

THE LUMBRINERIDS (ANNELIDA: POLYCHAETA)  
COLLECTED IN TWO NORTHWESTERN ATLANTIC  
SURVEYS WITH DESCRIPTIONS OF A  
NEW GENUS AND TWO NEW SPECIES

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*Abstract.*—Species of *Abyssoninoe*, *Eranno*, *Lumbrinerides*, *Lumbrineris*, *Paraninoe*, and *Scoletoma* (Polychaeta: Lumbrineridae) from the northwestern Atlantic are reviewed on the basis of numerous specimens collected in two long-term surveys off the east coast of the United States. The genus *Lumbrineris* Blainville is restricted; the genus *Scoletoma* Blainville is reinstated and emended; and the new genus *Lumbricalus* is erected. Two species, *Abyssoninoe winsnesae* and *Eranno petersenae*, are new to science. *Lumbrineris cingulata* (Ehlers) is newly recorded from this area and redescribed. *Scoletoma acicularum* (Webster and Benedict) is removed from synonymy with *Scoletoma fragilis* (O. F. Müller), reinstated and redescribed. *Scoletoma fragilis* is redescribed from northwestern Atlantic material. The description of *Scoletoma hebes* (Verrill) is supplemented and compared with the closely related *Scoletoma verrilli* (Perkins). *Paraninoe brevipes* (McIntosh) is redescribed and compared with *Ninoe nigripes* Verrill. *Lumbrinerides acuta* (Verrill) and *Scoletoma tenuis* (Verrill) are discussed. Key(s) are provided for the known species of *Eranno*, and for the reported northwestern Atlantic species of *Lumbrineris* and *Scoletoma*. The species of *Abyssoninoe*, *Paraninoe*, and *Lumbricalus* are discussed.

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Problems arise in identifying specimens of *Lumbrineris* due to the large number of described species, the lack of type specimens for some of the earliest described species, incomplete descriptions by early authors, numerous instances where identification is based on tradition rather than type, and the disinclination of many to examine the pharyngeal structures. Also, at the species level there is size-dependent variability and, in some cases, variability between specimens of similar size.

Various attempts have been made to separate the known species of lumbrinerids into manageable groups. Kinberg (1865) suggested separating lumbrinerids using the dentition of maxilla III. Hartman (1944a) separated some 70 species of *Lumbrineris* s. l. first by whether the individual had composite or simple hooks, or composite spin-

igers, in the anterior parapodia; secondly by length and shape of posterior postsetal lobes; and then by color of the aciculae. Fauthald (1970) classified some 143 lumbrinerids first by whether they had composite hooks (and simple setae or composite spinigers in anterior parapodia), simple hooks or no hooks; second by whether they had bidentate or multidentate hooks; and third by the dentition of maxilla III.

Orensanz (1973) separated species from the axial genus *Lumbrineris* using autapomorphisms. Species with bidentate hooded hooks and simple setae were separated into the genera *Lumbrineriopsis* Orensanz, 1973 and *Lumbrinerides* Orensanz, 1973, with the former having denticulations or articulate spines on maxilla IV, and the latter lacking them. The remaining lumbrinerids were placed into four groups by setal composi-

tion. Miura (1980) further separated the known species of *Lumbrinerides* by the dentition on the inner edge of maxilla I, and *Lumbrineriopsis* by the color of aciculae. Hartmann-Schröder (1979) erected the genus *Arabelloneris* for those species without hooded hooks. Levenstein (1977) established the genus *Paraninoe* for those species having a single branchial filament on the postsetal lip of the parapodium. Orensanz (1990) further restricted '*Lumbrineris*' by differences in the maxillae, establishing the genus *Abyssoninoe* for those species with the maxilla V completely fused to maxilla IV (Fig. 3k), and reinstating and emending the genus *Eranno* Kinberg, 1865 for those species with a long strap-like basal support or plate between maxilla II and maxilla I (Fig. 4k), and with maxilla V partially fused to maxilla IV.

Following the natural system of separation of lumbrinerid genera by autapomorphisms, I here propose the following: to restrict the genus *Lumbrineris* Blainville, 1828 to species with composite hooks, simple hooks and simple limbate setae; to resurrect the genus *Scoletoma* Blainville, 1828 for species with simple hooks and simple limbate setae; and to erect the genus *Lumbricalus* for species with composite spinigers, composite hooks, simple hooks, and simple limbate setae.

*Characters of diagnostic value in the Lumbrineridae.*—The major diagnostic characters used to separate the lumbrinerids within a genus are: the dentition of maxillae II, III and IV (maxilla II has true teeth with internal ducts, while the teeth of maxillae III and IV are often expansions of the incisive border); the color of the aciculae; the length of the posterior postsetal lobe; the setiger on which simple hooks start in mature specimens; and the shape of maxilla IV (consistent in our species) and how it is combined with maxilla V (also known as lateral support). For purposes of illustration, maxilla IV and maxilla V are drawn on the same plane, but in reality they are

part of a three-dimensional structure. Maxilla IV is a single curved piece over a muscular ridge and maxilla V is a continuation around the ridge or semicircle.

Other important characters include: the distribution and position within the parapodium of the various setae, the shape of the maxillary carriers, and the shape of the mandibles.

The number of anal cirri has been used in the literature as a means of identification. Examination of complete specimens from our surveys indicates this is frequently a size-dependent variability.

Three of our lumbrinerids have long, slender setae in the median parapodia. Hartman (1942a:117) suggests this may be an adaptation to life at great depth or to characteristics of the substratum. It is a feature easily overlooked and frequently these setae are either broken off or still present on only a few setigers.

Vascular loops should not be used as a means of identification. A vascular loop can be seen when the postsetal lobe (and sometimes the presetal lobe) is examined against background lighting, i.e., the loop shows up as lines that are lighter in color than the parapodial background. Vascular loops were found irregularly in the posterior and median regions in some mature species and can be seen in some individuals immediately and in others not until they have been preserved for a number of years. Also, these loops are more readily seen if preserved in an alcohol solution containing glycerin.

*Material and methods.*—Collections came from two extensive benthic surveys conducted by the National Oceanic and Atmospheric Administration: a semiannual sampling of 18–28 stations from Cape Hatteras to Nova Scotia as part of the Northeast Monitoring Program (NEMP) from 1978 to 1985 (5 grabs per station), and an annual monitoring of 44 or more stations in the New York Bight (NYB) from 1980 to 1985 (2 grabs per station). Samples were taken with a 0.1 m<sup>2</sup> Smith-McIntyre grab. Plastic

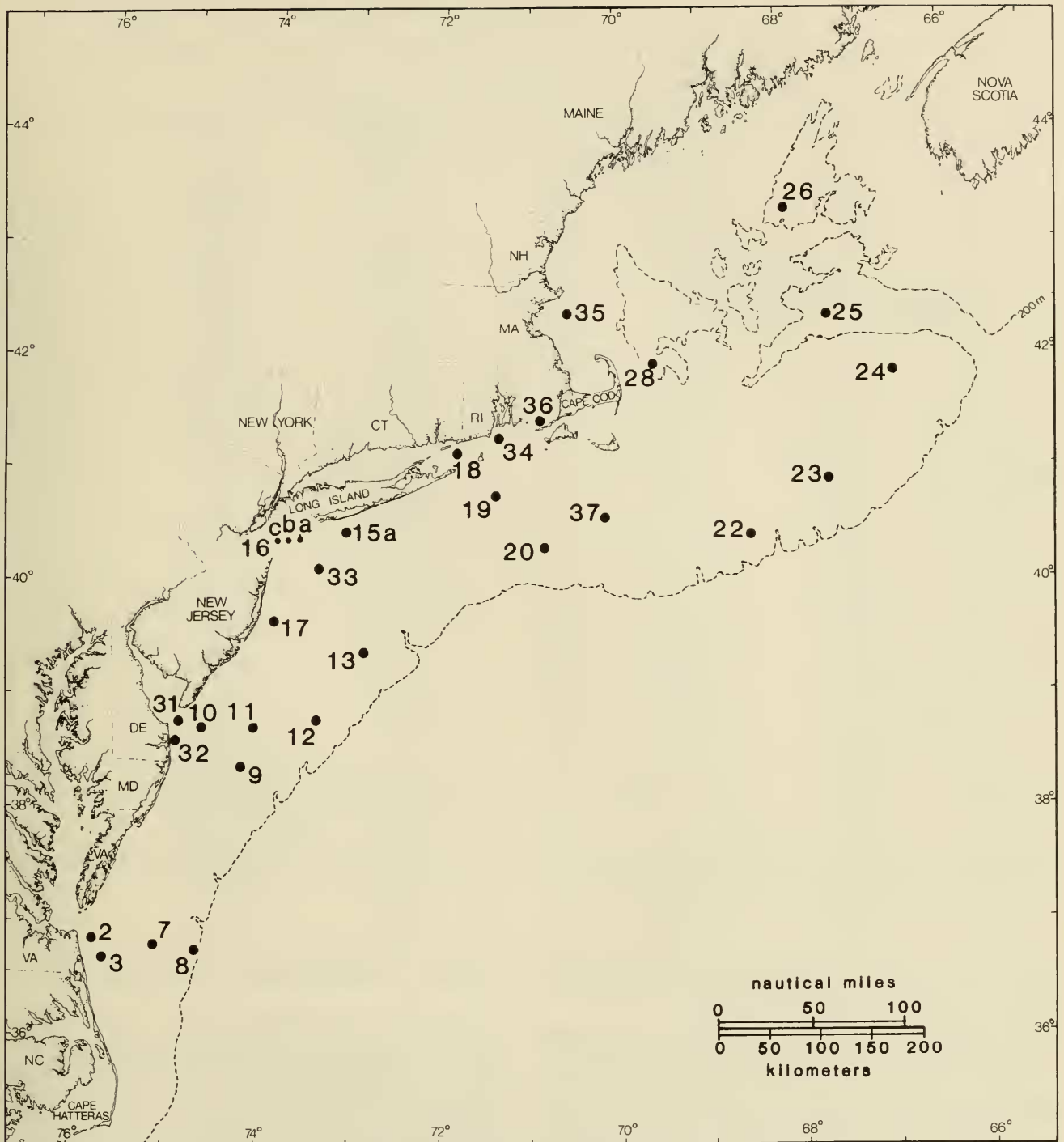


Fig. 1. Benthic stations Northeast Monitoring Program (NEMP).

tubes of 2.7 cm inner diameter were used to subsample one grab from each station for analysis of sediment grain size, organic carbon, nitrogen, and heavy metals. The remainder of the grab was rinsed through a 0.5 mm sieve, fixed in 10% buffered formalin with Rose Bengal, and transferred within one to three days to 70% ethanol with 5% glycerin. Wet weight biomass was de-

termined by blot-drying each taxon on absorbent toweling for three minutes and weighing to the nearest mg on an electronic balance.

