

parapodial lobes include L. africana (Augener, 1918), L. brevicirra (Schmarda, 1861), L. gulielmi (Benham, 1915), L. hartmani Day (1953), L. mando (Crossland, 1924), L. ocellata (Grube, 1878) and L. simplicis Hartman (1959). Seven of these eight species may be divided into two groups: 1. species with hooded hooks first present after setiger 35, including L. gulielmi, L. hartmani, L. ocellata and L. simplicis; and 2. species with hooks first present anterior to setiger 30, including L. africana, L. mando and L. monroi. The distribution of hooks in the type of L. brevicirra is not known; specimens from Australia have hooks from setigers 3 or 4 according to Augener (1927, pp. 184-186), but the type has not been re-examined.

All species involved in this discussion were based on large specimens; the type of L. monroi is the smallest, but it is sexually mature and is here considered fully grown. It is therefore assumed that the start of the simple hooks represents a real difference and is not a function of the size of the specimens.

The anterior hooded hooks are thick and have nine to eleven teeth each and the apical edge is nearly at right angles with the axis in L. monroi; they are slender with few (five?) teeth and the apical edge is nearly parallel to the axis in L. africana.

L. mando has short postsetal lobes in posterior setigers and numerous acicula in all parapodia.

The species in this group can be separated with difficulty and it was only after much hesitation that a new species was erected for the six specimens. The variability in the first occurrence of the hooded hooks is poorly known and large materials from the type areas of all species mentioned should be examined.

The juvenile specimen from K 116 is doubtfully

assigned to this species. It has hooded hooks from setiger 14; the maxillary formula and the development of the parapodial lobes fit this species.

Distribution: L. monroi is known from one locality near Acapulco in shallow water and possibly from Puerto Escondido in the Gulf of California.

Lumbrineris moorei Hartman, 1942

Lumbrineris moorei Hartman, 1942a, pp. 116-118, fig. 12a-b and g; Hartman, 1960, p. 103.

Records: 7228-60(1); 7229-60(1).

Remarks: L. moorei belongs to group II. b. 1.; its relation to other species with prolonged setae has been discussed in detail by Hartman (1942, 1960).

Distribution: L. moorei is known from abyssal depths off southern California (Hartman, 1961, p. 24). The two present records are from the vicinity of Cedros Island, Baja California, in 2402-2036 fms and 957-942 fms respectively.

Lumbrineris pallida Hartman, 1944

Lumbrineris pallida Hartman, 1944, pp. 166-167, pl. 12, figs. 270-274, pl. 13, figs. 275-277.

Earlier Record: Hartman (1944, p. 166): 1245-41(6).

Remarks: L. pallida belongs to group I. B. b. 1.; it has very short parapodia and dark acicula. Maxillae IV have large, flattened bases which are not known in any other species in this group.

Distribution: L. pallida is known from shelf and slope depths from southern California and western Mexico.

Lumbrineris penascensis, new species

(Plate 17, Figs. a-c)

Record: Puerto Penasco, Nov. 25, 1965, coll. V. A. Gallardo (1 and fragments, TYPE).

Description: The type is an incomplete specimen with 99 setigers and is 28 mm long and 1.4 mm wide with setae. It is brownish yellow and color patterns are absent except for a small dark spot in the center of the prostomium. The short anterior setigers are crowded; those in the posterior end are elongated and may be a little longer than wide.

The short prostomium (Fig. a) is rounded and nearly acorn-shaped. The two peristomial segments are together as long as the first setiger; the first peristomial segment is a little longer than the second one. Both peristomial segments are wider than the prostomium.

All parapodia (Fig. c) are similar, except that the anterior parapodia are somewhat shorter than the posterior ones. The presetal lobe is rounded and as long as the setal lobe; the long postsetal lobe is slender and digitate.

Two kinds of setae are present; the anterior parapodia have short, broadly limbate setae only; simple hooded hooks are present from setiger 26. The limbate setae decrease in number posteriorly and are absent posterior to setiger 50. Each hooded hook (Fig. b) has distally a large main fang and a crest of twelve to fifteen smaller teeth.

The pharyngeal apparatus is very delicate; the mandibles are uncalcified; the posterior three-fourths of their length is fused. The maxillary carriers are long and

narrow; maxilla I is falcate; each maxilla II has four well defined teeth; each maxilla III has two and each maxilla IV one tooth.

L. penascensis belongs to group II. b. 2. and resembles L. monroi, new species, closely. They differ in that L. penascensis has a short, blunt prostomium and the first peristomial segment is only slightly longer than the second; the prostomium is rounded conical and the first peristomial segment is more than twice as long as the second in L. monroi. The postsetal lobes are slender in L. penascensis and very thickset in L. monroi.

The relationship between L. penascensis and other species in group II. b. 2. is similar to that of L. monroi; it should be compared with the same species.

Distribution: L. penascensis is known from one intertidal locality near the upper end of the Gulf of California.

Lumbrineris platylobata, new species

(Plate 17, Figs. d-h)

Records: 566-36(1); K 126(1); P 51-59(2, TYPE).

Description: The type is an incomplete specimen with 84 setigers and is 16 mm long and 1.5 mm wide with setae. It is brown and lacks color pattern.

The flattened, acorn-shaped prostomium (Fig. g) has a distinct palpodelike projection at the anterior end. The conical first peristomial segment is slightly longer than the prostomium; the cylindrical second peristomial segment is only half as long as the first one.

The first setigers have short, truncate setal and pre-setal lobes (Fig. h); the diamond-shaped postsetal lobes

are nearly twice as long as the other lobes. The parapodia increase in length in median and posterior setigers and the parapodial lobes become conical, except for the presetal lobes, which are reduced. The presetal lobes are completely rudimentary in far posterior setigers (Fig. f) and the setal and postsetal lobes are bluntly conical.

The anterior six to nine parapodia have only limbate setae. Simple hooded hooks are present from setigers 7-10; those in the anterior 30-35 setigers (Fig. e) are long and slender with five to six slender teeth; those in posterior setigers are larger; each hook (Fig. d) has a large main fang and a crest of six to eight smaller teeth. Limbate setae are absent posterior to setiger 50. Anterior parapodia have two yellow acicula each; posterior parapodia have only one.

The mandibles are fused along half their length and have widely flaring cutting edges. The maxillary carriers are very broad and as long as the first maxilla. Maxilla I is falcate; each maxilla II has four teeth; each maxilla III and IV has one tooth.

L. platylobata belongs to group II. b. 1.; similar species include L. acutifrons (McIntosh, 1885), L. atlantica (Kinberg, 1865), L. debilis (Grube, 1878), L. hibernica (McIntosh, 1903), L. tenuis (Verrill, 1873) and L. uncinigera Hartmann-Schroeder (1959).

L. acutifrons differs from L. platylobata in that it has a greatly prolonged prostomium which is at least as long as the eight or nine first setigers together. L. atlantica was re-described by Hartman (1948, pp. 90-91, pl. 13, figs. 1-2); it differs from L. platylobata in that the postsetal lobe has the same shape and size in all parapodia; this is not the case in L. platylobata.

L. debilis is poorly known; it appears to have hooded hooks from setiger 16 and long postsetal lobes in median setigers.

L. hibernica was re-described by Clark (1952, pp. 11-12); it differs from L. platylobata in that the hooded hooks are first present from setigers 10-16; most of the fifty specimens had hooks from setigers 13-16, according to Clark (1952, p. 11); L. platylobata has hooks from setigers 7-10. L. tenuis was re-described by Hartman (1942b, pp. 54-55); it differs from L. platylobata in having short, inconspicuous parapodial lobes in all setigers; the anterior parapodia in L. platylobata are short, but the large, diamond-shaped postsetal lobe is very prominent. L. tenuis has hooded hooks from setiger 16.

L. uncinigera has rounded postsetal lobes in anterior setigers and hooded hooks are present from the first setiger; L. platylobata has diamond-shaped postsetal lobes in anterior setigers and hooded hooks are first present from setigers 7-10.

Distribution: L. platylobata is known from three localities in the Gulf of California in shallow subtidal and intertidal areas.

Lumbrineris platypygos, new species

(Plate 18, Figs. a-d)

Lumbrineris acuta Hartman, 1944, pp. 145-146, pl. 8, figs. 176-177 (not Verrill, 1873).

Records: 1251-41(1); 1924-49(1); 6179-59(11, TYPE).

Description: The type is a complete specimen with 58 setigers and is 8.5 mm long and 0.3 mm wide with setae. It

is white and lacks color pattern. The body is cylindrical and most setigers are longer than wide. The pygidium (Fig. a) is a strongly flattened funnel with semi-circular outline. The anus opens dorsally; anal cirri are absent.

The prostomium (Fig. d) is as long as the four first segments together; it is pointed conical; eyespots are absent. The nuchal organ is a pair of dorsolateral pockets. The first peristomial segment is wider than the prostomium and as wide as the first setigers; it is as long as the first setiger; the second peristomial segment is similar in width, but somewhat shorter.

The parapodia of the first setigers are very short; the short postsetal lobes are distinct. The postsetal lobes are longer in the posterior part of the body; they never exceed half the length of the parapodium in any setiger. The setal lobes are symmetrically rounded in all setigers; the presetal lobes are completely rudimentary throughout.

The first six or seven setigers have only limbate setae; all setigers from 7 or 8 have, in addition to the limbate setae, bidentate hooded hooks (Fig. b). The teeth of each hook are of the same length in anterior and median setigers; the distal tooth is a little shorter than the proximal one in far posterior setigers. The angle between the two teeth varies between  $45^\circ$  and nearly  $90^\circ$ .

The pharyngeal apparatus is very delicate; the mandibles are fused along the whole length and are posteriorly prolonged. Maxilla I (Fig. c) is falcate and has two small teeth on the inner edge in addition to the curved tip; each maxilla II has three teeth; each maxilla III and IV has one tooth. The large maxillary carriers are triangular with a marked constriction near the middle of their length.

L. platypygos belongs to group II. a. This group is characterized not only by the presence of simple, bidentate hooks, but some species have unusual pharyngeal structures. The only other species that has dentate maxilla I is L. acuta (Verrill, 1873), which differs from L. platypygos in that it has only one extra tooth on each maxilla I instead of two as in the latter.

The pygidial structure in L. platypygos resembles that in L. mucronata (Ehlers, 1908) and in L. paradoxa (Saint-Joseph, 1888). L. platypygos differs from both these species in that it has a dentate maxilla I; both the others have no teeth on maxilla I except for the falcate tip.

Distribution: L. platypygos is known from three localities in the vicinity of Cedros Island, Baja California, in shallow subtidal areas.

Lumbrineris simplicis Hartman, 1959

(Plate 19, Fig. a)

Lumbrineris simplicis Hartman, 1959, p. 336.

Lumbrineris simplex Hartman, 1944, pp. 152-153, pl. 10, figs. 224-229 (not Southern, 1921).

New Record: Puerto Refugio, Angel de la Guardia Island, April 2, 1940, coll. E. F. Ricketts (1).

Earlier Records: Hartman (1944, p. 152): 1053-40(1); 1063-40(1).

Remarks: L. simplicis belongs to group II. b. 2.; other species in the same group that have hooded hooks first present after setiger 35 include L. guielmi (Benham, 1915), L. hartmani Day (1953) and L. ocellata (Grube, 1878); see discussion under L. monroi.



L. guillemi and L. ocellata have rows of eyespots across the posterior end of the prostomium; eyes are absent in L. hartmani and L. simplicis.

L. simplicis has similar parapodial lobes in all setigers and has simple limbate setae present in at least 125 setigers. L. hartmani has weakly prolonged posterior post-setal lobes and simple setae in 60-70 setigers only.

Simple hooks (Fig. a) are present in L. simplicis from setigers 40-48; each has a thick axis and a small distal head; the main fang is larger than the teeth in the crest, which number nine or ten.

Distribution: L. simplicis is known from the upper end of the Gulf of California in shallow water. The specimens reported from the Galapagos Islands by Hartman (1944, p. 153) may belong to another species.

Lumbrineris tetraura (Schmarda, 1861)

(Plate 19, Figs. b-e)

Notocirrus tetraurus Schmarda, 1861, p. 117, 6 textfigs.

Lumbrinereis tetraura Day, 1953, pp. 435-436.

Lumbrineris tetraura Hartman, 1944, pp. 147-149, pl. 8, figs. 175, 190-191, pl. 9, figs. 192-195.

New Records: 265-34(1); 1706-49(1); San Quintin Bay, in small channel in tidal flats, April 6, 1950, coll. D. J. Reish (1); San Quintin Bay, mud-flats, April 7, 1950, coll. D. J. Reish (3); K 126(11 juveniles); K 133(2).

Earlier Records: Hartman (1944, p. 147): 638-37(2); 1045-40(3); 1076-40(1).

Remarks: L. tetraura belongs to group II. b. 2.; it has hooded hooks from setiger 1 and strongly prolonged

posterior postsetal lobes.

Anterior parapodia (Fig. e) have short, truncate pre-setal and setal lobes; the digitate postsetal lobes are nearly twice as long as the presetal ones. Posterior parapodia (Fig. d) have short, truncate presetal lobes which often have irregular notches along the distal margin. The bases of the parapodia are distinctly longer in posterior than in anterior parapodia. The erect postsetal lobes are more than three times as long as the presetal ones in far posterior setigers.

Anterior simple hooded hooks (Fig. b) have eight or nine similar teeth. Posterior hooks (Fig. c) have a large main fang and five distinct teeth in the crest; some small denticles are often present on the superior edge of the main fang.

Other species in group II. b. 2. with prolonged posterior postsetal lobes and hooded hooks from the first setiger include L. candida Treadwell (1921), L. cavifrons (Grube, 1867), L. impatiens (Claparède, 1868), L. nitida (Grube, 1869), L. oceanica (Kinberg, 1865), L. sarsi (Kinberg, 1865) and L. treadwelli Hartman (1956).

L. candida differs from the other species mentioned in that it has no teeth on maxilla IV (Hartman, 1956, p. 288). L. treadwelli is very similar to L. tetraura and appears to differ only in that the posterior postsetal lobes are somewhat shorter and maxilla II is symmetrical with four teeth on each side; fifteen of the seventeen specimens of L. tetraura here investigated for the character of the jaws have asymmetrical jaws with four and five teeth.

L. oceanica is also similar to L. tetraura and appears to differ only in that all parapodia have prolonged bases; L. tetraura has prolonged parapodial bases only in posterior setigers. L. sarsi was re-described by Hartman (1948,

pp. 88-89, pl. 13, figs. 6-7, pl. 14, fig. 8); it differs from L. tetraura in that it has digitate anterior postsetal lobes with narrow bases; the postsetal lobes in L. tetraura from the eastern Pacific Ocean have wide bases and they may be auricular as noted by Hartman (1944, p. 147). Auricular postsetal lobes were not found in the specimens from western Mexico. L. tetraura from the Cape region of South Africa, which is the type area for the species, has anterior postsetal lobes described by Day (1953, p. 436) as being "compressed and triangular with the rounded apex pointing upward and outward."

L. cavifrons as re-described by Day (1953, p. 437, fig. 6a-d) differs from L. tetraura in that the posterior postsetal lobes are barely longer than those in anterior setigers. The specimens examined by Day came from near the type area for the species.

