KRISTIAN FAUCHALD

A Revision of Six Species of the Flavus-Bidentatus Group of Eunice (Eunicidae: Polychaeta)

SMITHSONIAN CONTRIBUTIONS TO ZOOLOGY • 1969 NUMBER 6

SMITHSONIAN CONTRIBUTIONS TO
ZOOLOGY

NUMBER 6

Kristian Fauchald

A Revision of Six Species of the Flavus-Bidentatus Group of Eunice (Eunicidae: Polychaeta)

SMITHSONIAN INSTITUTION PRESS
CITY OF WASHINGTON
1969

SERIAL PUBLICATIONS OF THE SMITHSONIAN INSTITUTION

The emphasis upon publications as a means of diffusing knowledge was expressed by the first Secretary of the Smithsonian Institution. In his formal plan for the Institution, Joseph Henry articulated a program that included the following statement: "It is proposed to publish a series of reports, giving an account of the new discoveries in science, and of the changes made from year to year in all branches of knowledge not strictly professional." This keynote of basic research has been adhered to over the years in the issuance of thousands of titles in serial publications under the Smithsonian imprint, commencing with *Smithsonian Contributions to Knowledge* in 1848 and continuing with the following active series:

Smithsonian Annals of Flight
Smithsonian Contributions to Anthropology
Smithsonian Contributions to Astrophysics
Smithsonian Contributions to Botany
Smithsonian Contributions to the Earth Sciences
Smithsonian Contributions to Paleobiology
Smithsonian Contributions to Zoology
Smithsonian Studies in History and Technology

In these series, the Institution publishes original articles and monographs dealing with the research and collections of its several museums and offices and of professional colleagues at other institutions of learning. These papers report newly acquired facts, synoptic interpretations of data, or original theory in specialized fields. Each publication is distributed by mailing lists to libraries, laboratories, institutes, and interested specialists throughout the world. Individual copies may be obtained from the Smithsonian Institution Press as long as stocks are available.

S. Dillon Ripley
Secretary
Smithsonian Institution

Contribution number 324 from the Allan Hancock Foundation

Official publication date is handstamped in a limited number of initial copies and is recorded in the Institution's annual report, Smithsonian Year.

UNITED STATES GOVERNMENT PRINTING OFFICE
WASHINGTON : 1969

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402 - Price 30 cents (paper cover)

ABSTRACT

The species here revised have yellow, bidentate subacicular hooks and branchiae limited to a short anterior region. They include *E. biannulata* Moore (1904), *E. kobiensis* McIntosh (1885, holotype examined), *E. segregata* (Chamberlin, 1919a, restricted), *E. semisegregata,* new species, *E. valens* (Chamberlin, 1919b, types examined), and *E. websteri,* new name for *E. longicirrata* Webster (1884, holotype examined). The relationship between the six species is discussed.

The species here revised include *E. biannulata* Moore (1904), *E. kobiensis* McIntosh (1885), *E. segregata* (Chamberlin, 1919a, restricted), *E. semisegregata,* new species, *E. valens* (Chamberlin, 1919b), and *E. websteri,* new name for *E. longicirrata* Webster (1884). The six species all belong to the flavus-bidentatus group as defined by Hartman (1944, p. 100) in that they have yellow, bidentate subacicular hooks. Branchiae are present from setiger three and limited to a short anterior region in all species here treated.

Eunice valens has been found intertidally and in shallow subtidal areas in California and Washington. *E. biannulata* is known from shallow water in California and western Mexico. *E. websteri* is known from Bermuda and possibly from the West Indies. Authentic records of *E. kobiensis* come from shelf-depths off Japan; records from the eastern Pacific Ocean are limited to British Columbia and Washington (material from Berkeley and Berkeley's collections in USNM). These four species are found in shallow water and do not appear to occur on the deeper continental slopes. The two last species, *E. segregata* and *E. semisegregata,* come from slope-depths; *E. segregata* is known from Panama to southern California and *E. semisegregata* from one locality off southwestern Mexico.

The characters used to separate the six species include the relative length of the occipital tentacles, the maximal number of branchial filaments, the shape of the composite hooded hooks, the distribution and shape of the subacicular hooks, and the relationship between the length of the prostomium and the peristomial segments. A compilation of some of these characters and others is given in Table 1.

The shape of the different parapodial lobes appears to be constant within a given range of segments, but it was considered inadvisable to investigate this further on the sparse material of type-specimens available. Three regions may be recognized along the body: prebranchial, branchial, and postbranchial. One parapodium from each region was examined in detail and illustrated; other parapodia from the same region were compared superficially. Provisionally it appears that some species (*E. valens* and *E. segregata*) have very characteristic parapodial lobes. The development of the different parapodial lobes is most distinct in the branchial segments; lobes from the prebranchial and postbranchial regions tend to be similar in all species examined. The character of the parapodial lobes cannot be used taxonomically except in conjunction with other characters since the lobes remain unknown in most species of *Eunice.*

Type-specimens were borrowed from different museums; I am indebted to the following institutions and persons for allowing me to examine types placed in their care: the trustees of the British Museum (Natural History) (BMNH, Dr. J. David George), Museum of Comparative Zoology, Harvard University (MCZ, Dr. H. Levi), and United States National Museum (USNM, Dr. Marian H. Pettibone).

The study was supported by grant number B5–1780 from the National Science Foundation to the Allan Hancock Foundation. The Allan Hancock Foundation not only permitted me to examine specimens in their collections but gave me material support as well. Dr. Olga Hartman and Dr. Marian Pettibone gave valuable advice and critically read the manuscript.

Kristian Fauchald, Allan Hancock Foundation, University of Southern California, Los Angeles, California 90007.

Key to Species Included in this Revision

1. Maximal number of branchial filaments 8 or less 2
   Maximal number of branchial filaments 11 or more 3
2. Occipital tentacles with moniliform articles . . . . . 1. *E. biannulata* Moore
   Occipital tentacles with cylindrical articles . . . . . 2. *E. kobiensis* McIntosh
3. Maximal number of branchial filaments 34–38 . . . . . 3. *E. semisegregata*, new species
   Maximal number of branchial filaments less than 20 4
4. Median occipital tentacle reaches setiger 8 5
   Median occipital tentacle barely reaches setiger 2 . . . . . 4. *E. valens* (Chamberlin)
5. Composite hooks with strongly curved distal teeth; anterior dorsal cirri with seven or eight articulations . . . . . 5. *E. websteri*, new name
   Composite hooks with nearly straight distal teeth; anterior dorsal cirri with one or two articulations . . . . . 6. *E. segregata* (Chamberlin)

TABLE 1.—*Some taxonomic characters of six species of* Eunice

[Based on the specimens here treated]

Species of Eunice	*Branchiae present on setigers (number)*	*Maximal number of branchial filaments*	*Structure of first branchia*	*Occipital tentacles*	*Subacicular hooks present from setiger (number)*	*Shape of distal tooth of composite hook*	*Structure of dorsal cirri of anterior segments*
biannulata	3–53	6–8	single	moniliform	36	curved	articulated
kobiensis	3–41	8	single	cylindrical	30	curved	smooth
segregata	3–39	12–15	single	cylindrical	36	straight	articulated
semisegregata	3–69	34–38	pectinate	cylindrical	51	straight	smooth
valens	3–76	11	single	cylindrical	43	straight	articulated
websteri	3–53	15	single	cylindrical	31	curved	articulated

1. *Eunice biannulata* Moore, 1904

FIGURE 1

Eunice biannulata Moore, 1904, pp. 487–490, pl. 37: figs. 10–18, pl. 38: fig. 42.—Berkeley and Berkeley, 1939, p. 335.—[?] Hartman, 1939, p. 13.—Fauchald [in press].

Eunice longicirrata.—Hartman, 1944, pp. 104–107, pl. 6: figs. 118–122, partim [not *E. longicirrata* Webster].

MATERIAL.—La Jolla, shale and sandstone reefs just north of caves, 1940, Allan Hancock Foundation station 1210–40, 1 specimen (USNM 38983).

REMARKS.—The type of *E. biannulata* was collected by E. C. Starks at San Diego. The present specimen comes from La Jolla and fits the original description well except for some trivial differences mentioned below. It is a complete specimen with 192 setigers and is 148 mm long and 4.5 mm wide with setae.