To date there are 1108 processed samples from the NEMP survey and 441 samples from the NYB survey. Figures 1 and 2 show the station locations. Tables 1 and 2 list station coordinates, depths, mean sediment

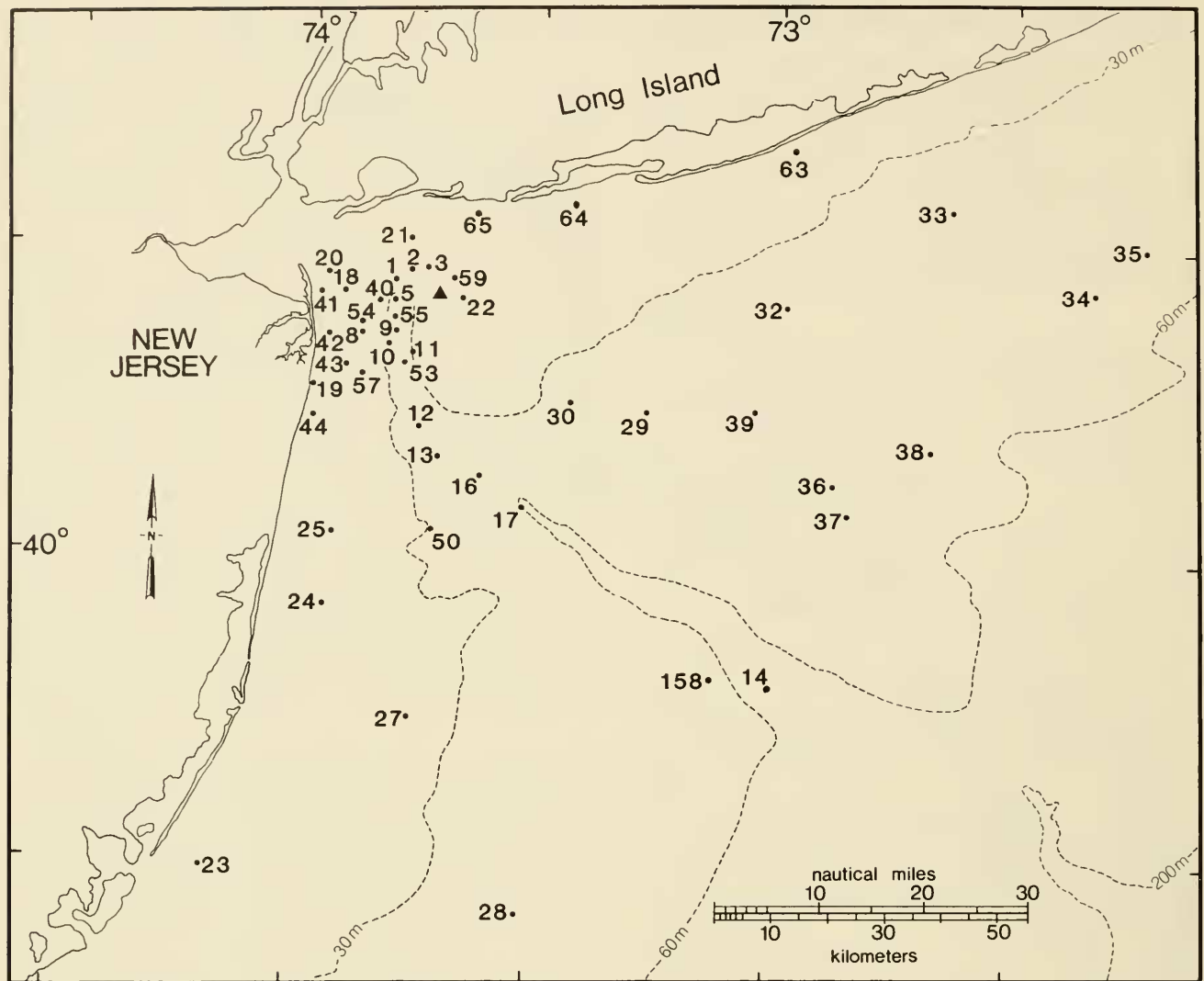


Fig. 2. Benthic stations New York Bight (NYB).

grain sizes, total organic carbon (TOC) and total Kjeldahl nitrogen (TKN).

Abbreviations used in the text and figures are as follows: bS, basal support; M, maxilla; mC, maxillary carriers; lS, lateral support; BNEMRL, Battelle New England Marine Research Laboratory; USNM, United States National Museum; ZMUC, Zoological Museum University of Copenhagen; ZMUO, Zoological Museum University of Oslo; ABF, author's personal collection.

The body width is measured on the 15th setiger (excluding parapodia) in mature species and on the 4th in juveniles. The deposit location for specimens not listed in the text is the NOAA Biological Sample Room at the Sandy Hook Laboratory, Highlands, New Jersey.

#### Family Lumbrineridae Malmgren, 1867

*Diagnosis.*—Eunicemorphs with maxillary apparatus of subprionognath structure (maxillae disposed in a semi-circle) to labidognath structure (maxillae in parallel rows). Maxillary carriers short. Five pairs of symmetrical maxillae. Maxilla I forceps-like, with pair of bridles (lateral supports) attached to its outer margin. Maxillae mineralized with calcite. Mandibles fused along symphysis, with distal calcified plate and concentric growth rings. Prostomium rounded, with 3 short occipital antennae in its pleiomorphic condition. Parapodia sub-biramous, without ventral cirri, with simple limbate setae (Orensanz 1990:72).

In his 1990 monograph on the Antarctic eunicemorphs, Orensanz compared the sys-

Table 1.—Benthic Stations Northeast Monitoring Program.

Station no.	Latitude north	Longitude west	Depth (m)	Mean grain size (phi units)	TOC	TKN
					(mg/g dry wt.)	
2	36°49.8'	75°50.3'	15	1.8	3.2	0.27
3	36°33.7'	75°48.0'	20	2.56	1.38	0.22
7	36°47.5'	75°11.7'	33	1.76	0.81	0.14
8	36°40.7'	74°45.1'	80	1.57	0.78	0.07
9	38°17.3'	74°17.7'	50	1.72	1.54	0.13
10	38°44.5'	74°48.3'	23	1.61	0.76	0.10
11	38°44.6'	74°02.1'	50	2.5	1.61	0.18
12	38°46.3'	73°30.7'	70	1.95	1.89	0.21
13	39°20.4'	72°58.9'	65	1.68	2.28	0.43
15A	40°25.6'	73°11.1'	30	1.43	0.71	0.11
16A	40°25.0'	73°44.0'	25	1.86	2.42	0.21
16B	40°25.0'	73°46.0'	27	2.73	11.33	0.90
16C	40°25.0'	73°52.0'	22	2.01	3.04	0.26
17	39°35.8'	73°54.2'	28	1.29	1.03	0.08
18	41°13.5'	71°51.1'	44	3.59	6.21	0.90
19	40°41.4'	71°21.0'	62	2.05	3.01	0.46
20	40°15.2'	70°49.1'	120	6.16	15.93	1.98
22	40°30.0'	68°00.0'	110	2.52	2.76	0.41
23	40°58.0'	67°33.1'	70	2.19	1.29	0.21
24	42°17.1'	67°31.3'	260	0.97	0.48	0.06
25	42°17.0'	67°31.3'	244	2.27	3.73	0.44
26	43°14.5'	67°59.1'	51	7.732	18.67	2.73
28	41°50.6'	69°30.0'	187	7.93	13.09	2.11
31	38°44.8'	75°01.0'	25	1.14	8.31	1.28
32	38°31.4'	74°57.9'	15	1.4	0.74	0.08
33	40°01.4'	73°25.6'	62	3.31	8.35	1.03
34	41°24.0'	71°25.0'	32	5.6	9.77	1.20
35	42°19.0'	70°36.0'	60	5.27	8.6	1.06
36	41°29.0'	70°53.0'	23	6.78	17.92	2.19
37	40°29.7'	70°12.2'	60	4.77	10.28	1.28

tematics and phylogeny of families by their complex maxillomandibular pharyngeal armature. He considered as secondary losses in the family Lumbrineridae: the loss of maxillae V in some genera, the loss of antennae in most genera, and the notopodia reduced or absent (uniramous parapodia) in most genera.

#### Genus *Abyssoninoe* Orensanz, 1990

*Type species.*—*Lumbriconereis abyssorum* McIntosh, 1885; designated by Orensanz, 1990.

*Diagnosis.*—Prostomium conical. Parapodia uniramous with simple limbate setae and simple, multidentate hooded hooks.

Hooded hooks may have a transitional phase, evolving through anterior setigers from rounded tip limbate setae, to faintly outlined hooks, to clearly defined hooks and teeth. M V completely fused to M IV, forming a broad semicircular plate with a tooth protruding from the middle of the inferior border. M III unidentate. Aciculae yellow. 1–2 pairs of anal cirri, if 2 pair dorsal cirri longer than ventral.