L. impatiens is also very similar to L. tetraura and the two have repeatedly been considered synonymous (Day, 1953, p. 436). The two species appear to differ in the number of teeth on the anterior hooded hooks; L. tetraura from the eastern Pacific Ocean has eight or nine teeth in a hook; L. impatiens from the Mediterranean Sea was described with three or four teeth in a hook by Fauvel (1923, p. 430).

Distribution: L. tetraura may have a very wide distribution; the status of the different species that at one time or another have been included in it is so confused that it is impossible to make any general statement. As presently accepted, it is found in western Mexico scattered in shallow subtidal and intertidal areas.

Lumbrineris zonata (Johnson, 1901)

(Plate 18, Figs. e-i)

Lumbriconereis zonata Johnson, 1901, pp. 408-409, pl. 9,  
figs. 93-100.

Lumbrineris zonata Hartman, 1944, pp. 146-147.

Records: 1976-50(8); 2026-51(1); 2066-51(2); 2624-54  
(1); 6198-59(1); Ensenada, littoral, Jan. 22, 1932, coll.  
G. E. MacGinitie (2); near Absitos, in holdfasts of Phyllo-  
spadix, Febr. 24, 1937, coll. C. R. Monk (8); El Descanso,  
June 1, 1938, coll. O. Hartman (22); San Quintin Bay,  
screened from sand, April 7, 1950, coll. D. J. Reish (1);  
1 mile N of El Descanso, intertidal, April 8, 1950, coll.  
D. J. Reish (19); 1 mile N of Ensenada, April 8, 1950, coll.  
D. J. Reish (2).

Remarks: L. zonata belongs to group II. b. 2.; it has  
short postsetal lobes in all setigers (Figs. f-g) and hooded  
hooks present from the first setiger. Hooks in anterior  
setigers (Figs. h-i) have five to six teeth each and the  
head of the hook is at a slight angle with the axis; poste-  
rior hooks (Fig. e) have a very large main fang at right  
angles with the axis and a crest of numerous, always more  
than fifteen, very small teeth in a single row. The maxil-  
lary formula is 1-4(5)-2-1. One specimen has five teeth in  
both maxillae II; approximately half the specimens have  
asymmetrical maxillae II; the rest have symmetrical maxil-  
lae II with four teeth in each.

Other species in group II. b. 2. known to have short  
posterior postsetal lobes and hooded hooks from the first  
setigers include L. araukensis Hartmann-Schroeder (1962),  
L. bifrons (Kinberg, 1865), L. brevicirra (Schmarda, 1861),  
L. dentata Hartmann-Schroeder (1965), L. parvapedata

Treadwell (1901) and possibly L. cavifrons (Grube, 1867).

L. araukensis is very similar to L. zonata and differs only in that the second peristomial segment is incomplete ventrally so that the posterior lip is formed by the first peristomial segment. It resembles L. zonata closely in all other characters, including the setal structure.

L. bifrons was re-described by Hartman (1948, pp. 95-96, pl. 14, figs. 10-13); it differs from L. zonata in that it has asymmetrically five and six teeth on each maxilla II; the structure of the hooded hooks is different in the two species (see Fig. e and Hartman, 1948, pl. 14, fig. 13).

L. brevicirra was re-described by Ehlers (1904, pp. 35-36); it differs from L. zonata in that the posterior hooded hooks have numerous teeth which evenly decrease in size from the main fang.

L. cavifrons differs from L. zonata in that the posterior postsetal lobes are slightly prolonged (see above under L. tetraura), and apparently the structure of the posterior hooded hooks is different in the two species. L. dentata differs from L. zonata in that it has dentate hoods on the hooded hooks and the teeth evenly decrease apically in all hooks.

L. parvapedata was re-described by Hartman (1942a, pp. 118-119, fig. 10i-j and m). It differs from L. zonata in body form; L. parvapedata is very slender, L. zonata is robust. L. parvapedata has six, L. zonata has four or five teeth on each maxilla II.

Distribution: L. zonata is known from western Canada to the southern end of Baja California; it is also found in the upper end of the Gulf of California in intertidal or shallow subtidal areas.

Genus Ninoe Kinberg, 1865, emended

The genus is here emended to include all lumbrinerids with branchial structures.

Species with branchiae associated with the parapodia and species with branchial and similar structures of unknown function not associated with the parapodia, were separated by Fauvel (1918, p. 508; 1919, p. 395; 1927, pp. 423-424; and 1943, p. 24). The former group were placed in Ninoe and the latter were retained in Lumbrineris. Fauvel (1927, pp. 423-424) argued that a structure, in order to be considered a branchia, must be clearly more vascularized than the surrounding epithelium. All structures with large vascular loops are here considered branchiae, independent of the structure of the skin; the presence of branchiae in addition to the vascularized skin only points out that the skin alone is unable to supply needed oxygen to the animals.

The position of the branchiae is difficult to use as a generic character since certain species (see Rioja, 1941, pls. 7 and 8) have branchiae on the parapodia and also on the ventral surface. The branchiae found distally on the parapodia may well differ from those found basally or on the ventral surface, but this can only be resolved by a thorough anatomical investigation, and may have no bearing on the taxonomic grouping of the species.

The genus is here, for purely practical reasons, separated into three groups:

- I. Branchiae present only as single filaments.
- II. Branchiae with two or more filaments.
- III. Branchial structure unknown.

Three species of Ninoe are found in the present material. Two additional species, N. moorei from Acapulco and Mazatlán and N. spinosa from Acapulco, were described by

Rioja (1941). These two are included in the key, but are not treated in the systematic account.

Key to Species of Ninoe from Western Mexico

1. Hooded hooks with pointed hoods .. spinosa
1. Hooded hooks with rounded hoods ..... 2
2. Branchiae present in a short anterior region only . 3
2. Branchiae present in a long posterior region ..... 4
3. Hooded hooks present from the first setiger .....  
..... gemmea
3. Hooded hooks present from setigers 60-70 .....  
..... fusca
4. Each branchial setiger with a single branchia on  
each side ..... moorei
4. Each branchial setiger with four branchiae on  
each side ..... dolichognatha

Ninoe dolichognatha Rioja, 1941

(Plate 19, Figs. f-k)

Ninoe dolichognatha Rioja, 1941, pp. 722-723, pl. 7, figs. 9-15, pl. 8, figs. 1-5.

Lumbriconereis branchiata Fauvel, 1943, pp. 22-24, fig. 2a-g.

New Records: Punta Cholla, May 9, 1941, intertidal, coll. S. A. Glassell (1 and fragments); K 117(1); Puerto Penasco, rocky intertidal, Febr. 25, 1967, coll. P. Pickens (1).

Earlier Records: Rioja (1941, p. 723): La Aguada, Acapulco; Mazatlán. Fauvel (1943, p. 22): Gulf of California, coll. M. Diguët, 1905.

Remarks: N. dolichognatha was described in great detail by Rioja (1941). The nuchal organ (Fig. f) is a centrally placed pocket with three short slender tentacles.

The different kinds of hooks found in this species were illustrated by Rioja (1941, pls. 7 and 8), but he did not mention their distribution. The anterior 30-35 setigers have simple hooks (Figs. g and i) with six to seven teeth each; the lowermost tooth in each hook is slightly larger than the others. Posterior to setigers 31-36, most of the inferior hooks are bidentate (Fig. k) with two to four small teeth between the two main teeth. Simple, unidentate hooks (Fig. h) are present in setigers 20 to 60. Most setigers posterior to setiger 35 have a single hook in superior positions, but some setigers retain a single limbate seta in those positions. The supra-acicular hooks (Fig. j) have a large main fang and three to five small teeth in a crest. A single limbate seta is present ventralmost in most setigers, but this seta may be absent in some posterior setigers. Two straight, yellow acicula are present in all parapodia.

Lumbriconereis branchiata Fauvel (1943) fits well with Ninoe dolichognatha and the two are here considered synonymous.

Distribution: N. dolichognatha is known exclusively from shallow water in western Mexico from Acapulco to the upper end of the Gulf of California.

Ninoe fusca Moore, 1911

Ninoe fusca Moore, 1911, pp. 285-288, pl. 19, figs. 110-118;  
Hartman, 1961, p. 25.

Record: 7231-61(2).



Remarks: N. fusca has a central nuchal pocket as described by Moore (1911). The present specimens have a small, possibly retractile, nuchal tentacle in the pocket. Hooded hooks are present from setiger 66 and 69 respectively in the two specimens.

Distribution: N. fusca is known from abyssal depths off southern California; the present record is from similar depth in the vicinity of Cedros Island, Baja California.

Ninoe gemmea Moore, 1911

Ninoe gemmea Moore, 1911, pp. 283-285, pl. 19, figs. 101-109; Hartman, 1961, p. 25.

Record: 2030-51(1).

Remarks: N. gemmea has a nuchal organ with a single nuchal tentacle in a deep pocket. Branchiae are limited to setigers 4 to 49 in the present specimen. Hooded hooks are present from the first setiger.

Distribution: N. gemmea is known from shelf-depths from western Canada to northern Baja California (Hartman, 1961). The present record is from off Cedros Island, in 40-41 fms depth.

Ninoe species indeterminable

Record: 523-36 (fragment).

Remark: This fragment consists of twenty segments and has large branchiae with six or seven filaments.

## IPHITIMIDAE, new family

Species in this family have short, rounded or truncate prostomia and two peristomial segments. Parapodia are uniramous and have large postsetal lobes and shorter presetal lobes. Simple falcate and composite falcate setae are present; hoods are absent. Branchiae are always present and may be simple or branched; they are sometimes pectinate.

The pharyngeal apparatus has a pair of mandibles which are fused medially over nearly half their length; a pair of maxillary carriers are fused to the simple falcate maxillae I. Maxillae II and III are usually present and may be falcate or have a few teeth each.

The family contains presently one genus, Iphitime Marenzeller (1902), with the genotype I. doederleini and three additional species which are listed in Appendix E with reference to the original description and type area. All species are inquilines in the branchial cavities of decapod crustaceans.

Iphitimidae resembles Onuphidae, Eunicidae and Lumbrineridae in the presence of a pair of short maxillary carriers. The maxillary carriers in the Iphitimidae are, however, fused to the falcate maxilla I; the maxillary carriers in the other families fuse to each other medially rather than with maxilla I, when they are fused.

The Onuphidae, Eunicidae and Iphitimidae have branched branchiae present in some species.

The Iphitimidae differs from the three families mentioned in that it has simple falcate setae only and no setae are hooded.

Iphitime has been associated with the Lysaretidae (Hartman, 1944, 1952 and 1959, 1965a) with which they have little in common. The association of the four species in

the genus with any known family in the super-family leads to a re-definition of the families so that practically the whole super-family could be fitted into the new concept. It was therefore decided that in order to keep the concepts of the different families more or less as they are presently accepted, a new family would have to be created to accommodate these four species.

Iphitime loxorhynchi Hartman, 1952

Iphitime loxorhynchi Hartman, 1952, pp. 11-12, pl. 3, figs. 1-6.

Record: 2023-51(10, in branchial cavity of Loxorhynchus grandis Stimpson).

Remarks: The four known species in the genus were separated by Hartman (1952, p. 14) on the first occurrence and character of the branchiae and on the number and structure of the setae.

The pharyngeal apparatus has been rather poorly described, but apparently furnishes diagnostic characters. The genotype, I. doederleini Marenzeller (1902), and I. cuenoti Fauvel (1914) have three pairs of maxillae; I. loxorhynchi has only two pairs. The jaws were not described for I. paguri Fage and Legendre (1934), but were said to be similar to those in I. cuenoti.

Distribution: I. loxorhynchi is known from southern California and from the vicinity of Cedros Island, Baja California. It has been found in the branchial cavities of Loxorhynchus grandis Stimpson.

## Family ARABELLIDAE Hartman, 1944

The family contains at present approximately 65 species in eight genera. The taxonomic characters are few and recognition of genera and species is difficult.

The prostomium is usually cone-shaped and may have two or four eyes. Pro- and peristomial appendages are absent. Parapodia have well developed neuropodia with a varying number of simple setae, which may be bilimbate, finely serrated or dentate. A large acicular spine is present ventral to the acicula in some genera (e.g., Drilonereis and Notocirrus). These spines are probably homologous to the bidentate, subacicular hooks present in other families (Eunicidae, Lysaretidae) but differ from the hooks in that they are straight or only slightly curved with a simple, blunt tip. The slender acicula are prolonged distally with fine filaments.

Notopodial rudiments are present in most species; they can be recognized as a series of fine rods at the superior side of the setal bundles and are visible externally as short papillae.

The short neuropodial presetal lobes are rounded; the postsetal lobes are longer than the presetal ones and may be elongated in posterior setigers.

The pharyngeal apparatus has usually a pair of mandibles and five pairs of maxillae. The mandibles are triangular or diamond-shaped plates fused along part of their median edges; they may be reduced or absent in certain species of Drilonereis (e.g., D. australiensis Augener, 1922, D. nuda, below; full references to all original descriptions of the arabellids are given in Appendices F-H). The mandibles are fused along their whole length and horseshoe-shaped with two slender prolongations in Oligognathus

(Spengler, 1882; Cerutti, 1909).

Three maxillary carriers, a symmetrically developed pair and an unpaired median one, are present. The paired carriers are prolonged and very slender; they are fused in some species (Haematocleptes terebellidis Wirén, 1886), but are separate at least for part of their length in most species. The unpaired carrier is attached to the anteroventral side of the paired ones; it is nearly always shorter and less chitinized than the others.

The first pair of maxillae is attached basally to the anterior ends of the paired carriers; it may be basally smooth or dentate and distally falcate or dentate. Maxillae II are dentate in nearly all species; Drilonereis parasiticus (Cauillery, 1914) was described with smooth maxillae II. Maxillae III to V have from one to several teeth. Maxillae V are absent in some species of Drilonereis; its presence or absence is not regarded as a diagnostic character.

The generic sub-division is based primarily on the presence or absence of acicular spines; spines are present in Drilonereis, Drilograthus, Haematocleptes and Notocirrus; they may be present in other genera, Oligognathus and Labrorostratus, but have been confused with the acicula. Acicular spines are absent in Arabella and Biborin.

The pharyngeal apparatus is to some degree characteristic for each genus. Arabella and Notocirrus have five pairs of maxillae and the maxillary carriers and mandibles are well developed in all species. Maxillae V and the mandibles may be absent in Drilonereis and the number of teeth on the other jaws is often low. Biborin has well developed mandibles, but the whole maxillary apparatus is absent. Labrorostratus, Oligognathus and Haematocleptes have well developed maxillary carriers which often are fused to one

solid rod; the maxillae show increasing reduction in the three genera; they are often single sharp points or missing. Drilognathus has well developed mandibles, but the whole maxillary apparatus is reduced to a single rod in the roof of the mouth, according to Day (1960, p. 370).

The generic subdivision of the family is summarized in Chart 3 and in the key to genera.

