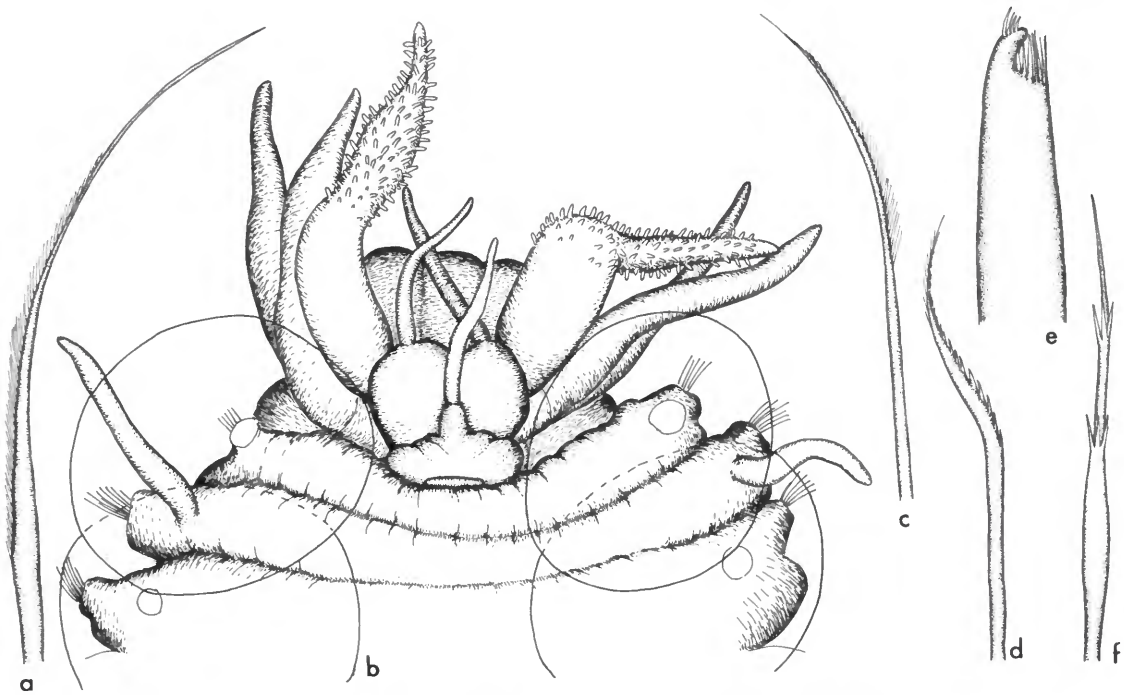

FIGURE 2.—*Eupanthalis perlae*, new species: *a*, seta from posterior fascicle, setiger 12, × 385; *b*, anterior end, dorsal view, × 25; *c*, superiormost seta, setiger 40, × 385; *d*, inferiormost seta, setiger 40, × 385; *e*, median seta, setiger 40, × 385; *f*, seta from anterior fascicle, setiger 12, × 385.

setigers have long, slender, gently curved setae (Figure 2*a*) with a fine marginal border of thin hairs. Setae are of four kinds in posterior setigers; thus in setiger 40 two slender, pilose setae are found superiormost (Figure 2*c*) resembling those found in anterior setigers; below them is a single straight, finely pilose seta with a smooth tip; then there are fifteen to sixteen thick, distally recurved setae (Figure 2*e*) with a subdistal double row of spines and a distal tuft of spines; these setae are in two rows. These are presumably homologous to the kind equipped with aristae in other species of the genus, but aristae are absent in all parapodia in the present specimen. Inferiormost in each fascicle is a series of gently curved or straight, pilose setae (Figure 2*d*); the innermost hairs on these setae may be very coarse, approaching spines.

Eupanthalis perlae closely resembles other species in the genus, but differs in the position of the median antenna, which is attached between the anterior eyes in the present species and at the posterior margin of the prostomium in all other species in the genus. *Eupanthalis nigromaculata* Grube (1878) has large eyes covering most of the prostomial lobes, and the palps are smooth. *Eupanthalis kinbergi* McIntosh (1876) lacks the whorled setae in anterior setigers and the position of the median antenna is different.

The shape of the aristate setae with their double groups of spines appears unique to *E. perlae*.

Eupanthalis perlae is described from one locality on the Pacific side of the Isthmus of Panama.

Panthalis mortenseni (Monro, 1928)

Polyodontes mortenseni Monro, 1928b:569–572, figs. 19–24.
Panthalis mortenseni (Monro).—Hartman, 1939a:87; 1968:143–144, 3 figs. [unnumbered].

MATERIAL EXAMINED.—Molones, 3–5 fm, 15 Dec 1915, coll. Mortensen (1). Taboga, muddy sandy beach at low tide, 5 Feb 1916, coll. Mortensen (2, holotype, BMNH; other specimen in ZMC).

REMARKS.—All three specimens reported by Monro (1928*b*) have been reviewed. They are as described by Monro. The pencillate setae with smooth tips are most easily distinguished in parapodia posterior to setiger 30.

Panthalis mortenseni is known from southern California to Pacific Panama.

Panthalis pacifica Treadwell, 1914

Panthalis pacifica Treadwell, 1914:184–186, pl. 11: figs. 1–7.—Hartman, 1968:145–146, 4 figs. [unnumbered].
Panthalis jogasimae.—Monro, 1928b:568–569 [not Izuka, 1912].

MATERIAL EXAMINED.—Gorgona Island, 20–30 fm, dredge, fine sand and shell (2), coll. Crossland.

REMARKS.—The specimens are as described by Monro (1928b); the setal structures correspond to those of *P. pacifica* rather than to *P. jogasimae*.

Panthalis pacifica is known from southern California to Panama in muddy bottoms.

Polyodontes oculea (Treadwell, 1901)

Panthalis oculea Treadwell, 1901:188–189, figs. 14–18.
Polyodontes oculea (Treadwell).—Monro, 1928b:572–575, figs. 25–30.—Hartman, 1939a:83–84, pl. 24: figs. 294–299.

MATERIAL EXAMINED.—Taboga, mud and sand (2); Balboa rock and rock-pools (6), both coll. Mortensen. Taboga, dredging, 1–2 fm, (3); Taboga, about 10 fm, mud (2); Colon, trawling in Limón Bay, 5 fm, thin mud (3); all coll. Crossland. Additionally 27 specimens from Port of Spain Roadstead, Trinidad, 4–5 fm, thin mud, were reexamined.

REMARKS.—The identification of the present specimens with Treadwell's species agrees with the reinterpretation made by Monro and Hartman.

Polyodontes oculea is known from the Caribbean Sea and from warm water areas in the eastern Pacific Ocean as far north as Baja California.

Family SIGALIONIDAE

Key to the Species from Panama

1. Prostomium quadrate with a small median antenna ..... ***Thalenessa lewisii***
   Prostomium subglobular with large median ceratophore and antenna 2
2. Ceratophore with ctenidia, parapodia sparsely papillose; elytrae without sand incrustations ..... ***Sthenelais fusca***
   Ceratophore without ctenidia; parapodia densely papillose, elytrae sand-incrusted ..... ***Psammolyce spinosa***

Psammolyce spinosa Hartman, 1939

Psammolyce spinosa Hartman, 1939a:72–74, pl. 19: figs. 232–243; 1968:159–160, 6 figs. [unnumbered].

MATERIAL EXAMINED.—Galeta Reef, *Thalassia* Zone (3); *Zoanthus* Zone (3).

REMARKS.—*Psammolyce spinosa* was described from warm water areas in the eastern Pacific Ocean and has been reported from as far north as California. The present specimens represent the first record from the Atlantic Ocean. The specimens have been directly compared with the California material; no relevant differences were noted.

Sthenelais fusca Johnson, 1897

Sthenelais fusca Johnson, 1897:185–186, pl. 9: figs. 60, 61, 61a,b; pl. 10: figs. 64, 64a–g.—Monro, 1933a:16.—Hartman, 1939a:61–62, pl. 13: figs. 153–162; 1968:163–164, 5 figs. [unnumbered].
Sthenelais variabilis var. *colorata*.—Monro, 1933a:14–16, fig. 7 [not Monro, 1924].—Hartman, 1939a:63–64, pl. 13: figs. 163–166.

MATERIAL EXAMINED.—Balboa, rocks and rock-pools at low tide (2); Coiba Island, in sand at low water, spring tide, fine sea grass and dead coral bedded in the sand (2); coll. Crossland.

REMARKS.—All these specimens belong to the same species. Presently, the rather variable *S. fusca* cannot be separated into subgroups. Some of the morphological variations indicated by Hartman (1939a), however, probably relate to different species.

Sthenelais fusca is known from the eastern Pacific Ocean from Washington to Panama.

Thalenessa lewisii (Berkeley and Berkeley, 1939)

Sigalion lewisii Berkeley and Berkeley, 1939:326–328, figs. 2, 3.

Eusigalion hancocki Hartman, 1939a:59–60, pl. 12: figs. 141–145, 148–152.

MATERIAL EXAMINED.—Taboguilla, sandy shore at low tide (1), coll. Mortensen.

REMARKS.—This specimen was not identified and reported on by Monro (1928b) in his study of the polychaetes collected by Mortensen.

Thalenessa lewisii is restricted to the warmer parts of the eastern Pacific Ocean.

Family CHRYSOPETALIDAE

Key to the Species from Panama

1. Body long and slender, caruncle absent 2
   Body short, caruncle present 3
2. Lancet-shaped notosetae present ventral to the paleae; paleae narrow ..... ***Bhawania goodei***
   Lancet-shaped notosetae absent; paleae distally expanded ..... ***Bhawania riveti***
3. Paleae of 2 abruptly different kinds in each fascicle ..... ***Paleanotus chrysolepis***
   All paleae similar in width or grading evenly from one end to the other in each fascicle ..... ***Chrysopetalum occidentale***

Bhawania goodei Webster, 1884

Bhawania goodei Webster, 1884:308–309, pl. 7: figs. 1–15.—Monro, 1933a:18–19.—Day, 1967:118–119, fig. 21a–f.

MATERIAL EXAMINED.—Galeta Reef, *Thalassia* Zone (1); Paitilla Beach, Hydroid Zone (1). Taboga Island, low water spring tide (2), coll. Crossland.

REMARKS.—*Bhawania goodei* can be separated from *B. riveti* (Gravier), which has also been found in the Panamanian material, by the presence of lancet-shaped notosetae ventral to the paleae. The paleae are usually rather narrow and have a speckled dirty gold color in *B. goodei;* they are distally expanded and a polished gold color in *B. riveti.*

Bhawania goodei is very widespread in warm water. Day (1967:119) indicated that the species may be circumtropical.

Bhawania riveti (Gravier, 1908)

Chrysopetalum riveti Gravier, 1908:40; 1909:638–641, pl. 17: figs. 31–34.
Bhawania riveti (Gravier).—Monro, 1933a:17–18.

MATERIAL EXAMINED.—Paitilla Beach, Hydroid Zone (2); *Tetraclita* Zone (4). Taboga Island, shore, collected in beach sandstone at low water, spring tide (1), coll. Crossland.

REMARKS.—The differences between this species and *B. goodei* have been listed above. The present specimens fit very well with the description given by Gravier (1909).

Bhawania riveti was originally described from Peru and has been reported from the Galapagos Islands (Treadwell, 1928:466), in addition to the Panamanian records (Monro, 1933a:17–18).

Chrysopetalum occidentale Johnson, 1897

Chrysopetalum occidentale Johnson, 1897:161–162, pl. 5: figs. 15, 16, pl. 6: figs. 17–19.—Monro, 1933a:19.—Hartman, 1968:185–186, 5 figs. [unnumbered].

MATERIAL EXAMINED.—Gorgona Island (1), coll. Crossland.

REMARKS.—According to Monro, the median antenna should be situated between the two pairs of eyes in the present specimen; in fact it is between the anterior eyes as usual in this species. The prostomium is large and globular, and the nuchal organ is nearly as large and of the same general shape.

Chrysopetalum occidentale is known from southern California to Panama in shallow water.

Paleanotus chrysolepis Schmarda, 1861

Paleanotus chrysolepis Schmarda, 1861:163, pl. 37: figs. 326–329.—Monro, 1933a:19.

MATERIAL EXAMINED.—Taboga Island from the float at the end of the stage of the hotel pier, coll. Crossland (fragments).

REMARKS.—The present fragments are unidentifiable to species at the present stage of preservation. They do belong to the genus *Paleanotus.* In view of the close similarities between *P. chrysolepis* and *P. bellis* (Johnson, 1897), to treat these fragments

as unidentifiable might be considered preferable. Monro considered the two species synonymous. Both species remain poorly known; I decided to leave the present fragments with the current name until the taxonomic problem has been satisfactorily clarified.

Paleanotus chrysolepis is possibly widespread in warm waters.

Family AMPHINOMIDAE

Key to the Species from Panama

1. Body short and depressed 2
   Body long and cylindrical 3
2. Dorsum with a single, reddish brown median stripe ..... ***Chloeia entypa***
   Dorsum with 3 dark longitudinal stripes ..... ***Chloeia viridis***
3. Caruncle reduced or absent, extending maximally through part of the first segment 4
   Caruncle large, often with complex lateral folds 6
4. Seven pairs of branchiae, antennae articulated ..... ***Linopherus canariensis***
   Numerous pairs of branchiae, antennae smooth 5
5. Eyes large, branchiae present on all but the first and last few segments ..... ***Linopherus oculata***
   Eyes indistinct; branchiae limited to the first two-thirds of the body ..... ***Linopherus ambigua***
6. Caruncle long and narrow, median fold covering the 2 lateral folds ..... ***Eurythoe complanata***
   Caruncle either very wide, or with very well-developed lateral folds visible from above 7
7. Caruncle diamond-shaped with indistinct lateral folds ..... ***Hermodice carunculata***
   Caruncle with very distinct lateral folds, usually spindle-shaped 8
8. Caruncle with wide lateral folds attached basally to the high median ridge ..... ***Notopygos ornata***
   Caruncle with lateral folds in the form of 7 or 8 leaves attached laterally to the high median ridge ..... ***Pherecardia striata***

Chloeia entypa Chamberlin, 1919

Chloeia entypa Chamberlin, 1919:30–31, pl. 13: figs. 8, 9, pl. 14: figs. 1, 2.—Hartman, 1968:191–192, 5 figs. [unnumbered].
Chloeia pinnata.—Monro, 1933a:7–8, fig. 3 [not Moore, 1911].

MATERIAL EXAMINED.—Gorgona Island, 30 fm, muddy sand, showing shell fragments after screening with a fine mesh (3), coll. Crossland.

REMARKS.—*Chloeia entypa* differs from *C. pinnata* Moore in that the former has a broad, reddish brown middorsal stripe, which is absent in the latter. *Chloeia pinnata* is usually salmon-colored without any distinct color patterns. The posterior notosetae are distally serrated in both species; these serrations point basally in *C. entypa* and distally in *C. pinnata*.

Chloeia entypa is widely distributed in warm waters in the eastern Pacific Ocean, but it has frequently been confused with *C. pinnata* so the exact distribution is difficult to ascertain at the present time.

Chloeia viridis Schmarda, 1861

Chloeia viridis Schmarda, 1861:144–146, pl. 25: figs. 295–305.—Monro, 1933a:9–10, fig. 4.—Hartman, 1940a:205.

MATERIAL EXAMINED.—Taboga Island, between Taboga and Taboguilla, 6–12 fm, soft mud (1), coll. Crossland.

REMARKS.—*Chloeia viridis* has a characteristic pattern of three longitudinal stripes on the dorsum, usually most distinct in the anterior end. This pattern is still distinct on the specimen reexamined above.

Chloeia viridis is known from both sides of the Isthmus of Panama (Hartman, 1944a:15).

Eurythoe complanata (Pallas, 1776)

Aphrodita complanata Pallas, 1776:109.
Eurythoe complanata (Pallas).—Chamberlin, 1919:28.—Monro, 1933a:4–5.—Hartman, 1968:195–196, 4 figs. [unnumbered].

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (6); *Zoanthus* Zone (1). Balboa, pools at lowest tide-level (1); Taboga Island, from colony of *Pocillopora*, all in anterior regeneration (5); Gorgona Island, low water, spring tide, from tubes of *Sabellaria* (6); Gorgona Island, from coral (2); Coiba Island, 5 fm. (1); Colon, from coral flat at SW corner of Limón Bay (3); St. Elmo Bay, Perlas Island, shore at low tide (5); all coll. Crossland.

REMARKS.—*Eurythoe complanata* as presently accepted has a circumtropical geographical dispersal pattern in the rocky intertidal and in shallow subtidal areas, frequently associated with pockets of sand under rocks and in coral reefs. It is easily separable from other Panamanian amphinomids by the long flexuose caruncle and the long, slender body shape. *Hermodice carunculata* is as long-bodied, but the caruncle of this species is wide and nearly diamond-shaped.

Hermodice carunculata (Pallas, 1776)

Aphrodita carunculata Pallas, 1776:102.
Hermodice carunculata (Pallas).—Fauvel, 1923:131–132, fig. 47a–i.—Hartman, 1951:22–25, pl. 5: fig. 1.

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (1).

REMARKS.—The present specimen is smaller than specimens usually reported, but otherwise it is very similar to the species as illustrated by Hartman (1951).

Hermodice carunculata is found in warm water areas of the Atlantic Ocean.

Linopherus ambigua (Monro, 1933), new combination

Eurythoe ambigua Monro, 1933a:6–7, fig. 2.
Pseudeurythoe ambigua (Monro).—Fauchald, 1972:38–40.

MATERIAL EXAMINED.—Taboga Island, bay between Taboga and Taboguilla, 6–12 fm, soft mud (1, holotype, BMNH), coll. Crossland.

REMARKS.—The specimen is as described by Monro (1933a). It is known through the original record from Panama and from North Carolina (Day, 1973:16). The generic name *Pseudeurythoe* is invalid, as indicated below (*L. canariensis*); thus the new combination.

Linopherus canariensis Langerhans, 1881

FIGURE 1*a*

Linopherus canariensis Langerhans, 1881:109–110, pl. 4: figs. 14a–g.
Pseudeurythoe canariensis (Langerhans).—Fauchald, 1972:38–41.

MATERIAL EXAMINED.—Galeta Reef, *Thalassia* Zone (1).

REMARKS.—The present specimen (Figure 1*a*) fits very well with *L. canariensis* as originally described, except that the first pair of eyes is slightly larger and half-moon-shaped rather than round as originally described. Branchiae are present from setiger 3; six pairs are present rather than seven as originally described. A caruncle is completely absent. The posterior antennae and the dorsal cirri of the first setiger are biarticulated. None of the notopodial setae are subdistally inflated.

The valid genotype for this genus is *canariensis* Langerhans, 1881. The generic name *Linopherus* is available in this combination and has priority over *Pseudeurythoe* Fauvel (1932), which was proposed for the same group of species.

Linopherus canariensis has been reported only once, from the Canary Islands; the present record is from the Atlantic side of Panama.

Linopherus oculata (Treadwell, 1941), new combination

Eurythoe oculata Treadwell, 1941:18, figs. 1–3.
Pseudeurythoe oculata (Treadwell).—Hartman, 1956:274.—Fauchald, 1972:38–40.
Eurythoe dubia.—Monro, 1933a:5–6, fig. 1 [not Horst, 1912].

MATERIAL EXAMINED.—Balboa, swimming along the surface alongside the ship in Balboa Dock (1), coll. Crossland.

REMARKS.—*Eurythoe dubia* sensu Horst (1912) is distinctly a species of *Eurythoe* in that it has a large caruncle (cf. Fauchald, 1972:38). The specimen reported by Monro (1933a:5–6) belongs to the genus *Linopherus* and agrees in all details with *L. oculata* as redescribed by Hartman (1956). The generic name *Pseudeurythoe* is invalid, as indicated above (*L. canariensis*); thus the new combination.

Linopherus oculata has been reported twice from Balboa, Panama; no further records are known. The large eyes are possibly related to the sexual maturation. Treadwell's specimen was sexually mature, and Crossland caught the present specimen swimming at the surface.

Notopygos ornata Grube, 1856

Notopygos ornata Grube, 1856:53.—Monro, 1933a:10–11, fig. 5.—Hartman, 1940, p. 207.

MATERIAL EXAMINED.—Balboa, pools at the low-

est tide-level (9); Taboga Island, from colony of *Pocillopora* (5); Gorgona Island, from coral (4); St. Elmo Bay, Perlas Islands, from shore at low tide (1); all coll. Crossland.

REMARKS.—*Notopygos ornata* has a long, spindle-shaped caruncle with widely expanded lateral folds attached basally to the median ridge. The color pattern of dark bluish patches on a pink background is very characteristic in life (Monro, 1933a, fig. 5b) but fades very rapidly in alcohol.

Notopygos ornata is known from the western Atlantic Ocean in warm waters as well as from similar areas in the eastern Pacific Ocean.

Pherecardia striata (Kinberg, 1857)

Hermodice striata Kinberg, 1857:13.
Pherecardia striata (Kinberg).—Monro, 1933a:7.—Hartman, 1940a:207; 1951:25, pl. 5: fig. 2.

MATERIAL EXAMINED.—Coiba Island, low water, spring tide (5); Taboga Island, from colony of *Pocillopora* (2); Gorgona Island, from coral (6); all coll. Crossland.

REMARKS.—The shape of the caruncle with the seven or eight large lateral leaves attached to the narrow median ridge and the color pattern consisting of numerous thin longitudinal pin-stripes are both characteristic of this species in the area.

Pherecardia striata is known from nearly circumtropical areas.

Family PHYLLODOCIDAE

Key to the Species from Panama

1. Ventral tentacular cirrus of segment 2 folicaceous; others cirriform 2
   All tentacular cirri cirriform 3
2. All tentacular segments dorsally complete; dorsal cirri distally bluntly rounded ..... ***Steggoa lobocephalica***
   First tentacular segment dorsally reduced; dorsal cirri distally pointed ..... ***Sige orientalis*** ?
3. Five antennae present, nuchal papilla absent 4
   Four antennae present, nuchal papilla present 5
4. Dorsum with transverse dark pigmented bands ..... ***Eumida bifoliata***
   Dorsum with three longitudinal dark stripes ..... ***Eulalia myriacyclum***
5. Proboscis with proximal papillae in scattered arrangement; dorsal cirri kidney-shaped ..... ***Phyllodoce panamensis***
   Proboscis with proximal papillae in longitudinal rows; dorsal cirri longer than wide 6
6. Dorsal cirri dark red (even in preserved material) ..... ***Anaitides erythrophyllus***
   Dorsal cirri colorless or greenish to tan-colored 7
7. Body colorless or white with colorless dorsal cirri ..... ***Anaitides madeirensis***
   Body tan colored with tan-colored or greenish dorsal cirri ..... ***Anaitides lamellifera***

Anaitides erythrophyllus (Schmarda, 1861)

Lepadorhynchus erythrophyllus Schmarda, 1861:88, pl. 39: fig. 232.
Anaitides erythrophyllus (Schmarda).—Hartman, 1951:33.
Phyllodoce oculata Ehlers, 1887:135–140, pl. 40: figs. 4–6.

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (1).

REMARKS.—The present specimen agrees well with *A. erythrophyllus* as described by Ehlers (1887). The dorsal cirri are rather distinctly pointed, and the eyes are very large in the prostomium. The identification cannot be considered certain, since the separation of the many species of *Anaitides* must be considered doubtful at the present time.

Anaitides erythrophyllus is apparently limited to the warmer parts of the western Atlantic Ocean.

Anaitides lamellifera (Pallas, 1788)

Nereis lamellifera Pallas, 1788:232.
Phyllodoce (Anaitides) lamellifera (Pallas).—Monro, 1933a:22–24, fig. 10.

MATERIAL EXAMINED.—Taboga Island, from float at the stage at the end of the hotel pier (7); ? Coiba Island, dredging off the convict settlement in 5 fm, smooth bottom with branched *Lithothamnion* (3); all coll. Crossland.

REMARKS.—As indicated by Monro, this species

is difficult to separate from *A. madeirensis*. The specimens agree with the species as described and illustrated by Monro. The lower edge of the dorsal cirri is evenly rounded. The specimens from Coiba Island were not reported by Monro; they are small, and in relatively poor condition. The identification is not considered certain.

Anaitides lamellifera is apparently widespread in warm waters; it may be circumtropical.

Anaitides madeirensis (Langerhans, 1880)

Phyllodoce (Anaitis) madeirensis Langerhans, 1880:307–308, fig. 44a,b.—Monro, 1933a:21–22.
Anaitides madeirensis (Langerhans).—Hartman, 1968:231–232, 3 figs. [unnumbered].

MATERIAL EXAMINED.—Gorgona Island, from coral (15); Taboga Island from floats at the end of the stage of the hotel pier (3); Taboga Island, from broken branches of coral (1); Balboa, scraped off buoy brought in from the canal entrance (1); all coll. Crossland.

REMARKS.—*Anaitides madeirensis* is here accepted as having pointed dorsal cirri and the ventral cirri projecting beyond the tip of the acicular lobe. There are no setae in the third tentacular segment. The proboscis has 12 rows of papillae, and there should be less than 12 papillae in each row. The specimens are always pale when preserved and apparently have little color in life. Monro (1933a: 22) remarked that he could not find any differences, except for the presence of setae in the third tentacular segment, between this species and *A. medipapillata* Moore; an additional difference lies in the fact that the latter species is usually very dark purplish brown in life and when freshly preserved.

Anaitides madeirensis is considered widely distributed in warm waters.

Anaitides species indeterminate

MATERIAL EXAMINED.—Paitilla Beach, Hydroid Zone (3).

REMARKS.—The present specimens are incomplete posteriorly, and most of the tentacular cirri and dorsal cirri have been lost. The eyes are relatively small and the dorsal cirri are distally bluntly rounded.

Eteone species indeterminate

MATERIAL EXAMINED.—Paitilla Beach, Hydroid Zone (3). Coiba Island, dredging off the convict settlement in 5 fm, smooth bottom with branched *Lithothamnion* (1), coll. Crossland.

REMARKS.—One of the specimens has been dried out; the others are either too incomplete or poorly preserved to allow further identification. The specimen from Coiba Island was not reported by Monro (1933a).

Eulalia myriacyclum (Schmarda, 1861)

Notophyllum myriacyclum Schmarda, 1861:87, pl. 29: fig. 233.
Eulalia myriacyclum (Schmarda).—Hartman, 1944a:16.

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (3).

REMARKS.—*Eulalia myriacyclum* has a yellow or orange base color with dark brown or black longitudinal stripes covering the whole body. It has yet to be reported from the eastern Pacific Ocean.

Eulalia species indeterminate

Eulalia species.—Monro, 1933a:21.

MATERIAL EXAMINED.—Paitilla Beach, Hydroid Zone (3); Paitilla Beach, *Tetraclita* Zone (11). Taboga Island, from floats at the stage at the end of the hotel pier (2), coll. Crossland.

REMARKS.—The present specimens fit rather well with *E. viridis* as suggested by Monro, but differ in color patterns and in that the enlarged terminal tooth on the setal shafts is considerably smaller than in that species. The specimens do not seem to belong to any species reported from the tropical western Atlantic nor from the eastern Pacific.

Eumida bifoliata (Moore, 1909)

FIGURE 5*a*

Eulalia (Sige) bifoliata Moore, 1909b:349–350, pl. 16: figs. 31–34.
Eumida bifoliata (Moore).—Hartman, 1968:271–272, 2 figs. [unnumbered].

MATERIAL EXAMINED.—Paitilla Beach, Hydroid Zone (1).

REMARKS.—The present specimen agrees with *E. bifoliata* as this species was originally described.

They share the same color pattern and the presence of two dark crescents posterior to the paired eyes on the prostomium.

The structure of the parapodia is different; the present specimen is posteriorly incomplete with about 25 setigers. The neuropodial acicular lobes (Figure 3*a*) are distally equally bifid rather than unequal as described, and the ventral cirrus is distally rounded rather than pointed. These differences may be related to the size of the specimen or to the incompleteness of the fragment.

Eumida bifoliata is known from central and southern California in shallow water. The present record is from the eastern Pacific side of the Isthmus of Panama.

Phyllodoce panamensis Treadwell, 1917

Phyllodoce panamensis Treadwell, 1917b:428–430, figs. 1, 2.
Phyllodoce (Anaitides) panamensis Treadwell.—Monro, 1933a:24–25, fig. 11.
Anaitides panamensis (Treadwell).—Hartman, 1956:260.

MATERIAL EXAMINED.—Paitilla Beach, Hydroid Zone (14); Paitilla Beach, *Tetraclita* Zone, partially in the parietal canals in dead *Tetraclita* (3). St. Elmo Bay, Perlas Islands, east side of the bay, 6–9 fm, shell and sand (3), coll. Crossland.