#### *Abyssoninoe winsnesae*, new species

Fig. 3

*Material examined.*—Northwestern Atlantic, Off NE U.S.A.: NEMP Sta. 20, 15 July 1981 (1 ABF); NEMP Sta. 25, 2 May

Table 2.—Benthic Stations New York Bight.

Station no.	Latitude north	Longitude west	Depth (m)	Mean grain size (phi units)	TOC	TKN
					(mg/g dry wt.)	
1	40°26.9'	73°48.1'	27	3.71	9.4	1.1
2	40°28.2'	73°45.8'	29	3.35	10.1	1.4
3	40°28.0'	73°43.8'	28	3.43	7.1	0.83
5	40°24.9'	73°48.0'	35	4.19	16.0	1.9
8	40°21.8'	73°51.6'	24	2.37	34.0	1.5
9	40°21.6'	73°47.8'	36	3.49	13.0	1.5
10	40°20.2'	73°49.1'	61	-0.24	1.6	0.17
11	40°19.1'	73°45.8'	31	3.3	5.1	0.71
12	40°12.8'	73°44.0'	38	3.29	5.5	0.70
13	40°09.8'	73°41.9'	56	4.25	11.0	1.8
14	39°47.3'	72°59.0'	74	2.01	4.9	0.73
16	40°07.6'	73°36.8'	71	4.68	15.0	2.2
17	40°05.4'	73°31.3'	73	3.62	11.0	1.5
18	40°25.0'	73°53.8'	24	2.2	14.0	1.1
19	40°16.0'	73°57.8'	14	1.76	0.86	0.15
20	40°27.9'	73°56.0'	12	1.96	0.95	0.17
21	40°31.1'	73°45.9'	21	3.15	12.0	1.5
22	40°25.0'	73°39.8'	24	3.07	2.4	0.36
23	39°29.9'	74°10.1'	16	1.01	0.46	0.09
24	39°55.0'	73°55.8'	18	-0.52	1.8	0.12
25	40°01.9'	73°55.1'	19	0.26	0.49	0.08
27	39°44.7'	73°44.9'	26	1.21	0.58	0.10
28	39°25.5'	73°30.6'	40	2.27	0.82	0.13
29	40°14.3'	73°15.9'	38	1.09	0.63	0.13
30	40°14.8'	73°25.1'	34	1.86	0.81	0.16
32	40°24.2'	72°58.3'	38	1.19	0.51	0.14
33	40°34.1'	72°37.8'	40	2.37	1.8	0.29
34	40°25.8'	72°19.8'	54	1.77	3.4	0.46
35	40°30.2'	72°13.1'	55	2.43	3.9	0.69
36	40°08.1'	72°51.6'	56	1.19	0.81	0.15
37	40°04.9'	72°50.2'	54	1.41	1.0	0.17
38	40°10.7'	72°40.3'	56	1.05	1.1	0.17
39	40°14.3'	73°02.0'	42	1.42	0.79	0.12
40	40°24.9'	73°49.7'	29	3.35	12.0	1.5
41	40°25.0'	73°56.8'	21	1.25	0.3	0.05
42	40°21.2'	73°56.6'	13	0.27	3.4	0.36
43	40°18.9'	73°53.7'	20	-0.19	1.1	0.12
44	40°13.0'	73°57.8'	19	-0.2	2.6	0.17
63	40°39.5'	73°00.0'	12	1.04	0.8	0.02
64	40°35.5'	73°22.0'	11	2.28	0.5	0.02
65	40°33.2'	73°37.5'	11	-0.61	0.86	0.03
158	39°46.2'	73°08.2'	48	0.86	1.3	0.03

1978 (4 ABF); NEMP Sta. 28, 17 Dec 1980 (28 ABF), 20 Jul 1981 (1 paratype USNM 146097, 45 paratypes ZMUO, 155 ABF), 28 Jan 1982 (29 paratypes USNM 146098, 25 ABF), 5 Jul 1983 (holotype USNM 146099, 4 paratypes USNM 146100, 1

USNM 146101, 76 ABF), 4 July 1984 (26 paratypes ZMUC, 42 ABF); NEMP Sta. 35, 21 Jul 1981 (5 ABF), 29 Jan 1982 (1 ABF).

*Description.*—Preserved material colorless to light tan, except for single specimen with transverse brown stripe across each se-

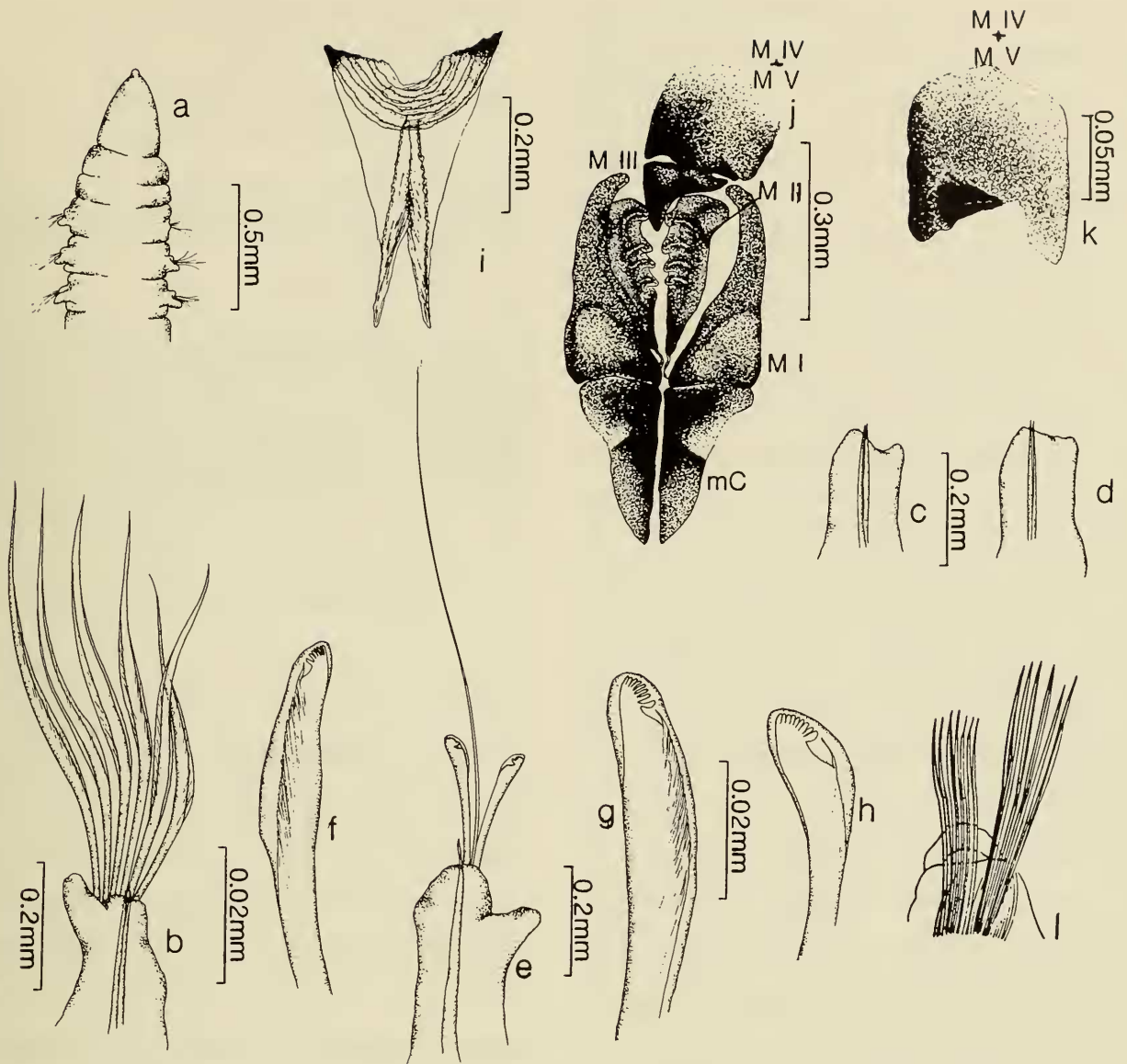


Fig. 3. *Abyssoninoe winsnesae*: a, Prostomium; b, Left parapodium 1; c, Parapodium 22, hooks and setae omitted; d, Parapodium 37, hooks and setae omitted; e, Parapodium 52; f, Hooded hook from parapodium 14; g, Hook from parapodium 47; h, Hook from parapodium 79; i, Mandibles; j, Maxillae; k, Left M IV fused with lateral support, dorsolateral view. *A. hibernica* (McIntosh, 1903): 1, Parapodium 1 (from McIntosh 1910, pl. 74, fig. 1).

tiger, and setiger more beadlike in anterior region (USNM 146101). Largest specimen (incomplete) 22 mm long, 1.1 mm wide, with 51 setigers. Largest whole specimen 13 mm long, 0.75 mm wide, with 102 setigers. Prostomium (Fig. 3a) longer than wide, acorn-shaped with mammiform extension of prostomium in freshly preserved material, with prostomium extension becoming less distinct after being preserved 6–12 months. Peristomial segments similar in width to first setiger, each about as long as first setiger. Body width uniform to about

setiger 64, then tapering towards posterior end; setigers wider than long anteriorly, becoming moniliform posteriorly. Postsetal lobes of anterior parapodia small, conical to setiger 8–12 (Fig. 3b); decreasing in size, not exceeding parapodium, appearing mitten-shaped (Fig. 3c); median parapodia without a distinct shape (Fig. 3d), then again appearing mitten-shaped; posterior lobes small, conical. Presetal lobes not distinguishable. 1 or 2 pairs of anal cirri: if 2 pairs, long dorsal and short ventral cirri. Pygidium rounded anal disc in a juvenile 4.2 mm

long by 0.3 mm wide with 38 setigers. Anterior parapodia with 5–6 (rarely 7–8) bilimbate setae, single superior seta longest, others of random length. Bilimbate setae number decreasing after setiger 8, totally lacking after setiger 20. From about setiger 17–35 (22–52 in large ovigerous female) parapodia with 1–2 very long, slender, capillary setae with whiplike tips, setae twice as long as anterior bilimbate setae (Fig. 3e). Simple hooded hooks starting on setiger 8–12, with 1–3 per parapodium. Hooks slender, of medium length in anterior setigers (Fig. 3f) becoming wider and more elongated in median region (Fig. 3g), bulbous posteriorly (Fig. 3h). Each hook with 6–8 teeth of equal size, with main fang only slightly larger. Aciculae yellow, 3 present in anterior parapodia decreasing to 1 in posterior parapodia, each with long, thin tip projecting through parapodial wall.