#### Key to Genera of ARABELLIDAE

- |                                                                                     |                       |
|-------------------------------------------------------------------------------------|-----------------------|
| 1. Acicular spines present .....                                                    | 2                     |
| 1. Acicular spines absent .....                                                     | 4                     |
| 2. Four or five pairs of jaws present .....                                         | 3                     |
| 2. Maxillary apparatus represented by a single rod .....                            | <u>Drilognathus</u>   |
| 3. Maxilla I distally falcate .....                                                 | <u>Drilonereis</u>    |
| 3. Maxilla I distally dentate .....                                                 | <u>Notocirrus</u>     |
| 4. Maxillary apparatus absent .....                                                 | <u>Biborin</u>        |
| 4. Maxillary apparatus present, but often reduced ....                              | 5                     |
| 5. Five pairs of maxillae present ...                                               | <u>Arabella</u>       |
| 5. Two or three pairs of maxillae present .....                                     | 6                     |
| 6. Mandibles fused and horseshoe-shaped .....                                       | <u>Oligognathus</u>   |
| 6. Mandibles two triangular plates .....                                            | 7                     |
| 7. Maxillary carriers anteriorly bilobed and fused along most of their length ..... | <u>Labrorostratus</u> |
| 7. Maxillary carriers anteriorly rounded and fused along their whole length .....   | <u>Haematocleptes</u> |

#### Genus Arabella Grube, 1850

Members of this genus have five pairs of maxillae; mandibles and three maxillary carriers are present. Setae

Chart 3

## Survey of Genera and Generic Characters in ARABELLIDAE

Genus	Acicular spines	Numbers of maxillae present	Maxilla I distally		Mandibles		Comments
			Falcate	Dentate	Fused totally	Fused over a short distance	
<u>Arabella</u>	-	5	+	+	-	+	
<u>Biborin</u>	-	0	-	-	-	+	Maxillae absent
<u>Notocirrus</u>	+	5	-	+	-	+	
<u>Drilonereis</u>	+	4-5	+	-	-	+	Mandibles may be absent
<u>Oligognathus</u>	?	2-3	-	+	+	-	Maxillae reduced
<u>Labrorostratus</u>	-	2	-	+	-	+	Maxillae reduced
<u>Haematocleptes</u>	-	2	-	+	-	+	Maxillae reduced
<u>Drilognathus</u>	+	0	-	-	-	+	Maxillae a single rod

are simple and may be limbate, serrated or dentate. Hooded simple setae are present in some species. Acicular spines are absent.

The distal end of maxilla I may be falcate or dentate; this is here considered the most important specific character. Other diagnostic characters include the presence or absence of hooded simple setae ventrally in median and posterior parapodia, the presence or absence of prolonged postsetal lobes in posterior setigers, and the dentition and shape of the different jaws. All these characters are poorly understood. The number of teeth on the different jaw-pieces has been assumed to be highly variable (Crossland, 1924, p. 83), but no thorough study has been made, except for comparisons between a few specimens from widely scattered parts of the world.

The simplicity of the morphological features may lead to a statistical treatment of variable features like the number of teeth on the jaw-pieces, from large materials. This could give a better and more accurate definition of the different taxa involved than the present method.

A temporary method for establishing the variability of the species was devised here. The variability of the number of teeth on the jaw-pieces exhibited by a species that could be defined by other characters (e.g., A. semimaculata) was considered a norm for all species. The other species were defined with similar limits of variability.

Four of the twenty-five species in the genus are found in western Mexico. Appendix F lists all named species of Arabella divided into two groups based on the character of the distal end of maxilla I. Most of the named species that have been considered synonyms of A. iricolor (Montagu, 1804) are included in the list; synonyms listed by Hartman (1959, 1965a) are indicated. A number of species are



known only through incomplete original descriptions; those that were considered indeterminable by Hartman (1959, 1965a) have been excluded from the list.

Key to Species of Arabella from Western Mexico

1. Posterior postsetal lobes erect and prolonged .....  
..... semimaculata
1. Posterior postsetal lobes not prolonged ..... 2
2. Hooded simple setae present ventrally in median  
and posterior parapodia ..... mutans
2. Hooded simple setae absent ..... 3
3. Teeth on maxillae III and IV even in size, maxilla  
III with 7-11 teeth, maxilla IV with 6-7 .....  
..... pectinata
3. Teeth on maxillae III and IV irregular, maxilla  
III with 4-5 teeth, maxilla IV with 2-5 .....  
..... iricolor

Arabella iricolor (Montagu, 1804)

(Plate 20, Figs. a-d)

Arabella iricolor McIntosh, 1910, pp. 395-400, pl. 54, fig. 4, pl. 62, fig. 8-8c, pl. 74, fig. 5-5c, pl. 83, fig. 2-2a; Fauvel, 1923, pp. 438-439, fig. 175a-h (partim?); Rioja, 1941, p. 724; Hartman, 1944, p. 173; Rioja, 1947a, p. 205; Rioja, 1962, p. 180; Reish, 1963, p. 426.

New Records: 1092-40(1); 1595-47(1); 1596-47(frag-ment); 1597-47(1); 1915-49(1); 1950-50(1); El Descanso, June 1, 1938, coll. O. Hartman (12); 300 yards off Cargo Island, in 16 fms, on shell, Febr. 27, 1939, coll. M. W.

Johnson (1); Dawson 1946-47 sta. 53(1 juvenile); Dawson 1946-47 sta. 94(1); 1 mile N of Ensenada, April 8, 1950, coll. D. J. Reish (fragment); P 51-59(2).

Earlier Records: Rioja (1941, p. 724): La Aguada, Acapulco. Hartman (1944, p. 173): 545-36(1); 1053-40(1); 1077-40(1); 1104-40(1); 1260-41(1). Rioja (1947a, p. 205): Topolobampo; Bahía Magdalena. Rioja (1962, p. 180): Zihuantanejo; Mazatlán; Topolobampo; Guaymas; Isla San Roque; Isla de la Asunción. Reish (1963, p. 426): six localities in Bahía de San Quintin.

Remarks: The definition of this species, which is the genotype, is confused. That given by McIntosh (1910) on specimens from Guernsey in the British Channel is here considered authoritative. These specimens have well developed, rounded presetal lobes and large, digitate postsetal lobes in all setigers (Figs. c and d); the description fits so well that reference is given to illustrations of specimens from western Mexico. The postsetal lobes are not prolonged in any setiger. Notopodial rudiments are distinct throughout. The acicula have long, slender filamentous tips. Smooth bilimbate and dentate (Fig. b) setae are present. The maxillary formula given by McIntosh (1910, pp. 397-398) can be re-written as  $8+9-8(10)+8(10)-4(5)+4(5)-4(5)+4(5)-1+1$ . The presence of an unpaired carrier was not noted by McIntosh.

A similar description is given by Fauvel (1923, pp. 438-439), but it differs in the maxillary formula:  $?+?-6(7)+12(14)-6+4(6)-5(6)+6-1+1$ . The presence of teeth on the base of maxilla I was noted, but no number was given. The two formulas differ most markedly in that maxilla II should be symmetrically developed with 8-10 teeth on each side according to McIntosh (1910) and asymmetrically with six to

seven teeth left and twice as many on the right side according to Fauvel (1923).

The summarized maxillary formula of the present specimens is  $7(9)+7(10)-6(9)+12(16)-4(5)+4(5)-2(5)+2(5)-1+1$ . The lower number of teeth is found in small specimens; a medium sized specimen has  $8+9-8+14-5+5-4+4-1+1$ . Maxillae III and IV are always symmetrical. These formulas resemble the one given by McIntosh in having symmetrically developed maxillae III and IV and approximately the same number of teeth on maxilla I as noted by McIntosh; they resemble the one given by Fauvel in having asymmetrical maxillae II.

Every second tooth is twice as large as its neighbors (Fig. a); all teeth are evenly conical with sharp pointed tips. This is best seen in maxillae III and IV. Illustrations showing this irregular development of the teeth were given by McIntosh (1910, pl. 62, fig. 8a-8b) and Fauvel (1923, fig. 175d). The upper end of the unpaired maxillary carrier is truncate according to Fauvel (1923, fig. 175d); it is anteriorly pointed in the present specimens and truncate in A. pectinata, new species.

Setae in the present specimens are similar to those described by McIntosh (1910); anterior setigers have only smooth, bilimbate setae; median and posterior setigers have in addition setae with marginal teeth (Fig. b). Median and posterior setae are strongly geniculate.

A. iricolor is considered cosmopolitan in warmer waters and has numerous synonyms. The survey of the species of Arabella (Appendix F) gives most of the named species commonly considered synonyms of A. iricolor. These names should be retained until the types have been compared directly, because of the confusion in the genus.

Distribution: A. iricolor may be very widespread in

warm water areas; it is common in western Mexico in intertidal and shallow subtidal areas.

Arabella mutans (Chamberlin, 1919)

(Plate 21, Figs. a-f)

Cenothrix mutans Chamberlin, 1919b, pp. 330-332, pl. 61, figs. 1-9, pl. 62, fig. 1.

Arabella mutans Fauvel, 1943, p. 24; Hartman, 1944, pp. 173-174.

New Records: 1077-40(1); Punta Trinidad, Dec. 31, 1953, coll. R. J. Menzies and G. Ewing (fragment); K 127(1).

Earlier Records: Fauvel (1943, p. 24): Gulf of California, 1905. Hartman (1944, p. 173): 662-37(1); 704-37(1).

Remarks: A. mutans was originally described from shallow water near Easter Island, Pacific Ocean. It has blunt, hooded setae ventralmost in median and posterior parapodia. The present specimens have only a few setae in median and posterior setigers. The superiormost one or two setae (Fig. c) are smoothly bilimbate and strongly geniculate. The two median setae (Fig. e) are serrated with very fine serrations that follow the pattern of internal striations. The lower one or two setae (Fig. d) have large marginal teeth. The ventralmost seta (Fig. f) is blunt with a sharply pointed hood. The acicula have very long projecting tips.

The jaws are symmetrically developed; a summarized maxillary formula is 9(10)+9(10)-14(16)+14(16)-5(6)+5(6)-3(5)+3(5)-1+1. The distal end of each maxilla I is strongly falcate. The maxillary formula given by Chamberlin (1919) is (re-written) 8+8-7+15(?) -5+5-3+4-1+1. Chamberlin

remarked that maxilla I was apparently broken in his specimen.

Hooded ventral setae have been found in other species. Crossland (1924, pp. 71-82) described A. novecrinita with four different forms--a main form and the subspecies A. n. asymmetrica, A. n. atlantica and A. n. logani. All four forms have hooded ventral setae and were synonymized with A. mutans by Monro (1928, pp. 91-92); none of the five types involved were examined on that occasion.

The maxillary formulas for Crossland's four forms are (re-written from Crossland's text and illustrations) novecrinita s. str.: 5(7)+6(7)-11+10(11)-4+5-4(5)+4(5)-1(4)+1; n. asymmetrica: 8+5(8)-12+8(10)-5(6)+5(6)-4+4(6)-1+1; n. atlantica: 8+5(?) -5+11-4+4-4+3-1+1; n. logani: 7+7-12+8-4+6-4+4-1+1. Three of these forms, A. novecrinita s. str., A. n. atlantica and A. n. logani, have falcate maxilla I; A. n. asymmetrica has maxilla I dentate to the tip (Crossland, 1924, textfigs. 90, 96, 104 and 105).

A. mutans should thus contain forms with a highly variable number of teeth on the different jaw-pieces, and it should contain forms with completely dentate maxillae I in addition to forms with clearly falcate tips at the end of that maxilla. A summarized maxillary formula for A. mutans sensu Monro (1928) is 5(10)+5(10)-5(15)+8(16)-4(6)+5(6)-3(5)+3(6)-1(4)+1. This compares with the widest concept of A. iricolor (Fauvel, 1923, p. 439), which has a maxillary formula of ?+?-6(7)+12(14)-6+4(6)-5(6)+6-1+1, and of A. semimaculata with 8(11)+8(11)-6(9)+13(17)-4(7)+4(7)-3(5)+3(6)-1+1.

The present specimens have symmetrically developed jaws; the species was originally described with strongly asymmetrical maxilla II. It is probable that the present specimens differ specifically from A. mutans as originally

described, but this cannot presently be resolved.

The presence of hooded setae in ventral positions is a very striking character that sets this and similar species apart from other species in the genus; the variability exhibited in the jaw-formulas of the wide concept of A. mutans suggests that more than one species is involved.

Distribution: A. mutans has presently no definite distribution; it was described from Easter Island, and may be present along the coast of the eastern Pacific Ocean from Panama to western Mexico. The present specimens come from the Gulf of California.

Arabella pectinata, new species

(Plate 22, Figs. a-f)

Record: El Descanso, June 1, 1938, coll. O. Hartman (4, TYPE).

Description: The type is an incomplete specimen with 355 setigers and is 182 mm long and 3.5 mm wide with setae. It is copper colored and lacks color pattern.

The short prostomium is rounded and has two pairs of eyes near the posterior edge. The two peristomial segments together are as long as the prostomium; the first one is a little longer than the second and similar in length to the first setiger.

Parapodia (Figs. c, d and f) are similar in all setigers; the presetal lobes are rounded; the postsetal lobes are digitate and twice as long as the presetal ones. The anterior postsetal lobes are thicker than those in posterior setigers. Notopodial rudiments are present as small papillae in all setigers.

Anterior setigers have nearly straight, limbate setae

with smooth cutting edges. Median and posterior setigers have similar setae in superior and inferior positions. Dentate, strongly geniculate setae are found medially in median and posterior setigers. Each (Fig. e) has five or six marginal teeth. Present are transverse rows of very fine teeth that cover the sides of each seta at the height of each marginal tooth; these teeth are continuous with the internal fibrillae in the stem of each seta.

The mandibles (Fig. b) are triangular with thick bases. The maxillary carriers (Fig. a) are separate along their whole length except near the posterior end, where they are joined by a small rounded plate. Each carrier has a lateral notch near the anterior end. The slender unpaired carrier is half as long as the paired ones and has a widened, truncate anterior end. Maxilla I is distally falcate; the left maxilla I has a double tip in all specimens, the right one is always simple. The maxillary formula of the type is  $9+9-8+14-8+8-7+7-1+1$ ; a summarized formula for all four specimens is  $9(10)+9(11)-8(10)+14(17)-7(9)+7(11)-6(7)+6(7)-1+1$ . The proximal teeth on right maxilla II are very small and are not shown in the illustration because maxillae II are strongly bent ventrally near the bases. All other teeth are of the same size in each jaw-piece. Each tooth has parallel sides and a very short, blunt tip; each jaw appears comb-shaped. This is especially apparent in maxillae III and IV.

A. pectinata belongs to group I and closely resembles A. iricolor. It differs in the shape and number of teeth on the different jaw-pieces. All teeth are evenly long in maxillae III and IV in A. pectinata and alternately long and short in A. iricolor. Each tooth in A. pectinata has parallel sides and a short blunt tip; each tooth is conical

with a sharp tip in A. iricolor. The unpaired maxillary carrier is anteriorly truncate in A. pectinata and pointed in A. iricolor.

Transverse rows of fine teeth on the dentate setae as in A. pectinata have not been described for any other species. The small joining plate at the posterior end of the paired maxillary carriers is believed to be unique to this species.