REMARKS.—*Phyllodoce panamensis* is a true *Phyllodoce* in that the papillae on the proximal part of the proboscis are in a scattered arrangement rather than in rows as in *Anaitides*. The species

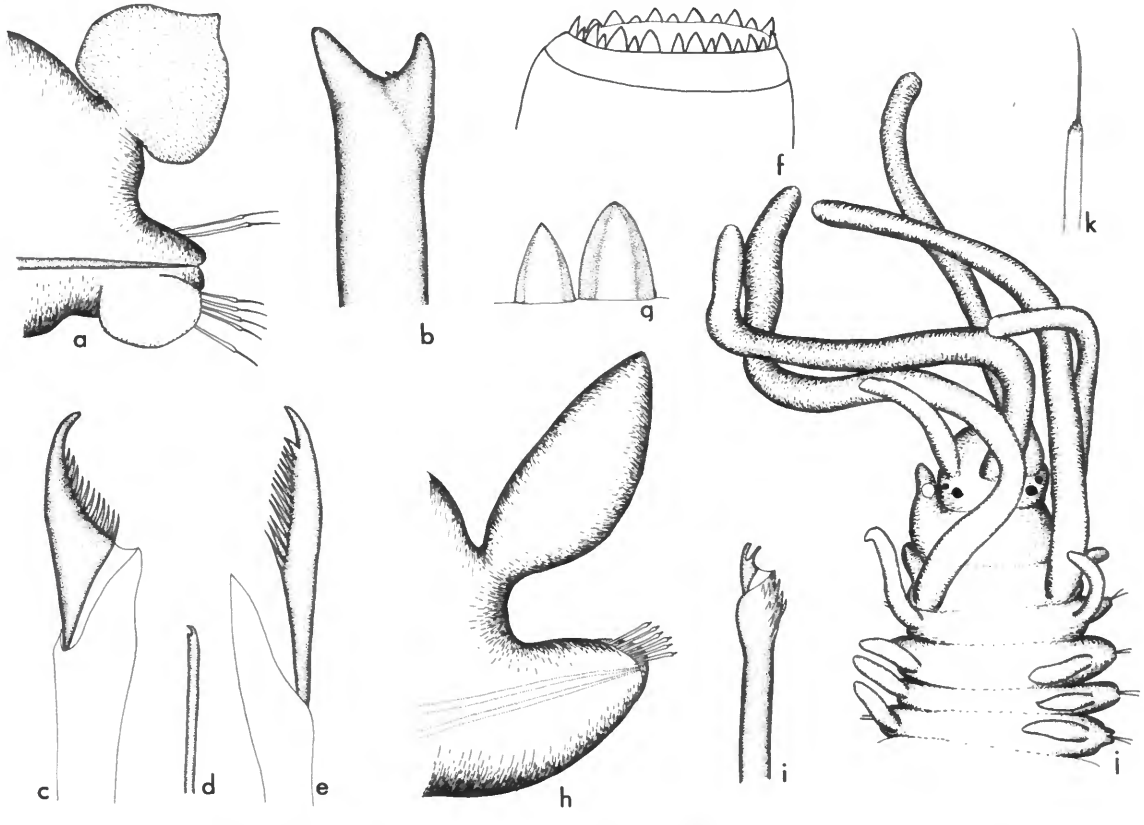

FIGURE 3.—*Eumida bifoliata* (Moore): *a*, parapodium 22, posterior view, × 95. *Syllis gracilis* Grube: *b*, median seta, median setiger, × 770. *Opisthosyllis brunnea* Langerhans: *c*, median seta, median setiger, × 950. *Typosyllis caeca* (Monro): *d*, simple seta, posterior setiger, × 700. *Typosyllis prolifera?* (Krohn): *e*, median seta, median setiger, × 950. *Autolytus anoplos* Monro: *f*, anterior margin of pharynx, × 160; *g*, two teeth from pharynx, × 385; *h*, median parapodium, anterior view, × 95; *i*, median seta, median setiger, × 950; *j*, anterior end, dorsal view, × 50; *k*, simple seta, posterior setiger, × 950.

superfically resembles members of the genus *Notophyllum* in that the large, kidney-shaped dorsal cirri are imbricated on the back. Treadwell's, Monro's and Hartman's descriptions of this species do not make clear that only one species is involved in the present concept; however, all material cited above belongs to one and the same species.

Phyllodoce panamensis is known exclusively from the Pacific coast of Panama.

Sige orientalis? Imajima and Hartman, 1964

Sige macroceros orientalis Imajima and Hartman, 1964:70, pl. 14c–f.

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (1).

REMARKS.—The present specimen agrees with *Sige* in that it has the strongly foliose, asymmetrical ventral tentacular cirrus. It resembles *S. orientalis* in that it lacks setae in the second tentacular segment. Dorsal cirri are only present in far posterior segments so the identification is considered doubtful since the shape of the dorsal cirri is known to vary along the body.

Sige orientalis is known only from intertidal areas in northern Japan.

Steggoa lobocephalica (Kinberg, 1866)

Eulalia lobocephalica Kinberg, 1866b:241.—Monro, 1933a:20, fig. 9 [not *E. lobocephala* Schmarda, 1861].

Steggoa lobocephalica (Kinberg).—Hartman, 1948:48, pl. 7: figs. 2–3.

MATERIAL EXAMINED.—Taboga Island, from branches of dead coral (12), coll. Crossland.

REMARKS.—These specimens are as described by Monro and Hartman. The dorsal cirri are basally truncate, so that the total shape of the dorsal cirri is narrowly triangular; they are held erect over the body in the best preserved specimens.

Steggoa lobocephalica is known from the eastern Pacific Ocean from Chile and Peru to Panama in shallow water.

Family HESIONIDAE

Key to the Species from Panama

1. Two antennae; palps absent 2
   Three antennae; palps present 3
2. Dorsum light tan with brown longitudinal stripes ..... ***Hesione intertexta***
   Dorsum dark brownish with light transverse stripes ..... ***Hesione picta***
3. Both parapodial rami well developed; 8 pairs of tentacular cirri ..... ***Gyptis*** sp. indet.
   Notopodia reduced; 6 pairs of tentacular cirri 4
4. Digitiform postsetal neuropodial lobe project beyond the other parapodial lobes in median setigers ..... ***Ophiodromus obscurus***
   All parapodial lobes of the same length ..... ***Ophiodromus pugettensis***

Gyptis species indeterminate

Harmothoe lunulata var. *pacifica* Monro, 1928b:559–560 [in part].

MATERIAL EXAMINED.—Taboga Island, 4–5 fm, sand and stone (1), coll. Mortensen.

REMARKS.—This specimen is an unidentifiable species of *Gyptis*. The specimen reported by Monro from the Galapagos Islands can be assumed to belong to a species of *Harmothoe*.

Hesione intertexta Grube, 1878

Hesione intertexta Grube, 1878:102–103, pl. 6: fig. 5.—Monro, 1933a:26.

MATERIAL EXAMINED.—Balboa, pools at the lowest tide levels (1), coll. Crossland.

REMARKS.— Even in preserved specimens, *H. intertexta* has distinct brown longitudinal lines on the pale dorsum. It is known from the Pacific and Indian Oceans in warm waters.

Hesione picta Müller, 1858

Hesione picta F. Müller, 1858:213–214, pl. 6: fig. 3.—Hartman, 1951:35.—Jones, 1962:180.

MATERIAL EXAMINED.—Galeta Reef, *Acanthophora* Zone (2); Galeta Reef, Coralline Zone (1).

REMARKS.—The complex synonymy of this species

has been worked out and is cited in the works indicated above. The species is best characterized by its color pattern; even in preserved specimens, the pattern is dark with series of light transverse stripes scattered irregularly along the length of the body.

Hesione picta is known from Florida to Brazil in the western Atlantic Ocean.

Ophiodromus obscurus (Verrill, 1873)

Podarke obscura Verrill, 1873:589–590, pl. 12: fig. 61.—Pettibone, 1963:104–105, fig. 28a,b.
Podarke near *guanica*.—Hartman, 1951:36, pl. 10: figs. 1–3.

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (2).

REMARKS.—*Ophiodromus obscurus* resembles *O. pugettensis* closely, but can be separated from it on the presence of a digitiform postsetal lobe in median setigers in *O. obscurus;* this lobe projects clearly beyond all other parapodial lobes. All parapodial lobes are of the same length in *O. pugettensis.*

Ophiodromus obscurus is known from the western Atlantic Ocean from New England to the Caribbean region and Gulf of Mexico.

Ophiodromus pugettensis (Johnson, 1901)

Podarke pugettensis Johnson, 1901:397–398, pl. 3: figs. 23–35.
Ophiodromus pugettensis (Johnson).—Hartman, 1968:369–370, 3 figs. [unnumbered].

MATERIAL EXAMINED.—Paitilla Beach, Hydroid Zone (1).

REMARKS.—*Ophiodromus pugettensis* can be separated from the rather similar east coast species of the genus as indicated above. It is previously known from Washington to western Mexico in the eastern Pacific Ocean, but this record of the species is the first from typical tropical waters.

Family PILARGIIDAE

Synelmis albini (Langerhans, 1881)

Ancistrosyllis Albini Langerhans, 1881:107.
Synelmis albini (Langerhans).—Pettibone, 1966:191–195, figs. 19–21.
Ancistrosyllis gorgonensis Monro, 1933a:26–18, fig. 12.

MATERIAL EXAMINED.—Gorgona Island, dredged close to shore, 15 fm, shell, dead coral and gravel (1, holotype, *A. gorgonensis,* BMNH); Gorgona Island, from coral (1); both coll. Crossland, det. Monro.

REMARKS.—The present specimens agree with *S. albini* as this species was defined by Pettibone (1966) who first suggested the synonymy of *A. gorgonensis* with *S. albini.* Considerable variation appears in the species, and a complete revision of large materials from worldwide areas should be undertaken in order to elucidate the variability.

As presently defined, *S. albini* is circumtropical.

Family SYLLIDAE

Key to the Species from Panama

1. Ventral cirri absent 2
   Ventral cirri present 4
2. Body yellow with dark purplish brown markings ..... ***Autolytus anoplos***
   Body pale yellow or pinkish with no distinct color markings 3
3. Distal tooth longer than the subdistal tooth in the composite setae ..... ***Autolytus*** cf. ***magnus***
   Distal tooth distinctly shorter than the subdistal one in the composite setae ..... ***Autolytus*** sp. indet.
4. Dorsal cirri distinctly articulated 5
   Dorsal cirri smooth or irregularly wrinkled 16
5. Body dorsoventrally flattened; pharynx with a trepan ..... ***Trypanosyllis (Trypanedenta) taeniaformis***
   Body cylindrical; pharynx with a single tooth 6
6. Pharynx with a middorsal tooth in posterior position ..... ***Opisthosyllis brunnea***
   Pharynx with a middorsal tooth in anterior positions 7
7. All setae thick and simple ..... ***Haplosyllis spongicola***
   At least some setae composite 8

8. Simple and composite setae mixed in most segments ..... ***Syllis gracilis***
   Simple setae present singly in posterior parapodia only 9
9. Composite setae include both spinigers and falcigers 10
   All composite setae falcigers 11
10. Large composite setae unidentate; median antenna posterior to the eyes ..... ***Langerhansia mexicana***
   Large composite setae bidentate; median antenna between the eyes ... ***Langerhansia cornuta***
11. Dorsal cirri with less than 20 articles 12
   Dorsal cirri with more than 20 articles 13
12. Dorsum with transverse broad pigment band on every few segments ..... ***Typosyllis hyalina***
   Two narrow dark lines across each segment dorsally ..... ***Typosyllis aciculata***
13. Dorsum with solid color, without distinct markings 14
   Dorsum with pattern of transverse dark lines 15
14. Dorsum white, eyes absent ..... ***Typosyllis caeca***
   Dorsum brownish purple, eyes present ..... ***Typosyllis prolifera?***
15. Enlarged appendages on some composite setae in median setigers; 2 regular transverse lines across dorsum of each segment ..... ***Typosyllis fuscosuturata***
   All composite setae with appendages of similar size; each segment with a series of irregular transverse markings on the dorsum ..... ***Typosyllis variegata***
16. Prostomium covered posteriorly by a nuchal flap 17
   Prostomium without a nuchal flap ..... ***Pionosyllis*** sp. indet.
17. Pharynx with 14 teeth ..... ***Odontosyllis*** sp. indet.
   Pharynx with 6 teeth ..... ***Odontosyllis polycera***

Autolytus anoplos Monro, 1933

FIGURE 3*f–k*

Autolytus anoplos Monro, 1933a:38–39, fig. 18.

MATERAL EXAMINED.—Galeta Reef, Coralline Zone (18); Galeta Reef, *Laurencia* Zone (2). Limón Bay, from wreck covered with sponges, *Balanus*, etc. (7, syntypes, BMNH), coll. Crossland.

REMARKS.—A somewhat expanded description of the species is given below based on the new material recorded above. The main differences between this material and the species as described by Monro are in details in the color pattern and in the somewhat different length of the anterior appendages.

A complete specimen with 125 setigers is 25 mm long and 0.5 mm wide. It is cream-colored with a single dark brown bar at the posterior margin of each segment. All dorsal cirri are dark brown except those in the first three setigers, which are cream-colored. Two pairs of lensed eyes are present. The body is ventrally flattened and evenly wide with abruptly tapering anterior and posterior ends.

The prostomium (Figure 3*j*) is twice as wide as long and has two pairs of eyes at the posterolateral half. The two short lateral antennae are slender; the median antenna is more than twice as long as the lateral ones and considerably stouter. All antennae are smooth. The peristomium is a little longer than the prostomium and has a pair of slender, relatively short peristomial cirri. The palps are as long as the prostomium and are free to the base. They project ventrally. The first dorsal cirri are very long and terete; each is about as long as the median antenna, resembling the latter also in structure and shape. The dorsal cirri of the second setiger are considerably shorter and more slender, but are longer and stouter than those in the more posterior setigers.

All parapodia posterior to setiger 3 resemble each other. Each has a bluntly conical acicular lobe (Figure 3*h*) and a poorly developed, low presetal lobe; postsetal lobes are absent. Ventral cirri are absent; each dorsal cirrus is short and fusiform.

Composite setae (Figure 3*i*) with short, deeply bifid appendages are present in all setigers; the basal part of the appendages is somewhat slenderer than the distal part. The shaft is strongly dentate. Each posterior setiger also contains a single bayonet-seta (Figure 3*k*); each has a thickened shaft, which is distally strongly dentate, and a mucron, which is slender and finely tapering.

The proboscis has a trepan (Figure 3*f*) with 25 teeth. The teeth alternate regularly between two sizes; both kinds have a median ridge and narrowed wings. The one kind is about one-fourth smaller than the other (Figure 3*g*).

The genus *Autolytus* was reviewed for the

Japanese fauna by Imajima (1966a) who subdivided the genus into two, based on the distribution and numbers of teeth in the trepan. The subgenus *Regulatus* should have teeth in groups of nine or multiples of nine; the subgenus *Autolytus* sensu stricto should have all other numbers of teeth. The teeth in *Regulatus* should alternate regularly between large and small; all teeth should be of approximately the same size in *Autolytus* sensu stricto.

The present species has 25 teeth in the trepan, thus not a multiple of nine; but the teeth alternate regularly between small and large. The species is, thus, intermediate between the two subgenera proposed by Imajima. The subdivision appears useful, and I do not suggest here that it should be rejected. The genus *Autolytus* sensu lato is large, and anything that can be used to subdivide it must be considered a help at the present stage of taxonomic knowledge. The scheme of subgenera in this genus may have to be extended to include other characters in addition to the structure of the trepan.

Autolytus anoplos resembles *A. magnus* Berkeley (see below) in the structure of the parapodia and the composite setae; it differs from the latter in that it has only 25 teeth in the trepan; *A. magnus* has nearly twice that number. The bayonet setae have a very short dentate region in *A. anoplos* and a somewhat longer spinose region in *A. magnus*. Other similar species include *A. irregularis* and *A. spinoculatus* both described by Imajima (1966a) from Japanese waters. *Autolytus anoplos* differs from both of these in the color pattern and in the number and structure of the teeth on the trepan.

Autolytus anoplos is known from two areas near Colón, Panama.

Autolytus cf. *magnus* Berkeley, 1923

Autolytus magnus Berkeley, 1923:210, pl. 1: figs. 3–4.—Imajima, 1966a:40–46, figs. 9a–f, 10a–f, 11a–d.

MATERIAL EXAMINED.—Paitilla Beach, *Tetraclita* Zone (4).

REMARKS.—The present four specimens fit very well with *A. magnus* as redescribed by Imajima (1966a) in the numbers of the teeth in the trepan and the shape of the teeth. The structure of the composite setae is also similar. The present specimens, however, have considerably shorter nuchal epaulettes, and the tentacular cirri are considerably shorter than shown by Imajima (1966a, fig. 9a). All present specimens are atokous.

Autolytus magnus is known from Japan and from western Canada; it has not been reported from California.

Autolytus species indeterminate

Autolytus sp.—Monro, 1933a:39–41, fig. 17.

MATERIAL EXAMINED.—Balboa, from buoy brought in from the canal entrance (1); Coiba Island, dredging off the convict settlement in 5 fm, smooth bottom with branching *Lithothamnion* (1); both coll. Crossland.

REMARKS.—Monro gave a rather detailed description of the specimen from Balboa. Nothing can presently be added to the description since the specimen is in a rather bad state of preservation. The identity cannot be further clarified. The specimen from Coiba Island is incomplete and badly preserved.

Haplosyllis spongicola (Grube, 1855)

Syllis spongicola Grube, 1855:104–105.
Haplosyllis spongicola (Grube).—Imajima, 1966c:220–221, fig. 38a–h.—Hartman, 1968:433–434, 4 figs. [unnumbered].

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (2); Paitilla Beach, *Tetraclita* Zone (2).

REMARKS.—The present specimens have simple, distally bifid setae with a subdistal boss; the body is relatively stout and the antennae and tentacular cirri are strongly beaded.

Haplosyllis spongicola is considered more or less cosmopolitan in warmer waters; it is usually associated with sponges (Monro, 1933a:34; Day, 1973:29).

Langerhansia cornuta (Rathke, 1843)

Syllis cornuta Rathke, 1843:164.
Syllis (Ehlersia) cornuta Rathke.—Fauvel, 1923:267–268, fig. 100g–i.—Monro, 1933a:34.
Langerhansia cornuta (Rathke).—Imajima, 1966d:256–259, fig. 51.

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (4). Taboga Island, from under the floating stage of the hotel pier (1) and from broken branches of dead coral, 1–2 fm (5); Gorgona Island, 15 fm,

shell, gravel and dead coral (26); all coll. Crossland.

REMARKS.—The present specimens fit very well with *L. cornuta* as described by Fauvel (1923) and Imajima (1966d). The species is distinguished from the similar *L. mexicana* below. *Langerhansia cornuta* is known from world-wide areas.

Langerhansia mexicana (Rioja, 1961), new combination

Ehlersia mexicana Rioja, 1961:291–295, figs. 4–11.

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (1).

REMARKS.—*Langerhansia mexicana* can be separated from the closely similar *L. cornuta* on the position of the median antenna, which is posterior to the eyes in the former and between the posterior eyes in the latter. Rioja (1961:295) indicated that the larger composite setae should be bifid in *L. cornuta* and unidentate in *L. mexicana;* this also is the case in the present specimen.

Langerhansia mexicana is known from the east coast of Mexico and possibly from Florida. Rioja (1961) indicated that he thought the material reported as *L. cornuta* by Hartman (1951) from Florida might belong to this species. The present record is from the Atlantic side of Panama.

Odontosyllis polycera (Schmarda, 1861)

Syllis polycera Schmarda, 1861:72, pl. 28: fig. 219.
Odontosyllis polycera (Schmarda).—Monro, 1933a:36–37, fig. 15.

MATERIAL EXAMINED.—Balboa, low tide at Panama (19), coll. Crossland.

REMARKS.—*Odontosyllis polycera* was redescribed by Monro (1933a) based on the specimens listed above. They are as described. The species is known from warm temperate and tropical waters in the Atlantic and Pacific Oceans.

Odontosyllis species indeterminate

MATERIAL EXAMINED.—Paitilla Beach, Hydroid Zone (1).

REMARKS.—The present specimen agrees with *Odontosyllis* in that it has short, smooth dorsal cirri and series of recurved pharyngeal teeth. The number of teeth, 14, is higher than in any species described in the genus. Setae are distally bidentate. The specimen cannot be further described since it is rather badly preserved.

Opisthosyllis brunnea Langerhans, 1879

FIGURE 3*c*

Opisthosyllis brunnea Langerhans, 1879:541–543, pl. 31: fig. 7.—Imajima, 1966c:230–233, fig. 42a–n.

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (3); Galeta Reef, *Laurencia* Zone (73); Galeta Reef, *Thalassia* Zone (11); Paitilla Beach, *Balanus* Zone (5); Paitilla Beach, Hydroid Zone (21); Paitilla Beach, *Tetraclita* Zone (7).

REMARKS.—The present specimen agrees with *O. brunnea* as originally described and as reviewed by Imajima (1966c). The only difference noted is that the serrations along the cutting edges of the composite setae (Figure 3*c*) appear to be somewhat finer than indicated by Imajima (1966c, fig. 42e–h). This difference is not considered critical.

Opisthosyllis brunnea was described from Madeira in intertidal areas and has since been reported from one locality in Japan. The species appears to be one of the most common syllids in all intertidal areas in Panama, both on the Atlantic and Pacific sides of the Isthmus.

Pionosyllis species indeterminate

MATERIAL EXAMINED.—Galeta Reef, *Acanthophora* Zone (1).

REMARKS.—The present specimen is incomplete. The proboscis is everted. The setae include composite smooth-edged spinigers and composite falcigers with distally expanded, blade-like appendages. It resembles *P. uraja* Imajima (1966b:114–116, fig. 37a–g) from Japan, but is too poorly preserved to be completely identified.

Syllis gracilis Grube, 1840

FIGURE 3*b*

Syllis gracilis Grube, 1840:77.—Fauvel, 1923:259, fig. 96f–i.—Monro, 1933a:30.—Imajima, 1966c:248–250, fig. 49a–k.—Hartman, 1968:463–464, 4 figs. [unnumbered].
Syllis longissima.—Monro, 1933a:30 [not Gravier, 1900].

MATERIAL EXAMINED.—Paitilla Beach, Hydroid Zone (2); Paitilla Beach, *Tetraclita* Zone (15).

Taboga Island, from broken branches of dead coral 1–2 fm (36), from under the floating pier of the hotel pier (3), and obtained by breaking up beach sandstones (2); Gorgona Island, shell, gravel, and dead coral, 15 fm (3); Balboa Docks, off piles and large sponges growing in the shade of the quays (12) and from pile scrapings (1); Colon (1); all coll. Crossland.

REMARKS.—*Syllis gracilis* is very widespread in warm waters. The present specimens differ in no manner from the species as described by the authors cited above. *Syllis longissima* Gravier has unidentate compound setae; the material reported as *S. longissima from* Balboa by Monro (1933a:30) have bidentate setae. *Syllis gracilis* has short dorsal cirri with 8–10 articles in median setigers. *Syllis longissima* has alternating long and slightly shorter dorsal cirri with 8–10 and 12–15 articles, respectively. The large setae in median setigers are characteristic (Figure 3*b*).

All of the above records, except the one from Colon, are from the Pacific side of the Isthmus of Panama. This fact is probably more due to the kinds of environment sampled on the two sides than to a distributional difference between the two oceans.

Trypanosyllis (Trypanedenta) taeniaeformis (Haswell, 1886)

Syllis taeniaeformis Haswell, 1886:741.
Trypanosyllis taeniaeformis (Haswell).—Monro, 1933a:35–36.
Trypanosyllis (Trypanedenta) taeniaeformis (Haswell).—Imajima, 1966c:239–241, fig. 45.

MATERIAL EXAMINED.—Gorgona Island, dredging close to shore, 15 fm, gravel, shell, dead coral (27), coll. Crossland.

REMARKS.—The present specimens agree with this species as reviewed by Imajima (1966c).

Trypanosyllis taeniaformis is known from warm water shallow areas in the Pacific and Indian Oceans.

Typosyllis aciculata Treadwell, 1945

Typosyllis aciculata Treadwell, 1945:1–2, figs. 1–5.—Reish, 1950:1–5, 8 figs. [unnumbered].—Hartman, 1968:475–476, 7 figs. [unnumbered].

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (2); Paitilla Beach, Hydroid Zone (1); Paitilla Beach, *Tetraclita* Zone (1). Coiba Island, dredging off the convict settlement, 5 fm, smooth bottom with branched *Lithothamnion* (1), coll. Crossland.

REMARKS.—*Typosyllis aciculata* is known from southern and central California. The present records come from both sides of the Isthmus of Panama. The specimens were compared to material from southern California and no differences could be noted. *Typosyllis aciculata* is differentiated from similar species in the area as indicated in the key.

Typosyllis caeca (Monro, 1933), new combination

FIGURE 3*d*

Syllis caeca Monro, 1933a:30–32, fig. 13.

MATERIAL EXAMINED.—Taboga Island, from floats at the stage at the end of the hotel pier (5, syntypes, BMNH), coll. Crossland.

REMARKS.—This species belongs to *Typosyllis* in that it has a single, simple bidentate seta (Figure 3*k*) in each of a few of the posterior setigers; in most specimens, they are most easily seen in setigers 7 or 8 from the posterior end. *Typosyllis caeca* resembles *T. variegata* (Grube) in setal structures as indicated by Monro (1933a:32) but differs clearly in that *T. caeca* is white without any color pattern, while *T. variegata* has series of transverse stripes.

Typosyllis caeca is known only from its original record.

Typosyllis fuscosuturata (Augener, 1922)

Syllis (Typosyllis) fuscosuturata Augener, 1922:43–44; 1927:52.
Syllis fuscosuturata Augener.—Monro, 1933a:32–34, fig. 14.

MATERIAL EXAMINED.—Galeta Reef, *Acanthophora* Zone (1); Galeta Reef, *Laurencia* Zone (3). Taboga Island, from broken branches of dead coral, 1–2 fm (1); Gorgona Island, 15 fm, shell, gravel and dead coral (2) and from coral (1); all coll. Crossland.

REMARKS.—This species is characterized by the enlarged hooks in median setigers. Other species of the genus that have similar hooks include *T. excilis* Gravier (1900) and *T. maculata* (Imajima, 1966d:277–279, fig. 59). *Typosyllis fuscosuturata* has two brown transverse lines on each segment. *Typosyllis maculata* has no color markings on the body proper but has dark dots on the dorsal cirri. *Typosyllis excilis* lacks color patterns.

Typosyllis fuscosuturata is known from the Caribbean Sea and the west Indies in addition to areas in the eastern Pacific Ocean in warm waters.

Typosyllis hyalina (Grube, 1863)

Syllis hyalina Grube, 1863:45–46, pl. 4: fig. 7.—Monro, 1933a:30.
Typosyllis hyalina (Grube).—Imajima, 1966d:271–273, fig. 57.

MATERIAL EXAMINED.—Gorgona Island, 15 fm, shell, gravel and dead coral (1); Taboga Island, from under the floating stage of the hotel pier (1); both coll. Crossland.

REMARKS.—The present specimens fit very well with the species as redescribed from Japan by Imajima (1966d); it is known from worldwide areas.

Typosyllis prolifera? (Krohn, 1852)

Syllis prolifera Krohn, 1852:66.
Syllis (Typosyllis) prolifera Krohn.—Fauvel, 1923:261–262, fig. 97a–g.
Typosyllis prolifera (Krohn).—Imajima, 1966d:292–294, fig. 651a–n.

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (1).

REMARKS.—The present specimens agree with *T. prolifera?* except that the appendage of the composite setae (Figure 3*e*) is somewhat smaller than as illustrated and the inferior tooth is smaller and does not project at as great an angle from the axis of the appendage.

Typosyllis prolifera has a reported circumtropical distribution.

Typosyllis variegata (Grube, 1860)

Syllis variegata Grube, 1860:85–87, pl. 3: fig. 6.—Monro, 1933a:28–29.
Syllis (Typosyllis) variegata Grube.—Fauvel, 1923:262, fig. 97h–n.
Typosyllis variegata (Grube).—Imajima, 1966d:292.—Hartman, 1968:495–496, 5 figs. [unnumbered].

MATERIAL EXAMINED.—Galeta Reef, *Acanthophora* Zone (1); Galeta Reef, Coralline Zone (13); Galeta Reef, *Laurencia* Zone (52); Paitilla Beach, Hydroid Zone (1); Paitilla Beach, *Tetraclita* Zone (5). Taboga Island, from floating stage at the end of the hotel pier (2); Balboa Docks, scrapings from piles under the shade of quays (2); Balboa, rocks and rock-pools at low tide (2); all coll. Crossland.

REMARKS.—The subdistal tooth of the composite setae is at a slightly greater angle than usual in this species; otherwise the specimens fit very well with the species as reported from other areas. The dorsal color pattern consists of fine dark brown or purplish bands on each segment.

Typosyllis variegata is cosmopolitan in algal zones intertidally.

Syllidae, Unidentifiable Fragments

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (fragments and poorly preserved specimens); Paitilla Beach, Hydroid Zone (8, all epitokes in bad condition); Paitilla Beach, *Tetraclita* Zone (posterior end).