The median occipital tentacle had 21 articles, the inner lateral ones had 13, and the outer lateral tentacles had 7 each in the type-specimen (Moore, 1904, p. 488). The median tentacle has 19 articulations (Figure 1*d*), the inner lateral ones have 11 and the outer lateral tentacles have 5 each in the present specimen.

The dorsal cirri were described as having three articles in anterior setigers, the two distal ones together as long as the proximal one. The dorsal cirri in the present specimen (Figure 1*a*) have three articulations, but the two distal articles together are shorter than the proximal one. Maximal number of branchial filaments (Figure 1*e*) is seven in the present specimen; it was originally described as six to eight.

The setae (Figure 1*b*) are similar to those described by Moore; the subacicular hooks (Figure 1*c*) are present from setiger 36 in the La Jolla specimen under

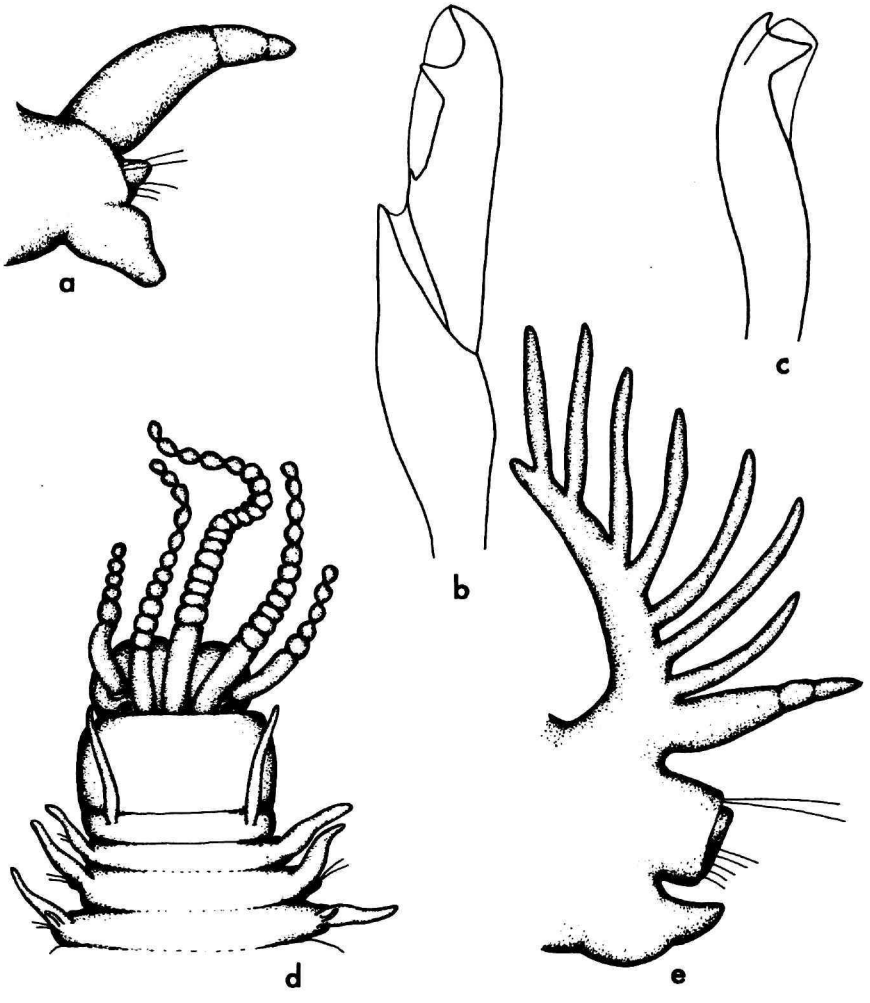

FIGURE 1.—*Eunice biannulata* Moore (USNM 38983): *a*, second parapodium, ×25; *b*, composite hooded hook, 60th setiger, ×570; *c*, subacicular hook, 60th setiger, ×285; *d*, anterior end, ×10; *e*, 28th parapodium, ×25.

review and were present from setigers 40–50 in the type-specimens.

DISCUSSION.—*E. biannulata* is the only species known in this group (flavus-bidentatus with a limited number of branchiae) that has occipital tentacles with moniliform articles.

Eunice biannulata was separated from *E. websteri* by Berkeley and Berkeley (1939, p. 335 as *E. longicirrata*) on the number of articulations of the anterior dorsal cirri. The number of articulations has been shown to be somewhat variable (Fauchald, in press) and cannot be used as the only character to separate the two species. All specimens from southern California and western Mexico reported by Berkeley and Berkeley (1939) have moniliform tentacles. Other records of this species and *E. websteri* (= *E. longicirrata* auctores) from the eastern Pacific Ocean have been discussed in some detail elsewhere (Fauchald, in press).

DISTRIBUTION.—*E. biannulata* is known from southern California and western Mexico (Moore, 1904; Berkeley and Berkeley, 1939; Hartman, 1944 and Fauchald, in press). It is found intertidally and in very shallow water. The possible wider distribution is not

known since *E. biannulata* has been confused with several related species.

2. *Eunice kobiensis* McIntosh, 1885

FIGURE 2

Eunice kobiensis McIntosh, 1885, pp. 278–280, pl. 38: figs. 12–13, pl. 20A: figs. 1–3.—Izuka, 1912, pp. 117–118, pl. 13: figs. 11–12.—Berkeley and Berkeley, 1948, p. 90, fig. 135. [Not *E. kobiensis* Åkesson, 1967.]

[?]*Eunice gracilis* Moore, 1903, pp. 440–441, pl. 25: figs. 46–48.

Eunice longicirrata.—Imajima and Hartman, 1964, p. 256 [not *E. longicirrata* Webster].

MATERIAL.—Holotype (BMNH 1885:12:1:197) off Kobe, Japan, *Challenger*.

DESCRIPTION.—The holotype is an incomplete specimen with 131 setigers; it is 55 mm long and 3.5 mm wide with setae. It is brown and lacks color pattern.

The prostomium (Figure 2*f*) is twice as wide as long; the palpi are visible from the dorsal side and the anterior incision reaches the base of the median occipital tentacle. All occipital tentacles are slender; the outer lateral ones reach the first setiger; each has four articulations. The inner lateral tentacles reach the fourth or the fifth setiger; each has five articulations. The median tentacle reaches the tenth or eleventh setiger and has seven articulations. All articles are cylindrical. A pair of eyes is present posterior to the bases of the outer lateral occipital tentacles.

The cylindrical first peristomial segment is twice as long as the first setiger; the second peristomial segment is slightly shorter than the first setiger; the slender peristomial cirri are smooth and barely reach the anterior edge of the first peristomial segment.

Prebranchial parapodia (Figure 2*b*) have short and truncate presetal and postsetal lobes; the setal lobes are truncate with a short dorsal extension covering the dorsalmost aciculum. The slender dorsal cirri are nearly as long as half the width of the body; each has one basal articulation. The large ventral cirri are digitate. Parapodia in the branchial region (Figure 2*g*) have rounded parapodial lobes; all lobes are of the same length and there is no prolongation of the setal lobes associated with the acicula. The dorsal cirri are shorter and slenderer than in the prebranchial segments; each retains one basal articulation. The ventral cirri have slight basal swellings, but retain the large digitate tip. Parapodia in the postbranchial region (Figure 2*a*) have short, truncate parapodial lobes; the long dorsal cirri are smooth; the ventral cirri are digitate and somewhat slenderer than in the prebranchial region; the basal swellings are absent.

Branchiae (Figure 2*g*) are present on setigers 3–41; the three first and the last two pairs are single filaments; all others are pectinate. The maximal number of branchial filaments is eight, but most branchiae have only six or seven. The branchial stem is short and thick; the branchiae are not held erect over the dorsum; the branchial filaments are long.