Distribution: A. pectinata is known from one intertidal locality at El Descanso on the Pacific side of Baja California.

Arabella semimaculata (Moore, 1911)

(Plate 20, Figs. e-g)

Aracoda semimaculata Moore, 1911, pp. 295-297, pl. 20, figs. 143-149.

Arabella semimaculata Hartman, 1944, p. 173; Rioja, 1947b, p. 521, figs. 8-10; Rioja, 1962, pp. 180-181.

Arabella pacifica Treadwell, 1941, p. 23, figs. 18-21.

New Records: 1079-40(2); 1594-47(2); 1595-47(1); 1976-50(9); 2603-54(2); 2623-54(1); 2624-54(2); El Estuario del Punta Banda, Dec. 19-20, 1930, coll. G. E. MacGinitie (1); San Felipe, April, 1954, coll. J. Kreuzfeldt (3); K 116(1).

Earlier Records: Treadwell (1941, p. 23): Zihuantanejo. Hartman (1944, p. 173): 1063-40(5); 1092-40(2); Rioja (1947b, p. 521): La Paz; Topolobampo; Bahía de Ouhuirá; Isla de la Asunción. Rioja (1962, p. 181): Isla de San Roque; Mazatlán; Guaymas.

Remarks: A. semimaculata has strongly prolonged,



erect postsetal lobes in posterior setigers (Figs. e and g). The maxillary formula (Moore, 1911, p. 297, re-written) is  $8(9)+7-10+15-5(6)+5(6)-4(5)+4(5)-1+1$ . The species was described with six pairs of jaws; the anterior ends of maxillae II were described as separate from the rest of the maxillae and given a separate number. This was caused by the presence of a sharp constriction in the base of maxillae II; such constrictions are present in all specimens and give the impression of the presence of an extra jaw. The number of teeth originally assigned to this extra jaw has been added to the number for maxillae II in the above formula.

The present specimens have a summarized maxillary formula of  $8(11)+8(11)-6(9)+13(17)-4(7)+4(7)-3(5)+3(6)-1+1$ . Smaller specimens have fewer teeth than larger ones.

Superior and inferior setae are smoothly bilimbate; median setae (Fig. f) have dentate cutting edges.

Distribution: A. semimaculata is known from central California to the southern part of western Mexico in shallow water. It is the most common species of the genus in western Mexico.

#### Genus Drilonereis Claparède, 1870

The genus as accepted here contains 34 named species. The specific characters are poorly defined; it is presently very difficult to delimit the variability of the characters used since the genotype, D. filum (Claparède, 1868) remains poorly known (Day, 1965, p. 21).

The presence or absence of proximal teeth on maxillae I, the presence or absence of mandibles and the relative development of the postsetal lobes are here considered the

most important diagnostic characters. Characters of less importance include the number of teeth on the different jaw-pieces and the structure of the simple setae. The presence or absence of prostomial eyes is not considered important; eyes are often present in the juveniles, which tend to be semi-transparent; as the specimens get larger, the eyes are covered by pigments in the epithelium.

Four species of Drilonereis are parasitic in other polychaetes, three of them in other members of the superfamily Eunicea and one, D. parasiticus, in an un-named terebellid (Caullery, 1914). These species are similar to other species of the genus (Pettibone, 1957, pp. 176-177); they differ in that they have fewer setae than other members of the genus and in some instances the setae do not penetrate the body wall. The genus Labidognathus Caullery (1914) was described for one of these parasitic species (L. parasiticus) and another, L. forcipes Hartman (1944), was assigned to it later. The genus as originally described resembles Drilonereis closely; it differs in that the number of teeth on the different jaw-pieces is lower in the former than in the latter. The acicular spines project from the parapodia in Drilonereis and are subcuticular in Labidognathus. Pettibone (1957, p. 176) did not consider these characters to be of generic value; the same view is taken here.

Drilonereis has for practical reasons been divided into four groups. The basic division used here is between species with dentate (I) and smooth (II) maxillae I; each of these two groups is divided into two, depending on the presence (A) or absence (B) of mandibles. Three temporary groups include: I.C., maxillae I dentate, presence or absence of mandibles unknown; II.C., maxillae I smooth, presence or absence of mandibles unknown; and III., dentition of maxillae I unknown.

All species in the genus are listed in Appendix G, where reference to all original descriptions, revisions of type material and type areas can be found. The maxillary formulas given below are similar to those used by Day (1967, p. 447, etc.), but differ in that the large falcate fang on maxilla I has not been given a separate number. Thus, smooth maxilla I will be cited as 0+0 rather than 1+1.

Key to Species of Drilonereis from Western Mexico

- |                                        |                 |
|----------------------------------------|-----------------|
| 1. Maxillae I proximally dentate ..... | 2               |
| 1. Maxillae I proximally smooth .....  | 3               |
| 2. Mandibles present .....             | <u>falcata</u>  |
| 2. Mandibles absent .....              | <u>mexicana</u> |
| 3. Mandibles present .....             | ? <u>filum</u>  |
| 3. Mandibles absent .....              | 4               |
| 4. Maxilla II dentate .....            | <u>nuda</u>     |
| 4. Maxilla II smooth .....             | <u>forcipes</u> |

Drilonereis falcata Moore, 1911

(Plate 21, Fig. g)

Drilonereis falcata Moore, 1911, pp. 298-299, pl. 20, figs. 150-154; Hartman, 1944, p. 179.

New Records: 1009-39(1); 1010-39(1); 6177-59(4); 6179-59(5); P 196-60(2).

Earlier Record: Hartman (1944, p. 179): 634-37(1).

Remarks: D. falcata belongs to group I. A. which contains ten named species; the relationship between the different species is not clear since most of the early descriptions are incomplete.

D. falcata was originally described with a maxillary formula of 3(4)+3(4)-6(7)+6(7)-1+1-1+1; maxillae I had also some faint crenulations at the bases. The number of teeth is higher in large than in small specimens in the present material. A summarized formula is 4(7)+4(7)-6(9)+6(8)-1(5)+1(5)-1(2)+1(2)-0(1)+0(1). The jaws are symmetrical except for one case of asymmetry in maxilla II. The mandibles are large.

Parapodia (Fig. g) are large and have short, rounded presetal lobes. The narrow setal lobes are truncate; the thick postsetal lobes are digitate.

Distribution: D. falcata is known from central California to western Mexico. It is found on the Pacific side of Baja California and has been recorded once from the Gulf of California. All records are from shallow subtidal areas.

Drilonereis ?filum (Claparède, 1868)

(Plate 21, Fig. h)

Lumbriconereis filum Claparède, 1868, pp. 454-455, pl. 9, fig. 1.

Drilonereis filum Claparède, 1870, pp. 399-400, pl. 2, fig. 4; ?Hartman, 1944, p. 180; ?Eliason, 1962, pp. 255-258, fig. 14.

Record: Ensenada, Jan. 22, 1932, shore, coll. G. E. MacGinitie (1).

Remarks: D. filum may belong to group II.A. or II.B., depending on the presence or absence of mandibles. Mandibles were not mentioned by Claparède (1868, 1870), but later authors (Saint-Joseph, 1888, pp. 227-228, and Fauvel, 1923, p. 436) state that mandibles may be present or absent.

Teeth may be present on maxilla I according to Fauvel (1923, p. 436). The concept of D. filum was widened even further by Eliason (1962, pp. 255-258, fig. 14). The consequence of Eliason's view is that most species of Drilonereis should be included in D. filum.

D. filum is here assumed to include forms with mandibles, but without dentition at the proximal end of maxillae I (group II.A.). The original maxillary formula was given as 0+0-5+5-3+3-1+1; maxillae V were absent. The specimen reported here has a maxillary formula of 0+0-9+9-6+6-3+3-1+1. Only with great doubt is it assigned to D. filum.

Parapodia (Fig. h) have rounded presetal lobes. The digitate postsetal lobes are more than twice as long as the presetal ones. Notopodial rudiments are distinct in all setigers.

Distribution: D. filum is considered cosmopolitan; in view of the unsettled state of the taxonomy in this genus, the species is here considered known from the Mediterranean Sea from which it was originally described. It may be present in western Mexico.

Drilonereis forcipes (Hartman, 1944)

Labidognathus forcipes Hartman, 1944, pp. 180-182, pl. 13, figs. 291-296.

Drilonereis forcipes Pettibone, 1957, p. 176.

Earlier Record: Hartman (1944, p. 180): 1251-41(1).

Remarks: Species formerly described in or assigned to Labidognathus (see Hartman, 1959, p. 342) belong to group II.B.; they all have maxillae I proximally smooth and mandibles are absent.

Distribution: *D. forcipes* is known only through the original record from *Eunice ?antennata* from Baja California.

*Drilonereis mexicana*, new species

(Plate 23, Figs. a-c)

*Drilonereis nuda* Hartman, 1944, pp. 178-179, pl. 13, figs. 297-302 (partim, not Moore, 1909).

Records: 2026-51(1); 6176-59(1, TYPE).

Description: The type is an incomplete specimen with 329 setigers. It is 115 mm long and 1.5 mm wide with setae and is evenly reddish brown without any color pattern.

The prostomium is short and conical; eyes are absent. The first and second peristomial segments together are as long as the prostomium; each is similar in length to the first setiger.

The segments in the anterior part of the body are between one-third and one-half as long as wide; they lengthen after setiger 200. Posterior to setiger 250 all segments are longer than wide; the longest segments may be twice as long as wide. The last segments are somewhat shorter than those immediately preceding them.

Parapodia (Fig. a) are very poorly developed; those in the anterior part of the body are visible only as very low folds; they become better developed farther back, but are never more than one-fifth as long as the body is wide. Presetal lobes are absent. Postsetal lobes are similar in all setigers posterior to setiger 30; each is short and nearly button-shaped.

Setae (Fig. b) are all of one kind; each is short, strongly curved and bilimbate with both wings on the same

side of the axis. The upper ends of the wings and the slender tips of the setae are serrated. Acicula number two in all parapodia; each is slender and has a projecting fine filamentous tip. The acicular spines (Fig. a) are very large; each is more than three times as long as the postsetal lobes in median and posterior setigers. The tip of each acicular spine is slightly curved toward the anterior end of the body.

The pharyngeal apparatus is well developed; mandibles are absent and there is no thickening of the ventral lining of the pharynx. The paired maxillary carriers (Fig. c) are fused anteriorly for nearly one-sixth of their length. The unpaired carrier is only one-fourth the length of the paired ones; it is paddle-shaped and has a truncate posterior end.

Maxilla I is falcate; the maxillary formula is 5+5-4+4-2+2-1+1; maxillae V are absent. Each maxilla IV has a low blunt basal projection in addition to the long, slender tooth.

D. mexicana belongs to group I.B.; other species in this group include D. australiensis Augener (1922), D. logani Crossland (1924), D. robustus (Moore, 1903) and D. tridentata Day (1965).

D. mexicana differs from D. australiensis in that the latter has a ventral chitinized plaque in the pharynx; this plaque is irregular in outline, according to Augener (1922), and is here not considered a true mandible.

D. logani has the distal end of maxilla I crenulated (Crossland, 1924, textfig. 82); such crenulations are absent in the other four species. D. robustus has well developed parapodia with rounded presetal lobes and digitate postsetal lobes; parapodia are rudimentary in D. tridentata and D. mexicana. The maxillary formula for D. robustus is

6+6-10+10-5+5-1+1; both D. tridentata and D. mexicana have fewer teeth on all jaw-pieces, except on maxilla IV.

D. mexicana resembles D. tridentata closely; they differ in that the former has the paired maxillary carriers fused near the anterior end; the maxillary carriers are free for the whole length in the latter. The maxillary formula for D. mexicana is 5+5-4+4-2+2-1+1; for D. tridentata it is 3+3-5+5-1+1-1+1.

Distribution: D. mexicana is known from two localities in the northern part of Baja California on the Pacific side of the peninsula.

Drilonereis nuda Moore, 1909

(Plate 22, Fig. g)

Drilonereis nuda Moore, 1909, pp. 254-256, pl. 8, figs. 21-23; Hartman, 1944, pp. 178-179, pl. 13, figs. 297-302, partim.

New Records: 6179-59(1); Ensenada, Jan. 22, 1932, shore, coll. G. E. MacGinitie (1).

Earlier Record: Hartman (1944, p. 178): 1251-41(1).

Remarks: D. nuda was originally described with a maxillary formula of 0+0-5+7-2+3-1+1-2+0. The present specimens have a summarized formula of 0+0-5(6)+5(6)-1(2)+1(2)-1+1-0+0; the jaws are symmetrical in all three specimens. The concept of the species was widened by Hartman (1944, p. 178) to include forms with proximal teeth on maxilla I; the specimens reported by Hartman (1944) have been re-examined and with the exception of one specimen listed above, are here considered to belong to D. mexicana, new species; these specimens were not from western Mexico and



are thus not listed under D. mexicana.

Parapodia (Fig. g) have low, truncate prosetal lobes. The digitate postsetal lobes are twice as long as the pre-setal lobes. Notopodial rudiments are distinct in all setigers.

Distribution: D. nuda is known from central and southern California to the vicinity of Cedros Island, Baja California, in intertidal and shallow subtidal areas.

Drilonereis species indeterminable

Records: 1063-40 (fragments); 6177-59 (fragment).

Remark: These fragments cannot be further identified.

Family LYSARETIDAE Kinberg, 1865, restricted

The family is one of the smallest in the super-family and contains at present five species in three genera. The genera include Lysarete Kinberg (1865), Halla Costa (1844) and Oenone Savigny (1818); all five species, with references to original descriptions, revisions of type material and type areas, are listed in Appendix I.

Members of the family have three antennae on the posterior half of the prostomium and one or two distinct peristomial segments. Parapodia are sub-biramous; the notopodium is a large, foliaceous lobe with internal acicula; the neuropodium is well developed. Simple, capillary or weakly limbate setae and bidentate or simple subacicular hooks are present. The pharyngeal apparatus has a pair of mandibles and five pairs of maxillae. Three maxillary carriers are present; the slender paired carriers are

prolonged. Branchiae are absent.

The three genera are closely related and can be separated only with difficulty. Lysarete and Halla have two well defined peristomial segments, which are fused in Oenone. Halla has well developed proximal teeth on maxillae I and the distal end of the same maxilla is simple and falcate. Lysarete has only a few, poorly developed teeth proximally on maxilla I and each of the distal ends has two large fangs.

The genus Iphitime has been associated with this family. It differs from the genera mentioned above in that it lacks the unpaired carrier and has branchiae and composite setae. The genus is here placed in a new family Iphitimi-  
dae.

Species recognition is difficult in all three genera. The number of teeth on the different jaw-pieces has been assumed to be highly variable (Fauvel, 1917, and Hartman, 1944), but no investigation of large materials has been undertaken. The two studies of the variability of the species that now form the basis for species recognition in the family, comprised five or six specimens (Fauvel, 1917, p. 241) and roughly a dozen (Crossland, 1924, pp. 89-90). Fauvel's specimens were from Australia and the Red Sea; Crossland's came from the Maldiva Islands, eastern Africa, the Red Sea and the Philippine Islands.