Family NEREIDAE

Key to the Species from Panama

1. Eversible proboscis with soft papillae only ..... ***Ceratocephala crosslandi***
   Eversible proboscis without soft papillae, but with paragnaths at least on some areas 2
2. Paragnaths present on both rings of the proboscis 5
   Paragnaths present either on the maxillary ring or the oral ring, but never on both 3
3. Paragnaths present on oral ring only ..... ***Eunereis paitillae***, new species
   Paragnaths present on maxillary ring only 4
4. Bidentate notopodial falcigers in median and posterior setigers ..... ***Ceratonereis mirabilis***
   No bidentate falcigers in any notopodia ..... ***Ceratonereis irritabilis***
5. All paragnaths of the same shape, pointed and conical 6
   At least 2 different kinds of paragnaths present 11
6. Median and posterior notopodia with homogomph falcigers 7
   Homogomph falcigers absent 9

7. Appendages of homogomph falcigers bi- or trifid ..... ***Nereis panamensis***, new species
   Appendages of homogomph falcigers unidentate 8
8. Appendage of homo- and heterogomph falcigers recurved ..... ***Nereis riisei***
   Appendage of homo- and heterogomph falcigers ankylosed ..... ***Nereis callaona***
9. Notopodial lobe similar in length to all other parapodial lobes in all setigers ..... ***Neanthes galetae***, new species
   Notopodial lobes distinctly longer than all other lobes in posterior setigers 10
10. Neuropodial falcigers with ankylosed appendages; superior notopodial lobe strongly foliose ..... ***Neanthes succinea***
    Neuropodial falcigers with recurved appendages; superior notopodial lobes narrow in all setigers ..... ***Neanthes pseudonoodti***, new species
11. Transverse and conical paragnaths present ..... ***Perinereis anderssoni***
    Pectinate, transverse, and conical paragnaths present 12
12. Area VI with transverse paragnaths 13
    Area VI with 1 or 2 rows of small paragnaths ..... ***Platynereis dumerilii***
13. Dorsal cirrus in posterior parapodia attached distally on the superior notopodial lobe; areas VII and VIII with a single row of alternating small and large paragnaths ..... ***Pseudonereis gallapagensis***
    Dorsal cirrus in posterior parapodia attached subdistally on the superior notopodial lobes; areas VII and VIII with paragnaths in 2 or 3 rows ..... ***Pseudonereis variegata***

Ceratocephala crosslandi (Monro, 1933)

Chaunorhynchus crosslandi Monro, 1933a:46–49, fig. 20.
Ceratocephala crosslandi (Monro).—Hartman, 1952:15.

MATERIAL EXAMINED.—Gorgona Island, dredging in 30 fm, muddy sand and shell-fragments (1, holotype, BMNH), coll. Crossland.

REMARKS.—The type is as described and illustrated by Monro. It closely resembles the subspecies *C. crosslandi americana* Hartman (1952) from southern California; the two may not be separable.

Ceratocephala crosslandi is known from the eastern Pacific Ocean from Panama to Washington.

Ceratonereis irritabilis (Webster, 1879)

Nereis irritabilis Webster, 1879:231–234, pl. 5: figs. 56–64, pl. 6: figs. 65–69.
Ceratonereis irritabilis (Webster).—Hartman, 1945:20–21, pl. 3: figs. 7–9; 1951:48.
Ceratonereis versipedata.—Monro, 1933a:45–46, fig. 19 [not Ehlers, 1887].

MATERIAL EXAMINED.—Colón, from the outer piles of the quays at the docks (6), coll. Crossland.

REMARKS.—These specimens agree with *C. irritabilis* as this species was redescribed by Hartman (1945). Day (1973:38–39) has retained the separation between *C. versipedata* Ehlers (1887) and *C. irritabilis*. This separation may not be justifiable, but under any circumstances the present specimens belong to *C. irritabilis* as this species is presently defined. If the two species should be synonymous, Webster's name has priority.

Ceratonereis mirabilis Kinberg, 1866

FIGURE 4*a–c*

Ceratonereis mirabilis Kinberg, 1866a:170.—Hartman, 1948: 71–72.
Ceratonereis tentaculata Kinberg, 1866a:170.—Hartman, 1940a: 218, pl. 35: fig. 47.—Monro, 1933a:45.

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (2); Galeta Reef, *Laurencia* Zone (3); Galeta Reef, *Thalassia* Zone (69). Colón, from piles of the quays (1); Gorgona Island, from coral (1); both coll. Crossland.

REMARKS.—*Ceratonereis mirabilis* has usually a distinctly bifid prostomium with very long antennae and long, slender palps. The parapodia are short in all setigers, but the dorsal cirri are enormously prolonged in posterior setigers (Figure 4*a*). Notopodia have slightly heterogomph falcigers (Figure 4*b*) in median and posterior setigers; each appendage is slightly bifid and has a fringe of long, slender hairs along the cutting edge. Neuropodial falcigers are similar, but are more distinctly heterogomph (Figure 4*c*).

Ceratonereis mirabilis appears to be rather widespread in warm waters and may be circumtropical.

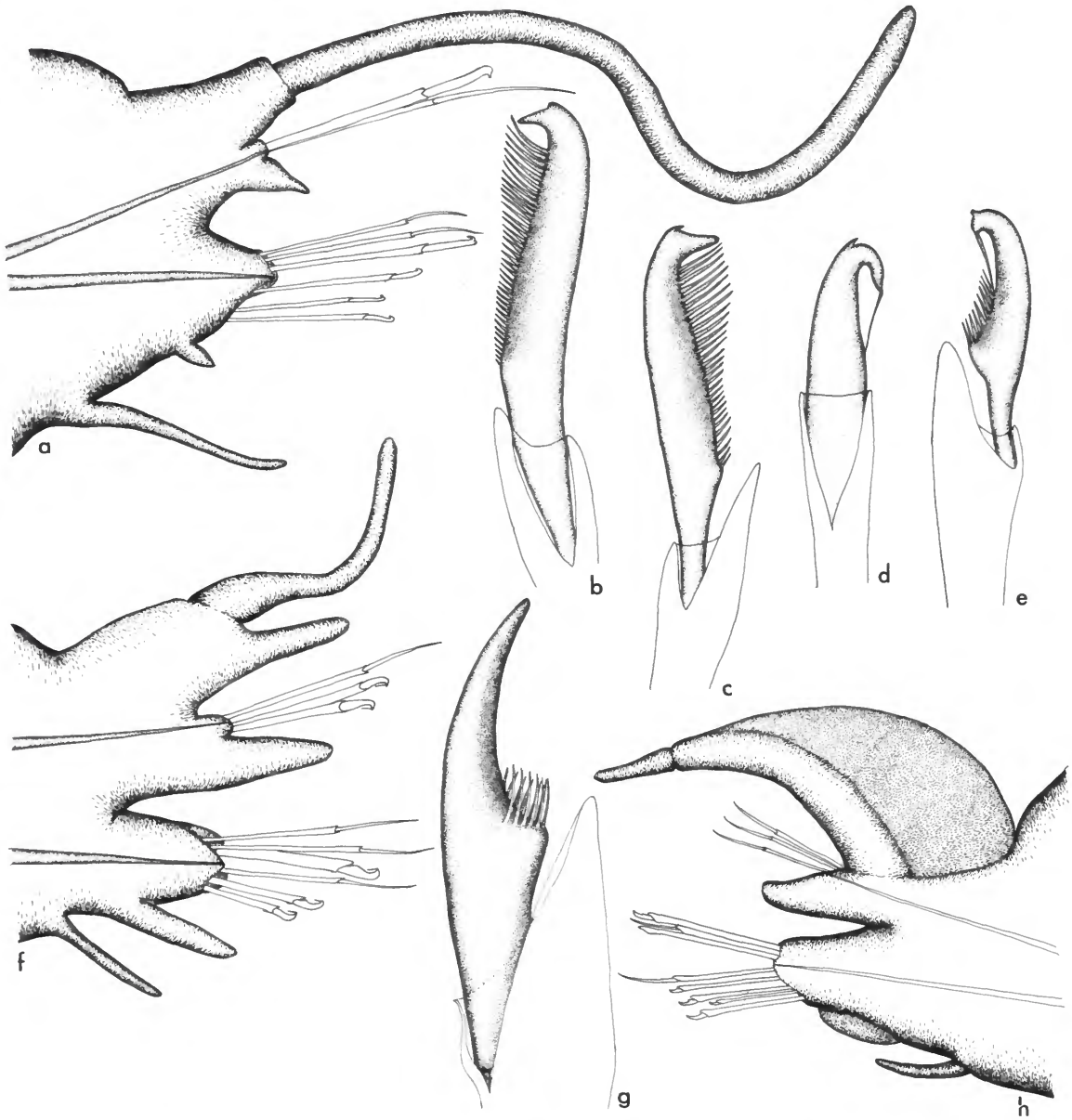

FIGURE 4.—*Ceratonereis mirabilis* Kinberg: *a*, far posterior parapodium, anterior view, × 160; *b*, notopodial falciger, posterior setiger, × 950; *c*, neuropodial falciger, posterior setiger, × 950. *Platynereis dumerilii* (Audouin and Milne Edwards): *d*, notopodial homogomph falciger, posterior setiger, × 950; *e*, neuropodial heterogomph falciger, posterior setiger, × 950; *f*, posterior parapodium, anterior view, × 160. *Pseudonereis gallapagensis* Kinberg: *g*, neuropodial heterogomph falciger, posterior setiger, × 950; *h*, posterior parapodium, anterior view, × 95.

Eunereis paitillae, new species

FIGURE 5

MATERIAL EXAMINED.—Paitilla Beach, Hydroid Zone (2, holotype, USNM 53086; paratype, USNM 53087).

DESCRIPTION.—The holotype is an incomplete specimen, 6 mm long and 1.2 mm wide without setae, with 32 setigers. Brown pigment spots are on the palpophores and laterally on the peristomium, as well as on the dorsolateral anterior margins of each of the first parapodia; otherwise the specimen is light yellow in color. The paratype has been dried out at one time.

The short prostomium (Figure 5*e*) is relatively wide. The palpophores are short; the long palpostyles are slender. The slender antennae do not reach beyond the tip of the palps.

The four pairs of tentacular cirri are slender; the anterior dorsal ones are the shortest and barely reach the posterior margin of the peristomium. The anterior ventral ones reach the posterior margin of the first setiger; the posterior dorsal ones reach the middle of the second setiger, and the longer posterior ventral ones reach the posterior margin of the fifth setiger.

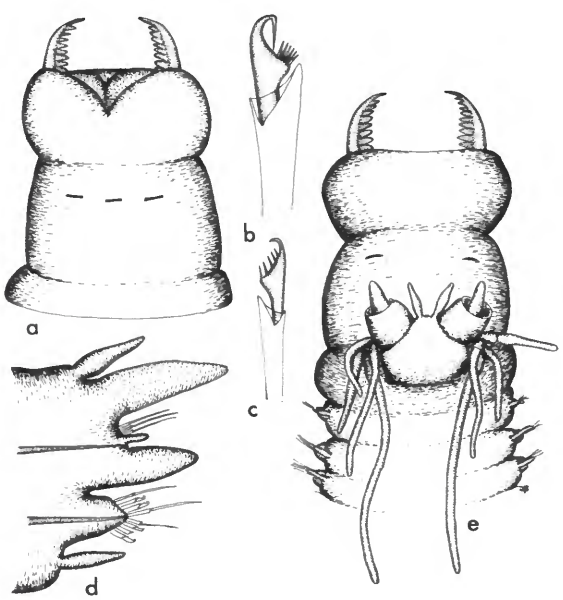

FIGURE 5.—*Eunereis paitillae*, new species: *a*, proboscis, ventral view, × 50; *b*, large supra-acicular neuropodial falciger, median setiger, × 950; *c*, subacicular neuropodial falciger, median setiger, × 950; *d*, posterior parapodium, anterior view, × 160; *e*, anterior end, dorsal view, × 50.

The proboscis (Figure 5*a*, *e*)is fully everted in the holotype; the jaws are rather slender and have approximately eight teeth along the cutting edge. The maxillary ring lacks paragnaths. Five paragnaths are on the oral ring; each of these is a single, transversely elongated piece. One is in area VI, and one each in areas VII and VIII; other paragnaths are absent.

All parapodia are similar, except that the notopodia are strongly reduced and asetigerous in the two first setigers. The notopodia (Figure 5*c*) are otherwise distinctly trilobed with a very large superior lobe, a short slender acicular lobe and a digitate inferior lobe. The neuropodia have distinct, but low, pre- and postsetal lobes, which are otherwise simple and bluntly conical. The slender, digitate dorsal and ventral cirri are attached basally.

Notopodial setae are all of one kind; each is a long, slender homogomph spiniger with the cutting edge of the appendage finely serrated. Neuropodial setae are of two kinds: supra- and subacicular fascicles are similar; both contain a number of heterogomph spinigers and falcigers. One falciger in each supra-acicular fascicle (Figure 5*b*) is considerably larger than the others. It has a short thick appendage with a strongly recurved, slender tip and a group of five to seven hairs near the base of the cutting edge. The other, slender falcigers (Figure 5*d*) are similar, but the appendage is considerably less recurved at the tip and the hairs along the cutting margin are found along the whole margin.

The genus *Eunereis* is known for six species in addition to *E. paitillae* described above; these six include *E. caeca* Hartman (1960:93–94), *E. longipes* Hartman (1936:479–480, fig. 53), *E. longissima* (Johnston, 1840:178; see Fauvel, 1923:352, fig. 138a–d), *E. marri* Monro (1939:117, fig. 10a–f), *E. paradoxa* Ørsted, 1843a:177–178, pl. 4: fig. 50 pl. 5: figs. 63, 64, 66), *E. patagonica* (McIntosh, 1885:228–229, pl. 35: figs. 13–15: pl. 17a: figs. 1–2) and *E. wailesi* Berkeley and Berkeley (1954:456–457, figs. 1, 2). These species are rather varied in other characters, but appear to have one feature in common: they all lack paragnaths on the maxillary ring and have at least a few on the oral ring.

Eunereis paitillae differs from all these in the

shape and number of paragnaths and in that it lacks homogomph falcigers in the notopodia.

Neanthes galetae, new species

FIGURE 6*a–c*

MATERIAL EXAMINED.—Galeta Reef, *Acanthophora* Zone (1); Galeta Reef, *Laurencia* Zone (6, holotype, USNM 53088; paratypes, USNM 53089, AHF Poly 1132); Galeta Reef, *Thalassia* Zone (1).

DESCRIPTION.—The holotype is a complete specimen 12 mm long and 1.5 mm wide without setae, with 56 setigers. It is yellow with transverse brown bars and small lateral brown patches on each of the first 10 to 15 setigers.

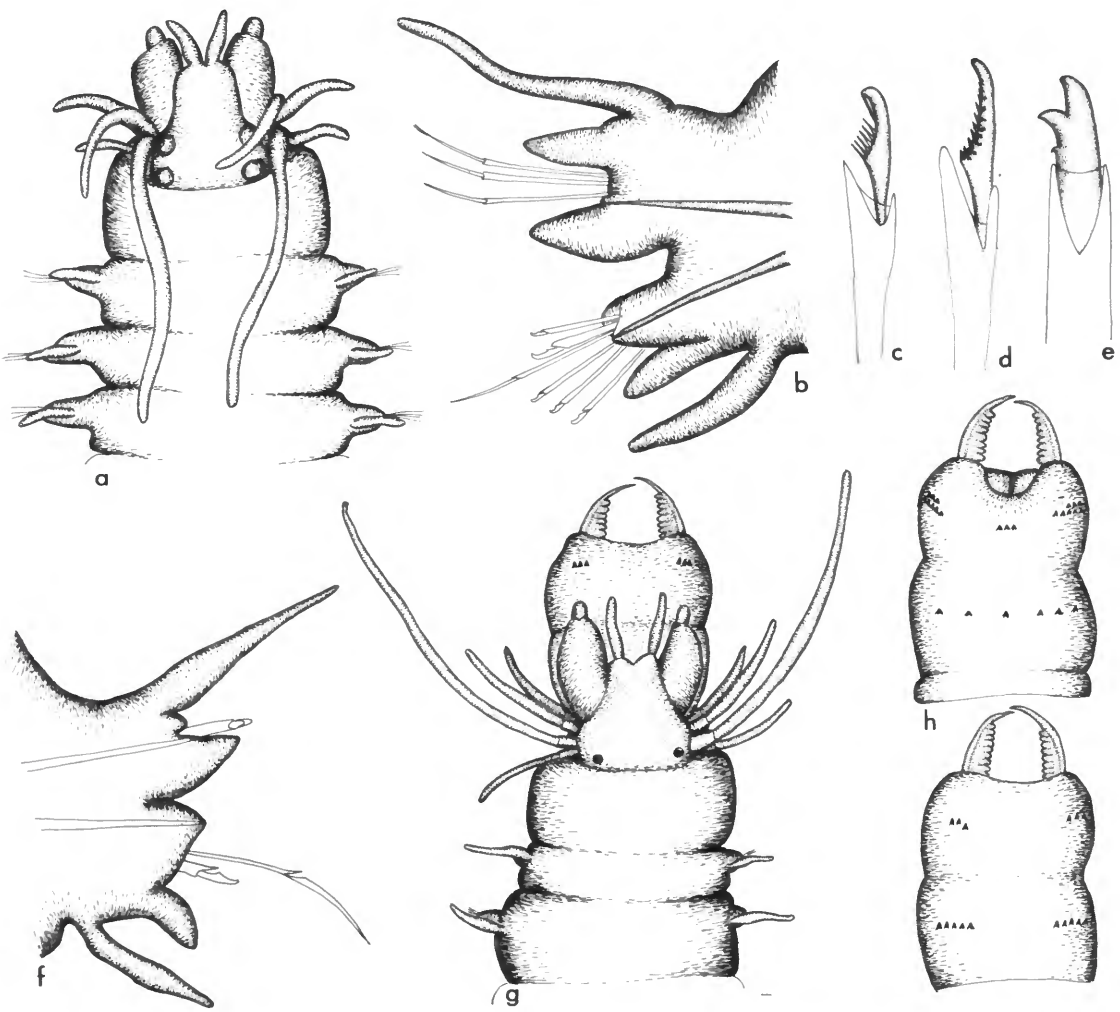

FIGURE 6.—*Neanthes galetae*, new species: *a*, anterior end, dorsal view, × 50; *b*, far posterior parapodium, anterior view, × 160; *c*, neuropodial heterogomph falciger, posterior setiger, × 950. *Nereis panamensis*, new species: *d*, neuropodial heterogomph falciger, posterior setiger, × 950; *e*, notopodial homogomph falciger, posterior setiger, × 950; *f*, posterior parapodium, anterior view, × 160; *g*, anterior end, dorsal view, × 50; *h*, proboscis, ventral view × 50; *i*, proboscis, dorsal view, × 50.

The prostomium (Figure 6*a*) is longer than wide and is rounded anteriorly; the antennae do not project beyond the palps and are attached closely together near the tip of the prostomium. The palpophores are massive; the short palpostyles are rounded. The four tentacular cirri are digitate; the posterior ventral ones are the longest and reach setiger three; the others do not reach beyond the peristomium.

The proboscis (seen in dissection) has paragnaths on most areas: area I has 2 in tandem, area II has 20 in 2 straight rows, area III has 18 in a rounded patch, area IV has 25 in a rectangular patch, area V lacks paragnaths, area VI has 8 in a round patch, and areas VII–VIII have 5 large paragnaths in a single row.

Parapodia are similar along the length of the body, except that the notopodia are slightly prolonged in posterior setigers. Each notopodium (Figure 6*b*), except the first two which are reduced, has a short, blunt acicular lobe and a flattened supra-acicular lobe; the subacicular lobe is thick and digitate and of the same length as the supra-acicular lobe. Each dorsal cirrus, especially in posterior setigers, is very long and slender; all dorsal cirri are attached basally. The neuropodia are bifid; the superior part with the acicula and setae has a very well-developed, bluntly rounded postsetal lobe; the presetal lobe is a low fold. The inferior neuropodial lobe is as long as the superior one; it is digitate. The ventral cirrus projects as far as the tip of the neuropodium in all setigers.

Notosetae are all of one kind; each is a long, slender, homogomph spiniger; the cutting edge of the appendage is slightly serrated. Neurosetae are of three kinds. In anterior setigers, a few homogomph spinigers are in the superior fascicle; these are replaced by heterogomph spinigers in more posterior setigers. Otherwise, heterogomph falcigers are found in both superior and inferior fascicles. Each falciger (Figure 6*c*) has a short, slender appendage with five or six fine hairs along the cutting edge; the distal part of the appendage is strongly recurved.

The genus *Neanthes* was separated into groups by Fauchald (1972:69–70, 408–410). According to this system, *N. galetae* belongs to group IIB 1 in that falcigers are present and in that it has the dorsal lobe of the notopodia barely longer than other lobes in the parapodium. Other species in this group with few paragnaths on areas VII and VIII include *N. agulhana* (Day, 1963:406–407, fig. 6d–j), *N. dawydovi* (Fauvel, 1937:297–299, fig. 1a–k), *N. kerguelensis* (McIntosh, 1885:225–227, pl. 35: figs. 10–12, pl. 16A: figs. 17–18), and *N. kerguelensis oligodonta* (Augener, 1913:164–166). *Neanthes diversicolor* (O. F. Müller, 1776), originally listed for this group, was moved to the genus *Hediste* by Hartmann-Schröder (1971:196, as a subgenus); this change is followed here.

Of these species, *N. agulhana, N. dawydovi,* and *N. kerguelensis oligodonta* lack paragnaths on both areas I and V; the other species have paragnaths on I but lack them on V. *Neanthes galetae* differs from *N. kerguelensis* in that the dorsal cirri are twice as long as the parapodial lobes in the former and no longer than these lobes in the latter; otherwise the two species are rather similar.

Neanthes pseudonoodti, new species

FIGURE 7

MATERIAL EXAMINED.—Paitilla Beach, *Balanus* Zone (4); Paitilla Beach, *Tetraclita* Zone (18, holotype, USNM 53090; paratypes, USNM 53091, AHF Poly 1133).

DESCRIPTION.—The holotype is a complete specimen, 18 mm long and 1 mm wide without setae, with 62 setigers. It is yellowish and has scattered brown pigment spots on the anterior end.

The prostomium (Figure 7*e*) is very broad and has a pair of short frontal antennae that are well-separated basally. The large palpophores are ovate and the short palpostyles button-shaped. The anterior eyes are crescentic; the posterior ones are ovate. The four pairs of tentacular cirri are slender; three pairs are of similar length and reach approximately setiger 2. The fourth pair is longer and reaches the posterior margin of setiger 4.

The proboscis (Figure 7*a,e*) is everted in the holotype; the jaws are thick and have five or six distally directed, pointed teeth. Paragnaths are present on all areas. Area I has three paragnaths in a transverse row and one in front of the others. Area II has 21 or 22 paragnaths in rows in a triangular patch. Area III has 36 paragnaths arranged in 4 rows in an ovate patch. Area IV has 35 or 36

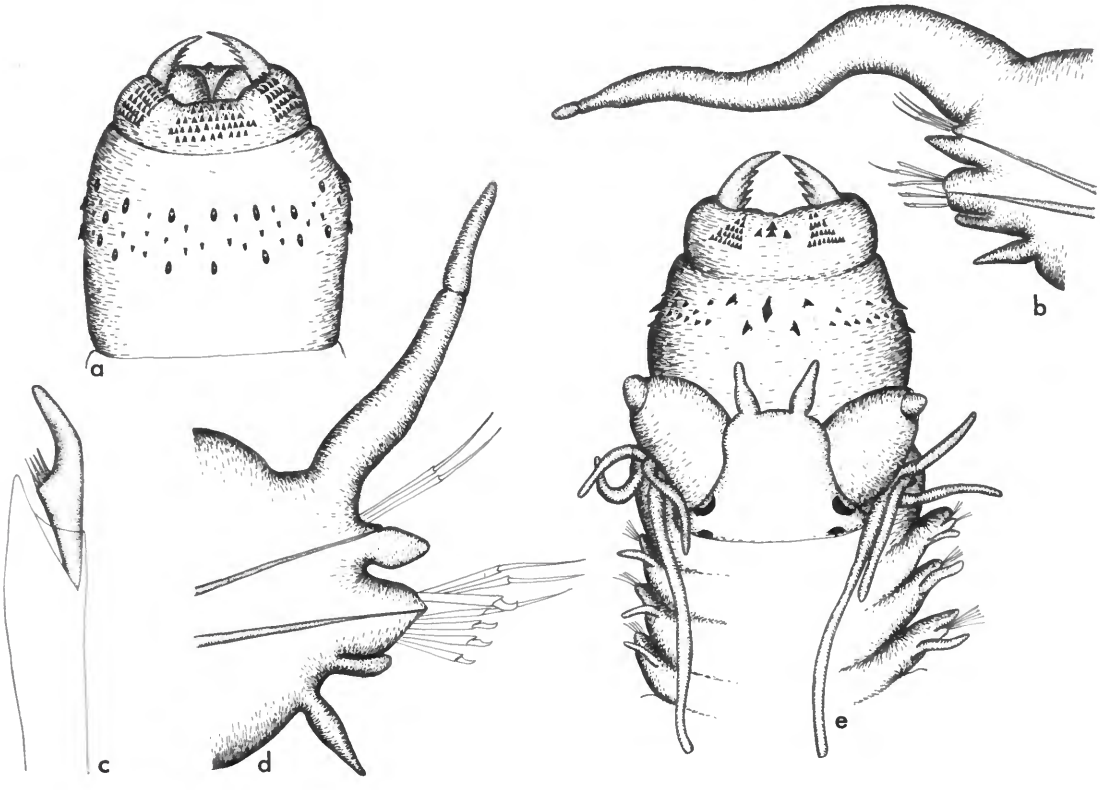

FIGURE 7.—*Neanthes pseudonoodti*, new species: *a*, proboscis, ventral view, × 50; *b*, far posterior parapodium, anterior view, × 95; *c*, neuropodial heterogomph falciger, posterior setiger, × 950; *d*, posterior parapodium, anterior view, × 160; *e*, anterior end, dorsal view, × 50.

paragnaths in 6 rows in a quadrangular patch (the anteriormost row on the right-hand side is not visible in Figure 7*a*). Area v has one very large paragnath, and a pair of small paragnaths on either side represent area vi. Areas vii and viii form a girdle consisting of two rows of larger, and several irregular rows of smaller, paragnaths. This girdle is continued dorsally in the lateral parts of area vi.

Anterior parapodia have both noto- and neuropodia of the same length; each notopodium has a short, rounded superior lobe; a short, nearly rudimentary acicular lobe and a long, digitate inferior lobe. The neuropodia are bifid; each superior lobe is distally truncate and has low, truncate pre- and postsetal lobes; each inferior lobe is a little shorter than the superior lobe and digitate. The short ventral cirri are slightly clavate in all setigers; the digitate dorsal cirri are attached distally on the superior lobe of the notopodium. The superior notopodial lobes become increasingly elongated in posterior setigers (Figure 7*d*) and are more than three times the length of all other parapodial parts in far posterior setigers. The dorsal cirrus remains of the same size in all setigers and finally appears as a short, inconspicuous distal part of the large superior lobe (Figure 7*b*).

All notopodial setae are similar; each is a homogomph spiniger with a long, slender appendage. Homogomph spinigers are also present in superior neuropodial fascicles; spinigers in the inferior neuropodial fascicles are heterogomph. Heterogomph falcigers are present in both superior and inferior neuropodial fascicles. Each superior fascicle contains a single, very large falciger (Figure 7*c*) with a short, slightly geniculate appendage with four or five hairs along the cutting edge near the

base. Inferior fascicles have more numerous, smaller falcigers of similar shape.

Neanthes pseudonoodti belongs to group IIB2c according to the system suggested by Fauchald (1972). Other species in this group include *N. noodti* Hartmann-Schröder (1962:129–130, pl. 11: figs. 65–66, pl. 12: fig. 68, pl. 20: fig. 67), *N. ruficeps* (Ehlers, 1905:24–25, pl. 3: figs. 10–15), and *N. seridentata* Hartmann-Schröder (1959:138–142, figs. 100–110).

The paragnaths on area VI are arranged in a nearly straight transverse row in *N. seridentata;* the other species have these paragnaths arranged in a small patch. *Neanthes ruficeps* lack paragnaths on areas V and VI; *N. noodti* and *N. pseudonoodti* have paragnaths on all areas.

Neanthes noodti and *N. pseudonoodti* resemble each other but differ in the distribution and shape of the paragnaths, especially on areas VII and VIII. The dorsal cirri are nearly half the total length of the prolonged superior notopodial lobe in *N. noodti* and less than one-fifth of the total length in *N. pseudonoodti.*

Neanthes succinea (Frey and Leuckart, 1847)

Nereis succinea Frey and Leuckart, 1874:154.—Monro, 1933a: 42–43, fig. 18.
Neanthes succinea (Frey and Leuckart).—Hartman, 1968:529–530, 5 figs. [unnumbered].

MATERIAL EXAMINED.—Balboa, rocks and rockpools at low tide (2); Balboa Dock, scrapings from piles of quays (1); Colón, from deck of wreck in Limón Bay (1) and from scrapings from piles of quays (11); all coll. Crossland.

REMARKS.—*Neanthes succinea* has large foliose notopodial superior lobes in posterior setigers with the dorsal cirri attached subdistally. It has been reported from worldwide areas.

Neanthes species indeterminate

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (8).

REMARKS.—The specimens differ from all species mentioned above in the structure of the neuropodial falcigers. They are poorly preserved and cannot be further identified.

Nereis callaona (Grube, 1857)

FIGURE 8*f–h*

Nereilepas callaona Grube, 1857:165–166.
Nereis callaona (Grube).—Hartman-Schröder, 1962b:399–400.

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (10); Galeta Reef, *Thalassia* Zone (1); Galeta Reef, *Zoanthus* Zone (1); Paitilla Beach, Hydroid Zone (3); Paitilla Beach, *Tetraclita* Zone (25).