Setae are broken off in most setigers; anterior setigers have simple limbate setae and composite hooks. The composite hooks (Figure 2*c*) have very short appendages; each has a thick, curved distal tooth and a small, conical proximal tooth. The short hoods are blunt; the proximal part of the hoods and the upper ends of the shafts are serrated. Pectinate setae (Figure 2*e*) are present in median and posterior setigers; each is distally straight with one slender whiplike prolongation and eleven to twelve teeth. Subacicular hooks (Figure 2*d*) are present from setiger 30 to the end of the fragment; one or two hooks are present in a parapodium. Each hook has a large proximal tooth and a small distal tooth; the hoods are short and blunt.

The pharyngeal apparatus has been dissected out and was found free in the tube with the specimen; it resembles the figure in McIntosh (1885, fig. 37) closely and it is assumed to be from the type-specimen. Maxilla I is falcate; maxilla II has seven teeth left and eight right; left maxilla III has seven teeth; the combined right maxillae III + IV have twelve teeth; left maxilla IV has ten teeth; both maxillae V and the mandibles are missing, but are assumed to have been present.

DISCUSSION.—*E. kobiensis* resembles *E. segregata* and *E. websteri*. The maximal number of branchial filaments is 8 in *E. kobiensis* and 12–15 and 15 in *E. segregata* and *E. websteri*, respectively. The development of the parapodial lobes in the branchial regions differs markedly in the three species and the proportions of the anterior end are different.

Eunice gracilis has been considered synonymous with *E. kobiensis* (Imajima and Hartman, 1964, p. 256, as *E. longicirrata*); it apparently differs from *E. kobiensis* in the maximal number of branchial filaments which is eleven in *E. gracilis* (Moore, 1903, p. 441) and eight in *E. kobiensis*. The median occipital tentacle appears to be somewhat shorter in relation to the inner lateral ones in *E. gracilis* than in *E. kobiensis*. The differences

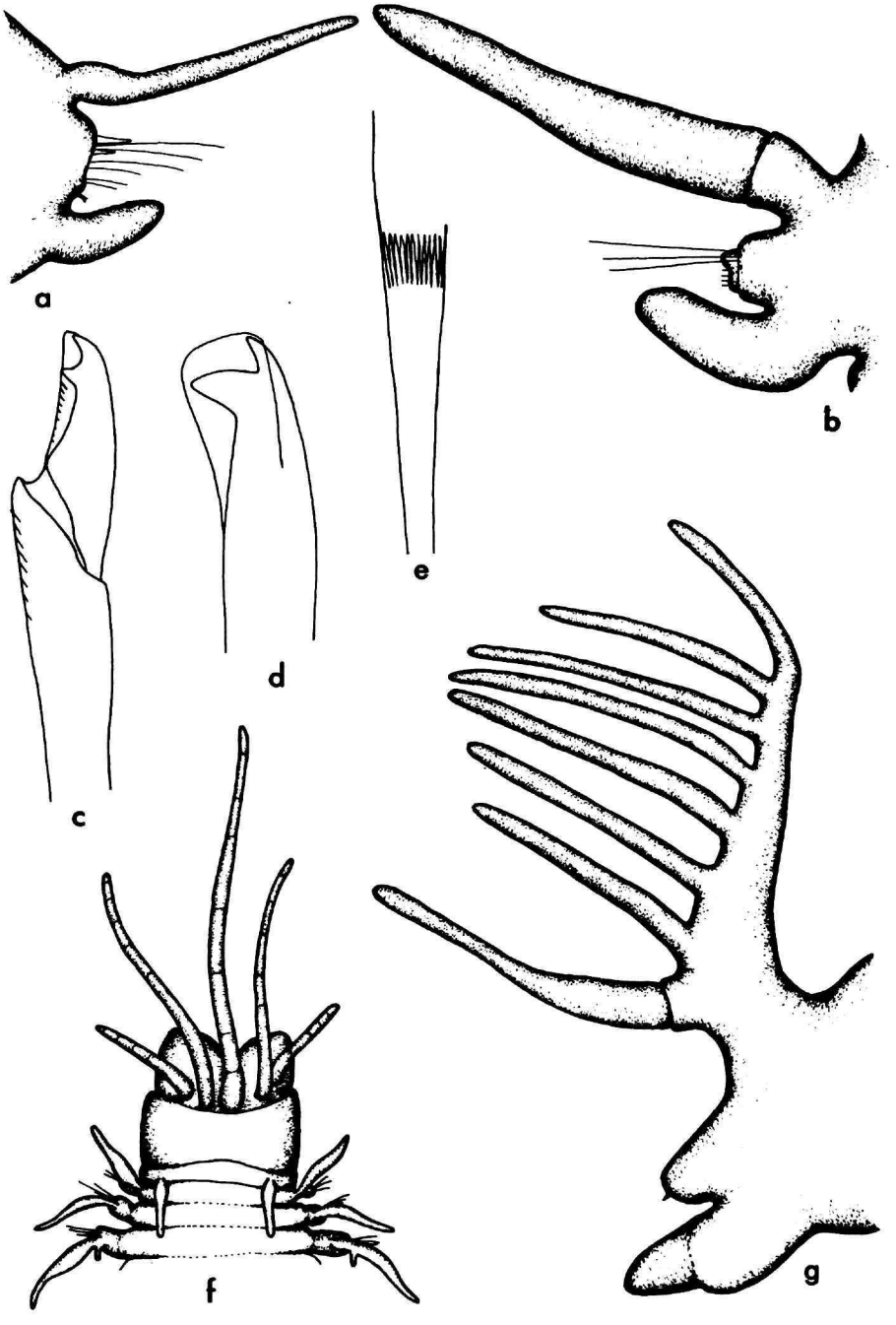

FIGURE 2.—*Eunice kobiensis* McIntosh (BMNH 1885:12:1:197): *a*, 126th parapodium, ×50; *b*, second parapodium, ×50; *c*, composite hooded hook, 126th setiger, ×570; *d*, subacicular hook, 126th setiger, ×570; *e*, pectinate seta, 28th setiger, ×635; *f*, anterior end, ×10; *g*, 28th parapodium, ×50.

are slight, and the two species are here doubtfully considered synonymous.

Eunice longicirrata Imajima and Hartman (1964) fits the description of *E. kobiensis* rather than that of *E. websteri* [=*E. longicirrata* Webster].

Records from the eastern Pacific Ocean (Berkeley and Berkeley, 1948, p. 90) are limited to Washington and British Columbia. *E. kobiensis* Åkesson (1967) is here referred to *E. valens;* the illustration of the anterior end of the adults (Åkesson, 1967, fig. 21) shows that the specimens had very short occipital tentacles and the relationship between the prostomium and the peristomial segments is similar to that found in *E. valens.* The setae found in the larvae (Åkesson, 1967, fig. 8) do not resemble setae in any of the six species here considered and may be characteristic larval setae.

Distribution.—*E. kobiensis* is known from Japan in 8 to 50 fathoms, but may be widely distributed in the western Pacific Ocean.

6. *Eunice segregata* (Chamberlin, 1919a) restricted

Figure 3

Leodice segregata Chamberlin, 1919a, pp. 237–240, pl. 54: figs. 1–4, partim.—Treadwell, 1923, p. 7, partim.
Eunice segregata.—Fauchald [in press].

Material.—Off southern California 33°33′ N, 120° 17′30″ W, 534 fathoms, agassiz trawl, green sand, *Globigerina,* 26 April 1911, *Albatross* station D 5695, one specimen (USNM 19153).

Remarks.—*Leodice segregata* was based on four specimens from three *Albatross* stations: stations 3354 and 3358 from off Panama (each with a single specimen) and station 3417 from off southwestern Mexico (two specimens). Only the two specimens from station 3417 have been recovered, one is in the United States National Museum (USNM 19398) and the other in the Museum of Comparative Zoology, Harvard University. These two specimens do not agree with the original description and were mentioned by Chamberlin (1919a) as different from the two specimens from Panama; they form the basis for a new species, *E. semisegregata* (see below).

A specimen from *Albatross* station D 5695 off southern California, identified by Treadwell (1923) as *Leodice segregata* (USNM 19153), agrees closely with the original description of Chamberlin and has been used as a basis for a redescription of the species.

Redescription.—The present specimen is incomplete and has 92 setigers; it is 60 mm long and 4.7 mm wide with setae and is olive colored without color pattern. The body is cylindrical except for a slight dorsal flattening in the posterior end.