Species of Lysarete are known from Brazil, the western Atlantic Ocean and from Australia. Species of Halla are known from the Mediterranean Sea and Japan. The single species presently accepted in Oenone is apparently circum-tropical, but this species is poorly understood and may have to be divided when more material is available.

## Key to Genera of LYSARETIDAE

1. One distinct peristomial segment present .....  
..... Oenone
1. Two distinct peristomial segments present ..... 2
2. Proximal end of maxilla I dentate, distal end  
falcate ..... Halla
2. Proximal end of maxilla I smooth or nearly smooth,  
each distal end with two large fangs .....  
..... Lysarete

Oenone fulgida (Savigny, 1818)

(Plate 24, Figs. a-d)

Aglaurides fulgida Fauvel, 1917, pp. 240-254, pl. 5, figs. 52-55; Hartman, 1944, pp. 185-186, pl. 14, figs. 302-307.

Oenone fulgida Crossland, 1924, pp. 86-92, textfigs. 106-111; Imajima, 1967, pp. 435-437, fig. 11a-m.

Oenone dyphillidia Rioja, 1941, p. 724.

New Records: 1049-40(1); 1079-40(1); 1718-49(1); 2596-54(2); Gulf of California, 24° 22' 15" N, 109° 19' 15" W, 7 fms, April 30, 1888, broken coral, dredge, ALBATROSS sta. 2825(1); Mazatlán, shore, sand and rock, Febr. 19, 1939, coll. M. W. Johnson (1); Point Lobos, Espiritu Santo Island, shore, March 20, 1940, coll. E. F. Ricketts (1); Puerto Escondido, March 25-26, 1940, coll. E. F. Ricketts (1); Punta Cholla, Sonora, May 9, 1941, coll. S. A. Glassell (1); Norse Beach, Puerto Penasco, May 1, 1965, coll. P. Pickens (1).

Earlier Records: Rioja (1941, p. 724): La Aguada, Acapulco. Hartman (1944, p. 185): 298-34(1); 530-36(2);

634-37(1); 638-37(4); 1042-40(2); 1077-40(1); 1091-40(1);  
1110-40(4).

Remarks: This species apparently occurs in two distinct morphological forms in parts of its range. The two forms differ in the arrangement and number of teeth on the different jaw-pieces and in the shape of the jaws.

Fauvel (1917, p. 245) showed that the original specimens described by Savigny (1818) had asymmetrical jaws with a small right maxilla I. The same author also showed that in the type the left maxilla I and right maxilla II must have been similar in shape and dentition; the left maxilla II was quite small, but had numerous teeth, and maxillae III and IV were similar on both sides.

The species may also have symmetrically developed maxillae I and II; Crossland (1924, p. 89, textfig. 109) showed the jaws to be symmetrical in a specimen from the Maldiv Islands. Specimens from Japan also have symmetrically developed jaws (Imajima, 1967, fig. 11d).

There are 32 specimens in the present material; thirteen of these have symmetrically developed jaws, seventeen have asymmetrical ones, and one specimen lacks the whole maxillary apparatus. The specimens are listed in Table 4, where the number of teeth on the different jaw-pieces is given.

The maxillary formulas for the two forms are

I. With symmetrical jaws:

Imajima (1967, p. 437): 8+8-6+5-6+6-6+6-1+1. Present material: 7(9)+7(10)-7(9)+6(8)-5(6)+5(6)-4(6)+4(6)-1+1.

II. With asymmetrical jaws:

Fauvel (1917, p. 246): 7(13)+10(13)-8(10)+11(14)-6(7)+9-6+6(7)-1+1. Present material: 8(14)+9(13)-12(15)+11(14)-5(9)+7(9)-5(8)+5(8)-1+1.

The term "asymmetrical jaws" differs slightly in usage in this genus from what is customary in other families of the Eunicea (e.g., Arabellidae). Generally the term is used to indicate differences in the number of teeth on both sides, followed of course by differences in the shape of the jaw-pieces; the term is used exclusively to describe differences in the size and shape of the jaw-pieces in Oenone fulgida, since the number of teeth may be identical on both sides even if the shape of the jaws differs widely.

The jaw-pieces of specimens in the second group consistently have a higher number of teeth than do specimens in the first group.

Bidentate subacicular hooks (Fig. b) are present from setigers 14-24 in the present specimens. Specimens from Japan have subacicular hooks present from setiger 22 (Imajima, 1967, p. 437). Specimens from Australia and the Red Sea have subacicular hooks first present from setigers 40-60 according to Fauvel (1917, p. 244). There are no differences between the two groups of specimens in the first occurrence of the bidentate hooks in the present material. The discrepancy between the Japanese-Mexican specimens and those from the Australia-Red Sea area in the first occurrence of the subacicular hooks cannot presently be explained.

The present large differences between the various descriptions of the pharyngeal apparatus and other variable characters may be caused by the presence of several different species, possibly as many as five or six. Some of these species may have symmetrically developed jaws; others have asymmetrical ones. The problem can be solved only by a statistical study of a large number of specimens from several areas. The name and concept of O. fulgida is retained here until such a study can be completed.

A detailed discussion of the intricate synonymic problems surrounding the names of the genus and species was given by Fauvel (1917, pp. 247-254); he concluded that the generic name of the species should be Agaurides Ehlers (1868); it has later been shown that the generic name Oeone is available and predates Agaurides by some fifty years; Crossland (1924, pp. 84-85) gave a summary of the history of the generic names.

Anterior parapodia (Fig. c) in the present specimens have narrow, truncate presetal lobes. The postsetal lobes are foliaceous. The foliaceous dorsal cirri are so directed that the plane of the cirri is parallel to the longitudinal axis of the parapodia. Median parapodia (Fig. a) have short, rounded presetal lobes which are distally directed dorsally. The postsetal lobes are digitate. The foliaceous dorsal cirri have the plane of the cirri at right angles to the plane of the parapodia. Posterior parapodia (Fig. d) resemble those in the median setigers in that they have digitate postsetal lobes and the dorsal cirri are oriented in the same manner. The short, rounded presetal lobes are distally straight.

Distribution: O. fulgida as presently accepted is circumtropical, but also occurs in colder waters in Japan. It is found in western Mexico from the upper end of the Gulf of California southwards, in shallow subtidal and intertidal areas.

#### Family DORVILLEIDAE Chamberlin, 1919

Species in this family have a short, rounded prostomium with one pair of tentacles and one pair of prostomial palps. Two peristomial segments are present; eyes may be

present. Parapodia are sub-biramous; the slender notopodia are elongated; they have internal acicula in some species; setae are absent. The neuropodia are well developed and have presetal, setal and postsetal lobes; digitate ventral cirri are present in all parapodia. Slender capillary setae are present in superior positions and bidentate, composite hooks in inferior positions. Furcate setae are present in some species.

The generic characters include the presence or absence of internal acicula in the notopodia, the presence or absence of a nuchal papilla, and the presence or absence of furcate setae (Pettibone, 1961, pp. 180-183).

The pharyngeal structures are considered important generic characters in the other families, but have been poorly described for members of this family. Most species are quite small, and it is necessary to make preparations of the jaws in order to describe them. The technique used here is outlined below.

The whole pharyngeal apparatus may be removed from the dorsal side of the specimen. This can be done without destroying the prostomium and the first peristomial segment by making a medial incision on setigers 5-7. The pharyngeal apparatus is removed with a pair of watchmaker's forceps. The whole structure is very muscular and is easily removed as a unit. Some of the ventral and lateral musculature must be trimmed off and this can be done under a stereo-microscope; the rows of denticles have good coherence and will keep together even if most of the musculature is removed. The whole pharyngeal apparatus is dehydrated in alcohol, cleared in toluol and mounted on slides with the maxillae facing up. Glycerol-jelly is useful as a mounting medium, since the preparations may have to be compressed so that details in the teeth can be seen.

The mandibles were usually separated from the rest of the pharyngeal apparatus before mounting.

Smaller specimens require a slightly different technique. The body wall over the pharyngeal apparatus is removed with a pair of iris-scissors and the whole specimen is dehydrated, cleared and mounted as above. These whole mounts usually have to be compressed slightly so that the mandibles are moved to one side.

All illustrations of the basal portions of the maxillary apparatus were made from the dorsal side on uncompressed specimens, except where otherwise stated. The denticles were drawn in full anterior view after the preparations had been flattened; these illustrations show the number and arrangement of lateral teeth on both sides of the main fang. The posterior denticles are strongly curved and the main fang especially will appear foreshortened in these illustrations. The anterior denticles are less curved and the illustrations show approximately the true shape of the teeth, in addition to showing the number and arrangement of the lateral teeth.

The pharyngeal apparatus is in principle bilaterally symmetrical. It consists of a pair of mandibles and two or four pairs of maxillae. The mandibles (Pl. 25, Fig. e, and Pl. 26, Fig. e) consist of a pair of elongated plates and are similar to those in other *Eunicea*. The anterior cutting edge is dentate in all species examined; the anterior part of the mandibles is divided into several small denticles.

The maxillary structures are complex; one or two pairs of maxillary carriers (Pl. 25, Fig. g, Pl. 26, Figs. f and g, Pl. 27, Figs. i and o) are found basally. One pair of carriers is always present; this pair is found at the postero-superior side of the base of the maxillae. The



posterior ends of the carriers may be free (Pl. 25, Fig. g) or fused (Pl. 26, Figs. f and g). Three of the four species here examined have smooth maxillary carriers; Dorvillea rudolphi has a dentate carrier (Pl. 27, Fig. i). A second pair of carriers is present in some species; this pair is ventral to the other pair and is fused posteriorly in both species where it is present (Pl. 26, Figs. f-g, and Pl. 27, Fig. o).

The superior carrier is anteriorly attached to the outer lateral side of the base of the maxillae; the inferior carrier is attached to the inner lateral side of the same maxillae.

Two or three large base plates are found anterior to the carriers; the plate attached to the carriers is the base plate of maxilla I. A second plate, which is found ventromedial to the base plate of maxilla I, is the base plate of maxilla II. These two base plates are present in all species. D. rudolphi has in addition a slender, dentate ribbon lateral to the bases of maxillae I and II; this ribbon is continued anteriorly in maxilla IV and is the base plate of maxilla IV.

All base plates are continued anteriorly in rows of denticles; Dorvillea annulata and D. cerasina have two rows of denticles on either side; D. rudolphi and Protodorvillea gracilis have four rows. One row of denticles (III) does not have a base plate; it ends ventrolateral to the anterior end of the base plate of maxilla I. The number of denticles in each row and the number and shape of the teeth on each denticle vary systematically from the posterior to the anterior end of the maxillary apparatus. This is described below for each species.

The two or four rows of denticles and the base plates are homologous to the maxillae in other Eunicea. The two

rows that are always present (I and II) have similar positions in relation to the maxillary carriers as maxillae I and II in other Eunicea. All members of the super-family have the carriers attached or adjacent to maxillae I. The posterior end of maxillae II is always ventromedial to maxillae I (Pl. 18, Fig. c, and Pl. 20, Fig. a). The two additional rows of denticles (III and IV) in the Dorvilleidae are homologous to maxillae III and IV. These maxillae are usually situated ventrolateral to maxillae I and II so that the posterior ends of each are tucked under maxillae I and II. The same positional relationship has been retained here. The basal portions of maxillae III and IV in the Dorvilleidae are not visible from the dorsal side, because they are situated ventrolateral to maxillae I. Dorvillea rudolphi has a large base plate for maxillae IV which is visible at the far posterior end.

The maxillary apparatus in the Dorvilleidae differs from that in other Eunicea in that each maxilla has been broken up into a series of denticles and the maxillae have been telescoped over each other.

The re-definition of the pharyngeal apparatus in the Dorvilleidae brings the members of this family closer to the other Eunicea and makes it possible to define genera and species with the same characters used in the other families.

The generic subdivision of the family may have to be revised in view of the varied development of the pharyngeal structures. One species, currently in the genus Protodorvillea, P. gracilis (Hartman, 1938), has the base plates of maxillae I and II fused with the inferior carriers (Pl. 27, Fig. o); all other species investigated have these three elements free from each other. Two of the three species of Dorvillea (D. cerasina and D. rudolphi) have the

superior carriers fused posteriorly; D. annulata has free superior carriers. D. cerasina and Protodorvillea gracilis have two pairs of carriers. Dorvillea annulata and D. rudolphi have only one pair each.

The interpretation of these characters on the generic level can only be suggested here; the shape and arrangement of the teeth on the different denticles are useful specific characters.

The current generic arrangement is retained temporarily. Two genera, Dorvillea Parfitt (1866) and Ophryotrocha Claparède and Metschnikow (1869), are recognized by most authors. The genus Dorvillea was divided into four smaller genera, Dorvillea s. str. Parfitt (1866), Papilliodorvillea Pettibone (1961), Protodorvillea Pettibone (1961) and Stauronereis s. str. Verrill (1900), by Pettibone (1961, pp. 180-183). Protodorvillea differs from the other genera in that it lacks internal acicula in the notopodia. The other genera differ in the presence or absence of nuchal papillae and furcate setae. Dorvillea, Papilliodorvillea and Stauronereis were considered synonymous by Day (1967, p. 451); this view is adopted here.

#### Key to Genera of DORVILLEIDAE

1. Palps present as minute papillae .. Ophryotrocha
1. Palps with a long palpophore and a short style .... 2
2. Notopodia with internal acicula ... Dorvillea
2. Internal acicula in the notopodia absent .....  
..... Protodorvillea

Genus Dorvillea Parfitt, 1866

As accepted here the genus includes Papilliodorvillea

Pettibone (1961) and Stauronereis Verrill (1900). A survey of all species in the genus is found in Pettibone (1961, pp. 180-183).

Specific characters include the shape and arrangement of the teeth on the maxillary denticles. Posterior denticles usually have large, curved main fangs with a few lateral teeth on either side. Anterior denticles may be strongly prolonged and hollow (Pl. 26, Figs. i-j) or have lateral comb-plates (Pl. 27, Fig. f). Most anterior denticles are smaller than the posterior ones; D. annulata has little change in shape and size of the denticles along the rows.

Other characters include the presence or absence of furcate setae and the shape and arrangement of the pre- and postsetal lobes in the neuropodia.

The length of the appendages of the composite, bidentate hooded hooks has been shown to be somewhat variable (Pettibone, 1963, p. 232) and the character can be used only in conjunction with other characters.

Key to Species of Dorvillea from Western Mexico

- |                                                                                       |                 |
|---------------------------------------------------------------------------------------|-----------------|
| 1. Furcate setae present .....                                                        | 2               |
| 1. Furcate setae absent .....                                                         | <u>cerasina</u> |
| 2. All composite hooks with short appendages, four pairs of maxillae present .....    | <u>rudolphi</u> |
| 2. Some composite hooks with prolonged appendages, two pairs of maxillae present .... | <u>annulata</u> |

Dorvillea annulata (Moore, 1906)

(Plate 25, Figs. a-j)

Stauronereis annulatus Moore, 1906, pp. 225-227, pl. 10,

figs. 12-13, pl. 11, figs. 18-22.

Stauronereis rudolphi Pettibone, 1963, pp. 231-233, fig. 60a-f partim (not delle Chiaje, 1828).

Records: 6177-59(2); P 71-59(1).