Mandibles translucent, fused for two thirds of their length (Fig. 3i). Maxillary apparatus of medium hardness. Maxillary carriers broad, slightly constricted in middle, permanently divided; M I base broad, tips falcate; M II with 4 (rarely 3) teeth, with space between distal teeth; M III unidentate; M IV large, with a short conical tooth at fusion with M V (Fig. 3j). M V completely fused to M IV, appearing as broad semicircular plate with tooth protruding from middle of inferior border (Fig. 3k).

*Remarks.*—In addition to *A. winsnesae*, the genus *Abyssoninoe* includes the following species:

*Lumbriconereis abyssorum* McIntosh, 1885; Antarctic, Peru-Chile trench off Chile, fjords of New Zealand and Norway, Gulf of Gascogne, off Congo, and Mediterranean Sea; 274–6000 m.

*Lumbriconereis hibernica* McIntosh, 1903; Clyde Sea; 49–70 m (Winsnes, pers. comm.).

*Lumbrineris galathea* Knox & Green, 1972; New Zealand; 23–1000 m.

*Lumbrineris scopa* Fauchald, 1974; Har-

dangerfjorden, fjords of W Norway and Trondelag; 200–395 m.

*Lumbrineris scopa aequilobata* Winsnes, 1981; fjords of W Norway and Trondelag; 20–340 m.

*Lumbrineris* cf. *scopa* (Miura, 1980); Bay of Biscay, off Congo, and Mediterranean Sea; 1163–2742 m.

All the known species of *Abyssoninoe* have a unidentate M III and yellow aciculae. *Abyssoninoe abyssorum* has transitional hooded hooks starting on setiger 1, with the teeth becoming clearly defined by setiger 10–18; 4 teeth on M II; and the postsetal lobes are short and conical throughout. Orensanz (1990:76) examined *L. cf. scopa* sensu Miura and placed it in synonymy with *A. abyssorum*. He considers *A. galathea* to be a presumable synonym of *A. abyssorum*, but the type material was not available for study. *Abyssoninoe scopa* has transitional hooks becoming clearly defined by setiger 20, 5 teeth on M II, and long postsetal lobes posteriorly. *Abyssoninoe scopa aequilobata* has transitional hooks becoming clearly defined by setiger 15, 5 teeth on M II, and bilabiate parapodia posteriorly. *Abyssoninoe winsnesae* is closest to *A. hibernica*. Both have hooks starting in the same area (*A. winsnesae* setigers 8–12 and *A. hibernica* 10–16, see Clark 1952:11), 4 teeth on M II, and very long, slender capillary setae in some of the median setigers. However, *A. hibernica* has low, gently rounded, triangular postsetal lobes in the anterior setigers, instead of small conical ones; and the anterior parapodia have two setal groups with the superior group longer than the inferior (copied as Fig. 3l), instead of a longest superior seta and the others of random length.

*Distribution.*—Gulf of Maine to 150 km south of Rhode Island; 110–224 m. Grain size range from granular to coarse clay; greatest numbers in fine sand. TOC values from 0.8–14.9 mg/g.

*Etymology.*—This species is named in honor of Dr. Inger M. Winsnes in recog-



dition of her scientific papers on the family Lumbrineridae.

Genus *Eranno* Kinberg, 1865

*Type species.*—*Eranno bifrons* Kinberg, 1865; reinstated and emended by Orensanz, 1990.

*Diagnosis.*—Prostomium conical. Parapodia uniramous with simple limbate setae and simple, multidentate hooded hooks. Mandible shafts long. M II proportionally short (about ½ the length of M I), connected to M I by broad basal supports or plates. M V partially fused to M IV.

*Eranno petersenae*, new species

Fig. 4

*Material examined.*—Northwestern Atlantic, Off NE U.S.A.: NEMP Sta. 19, 15 Jul 1980 (5 ABF), 27 Jan 1982 (1 paratype USNM 146102, 7 ABF); NEMP Sta. 20, 27 Sep 1978 (1 ABF), 10 Dec 1980 (1 ABF), 15 Jul 1981 (holotype USNM 146103).—Northwestern Atlantic, Off New Jersey (1 paratype USNM 146104): coll. BNEMRL, Duxbury, Massachusetts, BNEMRL *Lumbrineris* sp. 2, B. Hilbig ID.

*Description.*—Preserved material light tan to pinkish tan, slightly iridescent. Largest ovigerous female (incomplete) 78 mm long, 2 mm wide, with 138 segments. Largest anterior fragment 2.5 mm wide. Prostomium (Fig. 4a) short, conical, about as long as wide. Peristomial segments similar in length to setiger 1 and only slightly narrower. Body width uniform to about setiger 87, then tapering posteriorly; anterior setigers much wider than long, becoming subequal. Postsetal lobes of anterior parapodia low, obliquely truncate, flaplike to about setigers 18–21 (Fig. 4b); narrowing and becoming obliquely conical in median parapodia (Fig. 4c); digitate and elongated in posterior ones. Presetal lobes low, round, wider than postsetal lobes, with faint notopodial rudiment in anterior and median setigers; digitate, shorter than postsetal lobe in posterior ones,

forming a bilabiate parapodium (Fig. 4d). Two small specimens with single lobe pygidia.

Anterior parapodia with up to 11 bilimbate setae, greatest numbers of setae occurring on setigers 7–11, setae less numerous after setiger 11 (1–2), disappearing by setigers 60–70. Setiger 9 with 9 bilimbate setae, 9 hooded hooks followed by 2 bilimbate setae. Specimens 2 mm wide with one or more long, slender bilimbate setae with whiplike tips on setigers 22–67 (17–96). Setiger 45 with single short seta, 2–3 long, slender setae, and 2–3 bulbous hooks. Slender, long bladed hooks present from setiger 1, hooks bulbous in median and posterior setigers. All hooks with a subdivided main fang; above fang, a singular tooth standing distinctly by itself. Above singular tooth, anterior hooks with 4–7 teeth of equal size (Fig. 4e); hooks in median (Fig. 4f–g) and posterior setigers (Fig. 4h–i) with teeth varying widely in number and shape. Aciculae yellow, up to 6 in anterior parapodia, 2–3 in posterior ones. Aciculae bluntly conical with long acute tips protruding through parapodial wall. Vascular loops sometimes present in presetal and postsetal lobes.

Mandible blades (Fig. 4j) long and slender, fused for half their length. Maxillary apparatus hard. Maxillary carriers long (Fig. 4k); M I forceps long; M II short, half the length of M I, with 4 or 5 asymmetrically arranged teeth, distal tooth largest, M II attached to M I by long broad basal support in addition to small connecting membrane (broken in Fig. 4k); M III unidentate; M IV with single irregular tooth, plate deeply incised above tooth, M V attached at upper edge of incision (Fig. 4i). M V like thick comma; from where attached, it extends basally until it loops, at right angle, around inferior edge of M III's tooth (M III, M IV, and M V separated for purposes of illustration).

*Remarks.*—In addition to *E. petersenae*, the genus *Eranno* includes the following species:

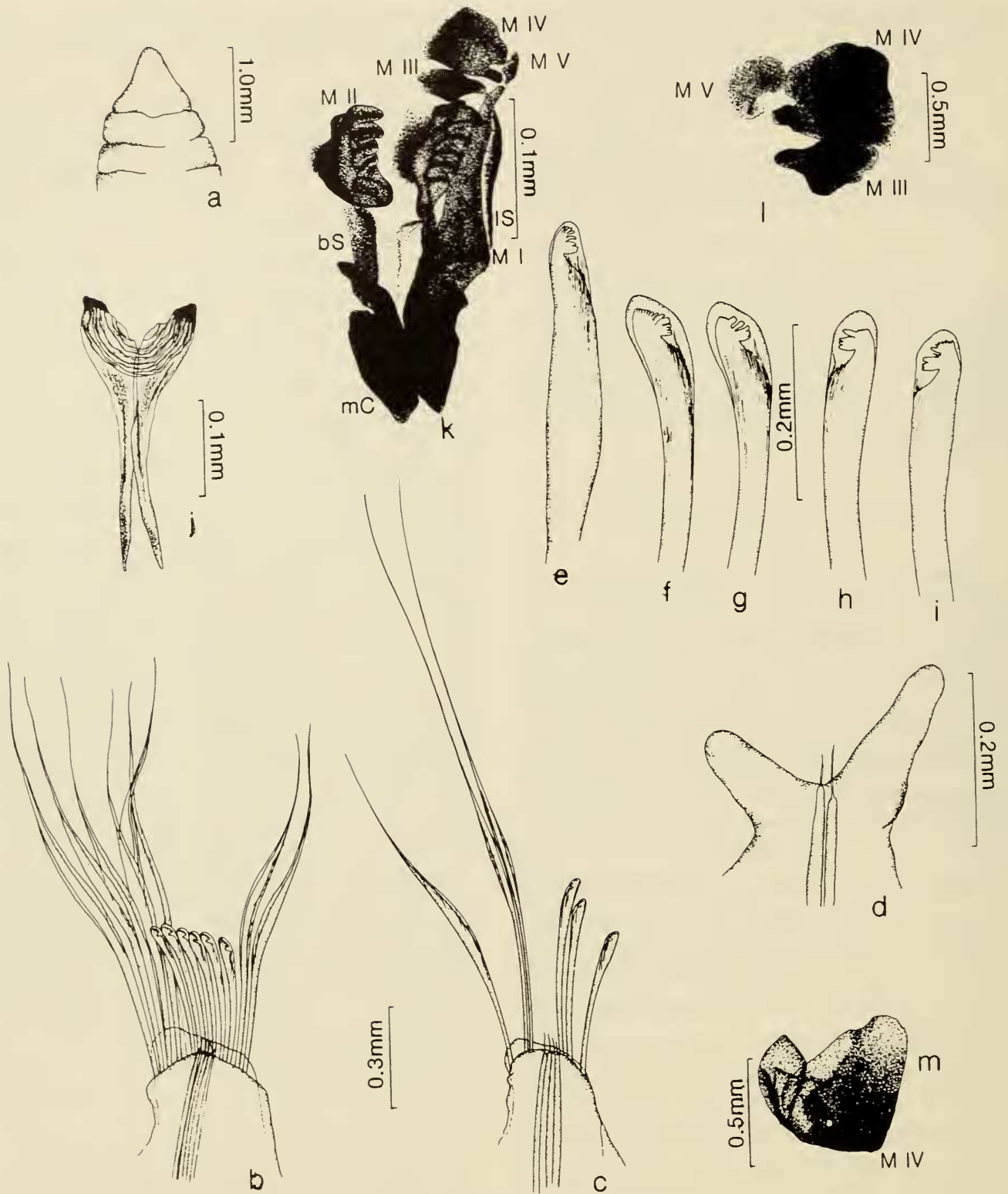


Fig. 4. *Eranno petersenae*: a, Prostomium; b, Right parapodium 4; c, Parapodium 45, BNEMRL specimen; d, Posterior parapodium; e, Hooded hook from parapodium 6; f-g, Hooks from parapodium 45; h-i, Hooks from posterior parapodium; h, Mandibles; i, Maxillae; j, Left M III, M IV and M V. *Eranno lagunae* (Fauchald, 1970): k, Right M IV (USNM 19405).

*Lumbriconereis abyssicola* Ushakov, 1950;  
Sea of Okhotsk; 3500 m.

*Lumbriconereis bifilaris* Ehlers, 1901; Chile.

*Lumbriconereis bifrons* (Kinberg, 1865);

southwestern Atlantic, South Sandwich  
Islands, North Atlantic, Irish Sea, Gulf of  
Gascogne, off Congo; 52-5121 m.

*Lumbriconereis bifurcata* (McIntosh, 1885);

Japan, Sea of Okhotsk, Pacific coast of North America; 592–1643 m.

*Lumbriconereis chilensis* Kinberg, 1865; off Valparaiso.

*Lumbriconereis ehlersii* (McIntosh), 1885; Greenland.

*Lumbriconereis ehlersii tenuisetis* (McIntosh, 1885); northwestern Atlantic, midway between Halifax and New York; 2352 m.

*Lumbrineris impatiens antarctica* (Averincev, 1972); Antarctic.

*Lumbrineris lagunae* (Fauchald, 1970); western Mexico, California; subtidally–49 m.

Key to the species of *Eranno*

- 1. Maxillae III unidentate ..... 2
- Maxillae III bidentate ..... 5
- 2. Maxillae more than 1/2 the length of maxillae II, aciculae black, hooks starting on setiger 7, posterior parapodia bilabiate ..... *E. bifurcata*
- Maxillae II less than 1/2 the length of maxillae II, aciculae yellow, hooks starting on setiger 1, posterior parapodia may be bilabiate ..... 3
- 3. Posterior parapodia with short conical postsetal lobes ..... *E. bifrons*
- Posterior parapodia lobes bilabiate ..... 4
- 4. Maxillae V overlaps maxillae IV ..  
..... *E. lagunae*
- Maxillae V does not overlap maxillae IV ..... *E. petersenae*
- 5. Maxillae IV with 4 sawlike teeth  
..... *E. bifilaris*
- Maxillae IV with 1 tooth ..... 6
- 6. With some of the parapodia bilabiate, maxillae I with 4 teeth .....
- ..... *E. chilensis*
- Without some of the parapodia bilabiate, maxillae II with 5–6 teeth  
..... *E. abyssicola*

Orensanz (1990:78) considers as synonyms of *E. bifrons*: *E. ehlersii* McIntosh, 1885; *E. ehlersii tenuisetis* McIntosh, 1885

(fide Miura 1980); *E. impatiens antarctica*. *E. petersenae* is very similar to *E. lagunae*. Examination by the author of the paratype of *E. lagunae* (Gulf of California, Sta. 3435, 859 fms, 22 Apr 1891 (1), K. Fauchald ID, 1970, USNM 19405) reveals that M V overlaps M IV (Fig. 41), and the tooth is a small knob on the maxilla surface (white in the figure). Also, *E. lagunae* has 1 aciculum per parapodium instead of 6 in anterior and 2–3 in posterior segments; its bilabiate parapodial lobes are about twice the length of *E. petersenae*; the digitate presetal lobes are present in the median region (setiger 65), instead of only in the posterior, and the mandibles are X-shaped with blades wide apart instead of long slender blades fused for half their length.

*Distribution.*—50–125 km south of Rhode Island; 62–120 m. Grain size range from fine sand to fine silt, greatest numbers in fine silt. TOC values from 3.2–17.6 mg/g. Present at BNEMRL from offshore stations from New Jersey to New England, in low but consistent numbers, 800–2000 m, in fine sand to clay.

*Etymology.*—This species is named in honor of Dr. Mary E. Petersen in appreciation for her help in providing the information on O. F. Müller’s type locality for *Lumbrineris fragilis*, and for providing the historical background and original descriptions of European lumbrinerids.

*Lumbricalus*, new genus

*Type species.*—*Lumbriconereis januarii* Grube, 1878.

*Diagnosis.*—Prostomium conical. Parapodia uniramous, may have a notopodial rudiment. Parapodia with composite spinigers; composite, multidentate hooded hooks (usually); simple limbate setae; and simple, multidentate hooded hooks. M III with up to 5 small teeth, M IV unidentate, M V free standing, displaced outward to M IV.

A typical fascicle is composed of a superior limbate seta, composite spinigers,

followed by 1–2 composite hooks, and limbate setae.

*Remarks.*—Hartman (1944a:167) examined and redescribed the type specimens of *Lumbriconeris januarii* Grube, 1878. M III was described as having 4–5 fine dentitions on its broad cutting edge, and M II having 5 teeth. As *Lumbriconeris brasiliensis* Kinberg, 1865 was the only species Hartman knew which had compound spinigerous setae, she proposed that *L. brasiliensis* be considered a synonym of *L. januarii* (Grube, 1878). Hartman (1948:93) later examined Kinberg's type species of *L. brasiliensis* and found it lacked mouthparts. Day (1973:62) briefly described and called a second species *L. januarii* which has a bidentate maxilla III. Uebelacker (1984:Ch. 41, pp. 32, figs. 30a–i) has an excellent description and figures of this species. It is proposed that *L. januarii* sensu Day be renamed *Lumbricalus dayi* in honor of Professor J. H. Day, who collected and first reported this species from North Carolina.

The following species are included in this genus:

*Lumbriconereis adriatica* Fauvel, 1940; Adriatic Sea, Mediterranean Sea, Senegambia, and Congo; 65–1163 m.

*Lumbriconereis adriatica foresti* Fauvel & Rullier, 1959; Adriatic Sea.

*Lumbrineris aotearoae* Knox & Green, 1972, New Zealand; shallow depths to 150 m.

*Lumbriconereis brasiliensis* Kinberg, 1865; Rio de Janeiro, Brazil.

*Lumbrineris composita* Hartmann-Schröder, 1965; Chile.

*Lumbrineris cultriformis* Intes & Le Loeuff, 1975; Ivory Coast, Africa; 80 m.

*Lumbricalus dayi*; new name proposed for *Lumbrineris januarii* sensu Day, 1973; North Carolina to Gulf of Mexico; 10–168 m.

*Lumbriconereis januarii* Grube, 1878; Tobago, West Indies.

Miura (1980:1035) examined the types of *L. adriatica* and *L. adriatica foresti* and con-

sidered *L. adriatica foresti* a synonym of *L. adriatica*. *Lumbricalus aotearoae* and *L. composita* have a unidentate M III. *Lumbricalus aotearoae* has a greater number of setae in anterior parapodia, 19 or more as opposed to 9; and lacks the long posterior postsetal lobe of *L. composita*. *Lumbricalus cultriformis*, *L. adriatica*, and *L. dayi* have a bidentate M III. *Lumbricalus cultriformis* lacks compound hooks and its simple hooks have 5 teeth. *Lumbricalus adriatica* simple hooks have 5–6 teeth, while *L. dayi* simple hooks have 9 teeth. *Lumbricalus januarii* M III has a broad edge with 4–5 fine dentitions. In Kinberg's (1865:570) description of *L. brasiliensis*, M II has 2 teeth, M IV has 1 tooth, while M III is not mentioned.

#### *Lumbrinerides* Orensanz, 1973

*Type species.*—*Lumbrinerides gesae* Orensanz, 1973.