The prostomium (Figure 3*g*) is slightly wider than long; the anterior incision is deep and narrow. Eyes are absent. The palpi are poorly marked dorsally; the ventral parts are rounded. The occipital tentacles are in a crescentic arrangement with the outer lateral pair in front of the others. All occipital tentacles are articulated, but the articulations are faint and visible only as septa inside the tentacles. Each of the outer lateral occipital tentacles reaches setiger 3 and has seven or eight articulations; each of the inner lateral ones reaches setiger 6 and has nine to ten articulations. The median tentacle reaches setiger 8 and has ten articulations.

The cylindrical first peristomial segment is slightly longer than the prostonium. The second peristomial segment is as long as the first setiger. The peristomial cirri reach the middle of the prostonium; each has eight or nine faint articulations.

The first setiger (Figure 3*e*) has low, transverse presetal and postsetal lobes; the setal lobe is conical. Both cirri are well developed; the large, digitiform dorsal cirrus is nearly as long as half the width of the body and has two articulations. Dorsal cirri in the branchial region (Figure 3*a*) have one articulation; those in the postbranchial region (Figure 3*f*) are smooth. The dorsal cirri decrease gradually in size from setiger 3 to the last setiger. The blunt ventral cirrus in the first setiger is thick; basal swellings are present in branchial and postbranchial setigers, but become less distinct in the posterior end; ventral cirri are shorter in the posterior than in the anterior end.

The branchial segments (Figure 3*a*) have blunt, well-developed setal lobes; the presetal lobes are low, transverse folds that continue round the ventral edges of the setal lobes. The large postsetal lobes are leaf shaped and envelope the setal lobes and the presetal lobes from behind. Postbranchial setigers (Figure 3*f*) have reduced postsetal lobes and the setal lobes are shorter than in the branchial setigers.

Branchiae (Figure 3*a*) are present on setigers 3–39; the first two and the last pair are single filaments; all others are pectinate. The maximal number of branchial filaments is 12–15 and the branchiae cover the dorsum completely where best developed.

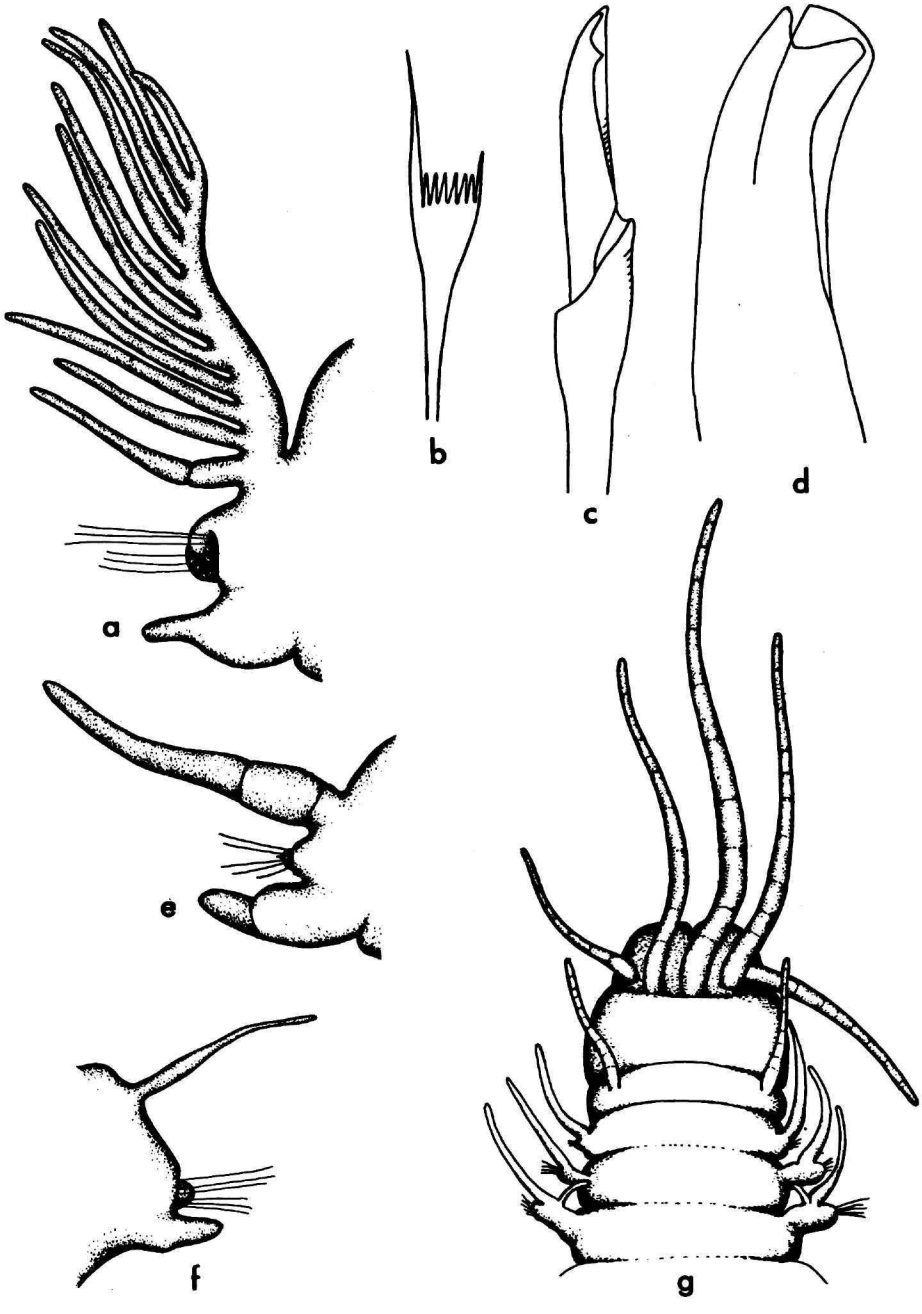

FIGURE 3.—*Eunice segregata* (Chamberlin) (USNM 19153): *a*, 21st parapodium, ×25; *b*, pectinate seta, second setiger, ×1350; *c*, composite hooded hook, second setiger, ×570; *d*, subacicular hook, posterior setiger, ×570; *e*, second parapodium, ×25; *f*, posterior parapodium, ×25; *g*, anterior end, ×10.

329-129 O—69——2

The dorsal setal fascicles have numerous slender capillary setae with serrated cutting edges and a number of pectinate setae in all setigers. Each pectinate seta (Figure 3*b*) is narrow and straight with 6–12 teeth and one margin prolonged; pectinate setae have fewer (6–8) teeth in anterior, than in posterior (11–12) setigers. Composite, bidentate hooded hooks (Figure 3*c*) with blunt hoods are present in all ventral fascicles. Each hook has a slightly curved distal tooth and the proximal tooth is bluntly conical. The hoods and the upper ends of the shafts are serrated. Acicula number two in a parapodium except in far posterior setigers where only one is present; each is conical and has a slightly bent tip. Subacicular hooks (Figure 3*d*) are present from setiger 36 to the end of the fragment. Each is yellow and bidentate with poorly marked neck; the proximal tooth is larger than the distal one and blunt. The hoods are short and rounded.

The pharyngeal apparatus was not dissected.

Discussion.—*E. segregata* as redescribed here differs in some respects from the original description (Chamberlin, 1919a). The occipital tentacles are obscurely articulated, not smooth as stated by Chamberlin. Two of the original paratypes of *E. segregata* (as *E. semisegregata* below) have clearly articulated occipital tentacles, so apparently Chamberlin overlooked this character. Branchiae are present on setigers 3–39 in the present specimen; the holotype had branchiae on setigers 3–43 according to Chamberlin. The maximal number of branchial filaments was 21 in the holotype according to Chamberlin; the present specimen has 12–15.

These differences are here considered minor and except for the discrepancy in the number of branchial filaments well within the patterns of variability established for other species in the genus (Fauchald, in press).