Remarks: Some of the appendages of the superior composite hooks are strongly prolonged in D. annulata; all are short in D. rudolphi. The length of the appendages was shown to be variable by Pettibone (1963, p. 232); she concluded that the two species are synonymous. The present specimens have strongly prolonged composite setae (Fig. f) in superior positions and short ones in inferior positions (Fig. d).

The pharyngeal apparatus is distinctly different from that found in D. rudolphi. The superior maxillary carriers are separated posteriorly; the inferior carriers are absent. The base plate of maxilla I has approximately 12 simple teeth decreasing in size toward the posterior end. Maxilla I has 40-42 denticles; each denticle (Figs. i and j) is strongly curved and has one large main fang, two outer lateral and three inner lateral teeth. All denticles are similar, except that the anterior ones are smaller and slightly prolonged near the bases. The long and slender base plate of maxilla II has 16-17 simple teeth; the left base plate is longer than the right one; both have the same number of teeth. Each maxilla II has 44-48 denticles; each denticle (Fig. h) has a large main fang, two outer lateral and eight to fourteen inner lateral teeth. All denticles are similar; the bases of the anterior denticles are slightly prolonged. The slender mandibles (Fig. e) have seven or eight free denticles each.

The articulation of each of the long and slender notopodia is near the middle (Fig. a). The neuropodium has a

bilobed setal lobe; both parts are conical. The short, digitate presetal lobe is near the inferior edge of the neuropodium. The short postsetal lobe is evenly rounded and near the inferior edge of the neuropodium.

The superior part of the setal fascicles has three or four furcate setae (Fig. b) and a number of long, slender capillary setae (Fig. c); both kinds have serrations along one edge. The inferior part of the setal fascicles consists of composite hooks only; two or three long, slender bidentate composite hooks (Fig. f) are found near the middle of the whole setal fascicle (*i.e.*, superiormost among the composite hooks); the appendage of these hooks is more than three times as long as the appendage of the inferior hooks. The hoods and the upper ends of the shafts are smooth in the prolonged hooks. The short inferiormost hooks (Fig. d) have strongly serrated hoods and shafts.

D. annulata is closely similar to D. rudolphi in external morphology, but differs sharply in the structure of the pharyngeal apparatus. Two maxillae are present in D. annulata and four in D. rudolphi. The denticles in each maxilla are similar in D. annulata; the anterior ones are markedly different from those near the base in all four maxillae of D. rudolphi. The maxillary carriers are smooth and free posteriorly in D. annulata and dentate and posteriorly fused in D. rudolphi.

Distribution: D. annulata is known from the type area in Washington and from two localities in western Mexico, one near Cedros Island and the other in the upper end of the Gulf of California.

Dorvillea cerasina (Ehlers, 1901)

(Plate 26, Figs. a-1)

Staurocephalus cerasinus Ehlers, 1901b, p. 263.

Stauronereis cerasina Ehlers, 1901a, pp. 147-149, pl. 19,  
figs. 11-17, pl. 20, figs. 1-3.

Dorvillea cerasina Hartman, 1944, p. 190.

New Record: Coronado Islands, March 27, 1940, from  
sponge, intertidal, coll. E. F. Ricketts (1).

Earlier Records: Hartman (1944, p. 190): 498-36(5);  
639-37(1); 662-37(1); 683-37(2); 728-37(1); 1101-40(2).

Remarks: The prostomium (Fig. a) is fused dorsally  
with the first peristomial segment. It is rounded and has  
two pairs of eyes; one pair is anterior to the base of the  
tentacles and the other is near the posterior margin. The  
palpi are wrinkled and have one small subdistal article.  
The tentacles are of the same length as the palpi; each is  
multiarticulated.

The parapodia (Fig. b) have long and slender notopodia  
with internal acicula and short, subdistal articles. The  
neuropodia have bifid setal lobes; the digitate superior  
part is slightly in front of the inferior part, which is  
low and evenly rounded. Digitate, small pre- and postsetal  
lobes are present near the superior edge of the neuropodia.  
The ventral cirri are nearly as long as the neuropodia.

Long, slender capillary setae (Fig. d), with one edge  
serrated, are present superiorly in each parapodium. Com-  
posite, bidentate hooded hooks are present ventrally in  
large fascicles. Each hook (Fig. c) has a slightly dis-  
tended shaft and a short appendage. The hoods are short  
and blunt. Furcate setae are absent.

D. cerasina was originally described with four

maxillae (Ehlers, 1901a, p. 148, pl. 20, figs. 1 and 3); the present specimens have two maxillae. Both pairs of maxillary carriers (Figs. f and g) are present. The superior carrier is somewhat longer than the inferior one. Both are fused posteriorly with small bulbs. Maxilla I has 31-33 denticles and the base plate has ten to eleven simple teeth. The posterior twenty denticles are all similar; each (Fig. i) has one large, strongly curved main fang, one outer lateral and four inner lateral teeth. The anterior ten to twelve denticles (Fig. l) are basally strongly prolonged and lack lateral teeth. The long curved main fang consists of three parallel hollow tubes (Fig. k).

Maxilla II has a short, smooth base plate placed partially below the base plate of maxilla I; denticles number 35-37; the posterior twenty (Fig. h) are all similar and resemble the posterior denticles in maxilla I, but the number of inner lateral teeth varies between three and four. The anterior ten to twelve denticles (Fig. j) are strongly prolonged basally; the lateral teeth are present; these denticles do not appear to be hollow.

The mandibles (Fig. e) have approximately twelve teeth on the cutting edge; four small free denticles are present.

Distribution: D. cerasina is known from the tropical eastern Pacific Ocean and possibly from the West Indies. It is found in western Mexico only in shallow water in the Gulf of California.

Dorvillea rudolphi (delle Chiaje, 1828)

(Plate 27, Figs. a-j)

Staurocephalus rudolphii Fauvel, 1923, pp. 446-447, fig. 178a-p.



Dorvillea rudolphii Hartman, 1944, p. 191.

Dorvillea rudolphi Day, 1967, p. 457, fig. 17.21d-j.

Stauronereis rudolphi Pettibone, 1963, pp. 231-233, fig. 60a-f, partim.

Stauronereis articulatus Hartman, 1938, pp. 101-102, figs. 39-44; Rioja, 1941, pp. 724-727, pl. 6, figs. 10-18.

Dorvillea articulata Hartman, 1944, p. 189; Rioja, 1947a, p. 205; Reish, 1963, p. 426.

New Records: 6176-59(1); 6197-59(5); K 133(1); K 134 (2).

Earlier Records: Rioja (1941, p. 727): Caleta, Aca-pulco. Rioja (1947a, p. 205): El Mogote, La Paz; Topolo-bampo. Reish (1963, p. 426): one locality in Bahía de San Quintin.

Remarks: The pharyngeal apparatus of D. rudolphi has remained poorly known. The four rows of maxillae and some of the posterior denticles have been illustrated several times (Fauvel, 1923, fig. 178e, g-i, and Day, 1967, fig. 17.21i); details in the basal portion of the apparatus have not been described. Other specific characters have been well described and reviewed by Fauvel (1923, pp. 446-447) and Pettibone (1963, pp. 231-233).

The material from western Mexico was compared directly with specimens collected near Naples (courtesy Dr. John L. Mohr); the two groups of specimens are identical in all features except that the specimens from Naples are larger than those from western Mexico.

The superior maxillary carriers are fused posteriorly and have numerous small teeth along the superior edge. Inferior carriers are absent.

Each base plate of maxilla I (Fig. i) has fourteen to

fifteen teeth, of which the posteriormost are small. Each base plate of maxilla II has approximately twenty irregular teeth (Fig. j). Maxilla III is short; it stops at the anterior edge of the maxillary carriers on the ventral side of the base plate of maxilla I; a base plate for maxilla III is absent. Maxilla IV is continued as a long, slender, dentate base plate ventrolateral to the basal portions of maxilla I. It stops posteriorly at the level of the junction of the maxillary carriers.

Maxilla I has 35 denticles; the posterior thirteen to fifteen denticles (Fig. a) have strongly curved main fangs and three small inner lateral teeth; the median tooth is always shorter than the others. The posterior denticles also have two short outer lateral teeth. The anterior eighteen to nineteen denticles (Fig. e) are comb-shaped; some of the teeth are rounded and blunt; others are very slender and pointed. The number of teeth in the anterior denticles varies.

Maxilla II has approximately forty denticles; the posterior twenty to twenty-two denticles (Fig. b) are similar; each has a large main fang, ten or eleven outer lateral and three inner lateral teeth. The anterior twenty denticles (Fig. f) are all similar; each has distally three or four slender teeth. The outer lateral margin is smooth; the inner lateral margin has a large, ovate plate with numerous minute teeth along the edge.

Maxilla III has nearly fifty denticles; the posterior thirty-five (Fig. c) are all similar; each has a large main fang, a single outer lateral tooth and approximately twenty inner lateral teeth. The anterior fifteen denticles (Fig. g) are alike; each has a poorly marked main fang and ten to twelve small outer lateral teeth; the inner lateral margin is smooth except for a subdistal notch.

Maxilla IV has approximately forty denticles; the posterior twenty-five (Fig. d) are similar; each has a large main fang, two outer lateral and five or six inner lateral teeth. The anterior fifteen denticles resemble those in the anterior end of maxilla I in that they have both rounded and pointed teeth. The inner lateral margin is smooth.

Distribution: D. rudolphi is known from the Mediterranean Sea and has a wide distribution in the western Atlantic Ocean, primarily in shallow warm water areas. It is known in the eastern Pacific Ocean from British Columbia to Chile and has been reported from a few localities in western Mexico in shallow water.

Genus Protodorvillea Pettibone, 1961

This genus was described by Pettibone (1961, p. 178) to include dorvilleids without internal acicula in the notopodia. A description of the maxillary apparatus in one species is added below. A differential key to all species known in the genus was given by Pettibone (1961, p. 180).

Protodorvillea gracilis (Hartman, 1938)

(Plate 27, Figs. k-o)

Stauronereis gracilis Hartman, 1938, pp. 100-101, figs. 36-38.

Dorvillea gracilis Hartman, 1944, p. 189.

Protodorvillea gracilis Pettibone, 1961, pp. 179-180.

Record: 6176-59(3).

Remarks: The pharyngeal apparatus of P. gracilis has never been described. Both pairs of maxillary carriers are

present; the superior one is fused posteriorly and is smooth. The inferior carriers and the base plates of maxillae I and II (Fig. o) are fused; each element can be recognized as raised, dentate ridges on a large plate; this combined plate ends posteriorly in a large, nearly spherical bulb.

The left base plate of maxilla I is longer than the right one; both have approximately ten small teeth. Each maxilla I has approximately twenty denticles; the posterior three (Fig. k) are similar; each has a large, curved main fang, one outer lateral and three inner lateral teeth. The anterior seventeen or eighteen denticles resemble each other (Fig. m); the main fang is absent and the distal edge has five or six similar teeth.

Each maxilla II has approximately twenty-five denticles; the base plates are symmetrically developed and have six or seven simple teeth each. The posterior three or four denticles (Fig. l) are similar; each has a large main fang and three outer lateral teeth. The inner lateral margin is smooth. The anterior twenty to twenty-two denticles (Fig. n) are similar; each has smooth lateral margins and the main fang is absent. The distal edge is oblique and has numerous small teeth in a single row.

The relationship between P. gracilis and other species has been discussed by Pettibone (1961, pp. 179-180).

Distribution: P. gracilis is known from central and southern California to western Mexico in the vicinity of Cedros Island, in shelf depths.

## STATION DATA

## A. Collections made by the VELERO IV

- 1517-46. May 18, 1946, Ensenada de San Francisco, Guaymas; reefs and pools, coll. Dawson and Durham.
- 1539-46. Aug. 26, 1946, beside Pinnacle Rock, 1.7 miles NE of Cape Henslow, Socorro Island; coll. C. L. Hubbs (= H46-221).
- 1561-46. Sept. 13, 1946, Santa Lucia Bay, Acapulco; coll. C. L. Hubbs (= H46-244).
- 1594-47. March 3, 1947, Punta Descanso, 7 miles N of Halfway House; rocky, intertidal, - 1.2 tide.
- 1595-47. March 4, 1947, mouth of Rio Santo Tomas, between Punta Santo Tomas and Punta San Jose; rocky, reef, - 1.4 tide.
- 1596-47. March 5, 1947, mouth of Rio Santo Tomas, between Punta Santo Tomas and Punta San Jose; rocky, reef, - 1.4 tide.
- 1597-47. March 6, 1947, 2 miles S of Rosarito, N of Punta Descanso and within sight of S. Coronado Island; rocky, reef, - 1.2 tide.
- 1693-49. March 3, 1949, 6 3/4 miles NW of San Martin Island, from 30° 34' 32" N, 116° 11' 40" W to 30° 33' 56" N, 116° 11' 07" W; 37 fms, dredge, sand, sea stars.
- 1694-49. March 3, 1949, 3 3/4 miles NW of San Martin Island, from 30° 31' 00" N, 116° 10' 15" W to 30° 00' 10" N, 116° 09' 52" W; 41 fms, dredge, sand, sea urchins.

- 1703-49. March 5, 1949, South Bay, Cedros Island, from 28° 04' 25" N, 115° 17' 58" W to 28° 04' 21" N, 115° 17' 50" W; 16 fms, dredge, sand and mud, Lovenia, sponges.
- 1706-49. March 6, 1949, 3 1/2 miles N of Natividad Island light, from 27° 55' 57" N, 115° 11' 58" W to 27° 55' 30" N, 115° 11' 55" W; 20 to 19 fms, dredge in Kellet Channel, rocks, sponges, Lithothamnion.
- 1711-49. March 7, 1949, 29 3/4 miles S of Abreojos Point, from 26° 15' 56" N, 113° 40' 30" W to 26° 15' 16" N, 113° 39' 59" W; 52 fms, dredge, tangles, coarse sand, broken shell, shale, brachiopods, alcyonarians.
- 1713-49. March 8, 1949, Entrada Point, Magdalena Bay; shore, rocky, beach, protected and exposed coastline.
- 1718-49. March 9, 1949, Marcy Channel, Magdalena Bay, from 24° 30' 50" N, 111° 50' 03" W to 24° 30' 36" N, 111° 50' 00" W; 13 fms, dredge, rock, sea urchins and sponges.
- 1727-49. March 11, 1949, 1 mile NE of Cabeza Ballena, 22° 54' 23" N, 109° 50' 09" W; shore, granitic reef, Sargassum.
- 1729-49. March 12, 1949, Outer Gorda Bank, from 23° 01' 14" N, 109° 28' 45" W to 23° 01' 53" N, 109° 28' 15" W; 70 fms, dredge, sand, shell, rock, mollusks.
- 1734-49. March 13, 1949, Los Frailes, 23° 22' 45" N, 109° 24' 37" W; shore, rocky, tidepools.
- 1736-49. March 14, 1949, San Gabriel Bay, Espiritu Santo

- Island, 24° 26' 15" N, 110° 21' 04" W; shore, mangrove lagoon, beach, sponges, Goniopsis, Uca.
- 1737-49. March 15, 1949, San Gabriel Bay, Espiritu Santo Island, 24° 26' 03" N, 110° 21' 22" W; 1 fm, coral heads containing crabs and shrimps.
- 1742-49. March 17, 1949, W side of San Marcial Rock, from 25° 31' 32" N, 111° 01' 57" W, to 25° 31' 30" N, 111° 01' 08" W; 4 to 3 fms, dredge, coarse sand, sea stars.
- 1743-49. March 17, 1949, entrance to Agua Verde Bay, from 25° 31' 36" N, 111° 03' 15" W, to 25° 31' 40" N, 111° 04' 13" W; 26 to 23 fms, dredge, sand, mollusks, crabs.
- 1749-49. March 18, 1949, Puerto Escondido, eastern shore, from 25° 48' 04" N, 111° 18' 53" W to 25° 49' 04" N, 111° 18' 45" W; rocky, sponges.
- 1752-49. March 20, 1949, Puerto Escondido, 25° 48' 45" N, 111° 18' 51" W; shore, rocky, brittle stars, -0.5 tide.
- 1759-49. March 21, 1949, 1 mile WSW of Perico Point, Carmen Island, from 25° 57' 35" N, 111° 05' 57" W to 25° 57' 56" N, 111° 06' 12" W; 11 to 7 fms, dredge, coarse sand.
- 1912-49. Dec. 17, 1949, Melpomene Cove, Guadalupe Island, 28° 52' 05" N, 118° 19' 05" W; shore, rocky, Eisenia.
- 1914-49. Dec. 18, 1949, between Melpomene Cove and Inner Island, Guadalupe Island, 28° 52' N, 118° 19' W; 5 to 15 fms, dredge, rock, sand.