*Diagnosis.*—Prostomium long, distally pointed. Parapodia uniramous with simple bidentate hooded hooks, and simple limbate setae. Maxillary carriers large, triangular, broad anteriorly. M I usually with 1–2 accessory teeth on inner margin, mandibles usually fused for entire length. Aciculae yellow or black.

#### *Lumbrinerides acuta* (Verrill, 1875)

*Lumbriconereis acuta* Verrill, 1875:39, pl. 3, fig. 5.

*Lumbrineris acuta.*—Hartman, 1942b:114, fig. 10a–d.—Pettibone, 1963:260, fig. 67g–i.—Perkins, 1979:419, fig. 1a.

*Lumbrinerides acuta.*—Orensanz, 1973:371.—Gardiner, 1976:203, fig. 26i–l (in part, New England specimens).—Perkins, 1979:419, fig. 1a.—Miura, 1980:1023.—Uebelacker, 1984:Ch. 41, pp. 11–13, figs. 7, 8a–g.

*Material examined.*—Northwestern Atlantic, Off NE U.S.A.: Numerous specimens, with 70 records at NEMP Stations 2, 7–13, 17, 19–20, 22, 24, 32–34, 36–37, 15A,

16C; and 155 records at NYB Stations 1, 8, 10–16, 18–19, 21, 24, 27–34, 36–44, 63, 65.

*Remarks.*—Orensanz (1973:373) referred 6 species to the genus *Lumbrinerides*. Perkins (1979:417) provided a key to 10 species of *Lumbrinerides*. His fig. 1a of the maxillary apparatus of *L. acuta* was drawn from the USNM syntype 12895. Miura (1980:1023) provided a key to 14 species of *Lumbrinerides*.

*Lumbrinerides acuta* may be distinguished from other *Lumbrinerides* by its having: the accessory tooth of M I as large as the distal tooth and located close to it; 3 teeth on M II; hooded hooks beginning in the middle setigers; and 2 visible peristomal segments.

*Distribution.*—Georges Bank to Gulf of Mexico; 14–260 m. Grain size range from coarse silt to pebble, greatest numbers in coarse silt to fine sand. TOC values from 0.3–32.6 mg/g.

#### *Lumbrineris* Blainville, 1828

*Type species.*—*Lumbrineris latreilli* Audouin & Milne Edwards, 1833; designated by Hartman, 1959.

*Diagnosis.*—Prostomium conical or globular, usually without papillae, occasionally with a single papilla in nuchal fold. Parapodia uniramous, sometimes with a notopodial rudiment. Parapodia with composite, multidentate hooded hooks in the anterior parapodia; simple limbate setae, and simple, multidentate hooded hooks. M III and IV usually unidentate or bidentate. M V free standing, displaced outward to M IV. Aciculae yellow or black, of light color in juveniles.

*Historical background.*—Blainville, author of the “Mollusques, Vers and Zoophytes” sections in the 1828 Dictionnaire des Sciences Naturelles, established the genera *Lumbrineris* (pp. 486–487) and *Scoletoma* (p. 492). In his system of classification, Blainville placed *Lumbrineris*, because of its buccal armature, among the multiden-

tate nereids. He established the genus *Lumbrineris* for two large and beautiful ‘chaetopoda,’ *L. brilliant* and *L. scolopendrina*, that he had in his collection, but was uncertain of their place of origin. Blainville goes on to say, “we are assured by a more detailed examination of what we had described in the dictionary and named the anus, is certainly the mouth.” He also placed within this genus *Nereis ebranchiata* Pallas, 1788. According to Hartman (1959:336–337) these three species are “indeterminable.” Blainville established the genus *Scoletoma* for *Lumbricus fragilis* O. F. Müller, 1776. Blainville states, “we do not believe we have seen this chaetopoda, but it could be one of the two species of *Lumbrineris*. However, the number of segments were less in the two [*Lumbrineris*], and neither one of them could be considered fragile.”

Audouin & Milne Edwards (1833:216) placed *Lumbrineris* within the family Eunicidae Savigny, 1818 (Eunicidae) and separated the genera by whether or not they had branchiae. They described the new species *L. latreilli* from the Chaussey Islands, placed within this genus *Nereis coccinea* Renier, 1804 from the Mediterranean (pp. 242–244), and commented on other lumbrinerids (indeterminable or placed in other genera). Audouin & Milne Edwards combined *Scoletoma* with *Lumbrineris* because it seemed probable that when *S. fragilis* was better studied, it would be placed within this group. But they go on to say, “in the actual state of science, this annelid is too poorly known for us to have a definite opinion.”

Grube (1840:79) listed *L. quadristriata* (*Arabella iricolor*), *L. Nardonis* (*L. latreilli*) and *L. unicornis* (*Nematoneris unicornis*) under *Lumbriconereis* Blainville (a misspelling of *Lumbrineris*). Treadwell (1921:94) noted that the original name was *Lumbrinereis* and not the *Lumbriconereis*. However, he used delle Chiaje’s (1841) spelling (-reis) not Blainville’s (-ris). Moore (1900:458) noted the name was usually erroneously written as *Lumbrinereis* or *Lumbri-*

*coneris*. Hartman (1944a:136) reinstated Blainville's spelling and listed the type (in general usage) as *Lumbrineris fragilis* O. F. Müller. However, in 1959 (p. 333) Hartman listed all the synonyms and variant spellings of *Lumbrineris*, and indicated *Lumbrineris latreilli* Audouin & Milne Edwards as the type species.

Given that (a) all the species originally included in the genus *Lumbrineris* by Blainville (1828) are indeterminable (Hartman 1959), (b) that their types probably no longer exist, and (c) that *L. latreilli* Audouin & Milne Edwards cannot be the type species according to the ICZN third edition articles 67.h and 69.a.i, the definition of *Lumbrineris* is uncertain. The ICZN 1990 meeting proposed a fourth edition in which procedures would be adopted that validate names in current use rather than those following strict priority. I use the *Lumbrineris* according to this paper's genus diagnosis, with the warning that a new name may have to be created, or a junior synonym may have to be revised and redefined.

According to the literature the following species of *Lumbrineris* s. s. are present from the northwestern Atlantic in addition to the ones found in this study: *L. coccinea* (Rénier, 1804); *L. cruzensis* Hartman, 1944; *L. inflata* Moore, 1911; and *L. latreilli* Audouin & Milne Edwards, 1833.

#### Key to the Northwestern Atlantic species of *Lumbrineris*

1. Maxillae III unidentate ..... 2
- Maxillae III bidentate ..... 3
- Maxillae III multidentate ... *L. inflata*
2. Posterior parapodia bilabiate, post-setal lobe long and slender *L. cruzensis*
- Posterior parapodia unilabiate, post-setal lobe short ..... *L. cingulata*
3. Blades of composite hooks of similar length throughout; prostomium short, globular or round ... *L. coccinea*
- Blades of composite hooks longer in

anterior parapodia; prostomium conical ..... *L. latreilli*

*Lumbrineris cingulata* (Ehlers, 1897)

Fig. 5

*Lumbriconereis cingulata* Ehlers, 1897:76, pl. 5, figs. 119–124; 1901:136.—Fauvel, 1936:22.

*Lumbriconereis virgini*.—Kinberg, 1865:568 (in part).

*Lumbriconereis magalhaensis*.—Ehlers, 1900:215; 1901:136 (in part).

*Lumbrinereis magalhaensis*.—Monro, 1930 (in part, st. DISC/51); 1936:53 (in part, WSCO/215 and WSCO/856).

*Lumbrinereis cingulata*.—Wesenberg-Lund, 1962:215.

*Lumbrineris cingulata*.—Hartman, 1964: 121, pl. 37:figs. 5–6.—Orensanz 1973:361–365, pls. 7–8; 1976:38; 1990:82–85, pls. 21, 22:figs. a–f, chart 4C.

*Lumbrineris patagonica*.—Hartmann-Schröder, 1962:119, figs. 124–127.

*Lumbrineris limbata*.—Hartmann-Schröder, 1965:178, figs. 153–156.

*Material examined*.—Northwestern Atlantic, Off NE U.S.A.: NEMP Sta. 8, Dec 15 1979 (10 ABF), 20 Jul 1980 (10 ABF), 7 Dec 1980 (19 ABF), 12 Jul 1981 (2 ABF), 8 Feb 1982 (13 ABF), 30 Aug 1982 (5 ABF), 10 Jul 1983 (1 ABF); NEMP Sta. 11, 29 Aug 1982 (10 ABF); NEMP Sta. 13, 17 Dec 1979 (1 ABF); NEMP Sta. 19, 15 Jul 1980 (2 ABF), 10 Dec 1980 (3 ABF), 2 Sep 1982 (11 ABF); NEMP Sta. 20, 28 Apr 1978 (3 ABF), 19 Sep 1979 (1 ABF), 11 Dec 1979 (19 ABF), 10 Dec 1980 (4 ABF), 15 Jul 1981 (3 ABF), 28 Aug 1982 (2 ABF), 5 Jul 1984 (4 ABF); NEMP Sta. 22, 30 Apr 1978 (38 ABF), 28 Sep 1978 (12 ABF), 24 Jul 1979 (15 Orensanz, 12 ABF), 17 Sep 1979 (24 ABF), 11 Jul 1980 (8 ABF), 18 Dec 1980 (2 USNM 146105, 64 ABF), 17 Jul 1981 (212 ABF), 31 Jan 1982 (134 ABF), 27 Aug 1982 (1 USNM 146106, 81 paratypes ZMUC, 72 paratypes ZMUO, 44 ABF), 18 Jul 1984 (88

USNM 146107, 45 ABF); NEMP Sta. 25, 2 May 1978 (2 ABF); NEMP Sta. 28, 4 Dec 1979 (82 ABF), 17 Dec 1980 (21 ABF), 20 Jul 1981 (2 ABF), 28 Jan 1982 (47 ABF), 5 Jul 1984 (1 ABF); NEMP Sta. 32, 10 Jul 1984 (1 ABF); NEMP Sta. 39, 12 Jul 1980 (19 ABF).