Eunice segregata resembles *E. kobiensis,* but differs from the latter in the structure of the parapodial lobes; the difference is most apparent in the branchial region. Presetal and postsetal lobes are distinct and differ in length from the setal lobes in *E. segregata* and are similar in length and shape in *E. kobiensis*. The peristomial cirri in *E. segregata* reach the middle of the prostomium and barely reach the anterior edge of the first peristomial segment in *E. kobiensis*. The prostomium is shorter than the peristomium in *E. segregata* and of the same length as the peristomium in *E. kobiensis*. Eyes are absent in *E. segregata* and present in *E. kobiensis*.

Eunice segregata also resembles *E. valens* and *E. websteri*. The composite hooded hooks have strongly curved distal teeth and slender proximal teeth in *E. websteri* and weakly curved distal teeth and blunt, conical proximal teeth in *E. segregata*. The anterior dorsal cirri have several articulations each in *E. websteri* and only one or two in *E. segregata*. The occipital tentacles do not reach the first setiger in *E. valens;* in *E. segregata* even the short outer lateral ones reach the third setiger.

Distribution.—*E. segregata* is known from slope depths from southern California to Panama.

3. *Eunic semisegregata,* new species

Figure 4

Leodice segregata Chamberlin, 1919a, pp. 237–240, pl. 54: fig. 5, partim.

Material.—Off southwestern Mexico, 16°32′00″N, 99°48′00″W, 493 fathoms, green mud, small beam trawl, 11 April 1891, *Albatross* station 3417, two specimens, holotype (Museum of Comparative Zoology, Harvard University), paratype (USNM 19398).

Description.—The holotype is an incomplete specimen with 91 setigers; it is 65 mm long and 7 mm wide with setae. It is evenly grey without any color pattern. The body is cylindrical and only slightly flattened in the posterior end.

The prostomium (Figure 4*c*) is shorter than wide and has a shallow anterior incision, both halves are rounded. The occipital tentacles are inserted in a straight line; the outer lateral ones reach the first setiger; each has three articulations (in the paratype, broken in the holotype). The inner lateral occipital tentacles reach setiger 5; each has four articulations. The median tentacle reaches setiger 7 and has five articulations. The cylindrical first peristomial segment is a little longer than the prostomium; the second peristomial segment is half as long as the first one and as long as the first setiger. The short peristomial cirri are smooth; each reaches the middle of the first peristomial segment.

All setigers have low, transverse presetal and postsetal lobes (Figure 4*d*). The rounded setal lobes are longer than the other lobes. The very thick dorsal cirrus is smooth and blunt in the prebranchial region; the ventral cirrus is shorter than the dorsal one, but

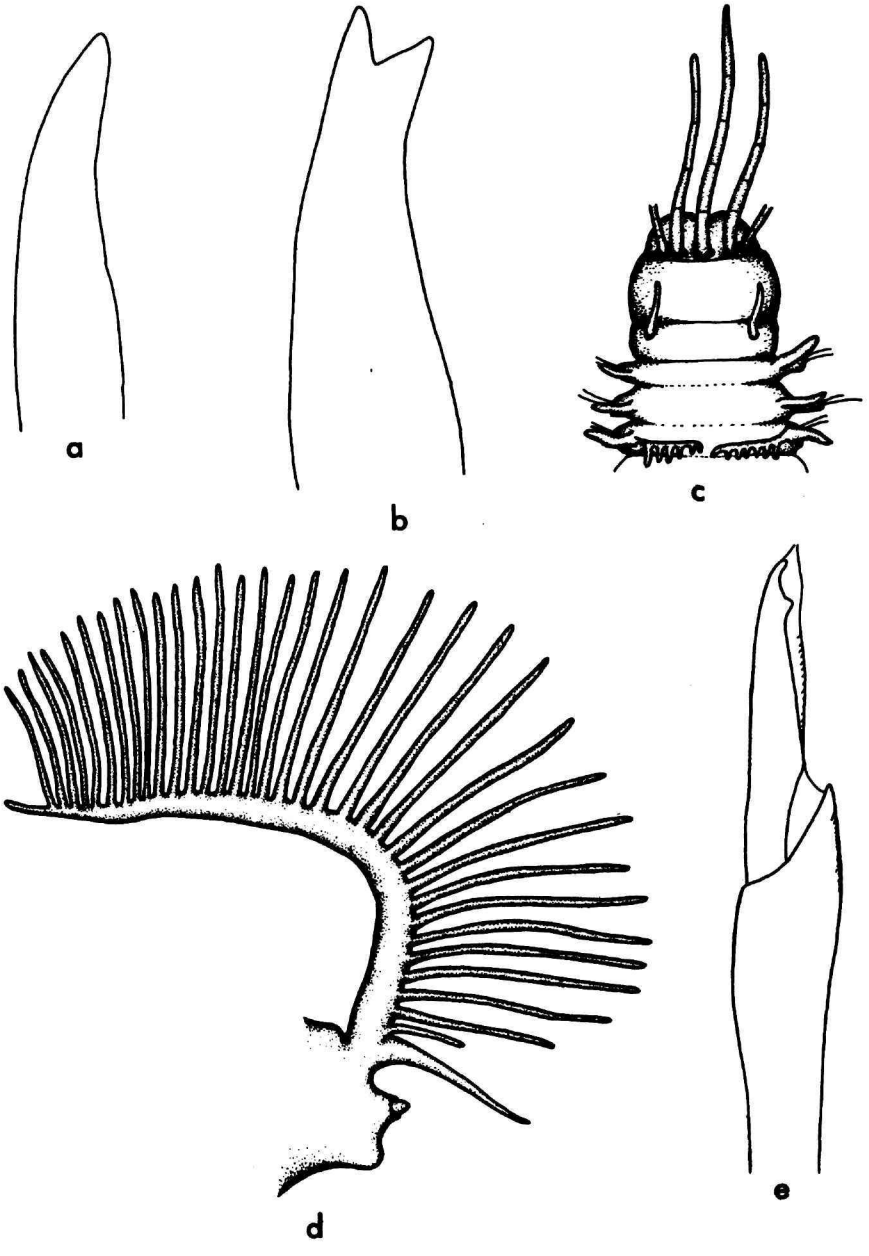

FIGURE 4.—*Eunice semisegregata*, new species (Museum of Comparative Zoology, Harvard University): *a*, aciculum, 70th setiger, ×570; *b*, subacicular hook, 70th setiger, ×570; *c*, anterior end, ×5; *d*, 25th parapodium, ×10; *e*, composite hooded hook, 4th setiger, ×570.

similar in shape. The dorsal cirri are slender in the branchial region; they are similar in shape, but shorter in the postbranchial region. Ventral cirri are basally swollen and lack a distinct tip in the branchial region; a thick, blunt tip reappears in the postbranchial region, and in the last segments present the ventral cirri are similar to those in the prebranchial region.

Branchiae (Figure 4*d*; Chamberlin, 1919a, pl. 54, fig. 5) are present in setigers 3–69; all branchiae are pectinate. The first branchia has six branchial filaments; where best developed each branchia has 34–36 (38 in the paratype) branchial filaments. The branchial stem is slender and the long branchial filaments are thin. The number of branchial filaments is rapidly reduced posterior to setiger 35; only eight or nine filaments are present in the last branchia. The branchiae cover the dorsum completely in most of the branchial region.

The dorsal setal fascicles have slender, limbate setae with one cutting edge serrated. Pectinate setae were not seen, but most setae were broken off; they are assumed to be present. Ventral fascicles have composite, hooded hooks (Figure 4*e*); each hook has a straight appendage with a slightly curved distal tooth and a blunt, conical proximal tooth. The hoods are blunt, but appear worn. Acicula (Figure 4*a*) number two in a parapodium, each is yellow and has a bluntly conical tip which is slightly bent. Subacicular hooks (Figure 4*b*) are present from setiger 51; each is bidentate with both teeth of the same length and shape.

The pharyngeal apparatus has been dissected; the following description is rewritten after remarks about the specimens from this station in Chamberlin (1919a, p. 239). Maxilla II has eight teeth left and nine right; left maxilla III has ten or eleven teeth; the combined right maxillae III + IV have nine teeth; left maxilla IV has nine teeth. Maxillae V and the mandibles were not specifically mentioned by Chamberlin for the specimens from this station.