REMARKS.—The present specimens fit with the species as reviewed by Hartmann-Schröder (1962) except that the homogomph and heterogomph falcigers have the distal parts of the appendages ankylosed rather than recurved as indicated by Hartmann-Schröder (Figure 8*f,h*). Specimens from both sides of the Isthmus are similar.

Nereis callaona is rather widespread in the eastern Pacific Ocean; the present records are the first from the western Atlantic Ocean.

Nereis panamensis, new species

FIGURE 6*d–i*

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (1, holotype, USNM 53139); Galeta Reef, *Laurencia* Zone (27, paratypes, USNM 53140 and AHF Poly 1136).

DESCRIPTION.—The holotype is a complete specimen, 12 mm long and 1.1 mm wide without setae, with 52 setigers. Two dark brown patches are on the lateral sides of the prostomium; the remainder of the specimen is light yellow with scattered brown dots. The long anal cirri are slender.

The prostomium (Figure 6*g*) is distinctly pentagonal with a slightly bifid anterior margin. The long frontal antennae project beyond the tips of the palps. The palpophores are ovate, and the short palpostyles are button-shaped. One pair of dark eyes is present near the posterior margin of the prostomium. Three of the four pairs of tentacular cirri reach just beyond the peristomium; the dorsoposterior pair is longer and reaches setiger 5; all tentacular cirri are slender and digitate.

The proboscis (Figure 6*h–i*) is nearly globose when fully everted. The jaws are slender and have seven or eight teeth along the cutting edge. Paragnaths are present on all areas except I and V. Area II has three cones in a transverse row; area III has three cones in a transverse row; area IV has

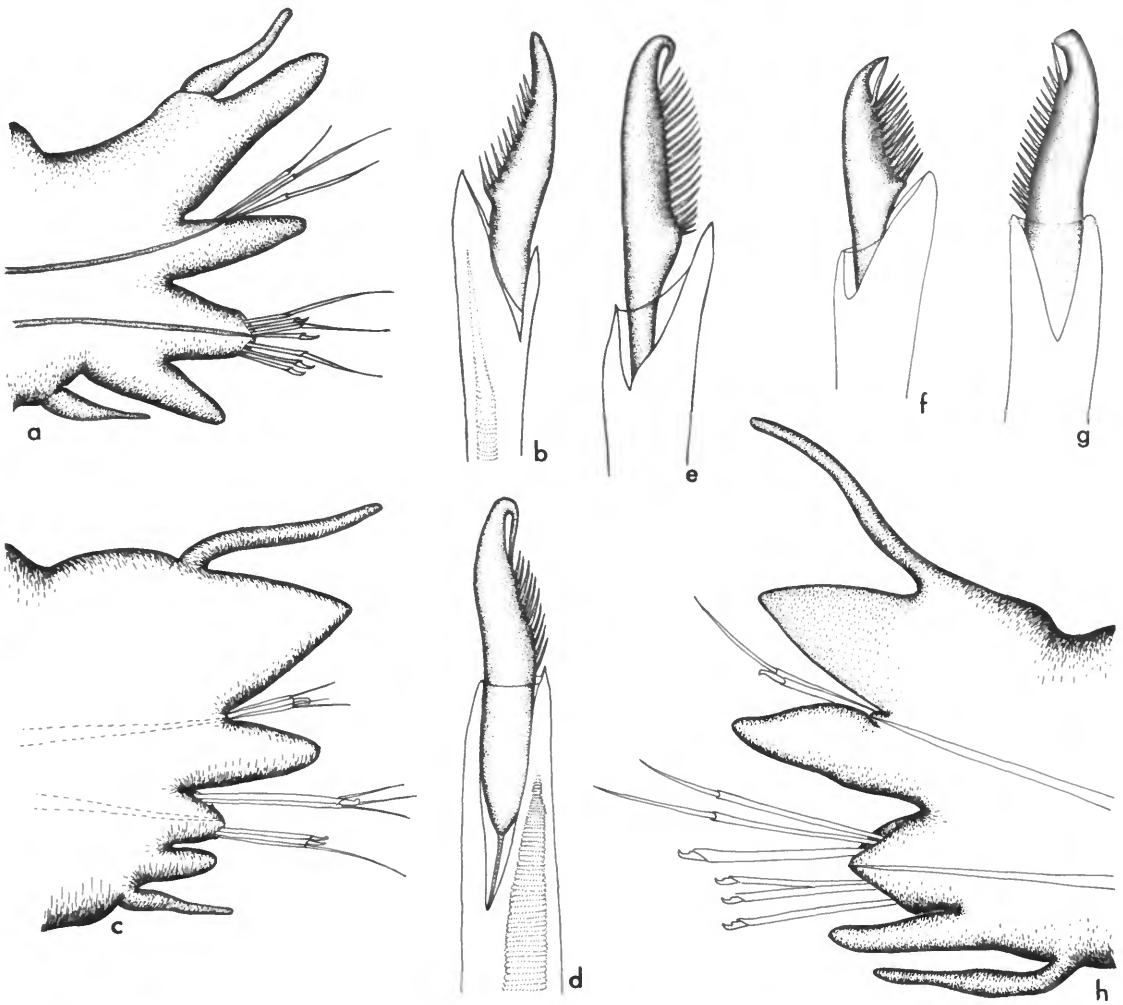

FIGURE 8.—*Perinereis anderssoni* Kinberg: *a*, posterior parapodium, anterior view, × 95; *b*, neuropodial heterogomph falciger, posterior setiger, × 950. *Nereis riisei* Grube: *c*, posterior parapodium, anterior view, × 50; *d*, notopodial homogomph falciger, posterior setiger, × 950; *e*, neuropodial heterogomph falciger, posterior setiger, × 950. *Nereis callaona* (Grube): *f*, neuropodial heterogomph falciger, posterior setiger, × 950; *g*, notopodial homogomph falciger, posterior setiger, × 950; *h*, posterior parapodium, anterior view, × 95.

eight cones in two rows, five in the posterior, and three in the anterior row. Area VI has five cones in a transverse row, and areas VII and VIII have six large cones in a single row.

The two first pairs of parapodia have reduced notopodia; otherwise all parapodia are similar. Each notopodium (Figure 6*f*) is bifid and has a distinct acicular lobe and a bluntly conical, thick inferior lobe; a distinct superior lobe is absent. Dorsal cirri are large in all setigers, but become prolonged in posterior setigers. All neuropodia are bifid; the superior part, which carries the aciculum, has low, poorly developed pre- and postsetal lobes; the thick inferior lobe is digitate and projects beyond the tip of the superior lobe. Ventral cirri are long and slender.

Notopodial setae include homogomph spinigers and falcigers; falcigers are present only in median and posterior setigers. Each homogomph falciger (Figure 6*e*) has a thick shaft and a short, bifid or trifid appendage; the third tooth is very small and may be worn off or absent in some hooks. Neuropodial fascicles contain heterogomph spinigers and falcigers in both supra- and subacicular positions. Each falciger (Figure 6*d*) has a short, slightly curved appendage with transverse rows of teeth along the cutting margin.

Nereis panamensis resembles *N. jacksoni* Kinberg, 1866 (as reviewed by Augener, 1922) in the distribution of paragnaths and the structure of the homogomph falcigers. A distinct group of species appears with bidentate or tridentate homogomph falcigers and reduced superior notopodial lobes. The earliest described species in the group is *N. jacksoni;* others include *N. thompsoni* Kott (1951: 103–105, fig. 5), *N. denhamensis* Augener (1913:156–159, pl. 2: fig. 51, text fig. 16), and *N. funchalensis* Langerhans (1880:287–289, see Fauvel, 1927:409, fig. 138f–n; Monro, 1933a:43, fig. 18).

Nereis jacksoni reducta was described by Hartmann-Schröder (1960:110–112, figs. 144–146) from the Red Sea; later Hartmann-Schröder (1965: 121–123, figs. 50–51) indicated that this subspecies was identical with the main form and withdrew the name; she also indicated that she thought *N. heirissonensis* and *N. denhamensis,* both described by Augener (1913) were synonymous with *N. jacksoni.* There appears to be general agreement that *N. heirissonensis* is in fact synonymous with *N. jacksoni,* but Hartman (1954:31) retains *N. denhamensis* as a distinct form.

Nereis panamensis differs from *N. jacksoni* (and all species listed above, whether valid or not) on the distribution of the paragnaths and on the shape of the appendage of the heterogomph falcigers.

Nereis riisei Grube, 1857

FIGURE 8*c–e*

Nereis riisei Grube, 1857:162–163.—Monro, 1933a:43–44.—Hartman, 1940a:221–222, pl. 33: fig. 37.

MATERIAL EXAMINED.—Galeta Reef, *Acanthophora* Zone (1); Galeta Reef, Coralline Zone (1); Galeta Reef, *Thalassia* Zone (2). Colón, scrapings from piles of quays (4); Gorgona Island, fine sand and shells, 20 fm (11); both coll. Crossland.

REMARKS.—The present specimens fit very well with the species as described by Hartman (1940). The homogomph falcigers (Figure 8*e*) have recurved appendages that have series of teeth along the cutting edges. The heterogomph falcigers (Figure 8*d*) are strongly recurved distally and have dense series of long, slender teeth along the cutting edges.

Nereis riisei has been reported from both sides of the Isthmus and appears to be most common in the western Atlantic Ocean in warm waters.

Perinereis anderssoni Kinberg, 1866

FIGURE 8*a,b*

Perinereis anderssoni Kinberg, 1866:175.—Hartman, 1948:72–73; 1951:47, pl. 13. fig. 6.

Perinereis bairdii Webster and Benedict, 1884:312, pl. 8: figs. 22–28.—Monro, 1933a:41.

MATERIAL EXAMINED.—Galeta Reef, *Acanthophora* Zone (1); Galeta Reef, Coralline Zone (2); Galeta Reef, *Laurencia* Zone (84); Galeta Reef, *Thalassia* Zone (21). Colón, from washings of weeds, etc. of the coral reef in Limón Bay (29), and from wreck in Limón Bay (13), from coral flat at the southwest corner of Limón Bay (13), and from the outer piles of the quays of the docks (5); all coll. Crossland.

REMARKS.—*Perinereis anderssoni* has the superior notopodial lobes prolonged in posterior setigers (Figure 8*a*); the dorsal cirrus is attached near the middle of the lobe. Each heterogomph falciger (Figure 8*b*) has a short, gently curved appendage with series of teeth along the cutting edges.

Perinereis anderssoni is common in the warmer parts of the western Atlantic Ocean; it has not been reported from the Pacific Ocean.

Perinereis species indeterminate

MATERIAL EXAMINED.—Paitilla Beach, Hydroid Zone (1).

REMARKS.—The present specimen is badly preserved and cannot be further identified.

Platynereis dumerilii (Audouin and Milne Edwards, 1834)

FIGURE 4*d–f*

Nereis Dumerilii Audouin and Milne Edwards, 1934:196–199, pl. 4A: figs. 10–12.

Platynereis dumerilii (Audouin and Milne Edwards).—Hartman, 1968:561–562, 5 figs. [unnumbered].

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (25). Colón, from piles of the quays (178); Taboga Island, at low tide, obtained by breaking up standstone (1); coll. Crossland.

REMARKS.—*Platynereis dumerilii* appears to be rather variable. The present specimens have the homogomph falcigers (Figure 4*d*) distinctly bidentate and the tip very strongly curved. Each appendage of the heterogomph falcigers (Figure 4*e*) has a distinct subdistal knob and the tip is strongly curved; the cutting edge is dentate.

The specimen reported from Taboga was found in a sample otherwise identified as *Lysidice ninetta* by Monro.

Platynereis dumerilii is very widespread in warm waters.

Platynereis species indeterminate

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (4); Galeta Reef, *Thalassia* Zone (4).

REMARKS.—These specimens have either been dried out or are so incomplete that they cannot be further identified.

Pseudonereis gallapagensis Kinberg, 1866

FIGURE 4*g,h*

Pseudonereis gallapagensis Kinberg, 1866:174.—Hartman, 1940a:231.—Hartmann-Schröder, 1962b:432–434.

MATERIAL EXAMINED.—Paitilla Beach, *Balanus* Zone (2); Paitilla Beach, *Tetraclita* Zone (38).

REMARKS.—*Pseudonereis gallapagensis* has the superior notopodial lobe strongly prolonged and foliose in posterior setigers (Figure 4*h*); the short

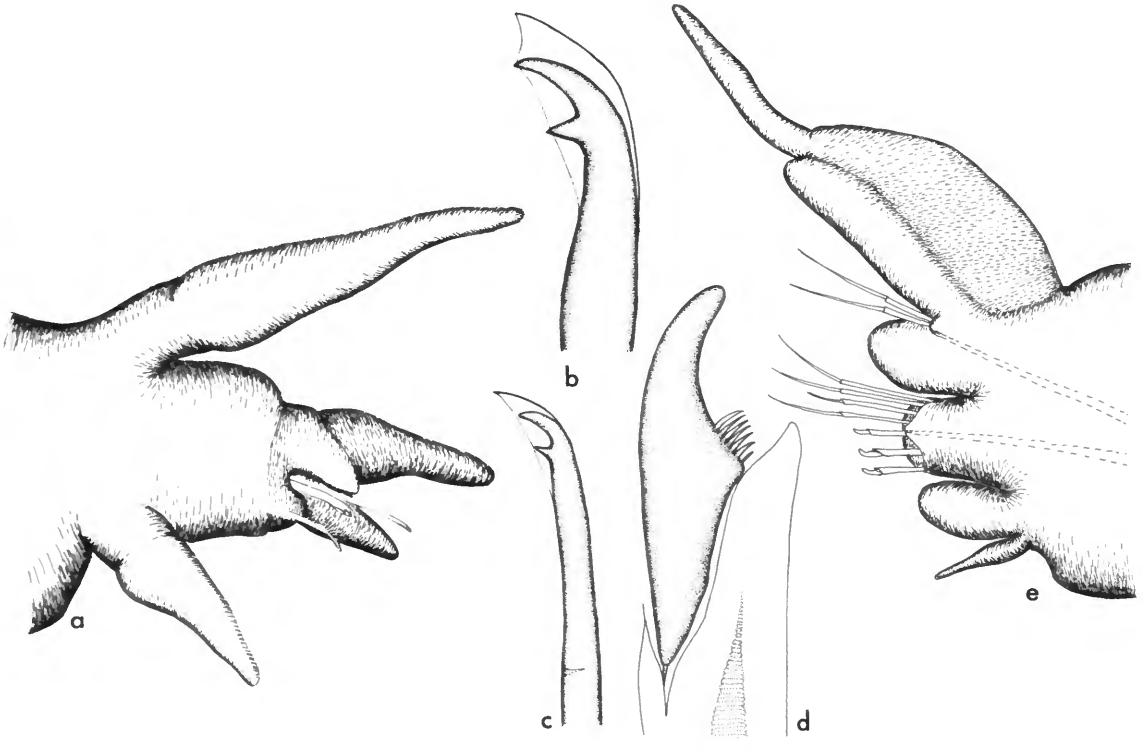

FIGURE 9.—*Diopatra chiliensis* Quatrefages: *a*, third parapodium, anterior view, × 50; *b*, giant hooded hook, third setiger, × 385; *c*, normal hooded hook, third setiger, × 385. *Pseudonereis variegata* (Grube): *d*, neuropodial heterogomph falciger, posterior setiger, × 950; *e*, posterior parapodium, posterior view, × 52.

dorsal cirrus is digitate and attaches distally to the superior lobe. Each heterogomph falciger (Figure 4*g*) has a large, gently curved appendage with approximately ten teeth in double rows near the base.

Pseudonereis gallapagensis may be widespread in both the Atlantic and Pacific Oceans, but the best verified records come from the Pacific Ocean. It has frequently been confused with other species in the genus, including *P. variegata*.

Pseudonereis variegata (Grube, 1857)

FIGURE 9*d,e*

Nereilepas variegata Grube, 1857:164–165.
Pseudonereis variegata (Grube).—Monro, 1933a:45.—Hartmann-Schröder, 1962b:434–435.

MATERIAL EXAMINED.—Colón, from the quays (1, heteronereis); Colón, from the coral flat at the southwest corner of Limón Bay (3); Colón, from deck of wreck in Limón Bay (2); all coll. Crossland.

REMARKS.—This species is recognized as indicated in the key and as remarked by Hartmann-Schröder (1962b). The dorsal cirrus is attached subdistally to the superior notopodial lobes (Figure 9*e*) and the paragnaths are in several rows on areas VII and VIII. The falcigers (Figure 9*d*) are recurved and have hairs in single rows.

Pseudonereis variegata may be widespread in warm waters.

Nereidae species indeterminate

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (1); Galeta Reef, *Laurencia* Zone (1); Paitilla Beach, *Tetraclita* Zone (posterior ends).

REMARKS.—These specimens have been died out or are incomplete and cannot be further identified.

Family NEPHTYIDAE

Key to the Species from Panama

1. Interramal cirri involute 2
   Interramal cirri recurved 3
2. Postsetal lobes absent in posterior setigers; notopodial cirri longer than the interramal cirri in posterior setigers ..... ***Aglaophamus tabogensis***
   Postsetal lobes distinct in all setigers; interramal cirri short and slender in all setigers ..... ***Aglaophamus dicirris***
3. Dorsolateral surface of body covered by flattened expansions from the dorsum ..... ***Nephtys squamosa***
   Dorsum not covered by expansions from the dorsum 4
4. Interramal cirri present from setiger 8, erect neuropodial cirri present in median setigers ..... ***Nephtys monroi***
   Interramal cirri present from setiger 4, erect neuropodial cirri present in anterior setigers ..... ***Nephtys singularis***

Aglaophamus dicirris Hartman, 1950

Aglaophamus dicirris Hartman, 1950:122–124, pl. 18: figs. 1–8.
Nephthys dibranchis.—Monro, 1933a:56–57, fig. 24 [not Grube, 1878].

MATERIAL EXAMINED.—Gorgona Island, 20 fm, fine sand and shell fragments (8); Gorgona Island, 30 fm, muddy sand and shell fragments (1); both coll. Crossland.

REMARKS.—*Aglaophamus dicirris* has a very characteristic thin prostomium with a strongly arched anterior margin; a pair of black eyespots are distinct on the posterior part of the prostomium. The proboscis is covered with small pointed warts; a median papilla is absent.

Aglaophamus dicirris is known from tropical America.

Aglaophamus tabogensis (Monro, 1933)

Nephthys tabogensis Monro, 1933a:53–55, fig. 23 [in part].
Aglaophamus tabogensis (Monro).—Hartman, 1950:125.

MATERIAL EXAMINED.—Taboga Island, 6–12 fm, mud (15, syntypes, BMNH), coll. Crossland, det. Monro.

REMARKS.—*Aglaophamus tabogensis* was restricted by Hartman (1950) to include the material listed above; the remainder reported by Monro from Panama was separated into a distinct species:

Nepthys monroi. *Aglaophamus tabogensis* can be separated from the only other species of *Aglaophamus* reported from Panama as indicated above.

Aglaophamus tabogensis is known only from the type-locality.

Nephtys monroi Hartman, 1950

Nephtys monroi Hartman, 1950:107–108, pl. 17: fig. 1.
Nephthys tabogensis Monro, 1933a:53–55, fig. 23h [in part].

MATERIAL EXAMINED.—Taboga Island, 6–12 fm, mud (1), coll. Crossland, det. Monro and Hartman.

REMARKS.—*Nephtys monroi* was based on a single large specimen of the collection made at Taboga. It differs from all other *Nephtys* along this coast on a combination of characters. It has interramal cirri from setiger 8, erect neuropodial lobes present in median segments only, and incised preacicular lobes in anterior setigers.

Nephtys monroi is known only from the original record.

Nephtys singularis Hartman, 1950

Nephtys singularis Hartman, 1950:98–100, pl. 15: figs. 1–6.
Nephthys sp.—Monro, 1933a:51–53, fig. 22.

MATERIAL EXAMINED.—Coiba Island, in sand at low tide, fine sea grass and dead coral embedded in the sand (2), coll. Crossland.

REMARKS.—*Nephtys singularis* has interramal cirri present from setiger 4 and erect neuropodial lobes present in anterior setigers. The presetal lobes are bilobed in all setigers, and the neuropodial postsetal lobes are greatly expanded in posterior setigers.

Nephtys singularis is known from shallow-water areas from western Mexico to Panama.

Nephtys squamosa Ehlers, 1887

Nephtys squamosa Ehlers, 1887:128–131, pl. 37: figs. 7–10.—Monro, 1933a:52–53.—Hartman, 1950:110–111.

MATERIAL EXAMINED.—Gorgona Island, 20 fm, fine sand and shell (2), coll. Crossland.

REMARKS.—*Nepthys squamosa* is characterized by the expanded, imbricated flattened leaves covering the dorsum in median and posterior setigers. It is common in shallow water in tropical America, both on the Atlantic and Pacific side.

Family GLYCERIDAE

Key to the Species from Panama

1. Parapodia with 1 postsetal lobe ..... *Glycera oxycephala*
   Parapodia with 2 postsetal lobes 2
2. Dendritically branched branchiae present ..... *Glycera americana*
   Branchiae absent 3
3. All proboscideal organs tall and slender with longitudinal ribs ..... *Glycera tesselata*
   All proboscideal organs smooth, either tall and slender or shorter and wide ..... *Glycera abranchiata*

Glycera abranchiata Treadwell, 1901

Glycera abranchiata Treadwell, 1901:200–201, fig. 49.—Jones, 1962:183, figs. 41–48.—Fauchald, 1973:21–22, fig. 1a–e.
Glycera sp.—Monro, 1933a:57–58, fig. 25.

MATERIAL EXAMINED.—Balboa, rocks and rockpools at low tide (1); Coiba Island, in sand at low water, fine sea grass and dead coral embedded in sand (1); Gorgona Island, low water spring tide (2) and 20 fm, sand and shell (1), all coll. Crossland.

REMARKS.—*Glycera abranchiata* has been confused with *G. tesselata* from which it can be separated by the presence of two kinds of proboscideal organs in the former and only one kind in the latter. It has previously been reported from sandy areas in the Caribbean Sea and Panama; the present records extend its distribution into the Pacific Ocean in similar environments.

Glycera americana Leidy, 1855

Glycera americana Leidy, 1855:147–148, pl. 11: figs. 49, 50.—Monro, 1933a:57.—Hartman, 1950:73–75; 1968:613–614, 1 fig.

MATERIAL EXAMINED.—Coiba Island, in sand at low water, fine sea grass and dead coral embedded in the sand (2); Gorgona Island, 30 fm, muddy sand with shell fragments (1); Perlas Island, St.

Elmo Bay, dredging and trawling on east side of bay (1); coll. Crossland.

REMARKS.—*Glycera americana* is one of the most common glycerids on both sides of the Americas. The branchiae are usually distinct; if they are retracted, the species can be identified by the proboscideal organs. They are of two kinds: one is large and ovate and lacks ridges; the other is smaller, usually somewhat more slender than the other kind and equipped with two oblique or transverse ridges.

Glycera oxycephala Ehlers, 1887

Glycera oxycephala Ehlers, 1887:121–123, pl. 41: figs. 7–11.—Hartman, 1950:70–71, fig. 3, pl. 10: figs. 3, 4.

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (1); Galeta Reef, Mangrove Zone (1).

REMARKS.—*Glycera oxycephala* has a single postsetal lobe in all setigers, and the proboscideal organs are all of one kind, tall and slender with 9 or 10 transverse ridges. The species is most common in warm water, but has been reported as far north as Oregon on the west coast; it is found on both sides of the Americas.

Glycera tesselata Grube, 1863

Glycera tesselata Grube, 1863:41–42, pl. 4: fig. 4.—Hartman, 1950:77–78, pl. 10: fig. 11.

MATERIAL EXAMINED.—Galeta Reef, *Thalassia* Zone (1).

REMARKS.—*Glycera tesselata* is widely distributed in warm waters. It is characterized by its lack of branchiae, the two rounded postsetal lobes, and the tall slender, longitudinally ribbed proboscideal organs. It can be separated from the similar *G. abranchiata* as indicated in the key.

Family GONIADIDAE

Goniada acicula Hartman, 1940

Goniada acicula Hartman, 1940a:252–254, pl. 44: figs. 132–141.—Hartman, 1950:31–32, pl. 4: figs. 2–7; 1968:649–650, 5 figs. [unnumbered].

MATERIAL EXAMINED.—Galeta Reef, *Thalassia* Zone (1).

REMARKS.—*Goniada acicula* has strong, gently curved setae in the posterior notopodia. The posterior body region is missing in the present specimen, but it fits otherwise very well with the species as described, both in terms of parapodial characters and in the structure of the proboscideal armament.

Goniada acicula is known from warm waters on both sides of the Americas.

Family ONUPHIDAE

Key to the Species from Panama

1. First 6 setigers modified and anteriorly directed ..... ***Americonuphis reesei***
   Maximally 1 setiger anteriorly directed 2
2. Branchiae single filaments or pectinate 3
   Branchiae spiralled in anterior segments 5
3. Branchiae single filaments, first present from setiger 23 ..... ***Nothria gorgonensis***
   Branchiae pectinate, first present anterior to setiger 10 4
4. Composite spinigers in some anterior setigers ..... ***Onuphis nebulosa***
   Composite spinigers absent ..... ***Onuphis vermillionensis***
5. Anterior parapodia with 2 postsetal lobes ..... ***Diopatra chiliensis***
   Postsetal lobes single in all setigers 6
6. Anterior hooded hooks tridentate ..... ***Diopatra denticulata***
   Anterior hooded hooks bidentate 7
7. Subdistal tooth of hooded hooks at right angles to the shaft of the setae ..... ***Diopatra ornata***
   Subdistal tooth of hooded hooks oblique to the shaft of the setae ..... ***Diopatra cuprea***

Americonuphis reesei Fauchald, 1973

Americonuphis reesei Fauchald, 1973:22–23, fig. 3a–e.
Onuphis magna.—Monro, 1933a:76 [not Andrews, 1891].

MATERIAL EXAMINED.—Balboa, rocks and rockpools at low tide (6).

REMARKS.—The present specimens are as de-

scribed by Fauchald (1973); the maximal number of branchial filaments is six or seven in all specimens rather than the 12 found in *Americonuphis magna*.

Americonuphis reesei is known from intertidal and shallow-water sandy and muddy areas in the Gulf of Panama.

Diopatra chiliensis Quatrefages, 1865

FIGURE 9*a–c*

Diopatra chiliensis Quatrefages, 1865:342–344.—Monro, 1933a: 72–73, fig. 30.

MATERIAL EXAMINED.—Balboa, rock and rockpools at low tide (8); Coiba Island, in sand at low tide, fine seagrass and dead coral embedded in the sand (2); both coll. Crossland.

REMARKS.—I follow Hartman (1944b:60–61) and consider *D. chiliensis* sensu Ehlers (1901:123–125, pl. 15: figs. 1–12) as a synonym of *D. obliqua* Hartman and consider *D. chiliensis* sensu Monro as the valid concept of Quatrefages's species.

The presetal lobe of the first setiger (Figure 9*a*) is a transverse fold with a deeply incised, flattened distal lobe; the two postsetal lobes are digitate. The hooded hooks of the anterior setigers are bidentate; a few are about three times larger than the others (Figure 9*b–c*).

Diopatra chiliensis is known from the southeastern Pacific Ocean.

Diopatra cuprea (Bosc, 1802)

Nereis cuprea Bosc, 1802:142.
Diopatra cuprea (Bosc).—Monro, 1933a:71–72, fig. 29.—Hartman, 1944b:54–55, pl. 1: figs. 9–14.

MATERIAL EXAMINED.—Colón, trawling in Limón Bay, 5 fm, thin mud (1), coll. Crossland.

REMARKS.—*Diopatra cuprea* and *D. ornata* can be separated only with difficulty. The two species, however, can be consistently separated as suggested in the key and in the following characters: the teeth in the hooded hooks are less curved in *D. cuprea* than in *D. ornata*, the papillation of the tentacular styles is different and the presetal lobe in anterior setigers is more oblique in *D. cuprea* than in *D. ornata*. The separation is sufficiently difficult, so it should not be undertaken except with the aid of comparative material.

Diopatra cuprea is found in the western Atlantic Ocean from Massachusetts to Brazil; it has never been reported from the eastern Pacific Ocean.

Diopatra denticulata Fauchald, 1968

Diopatra denticulata Fauchald, 1968:5–7, pl. 1a–g.
Diopatra dentata.—Monro, 1933a:73–76, fig. 31 [in part, not Kinberg, 1865].

MATERIAL EXAMINED.—Gorgona Island, dredging, 20 fm (2), and dredging 30 fm, mud, sand and shell fragments (5); both collected by Crossland.

REMARKS.—*Diopatra dentata* sensu Monro consists of two species, *D. denticulata* and *D. ornata*. The present specimens have tridentate anterior hooded hooks and fit very well with *D. denticulata* in the details of the presetal lobes in anterior segments. *Diopatra dentata* Kinberg (1865) has bidentate anterior hooded hooks (Hartman, 1948:86–87, pl. 12: figs. 1–7).

Diopatra denticulata was described from western Mexico; the present records extend its distribution to the Gulf of Panama.

Diopatra ornata Moore, 1911

Diopatra ornata Moore, 1911:273–277, pl. 18: figs. 77–85.—Hartman, 1944b:55–56, pl. 1: figs. 15–20.—Fauchald, 1968:10–11, pl. 2: fig. c.
Diopatra dentata.—Monro, 1933a:73–76, fig. 31 [in part, not Kinberg, 1865].