- 1915-49. Dec. 18, 1949, Melpomene Cove, Guadalupe Island, at landing,  $28^{\circ} 52' 00''$  N,  $118^{\circ} 19' 05''$  W; shore, rocky.
- 1919-49. Dec. 19, 1949, Melpomene Cove, Guadalupe Island, from  $28^{\circ} 55' 28''$  N,  $118^{\circ} 18' 38''$  W to  $28^{\circ} 51' 00''$  N,  $118^{\circ} 17' 30''$  W; 34 to 36 fms, dredge, sand.
- 1920-49. Dec. 19, 1949, Melpomene Cove, Guadalupe Island, from  $28^{\circ} 51' 08''$  N,  $118^{\circ} 17' 43''$  W to  $28^{\circ} 51' 20''$  N,  $118^{\circ} 17' 30''$  W; 50 to 51 fms, dredge, sand.
- 1921-49. Dec. 19, 1949, 1 3/4 miles from South Bluff, from  $28^{\circ} 51' 41''$  N,  $118^{\circ} 15' 25''$  W to  $28^{\circ} 51' 20''$  N,  $118^{\circ} 15' 31''$  W; 123 to 110 fms, dredge, rock.
- 1923-49. Dec. 19, 1949, 2 1/4 miles N of South Bluff,  $28^{\circ} 54' 00''$  N,  $118^{\circ} 16' 12''$  W; shore, rocky, tide-pools, Eisenia and Codium.
- 1924-49. Dec. 20, 1949, 1 1/4 miles from Sandstone Point, from  $28^{\circ} 54' 08''$  N,  $118^{\circ} 15' 36''$  W to  $28^{\circ} 53' 57''$  N,  $118^{\circ} 15' 41''$  W; 25 to 30 fms, dredge, sand, Eisenia.
- 1927-49. Dec. 20, 1949, 1.6 miles from South Bluff, from  $28^{\circ} 53' 08''$  N,  $118^{\circ} 15' 28''$  W to  $28^{\circ} 52' 46''$  N,  $118^{\circ} 15' 43''$  W; 56 to 40 fms, dredge, sand, red algae.
- 1928-49. Dec. 20, 1949, 2 1/4 miles N of South Bluff,  $28^{\circ} 54' 00''$  N,  $118^{\circ} 16' 10''$  W; shore, rocky, boulders and crevices.
- 1944-50. April 25, 1950, 6 1/2 miles SW of San Carlos Point, from  $29^{\circ} 33' 13''$  N,  $115^{\circ} 36' 07''$  W to  $29^{\circ} 33' 30''$  N,  $115^{\circ} 35' 28''$  W; 20 fms, dredge, rock.



- 1945-50. April 26, 1950, W San Benito Island, 28° 18' 45" N, 115° 34' 14" W; shore, rock, tidepools and crevices, kelp.
- 1950-50. April 28, 1950, Asuncion Point, 27° 08' 00" N, 114° 17' 35" W; shore, rock, tidepools, kelp, limpets and brittle stars.
- 1965-50. May 3, 1950, 1 mile off Entrada Point, from 24° 31' 28" N, 112° 03' 39" W to 24° 31' 10" N, 112° 03' 54" W; 28 to 34 fms, dredge, sand, shell, crabs and mollusks.
- 1976-50. May 8, 1950, W side of middle San Benito Island, 28° 18' 55" N, 115° 34' 06" W; shore, rocky, tidepools, surfgrass.
- 2022-51. April 17, 1951, 10 miles W of Malarrimo Point, 27° 49' 00" N, 114° 43' 00" W; shore, rock, reef and tidepools.
- 2023-51. April 17, 1951, 10 miles W of Malarrimo Point, 27° 49' 03" N, 114° 42' 08" W; 5 fms, lobsterpots, rock, Loxorhynchus, lobster, eel.
- 2024-51. April 18, 1951, 9 1/2 miles W of Malarrimo Point, from 27° 48' 33" N, 114° 42' 30" W to 27° 49' 00" N, 114° 42' 09" W; 7 to 9 fms, dredge, rock, sand, worms, crabs.
- 2025-51. April 18, 1951, 10 miles W of Malarrimo Point, 27° 49' 00" N, 114° 43' 00" W; shore, rock, reefs and tidepools.
- 2026-51. April 19, 1951, South Bay, Cedros Island, from 28° 05' 00" N, 115° 19' 45" W to 28° 04' 49" N, 115° 19' 24" W; 16 to 19 fms, dredge, mud, sand, sponges and amphipods.

- 2030-51. April 20, 1951, 5.4 miles E of Morro Redondo Point, Cedros Island, from  $28^{\circ} 02' 23''$  N,  $115^{\circ} 06' 08''$  W to  $28^{\circ} 02' 27''$  N,  $115^{\circ} 05' 36''$  W; 40 to 41 fms, trawl, green mud, sea pens.
- 2064-51. Oct. 31, 1951, Nameless Cove, 12 miles E of Punta Eugenia,  $27^{\circ} 50' 00''$  N,  $114^{\circ} 51' 30''$  W; shore, rock, shingle, - 0.8 tide.
- 2066-51. Nov. 1, 1951, Punta Eugenia,  $27^{\circ} 51' 15''$  N,  $115^{\circ} 04' 45''$  W; shore, rock.
- 2588-54. Jan. 26, 1954, Isabel Island,  $21^{\circ} 52' 20''$  N,  $105^{\circ} 53' 40''$  W; 0 to 3 fms, diving, reef on W side of cove with sand beach.
- 2596-54. Febr. 1-2, 1954, Santa Lucia Bay, Acapulco; 1 to 4 fms, diving, rock, mud and sand.
- 2600-54. Febr. 5, 1954, cove W of Squall Point,  $19^{\circ} 17' 33''$  N,  $104^{\circ} 51' 27''$  W; 0 to 4 fms, diving, rock.
- 2603-54. Febr. 11, 1954, 1.1 mile NNE of Kelp Point,  $27^{\circ} 41' 06''$  N,  $114^{\circ} 53' 38''$  W; shore, rocky ledge, kelp.
- 2623-54. April 12-13, 1954, San Felipe Bay, reef and 1 to 2 miles N; shore, sand and rock, sand flats with rock and loose stones.
- 2624-54. April 13-14, 1954, San Felipe Bay, shore, beach S of town; mud and sand flats.
- 6176-59. March 22, 1959, San Cristobal Bay, 12 1/2 miles  $186^{\circ}$ T from Morro Hermosa Point,  $27^{\circ} 19' 25''$  N,  $114^{\circ} 45' 40''$  W; orange peel grab, 65 fms, medium to coarse shell sand.
- 6177-59. March 22, 1959, San Cristobal Bay, 11 miles  $178.5^{\circ}$ T from Morro Hermosa Point,  $27^{\circ} 20' 38''$  N,

- 114° 43' 55" W; 51 fms, orange peel grab, glauconite silty sand.
- 6179-59. March 22, 1959, San Cristobal Bay, 9 miles 159°T from Morro Hermosa Point, 27° 23' 15" N, 115° 40' 45" W; 41 fms, orange peel grab, glauconite shelly sand.
- 6197-59. March 26, 1959, San Quintin Bay, 7 1/4 miles 111°T from Punta Entrada, 30° 19' 05" N, 115° 50' 40" W; 6.5 fms, orange peel grab, rocky.
- 6198-59. March 26, 1959, San Quintin Bay, 6.8 miles 129°T from Punta Entrada, 30° 18' 00" N, 115° 53' 57" W; 21 fms, orange peel grab, broken shale.
- 7228-60. Dec. 31, 1960, 30 miles 241°T from Natividad Island Light, from 27° 37' 17" N, 115° 49' 16" W to 27° 30' 35" N, 115° 48' 00" W; 2402-2036 fms, Menzies dredge, red and green clay with rock fragments and pebbles.
- 7229-60. Dec. 31, 1960, 26.3 miles 273.5°T from Natividad Island Light, 27° 54' 25" N, 115° 40' 00" W; 957 to 942 fms, Menzies dredge, green mud, foraminifera, crustacea, polychaetes.
- 7231-61. Jan. 1, 1961, 29 miles 180.5°T from Natividad Island Light, from 27° 24' 00" N, 115° 12' 15" W to 27° 23' 17" N, 115° 13' 45" W; 1355 to 1312 fms, Menzies dredge, green mud, foraminifera, crustaceans and worms.
- 7235-61. Jan. 25, 1961, 16.45 miles 233.5°T from Natividad Island Light, from 27° 42' 30" N, 115° 25' 55" W to 27° 42' 25" N, 115° 25' 30" W; 709 to 683 fms, Menzies dredge, green mud.

- 7358-61. April 21, 1961, 19 miles  $170^{\circ}$ T from Natividad Island Light, from  $27^{\circ} 35' 45''$  N,  $115^{\circ} 08' 30''$  W to  $27^{\circ} 32' 15''$  N,  $115^{\circ} 05' 00''$  W; 660 to 600 fms, Menzies dredge, rich foram sand, Psolus, scaphopods, bivalves.

B. Other Collections

- a. Collected by Dr. E. Yale Dawson, 1946-1947.
9. Oct. 10, 1946, Punta Rosarita on Bahía Rosarilla; wave-swept headland with dominant mussels and barnacles.
53. Nov. 9, 1946, Cabeza Ballena, 5 miles E of San Lucas; granite reef, tide-pools, shore.
57. Nov. 20, 1946, Bahía San Francisquito near Guaymas; rocky shore.
58. Nov. 22, 1946, Bahía de Bocochibampo at Playa Miramar; rocky shore, algae.
67. Dec. 5, 1946, Mazatlán, N and S of Playa de las Olas; shore, chitons and other mollusks.
68. Dec. 12, 1946, Mazatlán, immediately W of town, N of Olas Altas lighthouse; rocky shore.
71. Dec. 8, 1946, Mazatlán, small reef 2 miles N of town; rocky shore.
85. Dec. 25, 1946, Barra Navidad, Jalisco; rocky shore, tide-pools.
94. Jan. 9, 1947, Salina Cruz, Oaxaca, lighthouse point just NW of town; rocky, heavy surf.
123. Febr. 2, 1947, Acapulco, SE side of bay; San

Lorenzo Rocks and rocks opposite Farralon de Obispo; shore.

b. Collected by Dr. C. L. Hubbs, 1950.

H50-32. Jan. 29, 1950, Melpomene Cove, Guadalupe Island; ORCA haul 3.

H50-71. Febr. 9-11, 1950, San Ignacio Lagoon, North Whale Island.

H50-71. Febr. 11, 1950, San Ignacio Lagoon, North Whale Island; 3.25 to 3.75 m.

c. Collected by Drs. Jens Knudsen and Donn S. Gorsline, 1953, and by Dr. Jens Knudsen, 1955.

KG 7. Sept. 14, 1953, Scammon Lagoon; 5 fms, shell.

K 110. Jan. 18, 1955, Gorda Point, anchorage; bottom sample, yellow sand.

K 111. Jan. 18, 1955, Gorda Point; skin-diving, subtidal.

K 112. Jan. 19, 1955, Salinas Bay, Carmen Island, W of Perico Point; bottom sample, sand.

K 116. Jan. 21, 1955, Puerto Escondido; intertidal, under rocks and in coral.

K 117. Jan. 21, 1955, North Bay, Puerto Escondido; sandy mud.

K 125. Jan. 25, 1955, Agua Verde Bay; intertidal collecting.

K 126. Jan. 25, 1955, Agua Verde Bay; 16.3 fms, bottom sample, gray mud with shells.

K 127. Jan. 25, 1955, Agua Verde Bay; 16.3 fms, bottom sample, gray mud with shells.

- K 130. Jan. 26, 1955, Amortojada Bay, San Jose Island; mud grabs, coral heads and sand.
- K 133. Jan. 28, 1955, La Paz, 200 yards off boat dock at anchorage; 3 mud grabs, 2.6 fms.
- K 134. Jan. 28, 1955, La Paz, 200 yards off boat dock at anchorage; 1 mud grab, 2.6 fms.
- K 143. Febr. 7, 1955, N shore, San Juanico Bay; inter-tidal collection.
- d. Collected by Dr. Robert H. Parker, 1959-1960.
- P 41-59. March 22, 1959, from  $22^{\circ} 32.2' N$ ,  $109^{\circ} 43.0' W$  to  $22^{\circ} 35.8' N$ ,  $109^{\circ} 47.9' W$ ; 1520 to 1535 fms, deep diving dredge, silty clay.
- P 51-59. April 1, 1959,  $25^{\circ} 31.5' N$ ,  $109^{\circ} 13.5' W$ ; 9 fms, Petersen grab, sand.
- P 58-59. April 5, 1959,  $28^{\circ} 37.2' N$ ,  $113^{\circ} 02.5' W$ ; 250 fms, dredge, rock.
- P 68-59. April 9, 1959,  $29^{\circ} 24.3' N$ ,  $113^{\circ} 19.0' W$ ; 65 fms, shell dredge, sand.
- P 71-59. April 10, 1959,  $29^{\circ} 20.0' N$ ,  $113^{\circ} 00.2' W$ ; 40 fms, shell dredge, shelly sand.
- P 72-59. April 10, 1959,  $29^{\circ} 24.6' N$ ,  $113^{\circ} 19.0' W$ ; 72 fms, shell dredge, shelly sand.
- P 135-59. Jan. 29, 1959,  $32^{\circ} 36.6' N$ ,  $117^{\circ} 35.2' W$ ; 650 fms, deep diving dredge, silty clay.
- P 137-60. Febr. 13, 1960,  $31^{\circ} 16.4' N$ ,  $117^{\circ} 34.3' W$ ; 1130 to 1140 fms, otter trawl, silty clay and rock.
- P 191-60. March 25, 1960,  $28^{\circ} 41.0' N$ ,  $112^{\circ} 06.0' W$ ; 18.3 to 13 fms, otter trawl, mud.