Discussion.—The specimens here described as *E. semisegregata* were specifically mentioned by Chamberlin (1919a, p. 238). He stated that: "In a paratype from Sta. 3417 the first branchiae, i.e., those of somite V, have numerous branches, but on posterior somites the number gradually decreases." As noted above, the specimens were also mentioned for the differing pharyngeal apparatus.

Eunice semisegregata differs from *E. segregata* in that all branchiae are pectinate in the former; the latter have the first two and the last branchiae single. The character of the first branchiae is not generally a valid specific character; the first simple branchiae are often lost in large specimens; but in species with branchiae from setiger 3, the presence and character of the branchiae are remarkably conservative. This has been shown for five species of *Eunice* from western Mexico (Fauchald, in press).

The peristomial cirri reach the middle of the first peristomial segment in *E. semisegregata* and the middle of the prostomium in *E. segregata*. The dorsal cirri in the first setigers are short and thick in *E. semisegregata* and long and slender in *E. segregata*. The maximal number of branchial filaments is 12–15 (possibly 20–21, see comment above) in *E. segregata* and 34–38 in *E. semisegregata*. The subacicular hooks are present from setiger 51 in *E. semisegregata* and from setiger 36 in *E. segregata*.

Distribution.—*E. semisegregata* is known from one locality off Acapulco, Mexico, in 493 fathoms.

4. *Eunice valens* (Chamberlin, 1919b)

Figure 5

Leodice valens Chamberlin, 1919b, pp. 257–258, pl. 1: figs. 6–8.

Eunice kobiensis.—Åkesson, 1967, pp. 141–192, figs. 1–22 [not *E. kobiensis* McIntosh, 1885].

?*Eunice tridentata*.—Hartman, 1944, pp. 114–115, pl. 7: figs. 145–150, partim [not *E. tridentata* Ehlers, 1905].

Material.—Mendocino, California, collection of A. Agassiz, holotype (MCZ 120) and paratype (MCZ 121).

Description.—The holotype is a complete specimen with 179 setigers; it is 140 mm long and 7 mm wide with setae. It is evenly pink with a slight brown tinge and lacks color pattern. The anterior end of the body is cylindrical; the median and posterior end is slightly flattened dorsally. The anal cirri are as long as the ten last setigers. The paratype has been dried out and consists of several unidentifiable fragments.

The prostomium (Figure 5*b*) is wider than long and has a deep anterior incision; each half is evenly rounded. A pair of black eyes is present posterior to the bases of the outer lateral occipital tentacles. Each of the outer lateral occipital tentacles has five articulations; the inner lateral ones have ten articulations each and the median tentacle has eleven articulations.

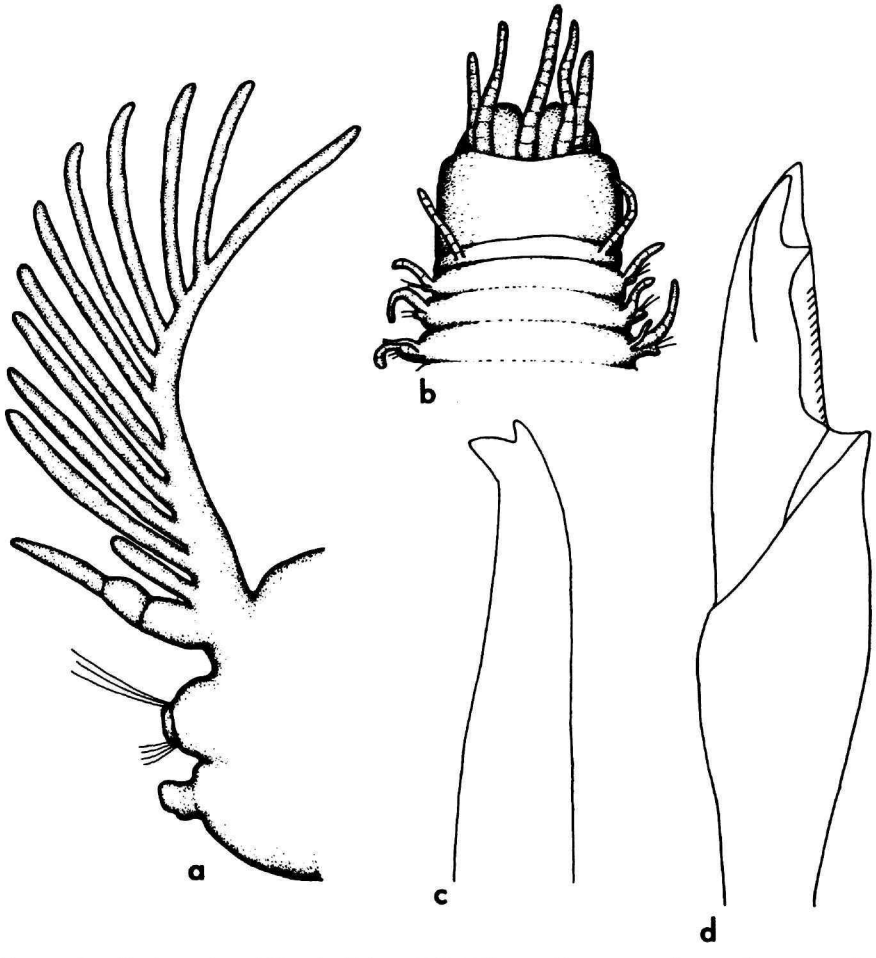

FIGURE 5.—*Eunice valens* (Chamberlin) (MCZ 120): *a*, 17th parapodium, ×18; *b*, anterior end, ×5; *c*, subacicular hook, 150th setiger, ×285; *d*, composite hooded hook, 13th setiger, ×570.

All articles are cylindrical and only faintly marked externally. The outer lateral pair of tentacles reaches the second peristomial segment and are somewhat stouter than the other tentacles. The inner lateral pair reaches the first setiger and the median tentacle reaches the second setiger.

The cylindrical first peristomial segment is twice as long as the first setiger; it projects forward like a collar and covers the bases of the occipital tentacles. The second peristomial segment is only half as long as the first setiger. The peristomial cirri are slender; each has seven or eight articulations and reaches the front edge of the first peristomial segment.

The first setigers have short, transverse presetal lobes; the setal and postsetal lobes are truncate; the setal lobes are a little longer than the presetal ones, but shorter than the postsetal lobes. The parapodia in the branchial region (Figure 5*a*) are similar to the first ones, but the postsetal lobes are reduced to transverse folds in the first branchial segments. The setal lobes become conical and the presetal and postsetal lobes are visible only as low folds in the postbranchial region.

The dorsal cirri are large in the prebranchial region and in the first branchial setigers; they are surpassed by the branchiae where these are fully developed even

if the cirri themselves are not reduced in size. Dorsal cirri in the postbranchial region are again very prominent. Each digitiform, thickset cirrus is divided into two to five irregular articles. The thickset ventral cirri in the prebranchial and early branchial setigers are blunt; farther back the bases become very swollen, but the distinct, blunt tips of the cirri are present in all setigers.

Branchiae (Figure 5*a*) are present in setigers 3–76. The first two and the last eight or nine pairs are simple filaments; all others are pectinate with long, stout branchial filaments. The branchiae are best developed in setigers 15–30; the maximal number of branchial filaments is eleven.

Composite hooded hooks (Figure 5*d*) are found in ventral fascicles in all setigers. They have smooth shafts which are distally enlarged; each appendage is triangular with a slightly curved distal tooth; the proximal tooth is blunt and nearly at right angles with the distal one. The short hoods are blunt and serrated near the bases of the appendages. Smooth, slightly curved capillary setae are found in dorsal fascicles in all parapodia; pectinate setae were not seen. Acicula number three or four in a parapodium; each is light yellow and has a strongly bent, conical tip. Subacicular hooks (Figure 5*c*) are present from setiger 43 to the end of the body. Each is tapering evenly and is light yellow; the proximal tooth is larger than the distal one and only at a slight angle with the axis of the hook.

The description of the pharyngeal apparatus is rewritten from Chamberlin (1919b); it was not dissected in the holotype and the condition of the paratype does not permit confirmation of the description. The mandibles have calcified cutting edges with three rounded teeth each. Maxilla II has six teeth left and eight right; left maxilla III has eight or nine teeth; the combined right maxillae III + IV have eight teeth; left maxilla IV has six teeth. Chamberlin gave no information on the dentition of either maxillae V; his illustration of maxillae I (pl. 1: fig. 8) shows that these are strongly falcate.