MATERIAL EXAMINED.—Perlas Islands, St. Elmo Bay, dredging and trawling on east side of bay, 6–9 fm, sand and shell (10), coll. Crossland.

REMARKS.—The separation between *D. cuprea* and *D. ornata* has been indicated above. Monro (1933a:73) thought Moore's species was identical with *D. dentata* from Australia. Hartman (1948:87) indicated that the two species differed in the distribution of the subacicular hooks, first present from setiger 15 in *D. dentata* and from setiger 30 in *D. ornata* and in the maxillary formula. The maxillary formula for *D. ornata* is left: 1–8–7–5 and right 1–10–7–1; for *D. dentata*, the formula is 1–9–12–0 and 1–8–9–6; maxilla IV on the left side is an oval piece without any distinct point. This difference is sufficiently large so the two species are considered distinct here.

Diopatra ornata is known from the eastern Pacific Ocean from Vancouver to Panama.

Nothria gorgonensis (Monro, 1933)

Onuphis gorgonensis Monro, 1933a:80–82, fig. 34.
Nothria gorgonensis (Monro).—Hartman, 1944b:83.

MATERIAL EXAMINED.—Gorgona Island, fine sand and shell, 20 fm (1, holotype, BMNH), coll. Crossland.

REMARKS.—The species is as described by Monro. The secondary and tertiary teeth in the hooded hooks are slightly narrower than as illustrated.

Nothria gorgonensis is known only through the original record.

Onuphis nebulosa Moore, 1911

Onuphis nebulosa Moore, 1911:269–273, pl. 17: figs. 58–68.—Monro, 1933a:76–78, fig. 32.—Hartman, 1968:699–700, 7 figs. [unnumbered].—Fauchald, 1968:36.

MATERIAL EXAMINED.—Perlas Islands, St. Elmo Bay, dredging and trawling on east side of the bay, 6–9 fm, shells and sand (15), coll. Crossland.

REMARKS.—*Onuphis nebulosa* has large, pseudocomposite or simple hooded hooks in anterior setigers; each hook has the teeth characteristically strongly curved. Composite spinigers are present in a number of setigers, usually most easily seen in setigers 5–15.

Onuphis nebulosa is found in the eastern Pacific Ocean from California to Panama.

Onuphis vermillionensis Fauchald, 1968

Onuphis vermillionensis Fauchald, 1968:41–42, pl. 11.

MATERIAL EXAMINED.—Galeta Reef, *Thalassia* Zone (5).

REMARKS.—*Onuphis vermillionensis* has branchiae present from setigers 7 or 8; the first 9 or 10 setigers have cirriform ventral cirri. All anterior hooded hooks are tridentate and large; simple tridentate hooks are present in 10 or 11 setigers. Composite spinigers are absent. Subacicular hooks are first present from setiger 12.

Onuphis vermillionensis was originally described from Golfo de California; the present records are from the western Atlantic Ocean in very shallow water.

Family EUNICIDAE

Key to the Species from Panama

1. Prostomium with a single occipital tentacle ..... ***Nematonereis unicornis***
   Prostomium with at least 3 occipital tentacles 2
2. Prostomium with 3 occipital tentacles ..... ***Lysidice ninetta***
   Prostomium with 5 occipital tentacles 3
3. Peristomial cirri absent 4
   Peristomial cirri present 5
4. All composite setae spinigers ..... ***Marphysa sanguinea***
   All composite setae falcigers ..... ***Marphysa amadae***, new species
5. Subacicular hooks absent ..... ***Palola siciliensis***
   Subacicular hooks present 6
6. Subacicular hooks and acicula dark or black 7
   Subacicular hooks and acicula light yellow 12
7. Branchiae absent, or if present, as single filaments only ..... ***Eunice (Nicidion) cariboea***
   Branchiae present, with at least 2 filaments in part of the body 8
8. Branchiae first present after setiger 10 9
   Branchiae first present before setiger 10 10
9. Branchiae first present from setigers 18–21; subacicular hooks first present from setigers 35–42 ..... ***Eunice afra***
   Branchiae first present from setigers 21–26; subacicular hooks first present from setigers 19–26 ..... ***Eunice filamentosa***
10. Occipital tentacles distinctly articulated; composite hooded hooks with rudimentary subdistal teeth ..... ***Eunice reducta***
    Occipital tentacles smooth or wrinkled; composite hooded hooks with subdistal teeth well developed 11
11. Occipital tentacles twice as long as the prostomium; branchiae erect ..... ***Eunice aphroditois***
    Occipital tentacles barely as long as the prostomium; branchiae flaccid ..... ***Eunice mutilata***

12. Subacicular hooks bidentate 13
    Subacicular hooks tridentate 14
13. Occipital tentacles with moniliform articles; maximal number of branchial filaments 10 ..... *Eunice biannulata*
    Occipital tentacles with cylindrical articles; maximal number of branchial filaments 15 ..... *Eunice websteri*
14. Occipital tentacles with cylindrical articles; branchiae present from setiger 3 ..... *Eunice vittatopsis*
    Occipital tentacles with moniliform articles; branchiae present from setiger 4 to 6 15
15. Branchiae in far posterior setigers single filaments ..... *Eunice antennata aedificatrix*
    Branchiae in far posterior setigers with 3 to 5 filaments ..... *Eunice antennata*, sensu stricto

Eunice afra Peters, 1854

Eunice afra Peters, 1854:611.—Hartman, 1944b:110–111, pl. 6: figs. 135–139.—Fauchald, 1970:16–18, pl. 1: figs. h–i.

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (3); Galeta Reef, *Laurencia* Zone (21); Galeta Reef, *Thalassia* Zone (12).

REMARKS.—The present specimens agree with specimens reported from western Mexico by Fauchald (1970). Branchiae are present from setigers 18–21; 30 of 36 specimens had the first branchiae either on setiger 19 or 20. Subacicular hooks are present from setigers 29–38 in the present material. The number of branchial filaments varies between two and three in the present material.

Eunice afra reported from Panama by Monro (1933a:66–67) is *E. mutilata* as indicated by Hartman (1944b).

Eunice afra is known from circumtropical areas; it appears to be rather variable, as indicated by Fauchald (1970).

Eunice antennata (Savigny, 1818)

Leodice antennata Savigny, 1818:322.
Eunice antennata (Savigny).—Monro, 1933a:59–60.—Fauchald, 1970:20–22, pl. 1a–c.

MATERIAL EXAMINED.—Colón, from rotten wood from deck of wreck in Limón Bay (2); Gorgona Island, from coral (5); Taboga Island, from floats of the stage at the end of the hotel pier (1); all coll. Crossland.

REMARKS.—*Eunice antennata*, sensu stricto, has branchiae from setigers 4–6 with maximally 10 branchial filaments and the branchiae in the posterior end have from three to five filaments. Yellow, tridentate subacicular hooks are present from setigers 15–25 in most normal-sized specimens; in really large specimens they may be first present from setigers 26–28, but this appearance is rare.

Eunice antennata is very widespread, possibly circumtropical, but some discrepancies in the descriptions from different areas make it difficult to assess the total distribution of the species.

Eunice antennata aedificatrix Monro, 1933

Eunice antennata aedificatrix Monro, 1933a:60–61.—Fauchald, 1970:22–23.

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (2); Galeta Reef, *Laurencia* Zone (1); Galeta Reef, *Zoanthus* Zone (1). Balboa, rock and rockpools at low tide (3), from scrapings off buoy at canal entrance (3) and from piles of quays (7); Colón, scrapings off piles of quays (2); coll. Crossland (types not designated).

REMARKS.—The material from Balboa represents the syntype material of this subspecies. The subspecies is characterized by having simple, rather than pectinate, branchiae in the posterior end. The present specimens have subacicular hooks first present from setigers 21–34, well within the range suggested by Fauchald (1970).

Eunice antennata aedificatrix is known from intertidal areas at or near Balboa and in western Mexico; the present records also include areas in the western Atlantic Ocean near Panama.

Eunice aphroditois (Pallas, 1788)

Nereis aphroditois Pallas, 1788:229.
Eunice aphroditois (Pallas).—Monro, 1933a:58–59.—Hartman, 1944b:109–110.—Fauchald, 1970:24–25, pl. 3a,b.

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (1); Galeta Reef, *Laurencia* Zone (1). Taboga Island, from floats at the stage at the end of the hotel pier (2), coll. Crossland.

REMARKS.—*Eunice aphroditois* has strongly

branched branchiae present from setigers 5–7. The subacicular hooks are present from setigers 15–54; the first occurrence is strongly dependent on the size of the specimen. The species is considered circumtropical and has previously been reported from both sides of the Isthmus of Panama.

Eunice biannulata Moore, 1904

Eunice biannulata Moore, 1904:487–490, pl. 37: figs. 10–18, pl. 38, fig. 42.—Fauchald, 1969:2–4, fig. 1; 1970:25–26.
Eunice longicirrata.—Monro, 1933a:61–62 [not Webster, 1884 = *Eunice websteri*].

MATERIAL EXAMINED.—Gorgona Island, from coral (4), coll. Crossland.

REMARKS.—The present specimens have the moniliform articles of the antennae and the low number of branchial filaments characteristic of this species. It has been found only in the eastern Pacific Ocean from southern California to Panama.

Eunice filamentosa Grube, 1856

Eunice filamentosa Grube, 1856:56.—Monro, 1933a:65–66, fig. 27.—Hartman, 1944b:107, pl. 6: figs. 123–126.—Fauchald, 1970:31–33, pl. 3c–g.

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (3); Gorgona Island, at low tide (2); coll. Crossland.

REMARKS.—The present specimens are well within the established limits of variation in terms of the origin of the branchiae and the subacicular hooks. The first branchiae are present on setigers 24–34, and the subacicular hooks from setiger 18 appear in all five specimens. *Eunice filamentosa* is further characterized by the strongly hammer-headed acicula in posterior setigers and strongly beaked, bidentate, dark, subacicular hooks.

Eunice filamentosa was described from tropical west Atlantic areas and is also common in the eastern Pacific Ocean.

Eunice mutilata Webster, 1884

Eunice mutilata Webster, 1884:315–316, pl. 9: figs. 36, 36a–d–40.—Hartman, 1944b:113–114, pl. 6: figs. 140–141.—Fauchald, 1970:37–38, pl. 3j–k.
Eunice afra.—Monro, 1933a:66–67 [not Peters, 1854].

MATERIAL EXAMINED.—Taboga Island, from floats at the end of the hotel pier (5), coll. Crossland.

REMARKS.—Hartman (1944b:113), pointed out that the specimens reported by Monro (1933a) from Panama, should belong to this species rather than to *E. afra*. I concur after having reexamined the material. Both species are known from the area and can be separated as indicated in the key.

Eunice mutilata is common in warm waters on both sides of the Americas.

Eunice (Nicidion) cariboea Grube, 1856

FIGURE 10

Eunice cariboea Grube, 1856:57.—Monro, 1933a:63.
Eunice (Nicidion) cariboea Grube.—Hartman, 1944b:123–124, pl. 7: figs. 157–163; pl. 8: fig. 178.—Fauchald, 1970:38–39.
Eunice cariboea var. *kinbergii*.—Monro, 1933a:63.

MATERIAL EXAMINED.—Galeta Reef, *Acanthophora* Zone (5); Galeta Reef, Coralline Zone (2); Galeta Reef, *Laurencia* Zone (261); Galeta Reef, *Thalassia* Zone (1). Colón (16); Colón, coral flat at southwest corner of Limón Bay (6); Coiba Island, dredging off the convict settlement, 5 fm, smooth bottom with branched *Lithothamnion* (6); Taboga,

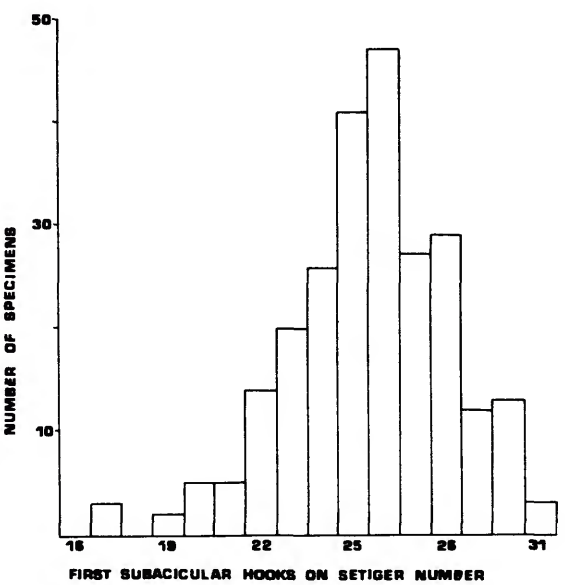

FIGURE 10.—Distribution of the first occurrence of subacicular hooks in *Eunice* (*Nicidion*) *cariboea* Grube from Panama.

at low tide, obtained by breaking up beach sandstone (1); coll. Crossland.

REMARKS.—*Eunice cariboea* is here taken to include *E. kinbergi* as discussed by Fauchald (1970). All the more than 265 specimens in the newly identified material lack branchiae. The distribution of the subacicular hooks is similar to the distribution in specimens from western Mexico. Figure 10 shows the distribution in specimens in which this feature could be determined; some specimens were too incomplete to be included in the survey. The shape of the eyes varies with the first start of the subacicular hooks as indicated by Fauchald (1970).

Eunice (*N.*) *cariboea* is known from both sides of tropical America.

Eunice reducta Fauchald, 1970

Eunice reducta Fauchald, 1970:39–43, pl. 5a–i.
Eunice tridentata.—Monro, 1933a:63–65, fig. 26 [not Ehlers, 1905].

MATERIAL EXAMINED.—Coiba Island, dredging off the convict settlement in 9 fm (3), coll. Crossland.

REMARKS.—*Eunice reducta* has reduced subdistal teeth in the composite hooded hooks, distinctly articulated occipital antennae, and branchiae first present from setiger 4 and limited to approximately one-half of the body. The bidentate subacicular hooks are black.

The relationship between *E. tridentata* Ehlers from New Zealand and the present species was discussed by Fauchald (1970). *Eunice reducta* is known from the eastern Pacific Ocean between Ecuador and western Mexico.

Eunice vittatopsis Fauchald, 1970

Eunice vittatopsis Fauchald, 1970:50–52, pl. 7a–d.
Eunice vittata.—Monro, 1933a:61 [not delle Chiaje, 1828].

MATERIAL EXAMINED.—Coiba Island, off a whale's vertebra fished up from 20 fm (3), coll. Crossland.

REMARKS.—These specimens belong to *E. vittatopsis* in that they have short, distally rounded hooks on the composite hooded hooks. Subacicular hooks are present from approximately setiger 30, and 35 to 40 pairs of branchiae are present.

Eunice vittatopsis was originally described from Golfo de California; the present record is from the Gulf of Panama.

Eunice websteri Fauchald, 1969

Eunice websteri Fauchald, 1969:12–14, fig. 6.

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (2).

REMARKS.—These two specimens agree with *E. longicirrata* as described by Webster (1884); the name has had to be replaced since it was preoccupied in the combination *E. longicirrata* (Kinberg, 1865) which is considered a synonym of *E.* (*N.*) *cariboea*.

The species concepts in this group of the genus are still somewhat confused. *Eunice websteri* has been reported from Brazil by Nonato and Luna (1970:80–81, figs. 80–81); their description indicates that the first branchiae should be present on setigers 4 or 5 with a maximal number of 10 branchial filaments. The type of *E. websteri* has branchiae from setiger 3 and a maximum of 15 branchial filaments.

Subacicular hooks are present from setiger 31 in the type; Nonato and Luna (1970) reported subacicular hooks present from setiger 20 in their material. These differences may indicate that still more species are presently involved in the concept of *E. websteri*.

Eunice websteri is known from Bermuda and is probably rather widely distributed in the western Atlantic Ocean in tropical waters.

Eunice species indeterminate

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone; Galeta Reef, *Laurencia* Zone; Galeta Reef, *Thalassia* Zone; Paitilla Beach, Hydroid Zone. Coiba Island, dredging off the convict settlement in 5 fm, smooth bottom with branched *Lithothamnion* (1), coll. Crossland.

REMARKS.—These posterior ends, median fragments, and poorly preserved specimens cannot be further identified.

Lysidice ninetta Audouin and Milne Edwards, 1833

Lysidice ninetta Audouin and Milne Edwards, 1833:235, pl. 12: figs. 1–8.—Monro, 1933a:70–71.—Hartman, 1944b:125.—Fauchald, 1970:52–53.
Lysidice collaris Grube, 1870:495–496.—Monro, 1933a:69–70.

MATERIAL EXAMINED.—Paitilla Beach, Hydroid

Zone (4); Paitilla Beach, *Tetraclita* Zone (3). Balboa, rocks and rock-pools at low tide (3); Coiba Island, dredging off the convict settlement in 5 fm, smooth bottom with branched *Lithothamnion* (6) and in sand at low water (1); Gorgona Island, in coral (2); Taboga Island, at low tide, obtained by breaking up beach sandstone (5) and from floats at the end of the hotel pier (1); all coll. Crossland.

REMARKS.—Subacicular hooks are present from setigers 15–19 in the present material, well within the range established for the species from western Mexico (Fauchald, 1970).

All present specimens are from the Pacific side of Panama, but the species is well known also from the western Atlantic; it appears to be circumtropical in dispersal.

Marphysa amadae, new species

FIGURE 11

MATERIAL EXAMINED.—Galeta Reef, *Thalassia* Zone (2, holotype, USNM 53094).

DESCRIPTION.—Both specimens are posteriorly incomplete. The holotype, 34 mm long and 3 mm wide, has 139 setigers. Preserved in alcohol, both specimens are ivory-colored without color patterns.

The prostomium (Figure 11*a*) is anteriorly deeply bifid. The five occipital tentacles are smooth and barely reach beyond the tip of the prostomium. The ceratophores are short and wide. The first peristomial segment is twice as long as the second one, which is similar in length to the first setiger.

Prebranchial parapodia (Figure 11*b*) are all similar. Each has a rounded acicular lobe, a low transverse presetal lobe, and a high, evenly rounded postsetal lobe. The parapodial lobes are best developed in anterior setigers. The digitate dorsal and ventral cirri are similar in length. The dorsal cirrus becomes shorter in late prebranchial segments, and the ventral cirrus is indistinct from late prebranchial segments to the ends of the two fragments.

Branchial parapodia (Figure 11*c*) are similar; each has barely distinct, elongated transverse pre- and postsetal lobes. The acicular lobe is gently pointed, depending in part on the degree of protrusion of the acicula. The short dorsal cirri are digitate; the ventral cirri are represented by blunt projections.

Branchiae are present from setiger 54 in the holotype and from setiger 47 in the paratype; the first branchiae are all simple, but some branchiae are bifid from approximately setiger 100. The maximal number of branchial filaments is two.

Anterior setigers have three black, distally pointed acicula. The number of acicula is reduced in late prebranchial setigers, and the branchial setigers have only one aciculum each. Subacicular hooks

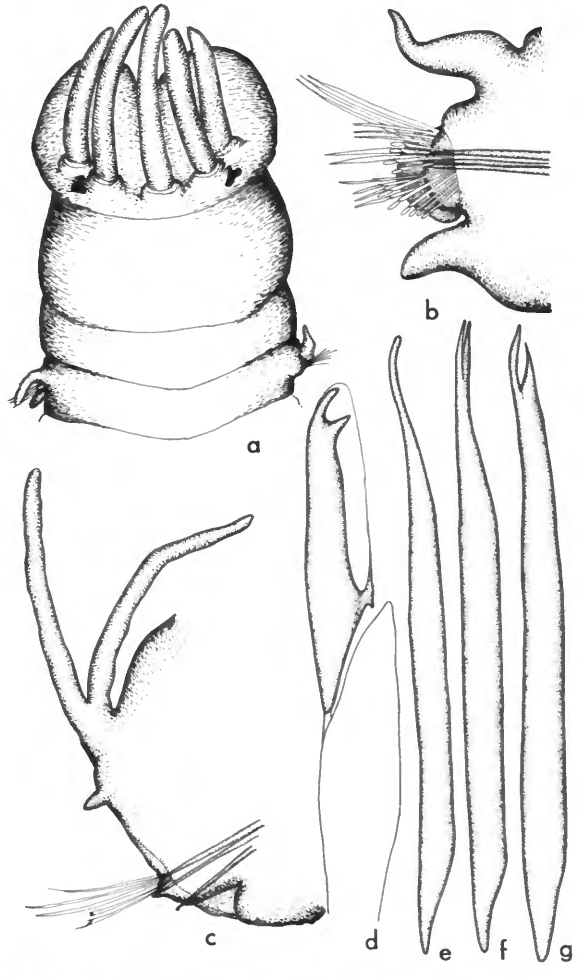

FIGURE 11.—*Marphysa amadae*, new species: *a*, anterior end, dorsal view, × 25; *b*, anterior parapodium, anterior view, × 61; *c*, posterior parapodium, anterior view, × 61; *d*, bidentate composite hook, anterior setiger, × 950; *e–g*, appendages of composite hooks of postacicular fascicles, median setiger, × 950.

are present from setigers 54 in the holotype and from setiger 45 in the paratype. Each is black and distally bifid with the proximal tooth at least twice as thick as the distal one. Composite falcigerous hooded hooks are present in dense preacicular fascicles in prebranchial parapodia. The appendages are of several different kinds. Most setae have short, distally bifid appendages (Figure 11*d*), but in postacicular fascicles are found setae with long, slender appendages; each of these appendages (Figure 11*e–g*) is distally, evenly bifid, or the proximal tooth may be reduced to a varying degree so that the appendage may appear distally simple. Other setae in postacicular fascicles include two different kinds of limbate simple setae; these are present in all setigers. The one kind is long and slender, and the other is short and comparatively wide.

Marphysa amadae belongs to the group of *Marphysa* that have only composite falcigers and branchiae present over a long region of the body (Group C2 according to Fauchald, 1970:210). It differs from all other species in this group in having small fascicles of composite postacicular setae in which the distal end of each appendage is prolonged and modified. All other species in this group have normal bidentate composite setae.

Marphysa amadae is named for Dr. Amada A. Reimers, Pennsylvania State University, who collected most of the new material identified in this study.

Marphysa sanguinea (Montagu, 1815)

Marphysa sanguinea Montagu, 1815:20–21, pl. 3: fig. 1.—Fauchald, 1970:64–66.
Marphysa sanguinea var. *americana* Monro, 1933a:68–69, fig. 28.

MATERIAL EXAMINED.—Balboa, shore pools at low tide (1, holotype of var. *americana*, BMNH), coll. Crossland.

REMARKS.—As indicated by Fauchald (1970:65), it is not possible to separate the variety described by Monro from the main form. The species is highly variable, but can be characterized in relation to other forms in the area as having exclusively composite spinigers and branchiae present over a long region of the body. The stem of the branchiae is very short, and the branchiae appear palmately arranged rather than pectinate in most specimens. Subacicular hooks may be absent completely.

Marphysa sanguinea is circumtropical as far as is known.

Marphysa species indeterminate

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (1).

REMARKS.—This specimen cannot be completely identified since it is incomplete posteriorly. The composite falcigers have short, bidentate appendages in all setigers present; branchiae are present from setiger 10.

Nematonereis unicornis (Grube, 1840)

Lumbriconereis unicornis Grube, 1840:80.
Nematonereis unicornis (Grube).—Fauvel, 1923:412–413, fig. 162h–n.

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (1).

REMARKS.—*Nematonereis unicornis* differs sharply from all other eunicids found in the present material in that it has only a single median antenna. The species is small and easily overlooked, or the specimens are assumed to be juveniles of larger species of the family.

Nematonereis unicornis is probably circumtropical but is poorly known for reasons indicated above.

Palola siciliensis (Grube, 1840)

Eunice siciliensis Grube, 1840:83.—Monro, 1933a:62.
Palola siciliensis (Grube).—Hartman, 1944b:131.—Fauchald, 1970:68–69.
Nicidion edentulum Ehlers, 1901:130–131, pl. 16: fig. 11–16.
Eunice siciliensis var. *edentulum*.—Monro, 1933a:62–63.

MATERIAL EXAMINED.—Galeta Reef, *Acanthophora* Zone (4), Galeta Reef, Coralline Zone (12); Galeta Reef, *Laurencia* Zone (14); Galeta Reef, *Thalassia* Zone (2); Paitilla Beach, Hydroid Zone (3); Paitilla Beach, *Tetraclita* Zone (1). Coiba Island, dredging off convict settlement, smooth bottom with branched *Lithothamnion*, 5 fm (5), and in 9 fm same location (1); Colón, coral flat at southwest corner of Limón Bay (1); Gorgona Island, from coral (2); Taboga Island, shore (1), and obtained by breaking up beach sandstone (1); all coll. Crossland.

REMARKS.—Most of the specimens are small, but

individuals from all environments are sexually mature or nearly so. All specimens that could be examined in detail were studied for the structure of the right second maxilla. All specimens had two distinct teeth and the third denticle, characteristic of *P. paloloides* (Moore) (Fauchald, 1970:67–68), was absent.

Palola siciliensis is circumtropical.

Palola species indeterminate

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone, Galeta Reef, *Laurencia* Zone; Galeta Reef, *Zoanthus* Zone; Paitilla Beach, Hydroid Zone.

REMARKS.—These posterior ends and median fragments cannot be further identified.

Family LUMBRINERIDAE

Key to the Species from Panama

1. Branched branchiae present on some anterior setigers ..... *Ninoe chilensis*
   Branchiae absent 2
2. All hooded hooks simple 3
   Anterior hooded hooks composite 4
3. Hooded hooks first present from setigers 21–45 ..... *Lumbrineris erecta*
   Hooded hooks present for the first setigers ..... *Lumbrineris tetraura*
4. Parapodial lobes no longer in posterior than in anterior setigers ..... *Lumbrineris latreilli*
   At least postsetal lobes prolonged in posterior setigers 5
5. Both pre- and postsetal lobes prolonged in posterior setigers ..... *Lumbrineris cruzensis?*
   Only postsetal lobes prolonged ..... *Lumbrineris inflata*

Lumbrineris cruzensis? Hartman, 1944

Lumbrineris cruzensis Hartman, 1944b:165–166, pl. 12: figs. 263–269.—Fauchald, 1970:83–84, pl. 12:g–j.

Lumbrineris sphaerocephala.—Monro, 1933a:86 [not Schmarda, 1861, nor Ehlers, 1905:33].

Lumbrineris latreilli.—Monro, 1933a:84–85 [in part, not Audouin and Milne Edwards, 1834].

MATERIAL EXAMINED.—Gorgona Island, dredging 30 fm, muddy sand and shell fragments (1); Gorgona Island, dredging 20 fm, fine sand and shell (1); coll. Crossland.

REMARKS.—Both specimens have the distinct rounded prostomium and prolonged pre- and postsetal lobes characteristic of *L. cruzensis*. The jaw apparatus is missing in both, so the identification must be considered somewhat questionable. Neither of the two species to which these specimens originally were assigned have prolonged posterior parapodial lobes.

Lumbrineris cruzensis is known from the eastern Pacific Ocean and has been reported more widely from other parts of the Americas.

Lumbrineris erecta (Moore, 1904)

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

Lumbrineris erecta (Moore).—Fauchald, 1970:85–87, pl. 13a,b.

Lumbrineris heteropoda.—Monro, 1933a:82–83 [not Marenzeller, 1879].

MATERIAL EXAMINED.—Balboa, rocks and rockpools at low tide (1), coll. Crossland.

REMARKS.—*Lumbrineris erecta* has long postsetal lobes in all setigers, but they are distinctly prolonged in the posterior parapodia. *Lumbrineris heteropoda*, on the other hand, has long postsetal lobes in anterior and posterior parapodia, but they are reduced to short blunt projections in median setigers.

Lumbrineris erecta is found from southern California to Panama in very shallow water or in the intertidal; it has not been reported from the Atlantic Ocean.

Lumbrineris inflata Moore, 1911

Lumbrineris inflata Moore, 1911:289–291, pl. 19, 20: figs. 128–134.—Hartman, 1944b:160–161.—Fauchald, 1970:89–91, pl. 14a–d.

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (1); Paitilla Beach, Hyroid Zone (3).

REMARKS.—The maxillary formula is the same in the present specimens as in those reported by Fauchald (1970) from western Mexico, in that each maxilla III has three or four teeth and each maxilla IV two teeth. The acicula are usually light brown in small specimens and darker, often nearly black, in large specimens.

Lumbrineris inflata is known from British Columbia to western Mexico in the eastern Pacific Ocean. A closely similar, perhaps identical, form, *L. albifrons* Crossland (1924), has been reported from the Galapagos Islands, and a series of other species have been considered synonyms of *L. inflata* from time to time (Fauchald. 1970). It is thus very difficult to assess the total distribution of the species, but at a minimum it is present both in the Atlantic Ocean and the Pacific Ocean as indicated by the above samples.

Lumbrineris latreilli Audouin and Milne Edwards, 1834

Lumbrineris latreilli Audouin and Milne Edwards, 1834:168–170, pl. 3b: figs. 13–15.—Monro, 1933a:84–85 [in part].—Fauchald, 1970:94–97, pl. 15f–h.

MATERIAL EXAMINED.—Gorgona Island, dredging 30 fm, muddy sand with shell fragments (1) and dredging close to shore in 15 fm, shells dead coral and gravel (1), coll. Crossland.

REMARKS.—*Lumbrineris latreilli* is difficult to identify because the limits of variability in the species are poorly defined. The present specimens fit well with the species as identified by Fauchald (1970) from western Mexico.