*Description.*—Preserved specimens colorless to light tan. Largest complete specimen 37 mm long, 1.5 mm wide, with 136 setigers. Largest fragment 40 mm long, 1.5 mm wide, with 98 setigers. Prostomium (Fig. 5a) short, bluntly conical, only slightly longer than wide. First peristomial segment as long as setiger 1, second somewhat shorter. Setigers wider than long throughout body, body wider anteriorly. Postsetal lobes short throughout; anterior parapodia gently rounded in juveniles, gently rounded or obliquely truncate in adults (Fig. 5b), conical in median (Fig. 5c) and posterior parapodia (Fig. 5d). Presetal lobes low, rounded in anterior parapodia; conical posteriorly. Large specimens with 2 pairs of anal cirri, dorsal pair twice as long as ventral pair; smaller specimens usually with two dorsal anal cirri. Anterior parapodia with 4–5 limbate setae dorsally, followed by 5–9 (3–13) composite hooks, and 0–2 setae; greatest numbers occurring about setiger 6. Composite hooded hooks on first 16 setigers (5–18); blades short in proportion to shaft and of similar length on all setigers; hood at distal end of shaft projecting beyond width of blade. Composite hooks with 7–8 teeth of equal size, main fang only slightly larger than preceding tooth (Fig. 5e). Simple hooded hooks (2–4 per parapodium) starting on setiger 17 (6–19) with 8–9 teeth decreasing apically in size, main fang entire or subdivided in median (Fig. 5f) and posterior setigers (Fig. 5g). Limbate setae lacking after setiger 40. Aciculae yellow, 2 per parapodium in anterior half of body, 1 thereafter; distal tips tapering and blunt in anterior and median parapodia, long and tapering with tips projecting in posterior parapodia.

Mandibles translucent, fused for two thirds of their length (Fig. 5h). Maxillary apparatus medium to dark brown. Maxillary carriers broad, width deeply constricted, permanently divided; M I base broad, tips falcate; M II with 4 teeth of equal size, with large space between distal teeth (Fig. 5i), some small specimens with evenly spaced teeth; M III unidentate with arched cutting edge and basal edge; M IV with long blunt tooth, riding hat-shaped, M V (Fig. 5j) free standing, displaced outward to M IV. Tips of M I and M II usually fit under tooth of M III (Fig. 5j), but in 2 specimens, tip of M II fit under M III, while tip of M I was above tooth of M IV (Fig. 5k).

*Remarks.*—There are only slight variations between our species and *L. cingulata* from southern oceans. Orensanz (1973:363–364, 1990:82–85) examined numerous specimens (including some types) and considers the following species as synonyms of *L. cingulata*: *L. magalhaensis* sensu Ehlers, 1900 (not Kinberg 1865); *L. virgini* Kinberg, 1865 (in part); *L. patagonica* Hartmann-Schröder, 1962; and *L. limbata* Hartmann-Schröder, 1965. Orensanz (1973) described *L. cingulata* as having 3–6 (usually 4) teeth on M II. His pl. 21, fig. e (1990) shows 4 evenly spaced teeth, while our mature specimens have 4 teeth on M II with a space between the distal teeth. M III of our species is similar to the M III in pl. 22, fig. c (from paratype of *L. patagonica*) and M IV is similar to the M IV in pl. 22, fig. f (from paratype of *L. limbata*). The southern species has composite hooks to setigers 19–21 (15–25), instead of to setiger 16 (5–18). None of the *L. cingulata* examined by Orensanz (pers. comm.) was complete. However, small specimens of the closely related *L. kerguelensis* also had 4 anal cirri with the dorsal pair longer (see Orensanz 1990; pl. 40, fig. c).

*Lumbrineris cingulata* resembles *L. cruzensis* Hartman, 1944a and *L. latreilli* Audouin & Milne Edwards, 1833. *Lumbrineris cruzensis* has a similarly shaped prostomi-

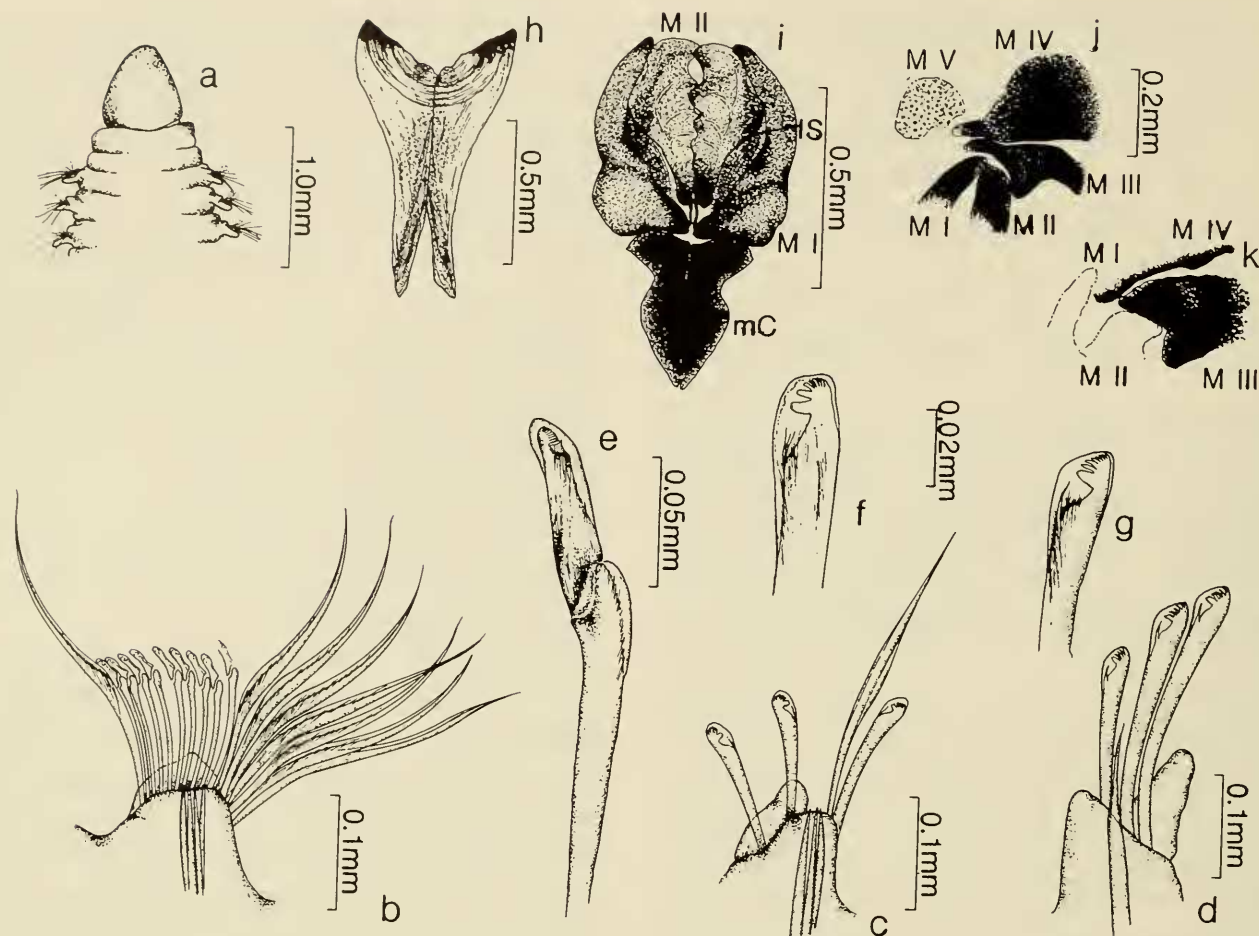


Fig. 5. *Lumbrineris cingulata*: a, Prostomium; b, Left parapodium 6; c, Parapodium 37; d, Posterior parapodium; e, Composite hooded hook from parapodium 6; f, Simple hook from parapodium 27; g, Hook from posterior parapodium; h, Mandibles; i, Maxillary carriers, M I and M II; j, Left M III, M IV and lateral support; k, Left M III.

um, a similar maxillary formula, and setigers 1–16 have short-bladed compound hooks. However, *L. cruzensis*' mandibles are fused for most of their length, and it has a bilabiate parapodium posteriorly. *Lumbrineris latreilli* has 2 teeth on M III instead of 1, and the blades of the composite hooks are longer anteriorly instead of being of equal length throughout.

**Distribution.**—Northwestern Atlantic specimens: Massachusetts to Virginia; 15–244 m. Grain size range from granular to coarse clay; greatest numbers in fine sand to very fine silt. TOC values from 0.7–17.6 mg/g. Southern ocean specimens: Falkland Islands to La Plata River, Argentina; Tierra del Fuego; Magellan Strait, north to central Chile; Scotia Sea; and Antarctic peninsula;

0–1000 m. Common on sheltered sandy-silt beaches, and shallow subtidal calm waters.

#### Genus *Paraninoe* Levenstein, 1977

**Type species.**—*Ninoe fusca* Moore, 1911; designated Levenstein 1977.

**Diagnosis.**—Prostomium conical, may have a retractable nuchal papilla. Parapodia uniramous, with simple limbate setae and simple, multidentate hooded hooks, blades of hooks long in anterior parapodia. Notopodia reduced; parapodia with a simple digitate branchia. M III and IV unidentate, M V lacking. Aciculae black.

The digitate postsetal lobe combined with the shape of the parapodia is a distinct morphological combination of this genus. The



digitate postsetal lobe on anterior setigers is frequently referred to as a single lobe branchia, corresponding to the multilobed branchiae in the genus *Ninoe*, while in the median and posterior setigers it is referred to as a postsetal lobe.