Discussion.—*E. valens* resembles *E. biannulata, E. kobiensis,* and *E. websteri.* It differs from *E. biannulata* and *E. websteri* in that the distal teeth of the composite hooks are nearly straight in the former and curved in the two latter. The occipital tentacles are very short in *E. valens,* the longest tentacle, which is the median one, barely reaches the second setiger; the occipital tentacles reach at least setiger 5 in the three other species.

The specimens reported by Åkesson (1967) from San Juan Archipelago, Washington, as *E. kobiensis* had very short occipital tentacles and are here considered to belong to *E. valens.*

Distribution.—*E. valens* is known from the type-locality at Mendocino in northern California and from the San Juan Archipelago, Washington.

5. *Eunice websteri,* new name

Figure 6

Eunice longicirrata Webster, 1884, pp. 318–319, pl. 12: figs. 74–80.

?Leodice longicirrata.—Treadwell, 1921, pp. 11–14, figs. 3–12, pl. 1: figs. 1–4.

Material.—Bermuda, collection of G. Brown Goode, 1876–77, holotype (USNM 4792).

Description.—The holotype is a complete specimen with about 150 setigers; it is about 120 mm long and 4 mm wide with setae. The parapodia of setigers 1–9 and 21–32 on the left side have been removed and are mounted on slides; parapodia from the postbranchial region and the whole posterior end also have been mounted on slides. The measurements given above are estimates of the length and width of the complete specimen. The specimen had been dissected for the pharyngeal apparatus and the illustration of the anterior end is partially reconstructed.

The prostomium (Figure 6*c*) is wider than long with a short, narrow anterior incision; both halves are anteriorly truncate and the lateral margins are nearly straight. The occipital tentacles are inserted in a crescent; all are about equidistant from each other. A pair of black eyes is present posterior to the outer lateral tentacles. The outer lateral occipital tentacles reach the second peristomial segment; each has five or six articulations. The inner lateral tentacles reach setiger 5; each has six or seven articulations. The median tentacle reaches setigers 8 or 9 and has eight articulations. All articles are cylindrical.

The cylindrical first peristomial segment is as long as the prostomium. The second peristomial segment is only one third as long as the first one, but of the same length as the first setiger. The long peristomial cirri are slender; they reach the middle of the prostomium; each has six or seven articulations.

The presetal lobes in the first parapodia (Figure 6*e*) are obliquely truncate; the setal lobes are triangular and the postsetal lobes are low, transverse folds. The branchial parapodia (Figure 6*d*) are similar to the

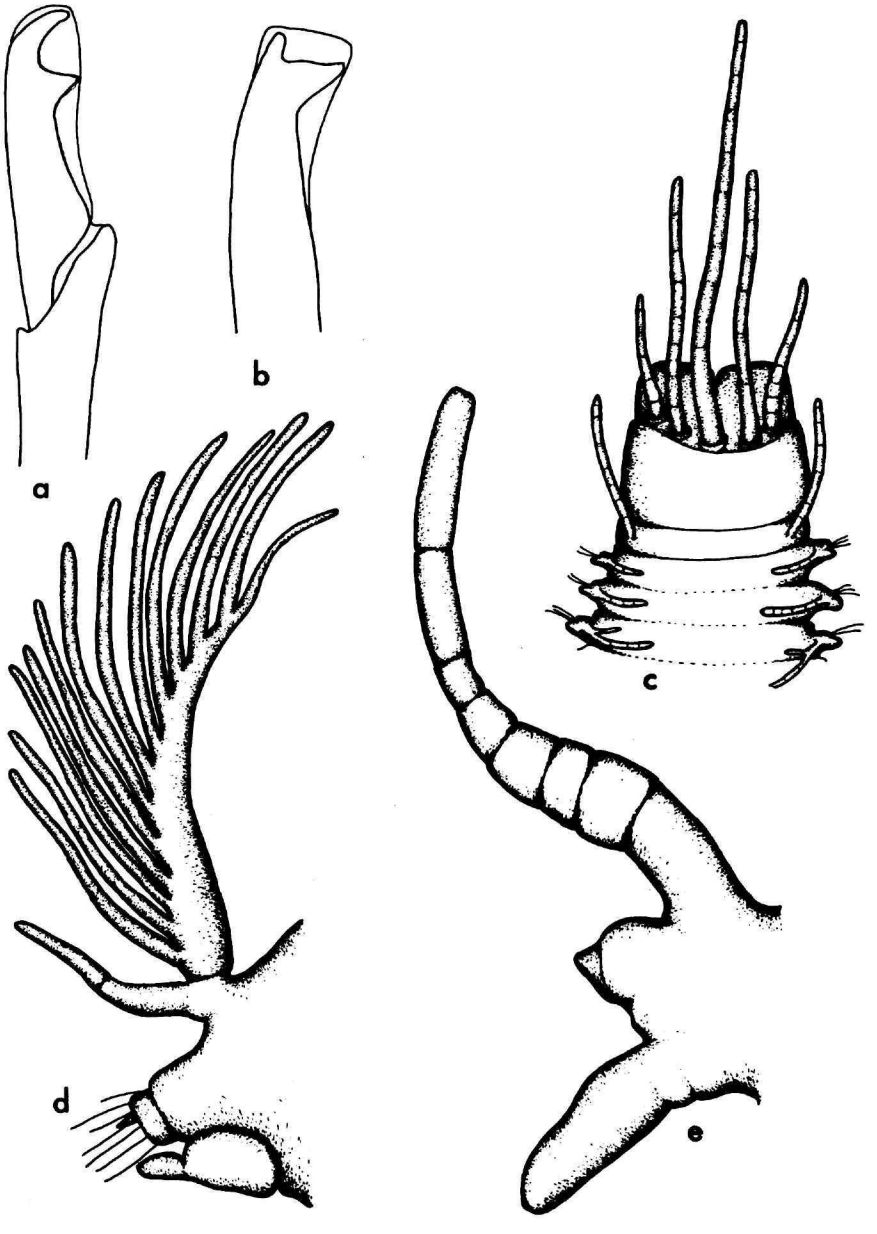

FIGURE 6.—*Eunice websteri*, new name (USNM 4792): *a*, composite hooded hook, first setiger, ×469; *b*, subacicular hook, median setiger, ×192; *c*, anterior end, ×10; *d*, median parapodium, ×25; *e*, second parapodium, ×50.

first ones; the setal lobes become more truncate; but this may be an artifact since the tissue has receded from the acicula which are left bare over a long distance. The dorsal cirri are similar in length and shape in all parapodia, but are most conspicuous in the prebranchial and postbranchial regions. Each of the dorsal cirri in the prebranchial region has seven or eight cylindrical articles; those in the branchial region have one or two articles each. The postbranchial dorsal cirri have four or five articles each. The ventral cirri in the prebranchial and anterior branchial setigers are thick and digitiform; ventral cirri in the posterior branchial and postbranchial regions have distinct basal swellings.

Branchiae (Figure 6*d*) are present on setigers 3–53. The first and the last ten branchiae are single filaments; all others are pectinate. The branchiae are fully developed on setigers 5–33; the maximal number of branchial filaments is fifteen.

Long, slender capillary setae are present in dorsal fascicles, and composite, hooded, bidentate hooks in ventral fascicles in all parapodia. Each hooded hook (Figure 6*a*) has a strongly curved distal tooth and a sharply pointed proximal tooth at right angles to the axis of the appendage; both teeth are similar in size. The hoods are blunt and serrations are absent. Pectinate setae were not seen. Acicula number three or four in a parapodium; each is light yellow and is expanded distally to form a bluntly conical tip. Subacicular hooks (Figure 6*b*) are present from setiger 31; they occur singly in most parapodia, but two hooks are sometimes present. Each is light yellow and has a short distal tooth and a much larger proximal tooth at right angles to the axis of the hook.

The pharyngeal apparatus is in position in the specimen, but the dissection has cut through parts of it so the number of teeth cannot be counted; the jaws appear to be of the usual kind.