Lumbrineris latreilli appears to be widely distributed, but as remarked by Fauchald (1970), some of the records may concern related species.

Lumbrineris tetraura (Schmarda, 1861)

Notocirrus tetraurus Schmarda, 1861:117.

Lumbrineris tetraura (Schmarda).—Hartman, 1944b:147–149, pl. 8: figs. 175, 190–191, pl. 9: figs. 192–195.—Fauchald, 1970:109–111, pl. 19b–e.

Lumbrineris brevicirra.—Monro, 1933a:83–84 [not Schmarda, 1861].

MATERIAL EXAMINED.—Coiba Island, dredging off convict settlement in 10–12 fm, fine sand, small shells, red weed (1); Gorgona Island, shore at low tide (1); coll. Crossland.

REMARKS.—The present specimens lack anterior composite hooks. *Lumbrineris sphaerocephala* has such hooks. The parapodial construction and the setal structures agree with *L. tetraura*. The jaw apparatus is missing in the specimen from Coibo Island; the identity is thus open to some doubt.

Lumbrineris tetraura appears widespread in warm waters, both in the Atlantic and Pacific Oceans.

Lumbrineris species indeterminate

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (1).

REMARKS.—The present specimen has been dried out, and all setae are broken off.

Ninoe chilensis Kinberg, 1857

Ninoe chilensis Kinberg, 1857:566.—Monro, 1933a:89–91, fig. 36.

MATERIAL EXAMINED.—Gorgona Island, dredging in 20 fm, fine sand and shell fragments (3), coll. Crossland.

REMARKS.—The specimens are as described by Monro. Hooded hooks are present at least from setigers 10–12, but anterior setae have been broken in all specimens and they may have been present even further anteriorly.

Ninoe foliosa and *N. longibranchia* were described by Fauchald (1972:153–160, pl. 29–32) and discussed in relation to other known species with branched branchiae. *Ninoe chilensis* differs from these species in that it lacks the free pectinate part of the branchiae projecting from the parapodia; *N. foliosa* and related species have such a structure.

Ninoe chilensis has only been reported from the eastern Pacific Ocean.

Family ARABELLIDAE

Key to the Species from Panama

1. At least median and posterior parapodia with stout emergent spines 2
   Emergent spines absent ..... ***Arabella mutans***
2. Maxilla I proximally dentate 3
   Maxilla I proximally smooth ..... ***Drilonereis nuda***
3. Mandibles present ..... ***Drilonereis falcata***
   Mandibles absent ..... ***Drilonereis mexicana***

Arabella mutans (Chamberlin, 1919)

Cenothrix mutans Chamberlin, 1919:330–332, pl. 61: figs. 1–9, pl. 62: fig. 1.
Arabella mutans (Chamberlin).—Monro, 1933a:88–89 [in part].—Hartman, 1944b:173–174.—Fauchald, 1970:128–130, pl. 21a–f.

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (1); Galeta Reef, *Thalassia* Zone (2); Paitilla Beach, Hydroid Zone (17). Taboguilla, sandy shore at low tide, coll. Mortensen, (fragment); Gorgona Island, coral (1); Taboga Island, washings from very barren-looking branches of dead coral 1–2 fm (11); coll. Crossland.

REMARKS.—*Arabella mutans* has the ventralmost seta distally bluntly pointed and hooded with a long, pointed hood in median and posterior setigers. The maxillary formula for the present specimens is 9(10) + 9(10) − 13(14) + 13(14) − 5 + 5 − 4(5) + 4(5) − 1 + 1 which agrees well with the formula given by Fauchald (1970) for material from western Mexico. The relationship between *A. mutans* and similar species was discussed by Fauchald (1970). Monro's concept of a widely distributed, variable species is not acceptable without more evidence. However, all material reexamined from his collections belong to this species.

Arabella mutans is known from the eastern Pacific Ocean and is now recorded also from the Atlantic side of the Isthmus of Panama.

Arabella species indeterminate

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (2). Paitilla Beach, Hydroid Zone (1).

REMARKS.—These specimens are poorly preserved.

Drilonereis falcata Moore, 1911

Drilonereis falcata Moore, 1911:298–299, pl. 20: figs. 150–154.—Fauchald, 1970:135–136, pl. 21g.
Drilonereis filum.—Monro, 1933a:88 [not Claparède, 1868].

MATERIAL EXAMINED.—Gorgona Island, dredging close to shore in 15 fm, shell, dead coral gravel (1), coll. Crossland.

REMARKS.—The present specimen fits with *D. falcata* rather than *D. filum* as these species were defined by Fauchald (1970). It has dentate bases on maxillae I, and mandibles are present. It is known from central California to Panama in the eastern Pacific Ocean.

Drilonereis mexicana Fauchald, 1970

Drilonereis mexicana Fauchald, 1970:138–140, pl. 23a–c.
Drilonereis nuda.—Monro, 1933a:86–87, fig. 35 [in part, not Moore, 1909].

MATERIAL EXAMINED.—Balboa, rocks and rock-pools at low tide (1), coll. Crossland.

REMARKS.—*Drilonereis nuda* as identified by Monro contains material of two species, *D. nuda* sensu Moore and *D. mexicana*. *Drilonereis mexicana* has the proximal part of the first maxillae dentate, and mandibles are absent. *Drilonereis nuda* lacks the dentition of the first maxillae.

Drilonereis mexicana is known from western Mexico and Panama.

Drilonereis nuda Moore, 1909

Drilonereis nuda Moore, 1909a:254–256, pl. 8: figs. 21–23.—Monro, 1933a:86–87 [in part].—Fauchald, 1970:140–141, pl. 22g.

MATERIAL EXAMINED.—Coiba Island, in sand at low tide, fine seagrass and dead coral bedded in sand (2); Gorgona Island, dredging close to shore 15 fm, shells, dead coral and gravel (1); coll. Crossland.

REMARKS.—The relation between this and similar species was reviewed by Fauchald (1970); it can be distinguished from other species in the area as indicated above. *Drilonereis nuda* is known from the eastern Pacific Ocean between California and Panama.

Family LYSARETIDAE

Oenone fulgida (Savigny, 1818)

Aglaura fulgida Savigny, 1818:326.
Oenone fulgida (Savigny).—Monro, 1933a:91–92.—Fauchald, 1970:143–146, pl. 24a–d.

MATERIAL EXAMINED.—Galeta Reef, *Acanthophora* Zone (1); Galeta Reef, Coralline Zone (1). Coiba Island, dredging off the convict settlement, 5 fm, smooth bottom with branched *Lithothamnion* (1) and in crevices of Lithothamnia and coral, 5–10 fm (3); coll. Crossland.

REMARKS.—The present specimens have the single peristomial segment characteristic of this genus, and the jaw-apparatus and setal structures are similar to those seen in specimens from western Mexico.

Oenone fulgida is circumtropical in distribution.

Lysaretidae genus and species indeterminate

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (fragment)

REMARKS.—The fragment is of some median segments and cannot be identified.

Family DORVILLEIDAE

Key to the Species from Panama

1. Furcate setae present ..... ***Schistomeringos longicornis***
   Furcate setae absent 2
2. Antennae smooth or wrinkled ..... ***Dorvillea rubrovittatus***
   Antennae distinctly articulated ..... ***Dorvillea cerasina***

Dorvillea cerasina (Ehlers, 1901)

Staurocephalus cerasinus Ehlers, 1901:263–264.
Dorvillea cerasina (Ehlers).—Hartman, 1944b:190.—Fauchald, 1970:155–156, pl. 26a–l.
Staurocephalus angolanus.—Monro, 1933a:93 [not Augener, 1918].

MATERIAL EXAMINED.—Paitilla Beach, Hydroid Zone (1). Colón, scrapings from piles of quays (4), coll. Crossland.

REMARKS.—The present specimens have the distinctly articulated antennae of *D. cerasina* as in the material from western Mexico (Fauchald, 1970).

The species was originally described from Chile and has been found commonly in shallow warm water areas in the eastern Pacific Ocean as well as from the western Atlantic.

Dorvillea rubrovittatus (Grube, 1855)

Staurocephalus rubrovittatus Grube, 1855:97–98.—Fauvel, 1923:445–446, fig. 177a–l.
Dorvillea rubrovittata (Grube).—Hartman, 1944b:190.

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (3).

REMARKS.—*Dorvillea rubrovittatus* was retained as genotype of *Dorvillea* as restricted by Pettibone (1961); it lacks furcate setae, and the articulation of palps and antennae is absent.

Dorvillea rubrovittatus is known from the warmer parts of the Atlantic Ocean but has never been found in the Pacific Ocean.

Schistomeringos longicornis (Ehlers, 1901)

Stauronereis longicornis Ehlers, 1901:150–151, pl. 19: figs. 18–21, pl. 20: figs. 4–6.
Schistomeringos longicornis (Ehlers).—Jumars, 1974:107–109, fig. 2.
Staurocephalus rudolphii.—Monro, 1933a:92–93 [not delle Chiaje, 1828:176].
Dorvillea rudolphi (delle Chiaje).—Fauchald, 1970:156–159, pl. 27a–j.

MATERIAL EXAMINED.—Galeta Reef, *Thalassia* Zone (1). Taboga Island, low tide (1), coll. Crossland.

REMARKS.—*Schistomeringos longicornis* has recently been separated from the similar *S. rudolphi* by Jumars (1974:104–109), who also demonstrated that the generic names used for these species were invalid and had to be replaced by *Schistomeringos*. *Schistomeringos rudolphi* is known from the Atlantic Ocean, but the material examined here, including the specimens reported by Monro (1933a:92) belongs to *S. longicornis*. *Schistomeringos longicornis* is known from the eastern Pacific Ocean from Chile to British Columbia. The record from Galeta is the first from the Atlantic Ocean.

Family ORBINIIDAE

Haploscoloplos panamensis Monro, 1933

Haploscoloplos panamensis Monro, 1933b:1045–1046, fig. 1.—Hartman, 1957:277.

MATERIAL EXAMINED.—Between Taboga and Taboguilla, 6–12 fm, soft mud (3, syntypes, BMNH), coll. Crossland.

REMARKS.—The species is as described by Monro and reviewed by Hartman. It is known from Alaska and from Panama in shallow water.

Family SPIONIDAE

Key to the Species from Panama

1. With modified setae in setiger 5 2
   Without modified setae in setiger 5 4
2. Some modified setae from setiger 5 densely bristle-topped 3
   No bristle-topped setae in setiger 5 ..... *Boccardia tricuspa*
3. Prostomium anteriorly rounded; short notosetae present in first setiger ..... *Boccardia proboscidea*
   Prostomium anteriorly bifid; notosetae absent from first setiger ..... *Boccardia polybranchia*
4. Five pairs of branchiae present; hooded hooks in at least some notopodia ..... *Prionospio heterobranchia texana*
   At least 30 pairs of branchiae; hooded hooks in neuropodia only ..... *Laonice japonica*

Boccardia polybranchia (Haswell, 1885)

Polydora (Boccardia) polybranchia Haswell, 1885:275.—Monro, 1933b:1047.
Boccardia polybranchia (Haswell).—Blake and Woodwick, 1971:39–41.

MATERIAL EXAMINED.—Gorgona, from coral (2) and dredging close to shore, 15 fm, shells, gravel and dead coral overgrown with Polyzoa, etc. (2); Taboga Island, from dead coral in large pieces just below low water (1); coll. Crossland.

REMARKS.—These specimens agree well with *B. polybranchia* as reviewed by Blake and Woodwick (1971).

The species is widespread, possibly cosmopolitan.

Boccardia proboscidea Hartman, 1940

Boccardia proboscidea Hartman, 1940b:383–387, fig. 1a–j.—Hartman, 1969:95–96, 5 figs. [unnumbered].—Blake and Woodwick, 1971:40.

MATERIAL EXAMINED.—Paitilla Beach, *Balanus* Zone (6).

REMARKS.—The present specimens fit *B. proboscidea* as reviewed by Blake and Woodwick (1971) and the description given by Hartman (1969). The characteristic rounded prostomium and the structure of the modified setae separate it from other species from this area.

Boccardia proboscidea has been reported from the eastern Pacific Ocean from Canada to Panama.

Boccardia tricuspa (Hartman, 1939)

Polydora tricuspa Hartman, 1939b:16–17, fig. 3c–k.
Boccardia tricuspa (Hartman).—Hartman, 1969:99–100, 4 figs. [unnumbered].—Blake and Woodwick, 1971:40.

MATERIAL EXAMINED.—Paitilla Beach, *Tetraclita* Zone (2).

REMARKS.—*Boccardia tricuspa* differs from *B. proboscidea* in the structure of the modified setae in setiger 5. Both species have two kinds of modified setae, including in both cases simple falcate spines. *Boccardia tricuspa* has in addition a series of distally smooth, tripartite modified setae; *B. proboscidea* has bifid, distally strongly hirsute setae in the same position.

Boccardia tricuspa is known from central California to the Galapagos Islands in shallow water and from the intertidal.

Laonice japonica (Moore, 1907)

Spionides japonicus Moore, 1907:204–206, pl. 16: figs. 31–34.
Laonice japonica (Moore).—Monro, 1933b:1047.

MATERIAL EXAMINED.—Perlas Islands (1), coll. Crossland.

REMARKS.—The species is here accepted as reviewed by Monro (1933b). It is very difficult to separate the species of *Laonice;* thus the conservative approach of not introducing another name for the same material would have to apply in this instance.

Laonice japonica has been reported from Japan in addition to this record.

Prionospio heterobranchia texana Hartman, 1951

Prionospio heterobranchia texana Hartman, 1951:85.

MATERIAL EXAMINED.—Galeta Reef *Thalassia* Zone (1).

REMARKS.—Foster (1971:93) synonymized the

two described subspecies of *P. heterobranchia* Moore (1907), *P. heterobranchia texana* Hartman, and *P. heterobranchia newportensis* Reish (1959), with the main form on the grounds that the ranges of the first occurrences of the hooded hooks overlapped within one sample as much as the difference between the subspecies. Type material was examined at the time.

I am unwilling to accept the fusion at the present time since no reference was made to the size of the specimens examined. Even when an absolute overlap in characters can be found in other polychaetes, a reference to the size of the specimens may readily separate the different forms. For conservative reasons, I prefer at this time to retain the two subspecies as distinct.

Prionospio heterobranchia texana is known from the western Atlantic Ocean.

Prionospio species indeterminate

Prionospio pinnata (Ehlers).—Monro, 1933b:1047.

MATERIAL EXAMINED.—Between Taboga and Taboguilla Islands, 6–12 fm, soft mud (2), coll. Crossland.

REMARKS.—The specimens are poorly preserved, however, the last pair of branchiae is distinctly digitate, not pinnate as it should be in *Paraprionospio pinnata* (Ehlers).

Family MAGELONIDAE

Key to the Species from Panama

Hooded hooks of posterior region bidentate, prostomium with frontal horns ..... ***Magelona pacifica***
Hooded hooks of posterior region tridentate, prostomium without frontal horns ..... ***Magelona papillicornis***

Magelona pacifica Monro, 1933

Magelona pacifica Monro, 1933b:1048–1049, fig. 2.—Jones, 1963:22–23.

MATERIAL EXAMINED.—Gorgona Island at low tide (14, syntypes, BMNH), coll. Crossland.

REMARKS.—The magelonids are presently under revision by Dr. Meredith L. Jones, Smithsonian Institution. The identification of the two species reported from Panama has been verified using the key published by Jones (1963), but otherwise the conservative view has been taken, which is not to change or introduce any new names into the lists until better evidence is available.

Magelona pacifica can be separated from *M. papillicornis,* also reported from this area, as indicated above. It has been reported from southern California to Panama.

Magelona papillicornis Müller, 1858

Magelona papillicornis F. Müller, 1858:216.—Monro, 1933b: 1048.—Jones, 1963:22–23.

MATERIAL EXAMINED.—Balboa, rock and rockpools at low tide (1), coll. Crossland.

REMARKS.—*Magelona papillicornis* can be separated from *M. pacifica* as indicated above. This species is possibly widely distributed, but may have been confused with other, similar species.

Family CHAETOPTERIDAE

Key to the Species from Panama

1. Tube U-shaped, thick-walled and pergamentaceous ..... ***Chaetopterus variopedatus***
   Tube straight, thin-walled, usually translucent brown 2
2. Notopodia of median setigers simple ..... ***Mesochaetopterus alipes***
   Notopodia of median setigers with at least 2 lobes 3
3. Paired palps with a pair of small tentacles at the base ..... ***Phyllochaetopterus*** sp. indet.
   Paired palps without tentacles at the base ..... ***Spiochaetopterus costarum***

Chaetopterus variopedatus (Renier, 1804)

Tricoelia variopedata Renier, 1804:xviii.
Chaetopterus variopedatus (Renier).—Monro, 1933b:1050.—Hartman, 1969:209–210, 3 figs. [unnumbered].

MATERIAL EXAMINED.—Gorgona Island, from coral (1) and dredging close to shore in 15 fm, dead coral and gravel (tubes); Taboga Island, at low water spring (tubes), coll. Crossland.

REMARKS.—*Chaetopterus variopedatus* can be found both in hard and soft substrates: in the former, it glues its tube to such objects as kelp-holdfasts, branching corals etc.; in the latter, it forms the characteristic symmetrically U-shaped tubes. The tube is open at both ends at all times, and functionally it does not appear to matter whether the tube is attached to rocks, etc., or buried in sediment.

Chaetopterus variopedatus is cosmopolitan.

Mesochaetopterus alipes Monro, 1928

Mesochaetopterus taylori var. *alipes* Monro, 1928a:92–93, figs. 14–15.
Mesochaetopterus alipes Monro.—Monro, 1933b:1050–1052, fig. 3.

MATERIAL EXAMINED.—Taboguilla, sandy shore at low tide (syntypes, BMNH), coll. Mortensen; Taboga Island, shore (12); Gorgona Island, at low water (21); coll. Crossland.

REMARKS.—The species is as described by Monro. The tubes are thin-walled and are covered externally with sand-grains, resembling tubes of certain onuphids. Monro (1928a:92) also reported *Mesochaetopterus minutus* Potts from Taboguilla Island. This material has not been reexamined and the record cannot be confirmed.

Phyllochaetopterus species indeterminate

Phyllochaetopterus sp.—Monro, 1933b:1050.

MATERIAL EXAMINED.—Taboga Island at low tide, sand (fragments), coll. Crossland.

REMARKS.—Sufficient parts of the bodies are present so it is possible to identify the present specimens as belonging to either *Spiochaetopterus* or *Phyllochaetopterus*. They are cited as originally identified by Monro, but have been excluded from consideration in the faunistic part.

Spiochaetopterus costarum (Claparède, 1870)

Telepsavus costarum Claparède, 1870:80–84, pl. 20: fig. 1.—Monro, 1933b:1052–1054, fig. 4.—Hartman, 1969:219–220, 6 figs. [unnumbered].

MATERIAL EXAMINED.—Gorgona Island at low tide (3), coll. Crossland.

REMARKS.—As pointed out by Gitay (1969:10), it is impossible to retain the separation between *Telepsavus* and *Spiochaetopterus*. The specimens are as described by Monro (1933b). The species is very widespread, possibly cosmopolitan.

Family CIRRATULIDAE

Key to the Species from Panama

1. A pair of long, grooved palps present 2
   Without grooved palps 5
2. All setae slender capillaries ..... ***Tharyx*** sp. indet.
   Setae in part acicular spines or hooks 3
3. Acicular spines distally excavate, body dark ..... ***Dodecaceria concharum***
   Acicular spines not excavate, body light 4
4. Posterior acicular spines distally entire ..... ***Chaetozone*** sp. indet.
   Posterior acicular spines distally bifid ..... ***Cauleriella*** sp. indet.
5. Several segments with transverse rows of dorsal tentacles ..... ***Timarete perbranchiata***
   Only 1 segment with transverse row of tentacles 6
6. Branchiae present anterior to the segment with the dorsal tentacles 7
   Branchiae present from the segment that carries the dorsal tentacles ..... ***Cirratulus cirratus?***
7. Posterior spines dark or black ..... ***Cirriformia luxuriosa***
   Posterior spines light yellow 8
8. Spines present from setigers 7–12; dorsum with irregular pattern of dark transverse bars ..... ***Cirriformia punctata***
   Spines first present from median segments, dorsum without color patterns ..... ***Cirriformia tentaculata***

Cauleriella species indeterminate

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (1).

REMARKS.—The present specimen is incomplete posteriorly with 27 setigers. It has bifid neuropodial hooks from setiger 20; notopodial hooks are not present in any segment. It does not fit in terms of the distribution of hooks with any described species in the genus.

Chaetozone species indeterminate

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (1).

REMARKS.—The present specimen resembles *C. multioculata* Hartman, 1961 (Hartman, 1969:239–240, 2 figs. [unnumbered]) in that it has a series of eyespots in a row on each side of the prostomium. Hooks are present in the neuropodia from setiger 7, and notopodial hooks are present from setiger 8 in the present specimen. *Chaetozone multioculata* has neuropodial hooks from setigers 10–13 and notopodial ones from a median setiger (approximately setiger 20). The present specimen is about the same size as the ones described by Hartman, so the difference in distribution does not appear related to size.

Cirratulus cirratus? (Müller, 1776)

Lumbricus cirratus O. F. Müller, 1776:281, fig. 5.
Cirratulus cirratus?.—Fauchald, 1973:25–26.

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (3).

REMARKS.—These specimens, like the ones previously reported from sandy beaches in Panama, have neuropodial spines first present from setigers 12–14 rather than from setigers 6–11 as in *C. cirratus* from other areas.

Cirratulus cirratus is considered cosmopolitan in shallow waters.

Cirriformia luxuriosa (Moore, 1904)

Cirratulus luxuriosus Moore, 1904:493–494, pl. 38: figs. 28–31.
Cirriformia luxuriosa (Moore).—Hartman. 1969:251–252, 2 figs. [unnumbered].

MATERIAL EXAMINED.—Paitilla Beach, Hydroid Zone (15); Paitilla Beach, *Tetraclita* Zone (9).

REMARKS.—*Cirriformia luxuriosa* has a single, curved dark spine in each ramus in each of the median and posterior parapodia in most specimens; two or three spines are present in each ramus in a few cases.

The species is known from the eastern Pacific Ocean from central California to Panama.

Cirriformia punctata (Grube, 1859)

Cirrhatulus punctata Grube, 1859:107.
Cirratulus punctata Grube.—Augener, 1918:465–467.
Cirriformia punctata (Grube).—Hartman, 1956:292.

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (34).

REMARKS.—The species is here accepted as revised by Augener (1918) based on material from Atlantic areas off Africa. Single, gently curved, yellow hooks are present from setigers 7–10 in the neuropodia and from setigers 9–12 in the notopodia. Hooks are always present in two more neuropodial than notopodial setigers. The dark transverse bars are characteristic of this species in the local area.

Cirriformia punctata has been reported from the tropical Atlantic Ocean.

Cirriformia tentaculata (Montagu, 1808)

Terebella tentaculata Montagu, 1808:110–111, pl. 6: fig. 2.
Audouinia tentaculata (Montagu).—Fauvel, 1927:91–92, fig. 32a–g.
Audouinia polytricha.—Monro, 1933b:1054 [not Schmarda, 1861].
Audouinia luxuriosa.—Monro, 1933b:1055 [not Moore, 1904].

MATERIAL EXAMINED.—Paitilla Beach, *Tetraclita* Zone (2). Balboa, rock and rock-pools at low tide (28); Balboa Docks (2); coll. Crossland.

REMARKS.—*Cirriformia tentaculata* closely resembles *C. spirabranchia* (Moore, 1904) from California and *C. filigera* (delle Chiaje, 1828) from European waters in that all three species have yellow spines starting from a median setiger. *Cirriformia spirabranchia* has at least five spines in each ramus in posterior setigers; the other two have only three. Fauvel (1927:91) separated the two species occurring in European waters on the basis of the position of the branchiae in relation to the dis-

tance between the rami in the parapodia. The branchiae are closer to the notopodia than the distance between the noto- and neuropodia in *C. tentaculata* and at a distance equal to or greater than the distance between the rami in *C. filigera*. The present specimens agree with *C. tentaculata*.

Cirriformia tentaculata may be widespread in warm waters; but due to the close morphological similarities between the several species of *Cirriformia*, it is difficult to estimate its total distribution.

Dodecaceria concharum Orsted, 1943

Dodecaceria concharum Ørsted, 1843b:44.—Fauvel, 1927:102–103, fig. 36a–n.—Hartman, 1969:255–256, 2 figs. [unnumbered].

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (3).

REMARKS.—The present specimens, all of which were solitary burrowers in calcareous substrate, fit very well with the species as described from Europe.

Dodecaceria concharum is cosmopolitan in shallow rocky areas.

Tharyx species indeterminate

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (1); Galeta Reef, *Laurencia* Zone (1); Paitilla Beach, Hydroid Zone (1); Paitilla Beach, *Tetraclita* Zone (1).

REMARKS.—Theses specimens are incomplete and cannot be further identified.

Timarete perbranchiata (Chamberlin, 1918)

Ambo perbranchiata Chamberlin, 1918:117–178.
Timarete perbranchiata (Chamberlin).—Hartman, 1969:269–270.
Ambo americana Monro, 1933b:1051–1056.

MATERIAL EXAMINED.—Gorgona Island, 30 fm, muddy sand (1, syntype of *Ambo americana*, BMNH), coll. Crossland.

REMARKS.—The present specimen agrees well with specimens of *T. perbranchiata* from California. My unpublished records extend the distribution of this species from California through western Mexico to Panama and possibly to the Galapagos Islands.

Cirratulidae species indeterminate

MATERIAL EXAMINED.—Paitilla Beach, Hydroid Zone (fragment); Paitilla Beach, *Tetraclita* Zone (fragments).

REMARKS.—These fragments are unidentifiable.

Family FLABELLIGERIDAE

Key to the Species from Panama

1. Neurosetae pseudocomposite; body encased in a mucoid sheath ..... ***Flabelligera infundibularis***
   Neurosetae simple; body not encased in a mucoid sheath 2
2. A prolonged, tongue-like branchial membrane present ..... ***Piromis americana***
   Branchial membrane short and semicircular ..... ***Pherusa inflata***

Flabelligera infundibularis Johnson, 1901

Flabelligera infundibularis Johnson, 1901:417, pl. 12: figs. 124–127.—Hartman, 1969:291–292, 5 figs. [unnumbered].
Flabelligera affinis?—Monro, 1933b:1056–1057, fig. 5 [not Sars, 1829].

MATERIAL EXAMINED.—Balboa, pools at the lowest tide level (14), coll. Crossland.

REMARKS.—These specimens have the pseudocomposite hooks of *F. infundibularis* rather than the fully composite hooks of *F. affinis*.

Flabelligera infundibularis is known from Alaska to Panama in shallow water.

Pherusa inflata (Treadwell, 1914)

Trophonia inflata Treadwell, 1914:213–214, pl. 12: fig. 33.
Pherusa inflata (Treadwell).—Hartman, 1969:297–298, 5 figs. [unnumbered].
Stylarioides papillata.—Monro, 1933b:1058–1059, fig. 7 [not Johnson, 1901].

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (27); Galeta Reef, *Laurencia* Zone (3); Paitilla Beach, Hydroid Zone (20). Taboga Island, from dead coral just below low tide level (4), coll. Crossland.

REMARKS.—All specimens are rather small, but

cannot otherwise be separated from specimens from California, except that the number of papillae tends to be slightly lower.

Pherusa inflata is known from Gulf of Mexico and along the coast from Oregon to Panama.

Piromis americana (Monro, 1928)

Stylarioides capensis var. *americana* Monro, 1928a:96–97, fig. 16; 1933b:1057–1058, fig. 6.
Piromis americana (Monro).—Hartman, 1969:305–306, 3 figs. [unnumbered].—Fauchald, 1973:27.

MATERIAL EXAMINED.—Paitilla Beach, Hydroid Zone (4). Balboa, rock and rock-pools at low tide (4); Balboa, scrapings from buoy at canal entrance (1); coll. Crossland.

REMARKS.—The striations of the neurosetae are completely indistinct in some of the present specimens; otherwise, they are very close to the original specimens described by Monro. The species is known from the eastern Pacific Ocean between Panama and central California.

Family OPHELIIDAE

Ammotrypane species indeterminate

Ammotrypane aulogaster.—Monro, 1933b:1059 [not Rathke, 1843].

MATERIAL EXAMINED.—Gorgona Island, 25 fm (1), coll. Crossland.

REMARKS.—The present specimen, which is the one used by Monro (1933b:1059), cannot belong to *A. aulogaster* in that it has prolonged anterior setae and the anal funnel is complete and equipped with long anal cirri. It is poorly preserved.

Family CAPITELLIDAE

Key to the Species from Panama

Thorax with 11 setigers with capillary setae ..... ***Notomastus (Clistomastus) lineatus***
Thorax with 13 setigers with capillary setae ..... ***Dasybranchus lumbricoides***

Dasybranchus lumbricoides Grube, 1878

Dasybranchus lumbricoides Grube, 1878:190–191, pl. 10: fig. 4.—Hartman, 1969:373–374, 3 figs. [unnumbered].
Dasybranchus caducus var. *lumbricoides* Grube.—Monro, 1933b:1059–1060, fig. 8.

MATERIAL EXAMINED.—Galeta Reef, *Thalassia* Zone (3). Gorgona Island, at low water (18), coll. Crossland.