P 196-60. March 27, 1960,  $28^{\circ} 45.8'$  N,  $112^{\circ} 04.0'$  W; 13 fms,  
shell dredge, sand.

P 212-60. March 31, 1960,  $30^{\circ} 20.5'$  N,  $113^{\circ} 20.5'$  W; 36.6  
to 30.8 fms, otter trawl, silty sand.

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## APPENDIX A.

Species of Eunice listed under the different groups and subdivisions

Groups:

- A. Flavus-bidentate
- B. Fuscus-bidentate
- C. Flavus-tridentate
- D. Fuscus-unidentate
- E. Subgenus Nicidion
- F. Subacicular hooks known for one character only
- G. Color and dentition of subacicular hooks unknown

Subdivisions of groups A-D:

1. Branchiae first present before setiger 10 and ending before setiger 100
2. Branchiae first present before setiger 10 and continuing to the end of the body
3. Branchiae first present after setiger 10 and ending before setiger 100
4. Branchiae first present after setiger 10 and continuing to the end of the body
5. Exact distribution of branchiae unknown

Subdivisions of group E:

1. Subacicular hooks black and bidentate
2. Subacicular hooks black and tridentate

Groups F and G have not been subdivided

The species are listed alphabetically inside each subdivision; species known from western Mexico are marked with an asterisk. Reference to the original description and type locality are given after each species.

## Group A. 1.

- antillensis Ehlers, 1887, p. 84; off Florida  
benedicti (Verrill, 1885, p. 427); northeast America  
 \*biannulata Moore, 1904, p. 487; southern California  
 \*biannulata mexicana, new subspecies  
edwardsi McIntosh, 1885, p. 280; off Prince Edward Island  
kobiensis McIntosh, 1885, p. 278; off Kobe, Japan  
longicirrata Webster, 1884, p. 318; Bermuda  
 \*megabranhia, new species  
norvegica (Linnaeus, 1767, in Linnaeus, 1788, p. 3116); Norway  
pennata (Müller, 1776, p. 217); Europe  
savignyi Grube, 1878, p. 150; Philippine Islands  
 \*segregata (Chamberlin, 1919, p. 237); Pacific side of Panama  
tridentata Ehlers, 1905, p. 288; New Zealand  
valens (Chamberlin, 1918, p. 176); northern California  
validobranchiata Monro, 1937, p. 288; south Arabian Sea

## Group A. 2.

- afuerensis Hartman, 1944, p. 108; Peru  
armillata (Treadwell, 1922, p. 144); Samoa

## Group A. 4.

- johnsoni Hartman, 1954, p. 633; north Marshall Islands  
schizobranhia Claparède, 1870, p. 394; Gulf of Naples  
spongicola (Treadwell, 1921, p. 25); West Indies  
tenuis (Treadwell, 1921, p. 51); Florida  
tubicola (Treadwell, 1922, p. 139); Samoa  
tubifex Crossland, 1904, p. 303; Zanzibar

## Group A. 5.

- panamena (Chamberlin, 1919, p. 256); Pacific side of Panama



## Group B. 1.

coccinoides Augener, 1922, p. 45; western Africa  
gravieri Fauvel, 1911, p. 14; France  
rosaurae Monro, 1939, p. 351; Caribbean Sea  
rubella Knox, 1951, p. 66; New Zealand

## Group B. 2.

\*aphroditois (Pallas, 1788, p. 229); Indian Ocean  
aphroditois djiboutiensis Gravier, 1900, p. 224; Red Sea  
biformicirrata (Treadwell, 1922, p. 148); Samoa  
contingens (Chamberlin, 1919, p. 260); Galapagos Islands  
flavofasciata Grube, 1878, p. 155; Philippine Islands  
floridana (Pourtalès, 1869, p. 108); Florida Keys  
frauenfeldi Grube, 1868, p. 11; St. Paul Island  
harassii Audouin and Milne Edwards, 1834, p. 141; Europe  
investigatoris Fauvel, 1932, p. 137; Persian Gulf  
longicirris Grube, 1870, p. 492; Red Sea  
\*longisetis Webster, 1884, p. 317; Bermuda  
macrobranchia Schmarda, 1861, p. 130; Cape of Good Hope  
manorae Aziz, 1938, p. 34; Karachi  
microprion Marenzeller, 1879, p. 135; southern Japan  
\*multipectinata Moore, 1911, p. 248; California  
\*mutilata Webster, 1884, p. 315; Bermuda  
palauensis Okuda, 1937, p. 285; Palau Islands  
pauroneurata (Chamberlin, 191, p. 249); Galapagos Islands  
torquata Quatrefages, 1865, p. 312; France

## Group B. 3.

collini Augener, 1906, p. 133; off the West Indies

## Group B. 4.

\*afra Peters, 1854, p. 611; Mozambique  
afra paupera Grube, 1878, p. 160; Philippine Islands  
afra punctata Peters, 1854, p. 611; Mozambique  
conglomerans Ehlers, 1887, p. 93; southern Florida  
crassitentaculata (Treadwell, 1922, p. 146); Samoa

- \*filamentosa Grube, 1856, p. 56; West Indies  
lita (Chamberlin, 1919, p. 240); Marshall Islands  
perrieri Gravier, 1900, p. 232; Red Sea  
 \*reducta, new species

## Group B. 5.

- franklini Monro, 1924, p. 56; Arafura Sea  
guildingi Baird, 1870, p. 351; West Indies  
guttata Baird, 1870, p. 350; between Bombay and Singapore  
impexa Grube, 1878, p. 159; Philippine Islands  
jeffreysii McIntosh, 1903, p. 137; Tangiers Bay  
megalodus Grube, 1878, p. 156; Philippine Islands  
mindanavensis McIntosh, 1885, p. 289; Philippine Islands  
northioidea Moore, 1903, p. 433; Suruga Bay, Japan  
ovalifera Fauvel, 1936, p. 67; Japan  
plicata Baird, 1870, p. 348; Fremantle, Australia  
prognatha McIntosh, 1885, p. 268; Ascension Island  
quinquifida Moore, 1903, p. 435; Sagami Bay, Japan

## Group C. 1.

- \*americana Hartman, 1944, p. 118; southern California  
australis Quatrefages, 1865, p. 321; New Zealand  
dicirrata Rullier, 1964, p. 178; Cape Verde Islands  
 \*cedroensis, new species  
 \*hawaiiensis Treadwell, 1906, p. 1166; Hawaii  
indica Kinberg, 1865, p. 562; Bangka Strait  
mucronata Moore, 1903, p. 437; Sagami Bay, Japan  
murrayi McIntosh, 1885, p. 288; Cape of Good Hope  
 \*vittata (delle Chiaje, 1828, p. 195); Mediterranean Sea  
 \*vittatopsis, new species

## Group C. 2.

- \*antennata (Savigny, 1818, p. 322); Suez  
 \*antennata aedificatrix Monro, 1933, p. 60; Pacific side of Panama  
makemoana (Chamberlin, 1919, p. 233); Paumotu Islands

oliga (Chamberlin, 1919, p. 244); Paumotu Islands  
oliga papeetensis (Chamberlin, 1919, p. 248); Tahiti  
pectinata Grube, 1870, p. 492; Red Sea  
rubra Grube, 1856, p. 59; Antilles and southern Florida  
valenciennesii Grube, 1878, p. 99; Philippine Islands

## Group D. 2.

schemacephala Schmarda, 1861, p. 132; Jamaica

## Group D. 4.

fauveli Gravier, 1900, p. 236; Red Sea  
marenzelleri Gravier, 1900, p. 229; Red Sea

\*sonorae, new species

\*unidentata Rioja, 1962, p. 175; Baja California

## Group E. 1.

balfouriana McIntosh, 1885, p. 301; off New Zealand  
brevis Ehlers, 1887, p. 98; Florida  
\*cariboea Grube, 1856, p. 57; West Indies  
cincta Kinberg, 1865, p. 564; Tahiti  
gracilis Crossland, 1904, p. 327; Zanzibar  
imogena Monro, 1924, p. 61; Brazil

## Group E. 2.

curticirrus Knox, 1960, p. 125; Chatham Islands

## Group F

color of hooks yellow

aequabilis Grube, 1878, p. 102; Cape York, Australia  
articulata (Hoagland, 1920, p. 615); Philippine Islands  
binominata Quatrefages, 1865, p. 237; West Indies  
flavocuprea Grube, 1878, p. 99; Red Sea

color of hooks dark or black

argentinensis (Treadwell, 1929, p. 3); Argentina  
bilobata Treadwell, 1906, p. 1168; Hawaii

borneensis Grube, 1878, p. 102; northern Borneo  
coccinea Grube, 1878, p. 153; Philippine Islands  
complanata Grube, 1877, p. 529; Timor  
jagori Grube, 1878, p. 103; Philippine Islands  
nesiotes (Chamberlin, 1919, p. 253); Marshall Islands  
nicidioformis Treadwell, 1906, p. 1169; Hawaii  
scombrinis Quatrefages, 1865, p. 319; Guayaquil, Ecuador

hooks bidentate

bowerbanki Baird, 1870, p. 349; Australia  
ehlersi Gravier, 1900, p. 248; Red Sea  
flavopicta Izuka, 1912, p. 121; Japan  
grubei Gravier, 1900, p. 258; Red Sea  
mutilatoides Augener, 1922, p. 45; southern Florida  
perimensis Gravier, 1900; p. 239; Red Sea  
thomasiana Augener, 1922, p. 45; West Indies

hooks tridentate

fijiensis Baird, 1870, p. 347; Fiji Islands

Group G.

adriatica Schmarda, 1861, p. 124; Adriatic Sea  
arenosa Kinberg, 1865, p. 563; Tahiti  
atlantica Kinberg, 1865, p. 563; Brazil  
auriculata Treadwell, 1901, p. 196; Puerto Rico  
bipapillata Grube, 1866, p. 64; Samoa  
brasiliensis Kinberg, 1865, p. 563; Brazil  
cirribranchis Grube, 1870, p. 55; Fiji Islands  
dubia Woodworth, 1907, p. 11; Samoa  
fimbriata Grube, 1870, p. 55; Fiji Islands  
fuscicirris Grube, 1878, p. 102; Locality unknown  
leptocirris Grube, 1870, p. 55; Fiji Islands  
longicornis Grube, 1866, p. 68; Venezuela  
magnifica Grube, 1866, p. 64; Samoa  
modesta Grube, 1866, p. 64; Samoa

(Nicidion) incerta Hansen, 1882, p. 8; Brazil  
oerstedii Stimpson, 1853, p. 34; eastern Canada  
pacifica Kinberg, 1865, p. 562; Tahiti  
parca Grube, 1878, p. 99; Locality unknown  
parvibranchis Grube, 1870, p. 55; Fiji Islands  
pelamidis Quatrefages, 1865, p. 322; Peru  
prayensis Kinberg, 1865, p. 563; Brazil  
procera Grube, 1866, p. 68; Brazil  
splendida Grube, 1856, p. 58; Valparaiso  
subdepressa Grube, 1866, p. 68; Venezuela  
tibiana (Pourtalès, 1869, p. 108); off Cuba  
tristriata Grube, 1870, p. 55; Fiji Islands  
zonata (delle Chiaje, 1841, p. 94); Gulf of Naples

## APPENDIX B.

Species of Marphysa listed under the different groups and subdivisions

## Groups:

- A. No composite setae present
- B. Only composite spinigers present
- C. Only composite falcigers present
- D. Both composite spinigers and falcigers present
- E. Composite setae unknown

## Subdivisions of groups A-D:

- 1. Branchiae present in a short anterior region only
- 2. Branchiae present in a long region, usually to the end of the body

The species are listed alphabetically inside each subdivision; specimens known from western Mexico are marked with an asterisk. Reference to the original description and type locality are given after each species.

## Group A.

mossambica (Peters, 1854, p. 612); Mozambique

## Group B. 1.

\*disjuncta Hartman, 1961, p. 81; southern California  
kinbergi McIntosh, 1910, p. 451; off Cape Finisterre

## Group B. 2.

aransensis Treadwell, 1939, p. 5; Texas  
brasiliensis (Hansen, 1882, p. 7); Brazil  
brevitentaculata Treadwell, 1921, p. 69; West Indies  
gravelyi Southern, 1921, p. 617; Chilka Lake, India  
macintoshi Crossland, 1903, p. 137; Zanzibar  
mangeri Augener, 1918, p. 330; Victoria, Africa  
orientalis Treadwell, 1936, p. 266; China  
\*sanguinea (Montagu, 1807, p. 20); England  
schmardai Gravier, 1907, p. 529; Peru

tamurai Okuda, 1934, p. 521; Japan  
teretiuscula (Schmarda, 1861, p. 129); Ceylon

## Group C. 1.

adenensis Gravier, 1900, p. 270; Red Sea  
\*conferta Moore, 1911, p. 252; southern California

## Group C. 2.

\*aenea (Blanchard, 1849, p. 19); Chile  
atlantica (Kinberg, 1865, p. 565); Argentina  
bifurcata Kott, 1951, p. 121; Western Australia  
borradailei Pillai, 1958, p. 94; Ceylon  
capensis (Schmarda, 1861, p. 126); Cape of Good Hope  
corallina (Kinberg, 1865, p. 564); Hawaii  
gayi Quatrefages, 1865, p. 335; Chile  
hamata (Schmarda, 1861, p. 125); Jamaica  
hentscheli Augener, 1931, p. 290; Brazil  
minima (Hansen, 1882, p. 8); Brazil  
\*mortenseni Monro, 1928, p. 86; Pacific side of Panama  
posterobranchia Day, 1962, p. 645; Natal  
quadrioculata (Grube, 1856, p. 60); Costa Rica  
regalis Verrill, 1900, p. 636; Bermuda  
saxicola Langerhans, 1881, p. 111; Canary Islands  
soembaensis Augener, 1933, p. 196; southwest Soemba  
striata (Kinberg, 1865, p. 565); Pacific side of Panama  
stylobranchiata Moore, 1909, p. 249; California

## Group D. 1.

bellii (Audouin and Milne Edwards, 1833, p. 223); France  
belli oculata Treadwell, 1921, p. 61; Florida and the West Indies  
sinensis Monro, 1934, p. 367; Amoy, China  
stragulum (Grube, 1878, p. 163); Philippine Islands

## Group D. 2.

\*angelensis, new species

- chevalensis Willey, 1905, p. 282; Gulf of Manaar, India  
dartevellei Monro, 1936, p. 246; Congo  
digitibranchia Hoagland, 1920, p. 617; Philippine Islands  
fallax Marion and Bobretzky, 1875, p. 13; Mediterranean Sea  
languida Treadwell, 1921, p. 73; Puerto Rico  
\*mixta, new species

Group E.

- antipathum Pourtalès, 1869, p. 109; Cuba  
januarii Grube, 1881, p. 111; Brazil  
simplex (Langerhans, 1884, p. 256); Madeira