Discussion.—The name *E. longicirrata* is preoccupied in the combination *Eunice* (*Nicidion*) *longicirrata* Kinberg (1865, p. 564) which is a synonym of *E.* (*N.*) *cariboea* Grube (see Hartman, 1948, p. 80). The species from Bermuda is renamed here in honor of Dr. G. E. Webster who originally described it. The records by Treadwell (1921) from the West Indies are doubtful; the occipital tentacles were described as articulated and shown in the illustration (pl. 1, fig. 2) as nearly moniliform and the composite hooks (text-fig. 9) were shown to have very short proximal teeth.

Eunice websteri has been confused with at least three of the species treated here, *E. biannulata, E. valens,* and *E. kobiensis;* the relationship between the four species has been discussed above and is tabulated in Table 1.

Distribution.—*E. websteri* is known from Bermuda and possibly from the West Indies. It may be widely distributed in this area, but it has been confused with other species so the total distribution remains unknown.

Literature Cited

Åkesson, B.

1967. The Embryology of the Polychaete *Eunice kobiensis. Acta Zoologica,* 48:141–192, figures 1–22.

Berkeley, E., and C. Berkeley

1939. On a Collection of Polychaeta, Chiefly from the West Coast of Mexico. *The Annals & Magazine of Natural History,* London, series 11, 3:321–346, figures 1–12.

1948. Annelida, Polychaeta Errantia. *Canadian Pacific Fauna,* 9b(1):1–100, figures 1–160.

Chamberlin, R. V.

1919a. The Annelida Polychaeta. *Memoirs of the Museum of Comparative Zoology,* Harvard University, 48:1–514, plates 1–80.

1919b. Pacific Coast Polychaeta Collected by Alexander Agassiz. *Bulletin of the Museum of Comparative Zoology,* Harvard University, 63:251–276, plates 1–3.

Ehlers, E.

1905. Anneliden der Sammlung Schauinsland. Ergebnisse einer Reise nach dem Pacific, Schauinsland 1896–97. *Zoologische Jahrbücher Abt. für Systematik, Ökologie und geographie der tiere,* Jena, 22:281–302, plate 9.

Fauchald, K.

In press. Polychaetous Annelids of the Families *Eunicidae, Lumbrineridae, Iphitimidae, Arabellidae, Lysaretidae* and *Dorvilleidae* from Western Mexico. 350 manuscript pages, 25 plates. *Monographs in Marine Biology,* Allan Hancock Foundation.

Hartman, O.

1939. The Polychaetous Annelids Collected by the Presidential Cruise of 1938. *Smithsonian Miscellaneous Collections,* 98:1–22, figures 1–3.

1944. Polychaetous Annelids, part 5: Eunicea. *Allan Hancock Pacific Expedition,* 10(1):1–238, plates 1–18.

1948. The Marine Annelids Erected by Kinberg with Notes on Some Other Types in the Swedish State Museum. *Arkiv för Zoologi,* Stockholm, 42A(1): 1–137, plates 1–18.

Imajima, M., and Hartman, O.
1964. The Polychaetous Annelids of Japan. *Allan Hancock Foundation Publications, Occasional Paper,* 26:1–452, plates 1–38.

Izuka, A.
1912. The Errantiate Polychaeta of Japan. *The Journal of the College of Science, Imperial University of Tokyo, Japan,* 30(2):1–262, plates 1–24.

Kinberg, J. G. H.
1865. Annulata Nova. *Öfversigt af Kongl. Vetenskaps-Akademiens Förhandlingar,* Stockholm, 21:559–574.

McIntosh, W. C.
1885. Report on the Annelida Polychaeta Collected by H.M.S. "Challenger" during the Years 1873–76. In *Reports on the Scientific Research of the "Challenger," Zoology,* 12:1–554, plates 1–55 and 1A–39A.

Moore, J. P.
1903. Polychaeta from the Coastal Slope of Japan and from Kamchatka and Bering Sea. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 55:401–490, plates 23–27.
1904. New Polychaeta from California. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 56:484–503, plates 37–38.

Treadwell, A. L.
1921. Leodicidae of the West Indian Region. *Publication, Carnegie Institution of Washington,* 293: 1–131, figures 1–467, plates 1–9.
1923. Polychaetous Annelids from Lower California with Description of New Species. *American Museum Novitates,* New York, 74:1–11, figures 1–8.

Webster, H. E.
1884. Annelida from Bermuda. *United States National Museum Bulletin,* 25:305–327, plates 7–12.

U.S. GOVERNMENT PRINTING OFFICE: 1969 O—329-129

Publication in *Smithsonian Contributions to Zoology*

Manuscripts for serial publications are accepted by the Smithsonian Institution Press, subject to substantive review, only through departments of the various Smithsonian museums. Non-Smithsonian authors should address inquiries to the appropriate department. If submission is invited, the following format requirements of the Press will govern the preparation of copy. (An instruction sheet for the preparation of illustrations is available from the Press on request.)

Copy must be typewritten, double-spaced, on one side of standard white bond paper, with 1½" top and left margins, submitted in ribbon copy with a carbon or duplicate, and accompanied by the original artwork. Duplicate copies of all material, including illustrations, should be retained by the author. There may be several paragraphs to a page, but each page should begin with a new paragraph. Number consecutively all pages, including title page, abstract, text, literature cited, legends, and tables. The minimum length is 30 pages of typescript and illustration.

The *title* should be complete and clear for easy indexing by abstracting services. Taxonomic titles will carry a final line indicating the higher categories to which the taxon is referable: "(Hymenoptera: Sphecidae)." Include an *abstract* as an introductory part of the text. Identify the *author* on the first page of text with an unnumbered footnote that includes his professional mailing address. A *table of contents* is optional. An *index,* if required, may be supplied by the author when he returns page proof.

Two *headings* are used: (1) text heads (boldface in print) for major sections and chapters and (2) paragraph sideheads (caps and small caps in print) for subdivisions. Further headings may be worked out with the editor.

In *taxonomic keys,* number only the first item of each couplet; if there is only one couplet, omit the number. For easy reference, number also the taxa and their corresponding headings throughout the text; do not incorporate page references in the key.

In *synonymy,* use the short form (taxon, author, date, page) with a full reference at the end of the paper under "Literature Cited." Begin each taxon at the left margin with subsequent lines indented about three spaces. Within a taxon, use a period-dash (.—) to separate each reference. Enclose with square brackets any annotation in or at the end of the taxon. For *references within the text,* use the author-date system: "(Jones, 1910)" or "Jones (1910)." If the reference is expanded, abbreviate the data: "Jones (1910, p. 122, pl. 20: fig. 1)."

Simple *tabulations* in the text (e.g., columns of data) may carry headings or not, but they should not contain rules. Formal *tables* must be submitted as pages separate from the text, and each table, no matter how large, should be pasted up as a single sheet of copy.

Illustrations (line drawings, maps, photographs, shaded drawings) can be intermixed throughout the printed text. They will be termed *Figures* and should be numbered consecutively; however, if a group of figures is treated as a single figure, the individual components should be indicated by lowercase italic letters on the illustration, in the legend, and in text references: "Figure 9*b*." If illustrations (usually tone photographs) are printed separately from the text as full pages on a different stock of paper, they will be termed *Plates,* and individual components should be lettered (Plate 9*b*) but may be numbered (Plate 9: figure 2). Never combine the numbering system of text illustrations with that of plate illustrations. Submit all legends on pages separate from the text and not attached to the artwork.

In the *bibliography* (usually called "Literature Cited"), spell out book, journal, and article titles, using initial caps with all words except minor terms such as "and, of, the." (For capitalization of titles in foreign languages, follow the national practice of each language.) Underscore (for italics) book and journal titles. Use the colon-parentheses system for volume, number, and page citations: "10(2):5–9." Spell out such words as "figures" and "plates" (or "pages" when used alone).

For *free copies* of his own paper, a Smithsonian author should indicate his requirements on "Form 36" (submitted to the Press with the manuscript). A non-Smithsonian author will receive 50 free copies; order forms for quantities above this amount with instructions for payment will be supplied when page proof is forwarded.

SMITHSONIAN INSTITUTION
WASHINGTON, D.C.