REMARKS.—*Dasybranchus lumbricoides* has retractable branchiae which could be identified only in a few of the present specimens. The hooks resemble those illustrated for *D. lumbricoides* (Hartman, 1969:373, figs. 2,3) rather than those described for *D. glabrus* Moore (Hartman: 1969:371, figs. 1, 2).

Dasybranchus lumbricoides was originally described from the Philippine Islands but has since been reported extensively from the eastern part of the Pacific Ocean.

Notomastus (Clistomastus) lineatus Claparède, 1870

Notomastus (Clistomastus) lineatus Claparède, 1870:18–20, pl. 17: fig. 4.—Hartman, 1969:395–396, 5 figs. [unnumbered].

MATERIAL EXAMINED.—Galeta Reef, *Thalassia* Zone (2).

REMARKS.—The present specimens have the vesicular superior organs of the abdominal neuropodia somewhat smaller than as illustrated by Hartman (1969:395, fig. 2); they are otherwise very similar. The species is known from world-wide areas and is mostly common in sandy substrates.

Notomastus species indeterminate

MATERIAL EXAMINED.—Taboga Island, washing from very barren-looking branches of dead coral (1), coll. Crossland.

REMARKS.—This specimen was found among specimens of *Arabella mutans* identified by Monro (1928a). It is not sufficiently complete to be identifiable as to species.

Family MALDANIDAE

Key to the Species from Panama

Anus terminal, cephalic plaque with an evenly low rim on all sides ..... ***Clymenella*** sp. indet.
Anus dorsal, cephalic plaque with posterior rim much higher than the anterior one..... ***Maldane gorgonensis***

Clymenella species indeterminate

Clymene (Euclymene) rubrocincta.—Monro, 1933b:1062, fig. 10 [not Johnson, 1901].

MATERIAL EXAMINED.—Coiba Island, 19–12 fm, fine sand with small shells and red weed (1), coll. Crossland.

REMARKS.—As remarked by Monro, the specimen is in two pieces. The two pieces may not belong to the same species; the anterior fragment resembles *Clymenella* in that setigers 4 and 5 have deep collars encircling the segments; such collars are absent in *Axiothella rubrocincta*. The posterior fragment is as described by Monro and could belong to either a species of *Euclymene* or *Axiothella*.

Maldane gorgonensis Monro, 1933

Maldane gorgonensis Monro, 1933b:1060–1061, fig. 9.

MATERIAL EXAMINED.—Gorgona Island, 30 fm, muddy sand and shell fragments (1, holotype, BMNH), coll. Crossland.

REMARKS.—The specimen is as described by Monro. The anal plaque has vaguely indicated, subdistal internal grooves that fail to reach the margin except ventrally where a series of vaguely indicated notches can be seen.

Maldane gorgonensis is known only through its original record.

Maldanidae genus and species indeterminate

MATERIAL EXAMINED.—Paitilla Beach, Hydroid Zone (anterior fragment).

REMARKS.—Without a complete specimen it is impossible to identify maldanids even as to genus in an area as poorly known as the Gulf of Panama.

Family OWENIIDAE

Owenia collaris Hartman, 1955

Owenia fusiformis collaris Hartman, 1955:46, pl. 2: figs. 6, 7.
Owenia collaris Hartman.—Hartman, 1969:493–494, 4 figs. [unnumbered].

MATERIAL EXAMINED.—Galeta Reef, *Thalassia* Zone (1).

REMARKS.—*Owenia collaris* differs from *O. fusiformis* delle Chiaje (1841) in that it has a high collar covering the base of the tentacular crown, which is absent in the latter. *Owenia collaris* is found from southern California and western Mexico in the eastern Pacific Ocean. The present record is the first from the Atlantic Ocean.

Family SABELLARIIDAE

Key to the Species from Panama

1. Operculum a conspicuous black cone ..... ***Phragmatopoma attenuata***
   Operculum of divergent yellow spines 2
2. Opercular spines in 2 series, nuchal hooks present 3
   Opercular spines in 3 series, nuchal hooks absent 4
3. Outer opercular spines strongly curved ..... ***Idanthyrsus pennatus***
   Outer opercular spines nearly straight ..... ***Idanthyrsus armatus***
4. Middle opercular spines alternating long and short 5
   Middle opercular spines all approximately same length 6
5. Inner opercular spines distally serrated ..... ***Sabellaria floridensis***
   Inner opercular spines distally smooth ..... ***Sabellaria alcocki***

6. Middle opercular spines distally blunty rounded; inner opercular spines distally serrated .... *Sabellaria moorei*
Middle opercular spines distally pointed; inner opercular spines distally smooth .... *Sabellaria spinulosa*

Idanthyrsus armatus Kinberg, 1867

Idanthyrsus armatus Kinberg, 1867:350.—Monro, 1933b:1066, fig. 14.

MATERIAL EXAMINED.—Gorgona Island, 20 fm, fine sand and shell (1), coll. Crossland.

REMARKS.—The specimen is no longer identifiable since all outer opercular spines have been broken. These spines however, were illustrated by Monro and are characteristic of this species.

Idanthyrsus armatus is known from shallow-water localities in South and Central America in the eastern Pacific Ocean.

Idanthyrsus pennatus (Peters, 1854)

Sabellaria (Pallasia) pennata Peters, 1854:613–614.
Idanthyrsus pennatus (Peters).—Monro, 1933b:1065, fig. 13.—Hartman, 1944c, pl. 31: fig. 35.

MATERIAL EXAMINED.—Gorgona Island, from coral (6), and from coral brought in by natives from about one fathom below low tide (4) and from low water spring (32); Taboga Island, from floats at the end of the hotel pier (4); coll. Crossland.

REMARKS.—All the present specimens are identifiable to species. The outer opercular spines are well illustrated by Hartman (1944c, pl. 31: fig 35).

Idanthyrsus pennatus appears to be circumtropical in distribution.

Phragmatopoma attenuata Hartman, 1944

Phragmatopoma attenuata Hartman, 1944c:352–353, pl. 38: figs. 90–96, pl. 39: figs. 100, 101.
Sabellaria (Phragmatopoma) virgini.—Monro, 1933b:1062–1063, fig. 11 [not Kinberg, 1867].

MATERIAL EXAMINED.—Perlas Islands, St. Elmo Bay, shore at low tide (numerous), coll. Crossland.

REMARKS.—As indicated by Hartman (1944:353), this material does not belong to *P. virgini,* which lacks the distinct plume present in this species. The drawing by Monro is slightly misleading since the outer opercular spines have two distinct teeth on either side of the distal plumes.

Phragmotopoma attenuata is known from tropical areas in the eastern Pacific Ocean.

Phragmatopoma species indeterminate

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (1); Paitilla Beach, Hydroid Zone (1).

REMARKS.—Both specimens belong to the same species and resemble *P. peruensis* Hartman (1944c:353–354, pl. 37: figs. 84–85, pl. 39: fig. 99, pl. 41: fig. 104) in that the outer opercular spines have an entire, flattened distal membrane. Both specimens are quite small and have been dried out, so it was considered best to identify them only to generic level.

Sabellaria alcocki Gravier, 1906

Sabellaria spinulosa alcocki Gravier, 1906:543.—Hartman, 1944c:339.
Sabellaria alcocki Gravier.—Hartman, 1969:503–504, 5 figs. [unnumbered].

MATERIAL EXAMINED.—Paitilla Beach, Hydroid Zone (28). Balboa (4), coll. Crossland.

REMARKS.—*Sabellaria alcocki* has frequently been considered a subspecies of *S. spinulosa.* The middle opercular spines are alternating long and short in the former and are all of the same size in the latter. The specimens from Balboa were identified by Monro as *S. pectinata* var., but were not reported upon in Monro (1933b:1063).

Sabellaria alcocki is circumtropical.

Sabellaria floridensis Hartman, 1944

Sabellaria floridensis Hartman, 1944c:345–346, pl. 31: figs. 37–41.

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (1); Paitilla Beach, Hydroid Zone (5).

REMARKS.—*Sabellaria floridensis* has the inner opercular spines distally strongly serrated and the middle spines alternating long and short. The present specimens have usually two short for every long middle spine.

Sabellaria floridensis has been reported from the

coast of the Gulf of Mexico; the present records from Panama are from both sides of the Isthmus.

Sabellaria moorei Monro, 1933

Sabellaria pectinata var. *moorei* Monro, 1933b:1063–1064, fig. 12.
Sabellaria moorei Monro.—Hartman, 1944c:339, pl. 30: figs. 24–26.

MATERIAL EXAMINED.—Paitilla Beach, *Tetraclita* Zone (1). Balboa, rocks and rock-pools at low tide (1, holotype, BMNH), coll. Crossland.

REMARKS.—*Sabellaria moorei* has serrated inner opercular spines, and the middle ones are short and distally bluntly rounded. It resembles *S. bellis* Hansen (1882) closely, but material from the original locality of Hansen's species will have to be examined in order to establish the synonymy.

Sabellaria moorei has been reported only from Panama.

Sabellaria spinulosa Leuckart, 1849

Sabellaria spinulosa Leuckart, 1849:178.—Monro, 1933b:1064. —Hartman, 1969:511–512, 5 figs. [unnumbered].

MATERIAL EXAMINED.—Balboa, rocks and rock-pools at low tide (many), coll. Crossland.

REMARKS.—The identity of these specimens is dubious; they are very much smaller than usual in this species, and the teeth and spines on the outer opercular spines are very short and thorn-like. *Sabellaria spinulosa* is mainly found in the north Atlantic Ocean but has been reported from San Francisco Bay.

Sabellariidae species indeterminate

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (1).

REMARKS.—The present specimen is in regeneration, and only two spines are present in the operculum. It generally resembles species of *Sabellaria*.

Family AMPHARETIDAE

Isolda bipinnata, new species

FIGURE 12*a–c*

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone, 27 March 1972 (paratypes, AHF Poly 1131) and 20 July 1972 (holotype, USNM 53092).

DESCRIPTION.—The holotype is a complete specimen with 17 thoracic and 55 abdominal setigers; it is 12 mm long and 1 mm wide without setae. The anterior part of the body is slightly inflated, and the abdomen is cylindrical; the pygidium is a thick, blunt lobe with the anus terminal.

The prostomium (Figure 12*a*) is trilobed with a rounded medial lobe and a pair of lateral folds; this lobation is most distinct when the tentacles are everted. The peristomium forms a collar ventrally and is dorsally produced into a pair of low lobes. The first few segments are completely fused dorsally and partially fused ventrally. Four segments (Figure 12*b*) are included in this fused area. The first has neuropodial needle setae only; the second and third have notopodial capillary setae also. In addition the large hooks are found dorsally at the level of the third fused segment. The transverse membrane is low and smooth. Thoracic notopodia are low and blunt; neuropodia are low ridges. Abdominal neuropodia are truncate, flattened lobes with the uncini arranged in a row at the apex. Abdominal notopodia are absent.

Eight branchiae are present, fused into two groups of four with the two groups emerging from one stem. The branchiae are of two kinds; the two lateral branchiae in each of the two groups are long and smooth; the two medial branchiae are distinctly bipinnate with long, cylindrical pinnae arranged in pairs on each branchial stem.

The uncini are in single rows. Thoracic and abdominal uncini (Figure 12*c*) are similar in size and shape; each has six teeth arranged in a single row and increasing evenly in size from the apical to the basal tooth; the inner margin of each uncinus has a blunt tip. Tubes were absent.

Isolda contains 5 species, of which 4 have one pair of bipinnate and 3 pairs of smooth branchiae. The 5th species, *I. whydahaensis* Augener (1918: 514), has numerous fine pinnae on the central pair of branchiae. The 2 groups of branchiae are partially fused in 3 species and widely separated in *I. sibogae* Caullery (1944:102–103). *I. bipinnata* differs from the other two (*I. pulchella* Müller (1858:219) and *I. warnbroensis* Augener (1914:82–87) in distribution of notosetae in the anterior end. *Isolda bipinnata* has notosetae first present from the 2nd setiger; the other two have them first present on the 3rd setiger. Separation of *I. pulchella* and *I. warnbroensis* appears problematical.

Family TEREBELLIDAE

Key to the Species from Panama

1. Thoracic uncini in single rows 2
   Thoracic uncini in double rows in median and posterior thoracic setigers 5
2. Branchiae absent ..... ***Polycirrus*** sp. indet.
   Branchiae present 3
3. Two pairs of digitiform branchiae present ..... ***Euthelepus pascua***, new species
   Two or 3 pairs of multifid branchiae 4
4. Setae present from first branchial segment; uncini with rectangular bases ..... ***Streblosoma crassibranchia***
   Setae present from second branchial segment; uncini with oval bases ..... ***Thelepus setosus***
5. Uncini pectiniform with all teeth in a single row 6
   Uncini crested with a large fang surmounted by a few to numerous smaller teeth 7
6. Thoracic uncini with 5 or 6 teeth ..... ***Loimia medusa***
   Thoracic uncini with 4 teeth ..... ***Loimia annulifilis***
7. At least anterior thoracic uncini long-handled 8
   All uncini short-handled 13
8. Nephridia basally connected ..... ***Lanicides taboguillae***
   Nephridia free from one another 9
9. All thoracic uncini long-handled ..... ***Pista fasciata***
   Only anterior thoracic uncini long-shafted 10
10. First pair of branchiae smaller than, or of the same size as, the second pair ..... ***Pista brevibranchiata***
    First pair of branchiae distinctly larger than the second pair 11
11. Expanded region of long-shafted uncini below the middle of the length ..... ***Pista herpini?***
    Expanded region of long-shafted uncini just below the head of the setae 12
12. Lappets of segment 3 fused middorsally ..... ***Pista alata***
    Lappets of segment 3 not fused ..... ***Pista elongata***
13. Seventeen thoracic setigers present 14
    Thorax with numerous setigers ..... ***Terebella gorgonae***
14. Eyes absent, a single large tooth above the main fang in each uncinus ..... ***Eupolymnia regnans***
    Eyes present, at least 2 teeth above the main fang in each uncinus ..... ***Eupolymnia nebulosa***

Eupolymnia nebulosa (Montagu, 1818)

Terebella nebulosa Montagu, 1818:343, pl. 12: fig. 2.
Polymnia nebulosa Montagu.—Fauvel, 1927:257–258, fig. 89a–g.—Monro, 1933b:1072.

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (4); Galeta Reef, *Thalassia* Zone (1). Coiba Island, dredging off the convict settlement, 5 fm, smooth bottom with branched *Lithothamnion* (13); Taboga Island, shore (6); coll. Crossland.

REMARKS.—The present specimens agree with *E. nebulosa* in that the three pairs of branchiae decrease in size evenly from the first and in that the lateral lappets are well developed. Fauvel (1927:258) indicated that the number of teeth in the crests of the uncini varies from one to five. This variation is not the case in the present material where all specimens have five teeth in the crests. The identification mav thus be somewhat doubtful. The specimens from Coiba Island were identified by Monro but not published in the report on the Panamanian fauna.

Eupolymnia nebulosa is widespread in shallow water.

Eupolymnia regnans Chamberlin, 1919

Eupolymnia regnans Chamberlin, 1919:433–434, pl. 79: figs. 1–3.
Polymnia regnans (Chamberlin).—Monro, 1933b:1072–1073, fig. 19.

MATERIAL EXAMINED.—Balboa, pools at the lowest tide level (2), coll. Crossland.

REMARKS.—This species is identifiable as indicated in the key. The uncini are as illustrated by Monro (1933b, fig. 19). The numbers of species included in this genus and the identity of several of them must remain doubtful until more material has been studied.

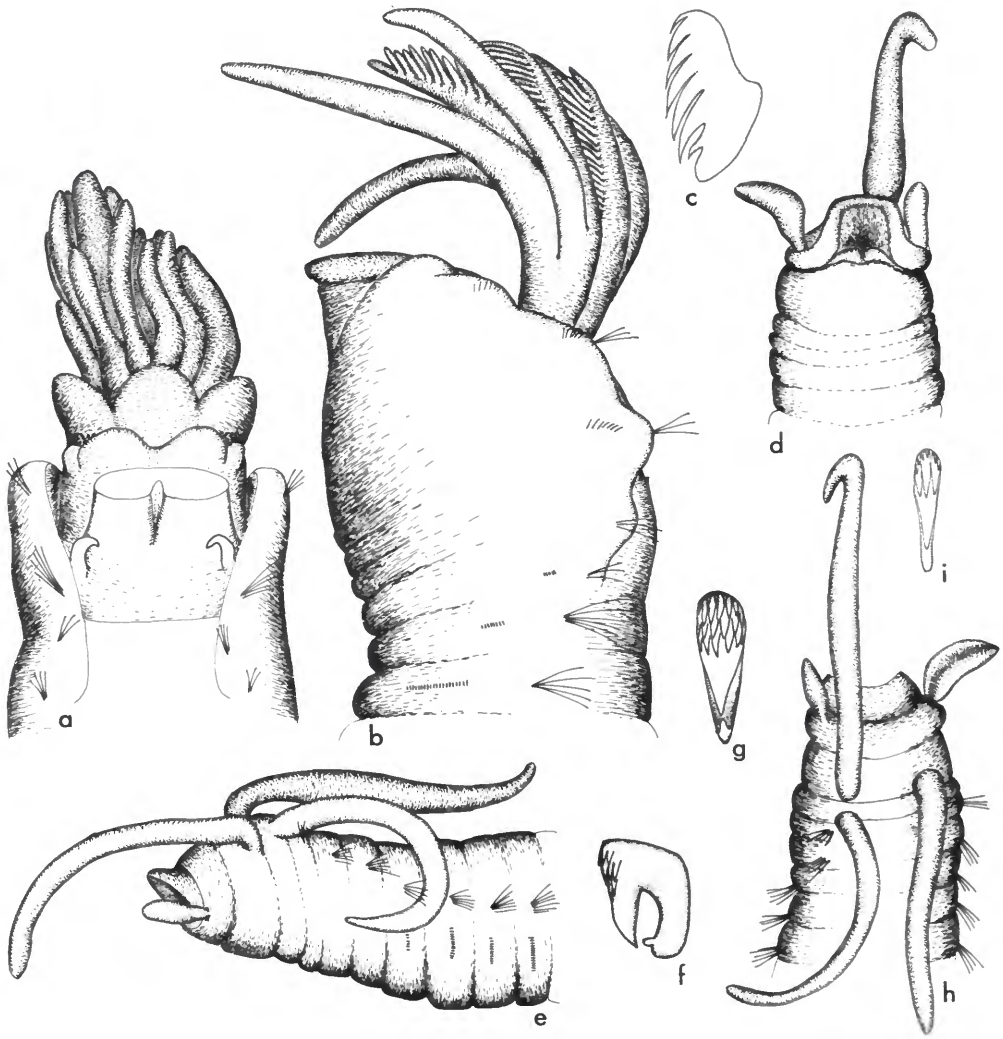

FIGURE 12.—*Melinna bipinnata*, new species: *a*, anterior end, dorsal view, × 50; *b*, anterior end, lateral view, × 50; *c*, thoracic uncinus, lateral view, × 950. *Euthelepus pascua*, new species: *d*, anterior end, ventral view, × 50; *e*, anterior end, lateral view, × 50; *f*, late thoracic uncinus, lateral view, × 950; *g*, late thoracic uncinus, frontal view, × 950; *h*, anterior end, dorsal view, × 50. *Terebella gorgonae* Monro: *i*, thoracic uncinus, frontal view, × 700.

Eupolymnia regnans appears limited to the warmer parts of the eastern Pacific Ocean.

Euthelepus pascua, new species

FIGURE 12*d–h*

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone, 17 March 1972 (1, holotype, USNM 53093).

DESCRIPTION.—The holotype and only known specimen is incomplete and consists of 21 thoracic and 8 abdominal setigers. It is 4.5 mm long and 0.75 mm wide without setae and is evenly tan-colored without distinct color patterns.

The prostomium (Figure 12*d,e,h*) forms a hood over the mouth; the anterior rim is thickened; eyes are absent. The peristomium is a complete ring posterior to the mouth; it carries laterally a single

pair of short, grooved tentacles; other anterior appendages are absent. The next two segments are asetigerous; each carries a pair of digitiform branchiae. The first pair is about one-third as long as the second pair and somewhat thicker.

The third postperistomial segment is the first setiger; it has a tuft of sessile notosetae. Distinct parapodia are absent in the thorax; the abdominal neuropodia are slightly raised as ridges. Uncini are present from the fourth setiger; they are in single rows. Each uncinus (Figure 12*f,g*) has a very short, square base and a large main fang surmounted by a crest of about 22 teeth in 4 distinct tiers. All uncini are similar.

The genus *Euthelepus* is presently known for three species; these include *E. malayensis* Caullery (1944:182, fig. 146), the genotype *E. setobalensis* McIntosh (1885:465–467. pl. 50: fig. 4, pl. 28A: fig. 13), and *E. tenuis* (Verrill, 1900:663). *Euthelepus malayensis* has one pair of branchiae and uncini from the second setiger. *Euthelepus tenuis* has similarly one pair of branchiae, and uncini are first present from setiger 3. *Euthelepus pascua* has two pairs of branchiae, and uncini are first present from the fourth setiger. Finally, *E. setobalensis* has three pairs of branchiae, and uncini appear to be first present from setiger 3.

There are indications that more than one taxon may be involved in the present concept of the genus; thus the genotype has notosetae present from the first branchial segment, and setae are first present in postbranchial segments in the present specimen.

Lanicides taboguillae (Chamberlin, 1919)

Nicolea taboguillae Chamberlin, 1919:425–427, pl. 79: figs. 12, 13.
Lanicides taboguillae (Chamberlin).—Monro, 1933b:1069–1070, fig. 17.

MATERIAL EXAMINED.—Balboa, shore on lee side of Taboga Island, south of the village (5); Colón, coral flat at SW corner of Limón Bay (1); coll. Crossland.

REMARKS.—The general appearance and most of the features of species of *Lanicides* agree with *Pista,* from which it can be separated mainly by anatomical features.

Lanicides taboguillae is known from both sides of the Isthmus of Panama in shallow water.

Loimia annulifilis (Grube, 1871)

Terebella annulifilis Grube, 1871:49.
Loimia medusa var. *annulifilis* (Grube).—Monro, 1933b:1069.

MATERIAL EXAMINED.—Taboga Island, shore (1). coll. Crossland.

REMARKS.—*Loimia annulifilis* differs from *L. medusa* in that it has four teeth in the thoracic uncini rather than five or six as in the latter.

Loimia annulifilis is known from the Indo-Pacific region.

Loimia medusa (Savigny, 1818)

Terebella medusa Savigny, 1818:85.
Loimia medusa (Savigny).—Monro, 1933b:1069.—Hartman, 1969:601–602, 2 figs. [unnumbered].

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (1); Galeta Reef, *Thalassia* Zone (4); Paitilla Beach, Hydroid Zone (3).

REMARKS.—*Loimia medusa* has the characteristic pectiniform uncini in which all the teeth are in a single row, usually five or six teeth are present. The specimens differ in no discernible way from specimens described from other areas. *Loimia medusa* is considered cosmopolitan in shallow water. It is usually found in sandy substrates, but only very small amounts of sand are necessary; thus the species has frequently been reported from hard-bottom areas.

Pista alata Moore, 1909

Pista alata Moore, 1909a:273–275, pl. 9: figs. 48–51.—Monro, 1933b:1066–1068, fig. 15.—Hartman, 1969:611–612, 3 figs. [unnumbered].

MATERIAL EXAMINED.—Balboa, rocks and rock-pools at low tide (7); Coiba Island, in sand at low water (7) and at low tide among volcanic rocks and boulders (3); coll. Crossland.

REMARKS.—The characteristic dorsally fused lappets on the third segment make *P. alata* easily identifiable on the west coast of the Americas. According to the labels, the specimens from Balboa were identified by Monro, but they were not reported on in his study.

Pista alata is known from southern California and Panama in shallow water.

Pista brevibranchiata Moore, 1923

Pista brevibranchiata Moore, 1923:196–197.—Hartman, 1969: 613–614, 4 figs. [unnumbered].

MATERIAL EXAMINED.—Paitilla Beach, Hydroid Zone (1).

REMARKS.—The present specimen agrees with *P. brevibranchiata* in the structures of the uncini, both anterior and posterior, but differs in that it has all branchiae of the same size. *Pista brevibranchiata* has the second pair very much larger than the first.

Pista brevibranchiata is known from central and southern California and western Mexico in intertidal and shelf depths.

Pista elongata Moore, 1909

Pista elongata Moore, 1909a:270–272, pl. 9: figs. 45–47.—Monro, 1933b:1068.—Hartman, 1969:619–620, 4 figs. [unnumbered].

MATERIAL EXAMINED.—Balboa, rocks and rock pools at low tide (9), coll. Crossland.

REMARKS.—The specimens are as described by Hartman (1969). The long-shafted uncinus has a narrow, pointed boss rather than the rounded expanded one, which is characteristic of the other species of *Pista* from this area.

This species is known from western Canada to Panama in shallow water.

Pista fasciata (Grube, 1870)

Terebella (Phyzelia) fasciata Grube, 1870a:513–514.
Pista fasciata (Grube).—Hartman, 1969:621–622, 2 figs. [unnumbered].

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (1); Galeta Reef, *Laurencia* Zone (1); Galeta Reef, *Thalassia* Zone (1).

REMARKS.—*Pista fasciata* has long-shafted uncini in all thoracic setigers. The branchiae are richly and loosely branched. It has been reported from world-wide areas, but appears to be most common in warm waters.

Pista herpini? Fauvel, 1928

Pista herpini Fauvel, 1928:160–162, fig. 2a–h.—Monro, 1933b: 1068, fig. 16.

MATERIAL EXAMINED.—Gorgona Island, at low water (1), coll. Crossland.

REMARKS.—The present specimen resembles *P. herpini;* but, as remarked by Monro, the shafts of the long-shafted uncini are stouter than in *P. herpini* and are in fact considerably stouter than as illustrated by Monro. The identity of the specimen remains doubtful.

Polycirrus species indeterminate

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (1); Galeta Reef, *Laurencia* Zone (1).

REMARKS.—The different species of *Polycirrus* are so difficult to identify that it seems foolhardy to attempt to name any specimens to species without a complete revision of the genus; materials for this revision are not yet available.

Streblosoma crassibranchia Treadwell, 1914

Streblosoma crassibranchia Treadwell, 1914:208–209, pl. 12: figs. 30–31.—Hartman, 1969:641–642, 5 figs. [unnumbered].
Streblosoma verrilli.—Monro, 1933b:1073–1074, fig. 20 [not Treadwell, 1911 = *Thelepus setosus* fide Hartman, 1956:297].

MATERIAL EXAMINED.—Galeta Reef, *Thalassia* Zone (2); Paitilla Beach, Hydroid Zone (10). Balboa, rocks and rock-pools at low tide (numerous); Coiba Island, in sand at low tide (numerous); coll. Crossland.

REMARKS.—The present specimens fit very well with *S. crassibranchia*. Setae are present from the first branchial segment. Each uncinus has a large main fang and three teeth in a transverse row in the crest.

The species is known from central California to Panama; it is present on both sides of the Isthmus.

Terebella gorgonae Monro, 1933

FIGURE 12*i*

Terebella gorgonae Monro, 1933b:1070–1071, fig. 18.

MATERIAL EXAMINED.—Gorgona Island, shore (10, syntypes, BMNH), coll. Crosslands.

REMARKS.—*Terebella gorgonae* closely resembles *T. californica* Moore, 1904, (Hartman, 1969:643–644, 4 figs.), but differs in the distribution and structure of the branchiae. The branchiae are on the first and third setiger in addition to the last

presetigerous segment in *T. gorgonae;* that is, they are missing on the second setigerous segment. The branchiae are on consecutive segments in *T. californica* and include only two pairs. The uncini (Figure 12*i*) have a large main fang and a double-tiered crest with three and seven teeth in each tier.

Terebella gorgonae has been reported from the type-locality and from the Galapagos Islands.

Thelepus setosus (Quatrefages, 1865)

Phenacia setosa Quatrefages, 1865:376–377.
Thelepus setosus (Quatrefages).—Hartman, 1969:649–650, 6 figs. [unnumbered].

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (1).

REMARKS.—The present specimen has the attachment points of the uncini in a slightly more subterminal position than is illustrated in Hartman (1969:649); otherwise the specimen fits very well within the species as described.

Thelepus setosus is cosmopolitan in shallow water.

Terebellidae species indeterminate

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (dried-out specimens and posterior ends); Galeta Reef, *Thalassia* Zone (fragments and posterior ends); Paitilla Beach, Hydroid Zone (fragment); Paitilla Beach, *Tetraclita* Zone (posterior ends); Paitilla Beach, 31 Dec. 1970 (tubes only).

REMARKS.—These fragments cannot be further identified.

Family TRICHOBRANCHIDAE

Terebellides stroemi? Sars, 1835

Terebellides stroemi Sars, 1835:48—Monro, 1933b:1075.—Hartman, 1969:653–654, 7 figs. [unnumbered].

MATERIAL EXAMINED.—Gorgona Island, 30 fm, muddy sand and shells (1), coll. Crossland.

REMARKS.—The neuropodial spines in setiger 6 are nearly straight and sharply pointed in the present specimen; they are usually distinctly bent and blunt in this species.

Terebellides stroemi is cosmopolitan, apparently in all depths.

Family SABELLIDAE

Key to the Species from Panama

1. Thorax with pennoned neurosetae in addition to the uncini 2
   Thorax with only uncini in the neuropodia ..... *Chone* sp. indet.
2. Radioles spiralled; with their bases rolled in at the dorsal end 3
   Radioles not spiralled; each of their bases semicircular 4
3. Some thoracic notosetae scimitar-shaped ..... *Bispira monroi*
   All thoracic notosetae limbate ..... *Demonax leucaspis?*
4. Some radioles with terminal compound eyes ..... *Megalomma vesiculosum*
   Terminal compound eyes absent 5
5. First setiger with a linear or gently curved series of limbate setae ... *Hypsicomus phaeotaenia*
   First setiger with a tuft of setae 6
6. All thoracic notosetae slender and limbate; eyes in double rows ..... *Sabella melanostigma*
   Thoracic notosetae of two kinds, slender and broad, eyes in single rows 7
7. Collar 2-lobed and projecting anteriorly ventrally in 2 sharp points ..... *Potamilla fonticula*
   Collar 4-lobed; ventrally recurved or rounded 8
8. Dorsal edge of the radiolar bases deeply cleft ..... *Pseudopotamilla occelata*
   Dorsal edge of radiolar bases smooth 9
9. At most 2 eyes per radiole, dorsal lappets distally pointed ..... *Pseudopotamilla intermedia*
   Seven or 8 eyes per radiole; dorsal lappets distinctly triangular ... *Pseudopotamilla reniformis*

Bispira monroi (Hartman, 1961)

FIGURE 13*a–b*

Distylidia monroi Hartman, 1961:129.
Bispira rugosa var. *monterea*.—Monro, 1933b:1076–1077, fig. 23 [not *Distylia* [= *Distylidia*] *rugosa* Moore, 1904, nor *Distylia monterea* Chamberlin, 1919 = *Eudistylia polymorpha* (Johnson, 1901)].

MATERIAL EXAMINED.—Balboa, pools at the lowest tide (numerous); Coiba Island, in sand at low

water, fine seagrass and dead coral bedded in the sand (2); coll. Crossland.

REMARKS.—The present specimens have the scimitar-shaped setae characteristic of the genus *Bispira*. It differs from *Bispira volutacornis* (Montagu, 1804) (Hartman, 1969:659–660, 5 figs. [unnumbered]) in the shape of the lobes of the collar. The illustrations give the details of the anterior end (Figure 13*a,b*).

Bispira monroi is known from Panama only.

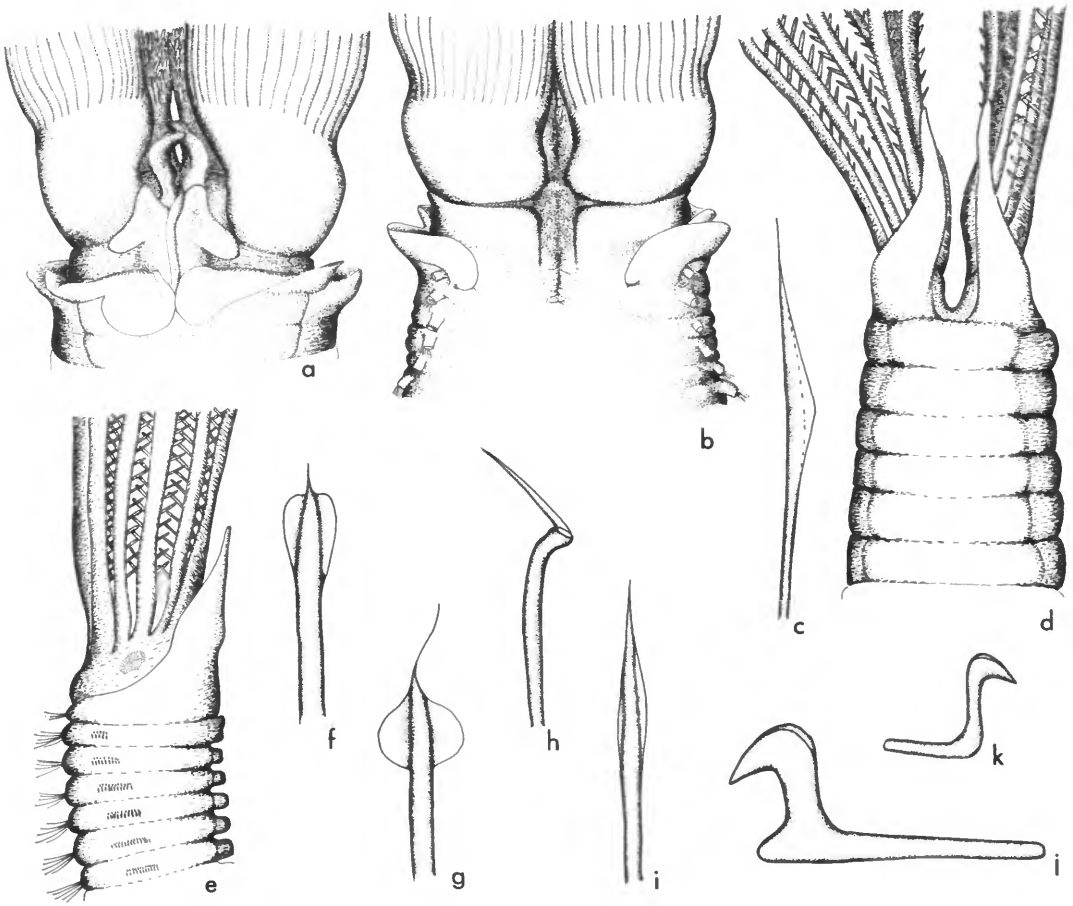

FIGURE 13.—*Bispira monroi* (Hartman): *a*, anterior end, ventral view, × 5; *b*, anterior end, dorsal view, × 5. *Potamilla fonticula* (Hoagland): *c*, bilimbate notoseta, lateral view, × 385; *d*, anterior end, ventral view, × 50; *e*, anterior end, lateral view, × 50; *f*, thoracic mucronate seta, × 385; *g*, abdominal mucronate seta, × 385; *h*, pennoned seta, × 385; *i*, bilimbate notopodial seta, frontal view, × 385; *j*, thoracic uncinus, × 385; *k*, abdominal uncinus, × 385.

Chone species indeterminate

MATERIAL EXAMINED.—Galeta Reef, *Laurencia* Zone (1).

REMARKS.—The present specimen can be identified only to genus.

Demonax leucaspis? Kinberg, 1857

Demonax leucaspis Kinberg, 1867:354.—Monro, 1933b:1075–1076, fig. 22.

MATERIAL EXAMINED.—Galeta Reef, Laurencia Zone (1). Balboa, rocks and rock-pools at low tide

(7); Balboa from buoy brought in from the canal entrance (numerous); coll. Crossland.

REMARKS.—The present specimens fit into *Demonax* in that they have spiralled tentacular crowns, limbate notosetae, two-lobed collars and smooth abdomens. Monro (1933b) indicated the presence of *D. leucaspis* in Panama. His concept of the species appears very wide; thus, he includes *D. medius* (Bush, 1904) into his concept. Based on the shape of the collar, this species is definitely distinct, but the whole species concept in this group appears indeterminate. Until a complete revision of the genus has been done, the name previously used for this Panamanian material is retained.

Hypsicomus phaeotenia (Schmarda, 1861)

Sabella phaeotaenia Schmarda, 1861:35, pl. 22: fig. 188.
Hypisicomus phaeotenia (Schmarda).—Fauvel, 1927:312–314, fig. 108a–l.—Monro, 1933b:1079.

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (11); Galeta Reef, *Laurencia* Zone (1, a tentacular crown); Paitilla Beach, Hydroid Zone (2). Balboa, scrapings off piles of quays at the docks (1); Gorgona Island, from coral (1); Taboga Island, 5 fm off the hotel pier (1) and from low water spring (8); coll. Crossland.

REMARKS.—Hartman (1944a:24) reported *H. circumspiciens* Ehlers from Venezuela; in addition to the present species, *H. torquatus* (Grube) has been reported from the area. The synonymy appears at least in part confused (cf. Day, 1973:125). For this reason, it seems best to retain the name already used for specimens from this area. All specimens examined belong to the same species; they agree well with the description of this species as given by Fauvel (1927); but as indicated above, the conclusions drawn here may be incorrect and another name should possibly be applied to the present collection.

Hypsicomus phaeotaenia is circumtropical in distribution.

Megalomma vesiculosum (Montagu 1815)

Amphitrite vesiculosa Montagu, 1815:19–20, pl. 5: fig. 1.
Branchiomma vesiculosum (Montagu).—Fauvel, 1927:315, fig. 109a–q.

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (7).

REMARKS.—The present specimens agree in all essential characters with the species as described from European waters. The species is widely distributed in warm waters.

Potamilla fonticula (Hoagland, 1919)

FIGURE 13*c–k*

Parasabella fonticula Hoagland, 1919:579, pl. 31: figs. 3–9.
?*Potamilla floridana* Augener, 1922:48.

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (4); Galeta Reef, *Laurencia* Zone (36).

REMARKS.—*Potamilla fonticula* differs from most other species of *Potamilla* in that it has a high, somewhat variable number of thoracic setigers. The number was originally indicated as 20; in the present material the number varies from 14 to 22, but appears to be approximately 20 in all larger specimens. The segment of change between thorax and abdomen appears strongly related to the size of the specimen.

The collar (Figure 13*d,e*) is deeply cleft ventrally and the two parts are prolonged anteriorly; palps were not observed, but are presumably hidden below the tall collar folds. Dorsally the collar is completely reduced, and the base of the tentacular crown is naked. Laterally the base of the tentacular crown has a dark brown spot.

Thoracic notopodial setae include spatulate, mucronate setae, and long, slender bilimbate setae (Figure 13*c,f,i*). Thoracic neuropodia have a row of large avicular uncini (Figure 13*j*) with a very distinct subdistal thickening and a long, straight shaft. The pennoned setae (Figure 13*h*) are subdistally double-curved and thickened; the distal part is very thin, flimsy, and often difficult to find. Abdominal setigers have small, very slender uncini (Figure 13*k*) without the distinct subdistal thickening and very strongly spatulate, mucronate setae (Figure 13*g*). *Potamilla floridana* Augener agrees with the present species in so far as it has been described.

Potamilla fonticula was described from Puerto Rico; the present records are from Panama on the Atlantic side. It may also be present in Florida.

Pseudopotamilla intermedia Moore, 1905

Pseudopotamilla intermedia Moore, 1905:562–564, pl. 37: figs. 15–22.—Hartman, 1969:727–728, 6 figs. [unnumbered].

Potamilla brevibranchiata.—Monro, 1933b:1079 [not Moore, 1905].

MATERIAL EXAMINED.—Balboa, rock and rockpools at low tide (3), coll. Crossland.

REMARKS.—The present specimens differ from *P. brevibranchiata* in that the tentacular crown is too tall, the collar is too well developed, and the uncini in the last three thoracic setigers are twice as large as those in anterior setigers. These features are characteristic of *Pseudopotamilla intermedia*. This species is known from California and Alaska.

Pseudopotamilla occelata Moore, 1905

Pseudopotamilla occelata Moore, 1905:559–562, pl. 37: figs. 8–14.—Hartman, 1969:729–730, 5 figs. [unnumbered].

MATERIAL EXAMINED.—Paitilla Beach, Hydroid Zone (2); Paitilla Beach, *Tetraclita* Zone (1).

REMARKS.—The present specimens have the deeply cleft dorsal margin of the tentacular crown characteristic of this species. The species is known from Alaska and California to western Panama.

Pseudopotamilla reniformis (Müller, 1771)

Amphitrite reniformis O. F. Müller, 1771:194.
Potamilla reniformis (Müller).—Fauvel, 1927:309–310, fig. 107a–l.

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (1).

REMARKS.—*Pseudopotamilla reniformis* can be separated from other species in the area as indicated in the key. The species is common in European waters and has been reported from widely scattered areas.

Sabella melanostigma Schmarda, 1861

Sabella melanostigma Schmarda, 1861:36, pl. 22: fig. 190.—Jones, 1962:194.

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (1); Galeta Reef (1), collected on plexiglass, 31 January 1971, coll. C. Birkeland; Paitilla Beach, Hydroid Zone (2).

REMARKS.—This is the only species of the genus *Sabella* identifiable in the present material. The specimens from Paitilla Beach seem to represent the first record of this species from the Pacific Ocean.

Sabella species indeterminate

MATERIAL EXAMINED.—Paitilla Beach, Hydroid Zone (2).

REMARKS.—These are two small specimens without the distinctive color patterns characteristic of most species of *Sabella*.

Sabellidae species indeterminate

MATERIAL EXAMINED.—Galeta Reef, Coralline Zone (fragment); Galeta Reef, *Laurencia* Zone (posterior fragment).

REMARKS.—These fragments can be identified as sabellids only on the distribution of setae.

Biogeography

The fauna of the Atlantic and Pacific sides of Panama represents the split remnants of a previously unified warm water fauna. Ekman (1953) and Briggs (1974) summarized the information on the region, based mainly on the records of crustaceans and fishes. Generally, the Atlantic side is considered to have the richer fauna in terms of numbers of species and the Pacific side is considered as depauperate with a fauna derived in the main from the western Atlantic.

A study of the sandy beaches of central America (Fauchald, 1973) demonstrated that the populations and species numbers were in fact much higher on the Pacific side than on the Atlantic in terms of the polychaetes. The same general picture emerges from the current study (Tables 1, 2) in that 136 of 179 species are represented on the Pacific side and only 73 on the Atlantic side.

Tables 1 and 2 survey the occurrence of species of polychaetes on the Pacific and Atlantic sides of Panama in relation to the total geographical dispersal of each species. For practical reasons, individual dispersals have been reduced to 14 patterns as defined below.

Ia. Cosmopolitan species are shallow-water species reported from both cold and warm water regions in all three major oceans in suitable localities. Deep-water dispersal beyond the shelf has not been considered.

TABLE 1.—Relation between the local occurrence and geographic dispersal of polychaetes reported from Panama in terms of numbers of species (numbers in parenthesis = percentages of total numbers of species reported from each coast line)

Pattern	Atlantic	Pacific	Total species
I a. Cosmopolitan	10 (13.70)	13 (9.56)	18 (10.06)
b. Circumtropical	21 (28.77)	28 (20.59)	35 (19.55)
II Amphi-American			
a. Extended	2 (2.74)	1 (0.74)	3 (1.68)
b. Warm water only	16 (21.92)	21 (15.44)	26 (14.53)
III One coast only			
a. Atlantic Ocean			
1. Extended	4 (5.48)	–	4 (2.23)
2. Warm water only	13 (17.81)	–	13 (7.26)
3. Endemic	7 (9.59)	–	7 (3.91)
b. Pacific Ocean			
1. North Pacific	–	4 (2.94)	4 (2.23)
2. Extended East Pacific			
north	–	12 (8.82)	12 (6.70)
south	–	5 (3.68)	5 (2.79)
3. Indo-Pacific warm	–	7 (5.15)	7 (3.91)
4. Warm water East Pacific	–	29 (21.32)	29 (16.20)
5. Endemic	–	16 (11.76)	16 (8.94)
Total number of species	73	136	179

TABLE 2.—Geographic dispersal and local occurrences of polychaetes reported from Panama (WW = limited to warm water; W–C = found in both warm and cold water; dash = no other record)

Species	Panama	General dispersal
Aphrodita diplops	Atlantic	–
A. japonica	Pacific	North Pacific
Chaetacanthus magnificus	Pacific	Circumtropical
Halosydna glabra	Pacific	WW Eastern Pacific
H. leucohyba	Atlantic	WW Western Atlantic
Harmothoe balboensis	Pacific	–
H. hirsuta	Pacific	WW Eastern Pacific
Iphione ovata	Pacific	WW East-Central Pacific
Lepidasthenia gigas	Pacific	WW Eastern Pacific
L. varius	Atlantic	WW Americas
Lepidonotus crosslandi	Pacific	WW Eastern Pacific
L. humilis	Both	WW Western Atlantic
L. nesophilus	Pacific	WW Eastern Pacific
Thormora johnstoni	Pacific	WW Eastern Pacific
T. taeniata	Pacific	WW Western Atlantic
Eupanthalis perlae	Pacific	–
Panthalis mortenseni	Pacific	WW Eastern Pacific
P. pacifica	Pacific	WW Eastern Pacific
Polyodontes oculea	Both	WW Americas
Psammolyce spinosa	Atlantic	WW Eastern Pacific
Sthenelais fusca	Pacific	W-C Eastern Pacific (north)
Thalenessa lewisii	Pacific	WW Eastern Pacific
Bhawania goodei	Both	Circumtropical
B. riveti	Pacific	WW Eastern Pacific
Chrysopetalum occidentale	Pacific	WW Eastern Pacific

TABLE 2.—Continued

Species	Panama	General dispersal
Paleanotus chrysolepis	Pacific	Circumtropical
Chloeia entypa	Pacific	WW Eastern Pacific
C. viridis	Pacific	WW Americas
Eurythoe complanata	Both	Circumtropical
Hermodice carunculata	Atlantic	WW Western Atlantic
Linopherus ambigua	Pacific	WW Americas
L. canariensis	Atlantic	WW Atlantic (both sides)
L. oculata	Pacific	Pacific Panama only
Notopygos ornata	Pacific	WW Americas
Pherecardia striata	Pacific	Circumtropical
Anaitides erythrophyllus	Atlantic	WW Western Atlantic
A. lamellifera	Pacific	Circumtropical
A. madeirensis	Pacific	Circumtropical
Eulalia myriacyclum	Atlantic	WW Western Atlantic
Eumida bifoliata	Pacific	W-C Eastern Pacific (north)
Phyllodoce panamensis	Pacific	Pacific Panama only
Sige orientalis?	Atlantic	Northern Pacific
Steggoa lobocephalica	Pacific	W-C Eastern Pacific (south)
Hesione intertexta	Pacific	WW Indo-Pacific
H. picta	Atlantic	WW Western Atlantic
Ophiodromus obscurus	Atlantic	W-C Western Atlantic (north)
O. pugettensis	Pacific	W-C Eastern Pacific (north)
Synelmis albini	Pacific	Cosmopolitan
Autolytus anoplos	Atlantic	Atlantic Panama only
A. cf. *magnus*	Pacific	North Pacific
Haplosyllis spongicola	Both	Circumtropical
Langerhansia cornuta	Both	Cosmopolitan
L. mexicana	Atlantic	WW Western Atlantic
Odontosyllis polycera	Pacific	Circumtropical
Opisthosyllis brunnea	Both	?Circumtropical
Syllis gracilis	Both	Circumtropical
Trypanosyllis (Trypanedenta) taeniaformis	Pacific	WW Indo-Pacific
Typosyllis aciculata	Both	W-C Eastern Pacific (north)
T. caeca	Pacific	–
T. fuscosuturata	Both	WW Americas
T. hyalina	Pacific	Cosmopolitan
T. prolifera?	Atlantic	Circumtropical
T. variegata	Both	Cosmopolitan
Ceratocephala crosslandi	Pacific	Eastern Pacific
Ceratonereis irritabilis	Atlantic	W-C Western Atlantic (north)
C. mirabilis	Both	Circumtropical
Eunereis paitillae	Pacific	–
Neanthes galetae	Atlantic	–
N. pseudonoodti	Pacific	–
N. succinea	Both	Cosmopolitan
Nereis callaona	Both	W-C Eastern Pacific (south)
N. panamensis	Atlantic	–
N. riisei	Both	WW Americas
Perinereis anderssoni	Atlantic	WW Western Atlantic
Platynereis dumerilii	Both	Circumtropical (extended)
Pseudonereis gallapagensis	Pacific	WW Indo-Pacific
P. variegata	Atlantic	Circumtropical
Aglaophamus dicirris	Pacific	WW Americas
A. tabogensis	Pacific	

TABLE 2.—Continued

Species	Panama	General dispersal
Nephtys monroi	Pacific	–
N. singularis	Pacific	WW Eastern Pacific
N. squamosa	Pacific	WW Americas
Glycera abranchiata	Pacific	WW Western Atlantic
G. americana	Pacific	W-C Americas
G. oxycephala	Atlantic	W-C Americas
G. tesselata	Atlantic	Circumtropical
Goniada acicula	Atlantic	WW Americas
Americonuphis reesei	Pacific	Pacific Panama only
Diopatra chiliensis	Pacific	W-C Eastern Pacific (south)
D. cuprea	Atlantic	W-C Western Atlantic (north)
D. denticulata	Pacific	WW Eastern Pacific
D. ornata	Pacific	W-C Eastern Pacific (north)
Nothria gorgonensis	Pacific	–
Onuphis nebulosa	Atlantic	WW Eastern Pacific
O. vermillionensis	Atlantic	WW Eastern Pacific
Eunice afra	Both	Circumtropical
E. antennata, sensu stricto	Both	Circumtropical
E. antennata aedificatrix	Both	WW Eastern Pacific
E. aphroditois	Both	Circumtropical
E. biannulata	Pacific	WW Eastern Pacific
E. filamentosa	Both	WW Americas
E. mutilata	Pacific	WW Americas
E. (Nicidion) cariboea	Both	WW Americas
E. reducta	Pacific	WW Eastern Pacific
E. vittatopsis	Pacific	WW Eastern Pacific
E. websteri	Atlantic	WW Western Atlantic
Lysidice ninetta	Pacific	Circumtropical
Marphysa amadae	Atlantic	–
M. sanguinea	Pacific	Circumtropical (extended)
Nematonereis unicornis	Atlantic	Circumtropical
Palola siciliensis	Both	Circumtropical
Lumbrineris cruzensis?	Pacific	WW Americas
L. erecta	Pacific	WW Eastern Pacific
L. inflata	Both	WW Americas
L. latreilli	Pacific	Cosmopolitan
L. tetraura	Pacific	Circumtropical (extended)
Ninoe chilensis	Pacific	W-C Eastern Pacific (south)
Arabella mutans	Both	WW Eastern-Central Pacific
Drilonereis falcata	Pacific	W-C Eastern Pacific (north)
D. mexicana	Pacific	WW Eastern Pacific
D. nuda	Pacific	WW Eastern Pacific
Oenone fulgida	Both	Circumtropical
Dorvillea cerasina	Both	W-C Americas (south)
D. rubrovittatus	Atlantic	WW Atlantic (both sides)
Schistomeringos longicornis	Both	Circumtropical
Haploscoloplos panamensis	Pacific	–
Boccardia polybranchia	Pacific	Cosmopolitan
B. proboscidea	Pacific	W-C Eastern Pacific (north)
B. tricuspa	Pacific	WW Eastern Pacific (extended)
Laonice japonica	Pacific	North Pacific
Prionospio heterobranchia texana	Atlantic	WW Western Atlantic
Magelona pacifica	Pacific	–
M. papillicornis	Pacific	Circumtropical
Chaetopterus variopedatus	Pacific	Cosmopolitan

TABLE 2.—Continued

Species	Panama	General dispersal
Mesochaetopterus alipes	Pacific	–
Spiochaetopterus costarum	Pacific	Cosmopolitan
Cirratulus cirratus?	Atlantic	Cosmopolitan
Cirriformia luxuriosa	Pacific	W-C Eastern Pacific (north)
C. punctata	Atlantic	WW Western Atlantic
C. tentaculata	Pacific	Circumtropical
Dodecaceria concharum	Atlantic	Cosmopolitan
Timarete perbranchiata	Pacific	WW Eastern Pacific
Flabelligera infundibularis	Pacific	W-C Eastern Pacific (north)
Pherusa. inflata	Atlantic	W-C Americas
Piromis americana	Pacific	WW Eastern Pacific
Dasybranchus lumbricoides	Both	WW Indo-Pacific
Notomastus (Clistomastus) lineatus	Atlantic	Cosmopolitan
Maldane gorgonensis	Pacific	–
Owenia collaris	Atlantic	WW Eastern Pacific
Idanthyrsus armatus	Pacific	W-C Eastern Pacific (south)
I. pennatus	Pacific	Circumtropical
Phragmatopoma attenuata	Pacific	WW Eastern Pacific
Sabellaria alcocki	Pacific	Circumtropical
S. floridensis	Both	WW Western Atlantic
S. moorei	Pacific	Pacific Panama only
S. spinulosa	Pacific	W-C Atlantic Ocean (north)
Isolda bipinnata	Atlantic	–
Eupolymnia nebulosa	Both	Cosmopolitan
E. regnans	Pacific	WW Eastern Pacific
Euthelepus pascua	Atlantic	–
Lanicides taboguillae	Both	Panama, both sides
Loimia annulifilis	Pacific	WW Indo-Pacific
L. medusa	Both	Cosmopolitan
Pista alata	Pacific	WW Eastern Pacific
P. brevibranchiata	Pacific	WW Eastern Pacific
P. elongata	Pacific	W-C Eastern Pacific (north)
P. fasciata	Atlantic	Circumtropical (extended)
P. herpini?	Pacific	WW Indo-Pacific
Streblosoma crassibranchia	Both	WW Eastern Pacific
Terebella gorgonae	Pacific	WW Eastern Pacific
Thelepus setosus	Atlantic	Cosmopolitan
Terebellides stroemi?	Pacific	Cosmopolitan
Bispira monroi	Pacific	–
Demonax leucaspis?	Both	Circumtropical
Hypsicomus phaeotenia	Both	Circumtropical
Megalomma vesiculosum	Atlantic	Circumtropical
Potamilla fonticula	Atlantic	WW Western Atlantic
Pseudopotamilla intermedia	Pacific	W-C Eastern Pacific
P. occelata	Pacific	W-C Eastern Pacific
P. reniformis	Atlantic	Cosmopolitan
Sabella melanostigma	Both	WW Western Atlantic

Ib. Circumtropical species are found in warm waters in the three major oceans. They are also frequently present in the Mediterranean Sea. The dispersal of this component is centered in the tropical regions, so that dispersal around the continents in colder waters is assumed to be limited or precluded.

IIa-b. Amphi-American species include forms limited to the two American continents, but present in both the Atlantic and Pacific Oceans. Two sub-

patterns can be recognized in that some species have an extended dispersal into colder waters in at least parts of their total range (IIa), whereas others are limited to warm waters (IIb).

III. Species limited to only one ocean include a series of distinct patterns on both sides of the isthmus. Species with an extended Atlantic distribution (IIIa1) have been reported from the coasts of the Mid-Atlantic or New England states of the United States. The warm water forms (IIIa2) have been found in the Gulf of Mexico, Caribbean Sea, and Bermuda in most cases, sometimes also in Brazil or Venezuela. Endemic species (IIIa3) have never been reported outside Panama; in most cases, they have been reported only once.

In the Pacific Ocean, North Pacific species (IIIb1) are known from Japan, Canada, and usually from California, in addition to the present records. Extended eastern Pacific patterns (IIIb2) can be separated into two subpatterns; the first including species known from boreal areas; the second including forms known from antiboreal areas in addition to the warm-water records. Indo-Pacific warm-water forms (IIIb3) are known from the central Pacific and usually from the Indian Ocean as well. Eastern Pacific warm-water species (IIIb4) are found from southern California to Galapagos Islands and northern Peru. Finally, a series of species have never been reported from areas outside the Gulf of Panama (IIIb5).

A certain number of species have recorded occurrences on both the Atlantic and Pacific coastlines of Panama. These have been listed in both columns in Table 1 and, for that reason, the total number of species showing dispersal patterns Ia,b and IIb is less than the sum of the two columns. The species found on both sides of the Isthmus include 5 cosmopolitan, 14 circumtropical, and 11 species with warm water amphi-American dispersal patterns.

An additional 52 species could potentially occur on both sides. When these are absent from one side, the absence is either due to incomplete sampling or to a lack of suitable habitats on either side.

The general picture that emerges demonstrates three dominant faunal elements on either side. The widely dispersed, cosmopolitan or circumtropical forms make up about 42 percent of the total fauna on the Atlantic side and about 30 percent on the Pacific side. A distinct amphi-American element, limited largely to warm waters, makes up 24 percent of the Atlantic fauna and 16 percent of the Pacific fauna. Finally, the last faunal element includes forms limited to one ocean only. This element makes up about 33 percent of the total fauna on the Atlantic side and 54 percent on the Pacific side. Of these large fractions, elements also present in cold water represent 5 percent of the total fauna in the Atlantic Ocean; whereas the long-shore patterns are much better developed in the Pacific Ocean, where 15 percent of the total fauna are distributed long-shore. This distribution appears to be related to the prevalent current-patterns on the two sides.

Geminate species have been recognized in the Panama region for crabs and fishes (e.g., Briggs, 1974); in general, the state of polychaete taxonomy is too primitive to allow recognition of sister species even in the best analyzed families.

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A few points of style: (1) Do not use periods after such abbreviations as "mm, ft, yds, USNM, NNE, AM, BC." (2) Use hyphens in spelled-out fractions: "two-thirds." (3) Spell out numbers "one" through "nine" in expository text, but use numerals in all other cases if possible. (4) Use the metric system of measurement, where possible, instead of the English system. (5) Use the decimal system, where possible, in place of fractions. (6) Use day/month/year sequence for dates: "9 April 1976." (7) For months in tabular listings or data sections, use three-letter abbreviations with no periods: "Jan, Mar, Jun," etc.

Arrange and paginate sequentially EVERY sheet of manuscript—including ALL front matter and ALL legends, etc., at the back of the text—in the following order: (1) title page, (2) abstract, (3) table of contents, (4) foreword and/or preface, (5) text, (6) appendixes, (7) notes, (8) glossary, (9) bibliography, (10) index, (11) legends.