*Paraninoe brevipes* (McIntosh, 1903)

Fig. 6

*Lumbriconeris brevipes* McIntosh, 1903:147–149, text fig. 3, pl. 12, figs. 33–34.

*Lumbrineris brevipes*. —Pettibone, 1963:260–262, fig. 68h. —Fauchald, 1970:217. —Day, 1973:62. —Uebelacker, 1984:Ch. 41, pp. 19–21, figs. 15, 16a–h.

*Ninoe brevipes*. —Hartman and Fauchald, 1971:85–86, pl. 11, fig. a.

*Paraninoe brevipes*. —Levenstein, 1977:191. —Miura, 1980:1046–1048, fig. 13A–C. —Orensanz, 1990:96.

*Material examined*. —Northwestern Atlantic, Off NE USA: NEMP Sta. 13, 17 Aug 1981 (1 ABF); NEMP Sta. 20, 28 Apr 1978 (4 ABF), 22 Jul 1979 (2 ABF), 19 Sep 1979 (2 ZMUC, 2 ABF), 11 Dec 1979 (1 ABF), 16 Jul 1980 (1 ZMUC), 10 Dec 1980 (1 ABF), 15 Jul 1981 (6 ABF), 2 Feb 1982 (14 ABF), 28 Aug 1982 (3 USNM 146108, 2 ZMUO, 4 ABF), 7 Jul 1983 (8 ABF), 5 Jul 1984 (6 USNM 146109, 10 ABF); NEMP Sta. 22, 11 Jul 1980 (2 ABF); NEMP Sta. 28, 5 Jul 1983 (1 ABF); NEMP Sta. 37, 11 Dec 1983 (4 ABF).

*Description*. —Preserved specimens colorless, slightly iridescent. Largest fragment 2.2 mm wide. Largest complete specimen 21 mm long, 1.5 mm wide, with 109 setigers. Prostomium conical, longer than wide (Fig. 6a). First peristomial segment longer than second, second equal to first setiger. Anterior postsetal lobes of parapodia 1–2 small, conical; lengthening on setigers 3–5 (Fig. 6b); digitate and directed distally in setigers 6–30; shortening, becoming thumb of mitten-shaped in median (Fig. 6c, d) and

posterior parapodia (Fig. 6e). Presetal lobes low, rounded in anterior and median parapodia, thin and conical in posterior ones. Largest complete specimen with 2 anal cirri, juveniles with single lobe.

Anterior parapodia with 3 or 4 limbate setae in superior position, followed by 4 long-bladed hooded hooks and a single inferior seta. All limbate setae with long acute tips, becoming fewer in number after setiger 14, totally lacking after setiger 98 (large specimen). Long slender-bladed hooded hooks (Fig. 6f) starting on setiger 1, replaced by shorter hooks with wider blades (Fig. 6g) on setiger 14 (10–18), posterior hooks bulbous (Fig. 6h). Long-bladed anterior hooks with 6–7 teeth of equal size, median ones with 8–10 teeth of equal size above a main fang occasionally subdivided; posterior hooks with 6–12 fine teeth above a main fang usually subdivided into 2–4 teeth. Limbate setae and long slender hooks with blades pale yellow, shafts a darker color; shorter hooks all gold or gold with shafts a deep gold. Aciculae deep gold, dark brown or black, 2–3 per parapodium with filamentous tips projecting through parapodial wall; distal part deep gold. Hooks and aciculae a lighter color in anterior setigers, darker in posterior ones. Hooks and aciculae of lighter color in juveniles than in adults. Vascular loops frequently discernable in some median postsetal lobes in specimens 1.5 mm wide or larger, preserved for months or years.

Mandibles (Fig. 6i) white, well calcified with blades close together but not fused. Maxillary apparatus (Fig. 6j) medium brown, hard. Maxillary carriers long, broad, slightly constricted medially; M I base broad, tips falcate; M II with 3 evenly spaced teeth; M III with long blunt tooth; M IV riding-hat shaped, M V lacking except for a single specimen with large unattached, nearly circular M V.

*Remarks*. —In addition to *P. brevipes*, the genus *Paraninoe* includes the following species:

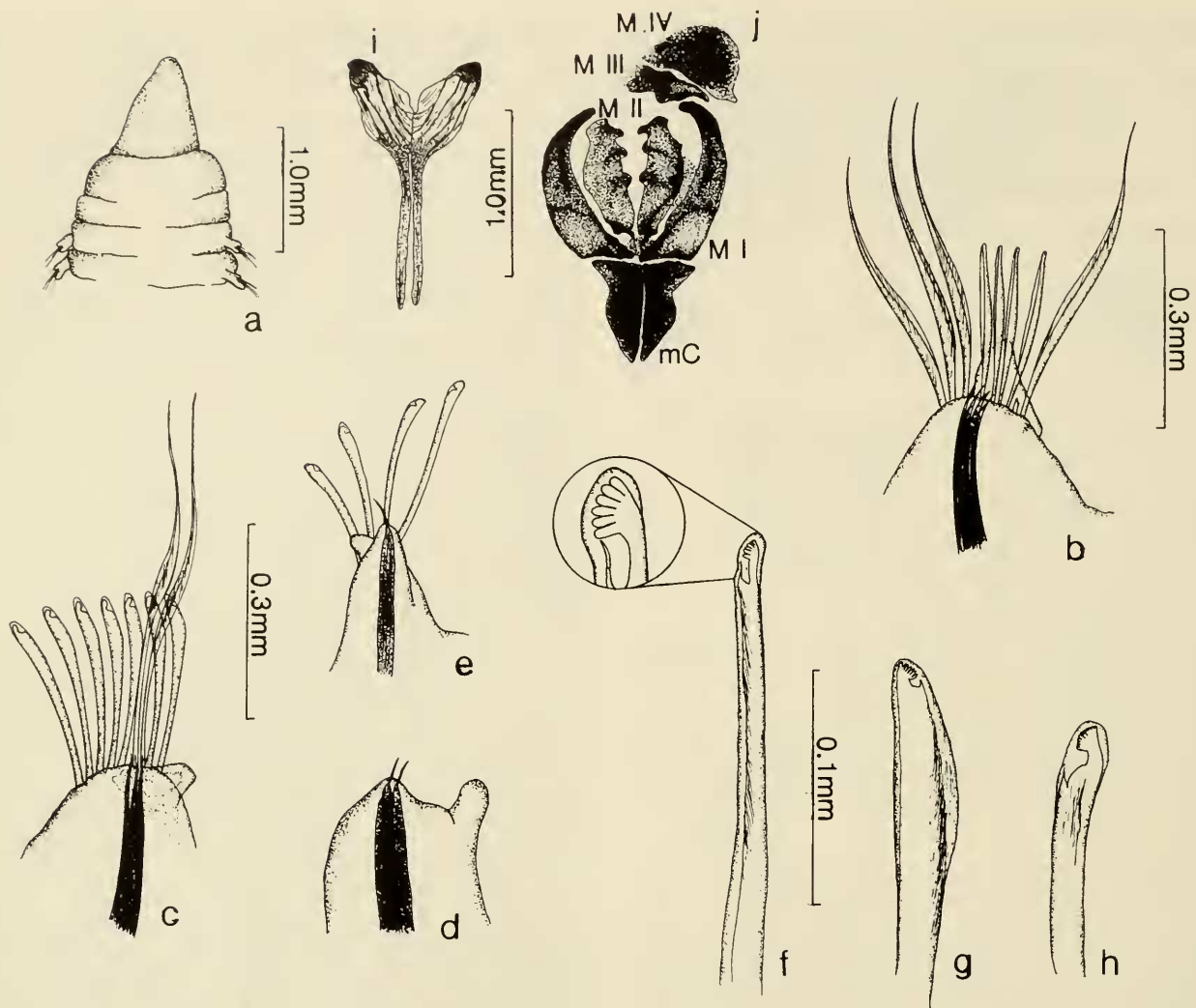


Fig. 6. *Paraninoe brevipes*: a, Prostomium; b, Right parapodium 5; c, Parapodium 40; d, Median parapodium, side view; e, Posterior parapodium; f, Hooded hook from parapodium 4; g, Hook from parapodium 27; h, Hook from posterior parapodium; i, Mandibles; j, Maxillae.

*Lumbrineris abyssalis* Imajima & Higuchi, 1975; Japan; 590–1055 m.

*Lumbrineris antarctica* Monro, 1930; Antarctica; 365–3747 m.

*Ninoe fusca* Moore, 1911; California, and Kermadec Trench; 2770–7000 m.

*Ninoe fuscoides* Fauchald, 1972; California; 2230–2650 m.

*Paraninoe hartmanae* Levenstein, 1977; Alaska, Kuril-Kamchatka and Japanese Trenches; 6157–8100 m.

*Lumbriconereis minuta* Théel, 1879; Arctic.

*Augeneria monotentaculata* Averincev, 1972; Antarctic.

*Lumbrineris nagae* Gallardo, 1968; Nha Trang, South Viet Nam.

*Ninoe simpla* Moore, 1905; Alaska; 238–419 m.

Orensanz (1990:96) considers *P. monotentaculata*, from the same area, to be a synonym of *P. antarctica*. *Paraninoe fusca* M II has 2 teeth, and the hooks start about setiger 40. *Paraninoe brevipes* and *P. antarctica* M III has 3 teeth, but *P. antarctica* has transitional hooks on setiger 1, while *P. brevipes* hooks and their teeth are clearly defined on setiger 1. *Paraninoe hartmanae*, *P. fuscoides*, and *P. minuta* M II has 4 teeth; *P. hartmanae* has a large retractable nuchal papilla at the boundary of the prostomium and peristomium, and the hooks start about

setiger 100; *P. fuscoides* lacks a nuchal papilla, the hooks start on setiger 1, and the branchiae are located posteroventrally; *P. minuta* lacks a nuchal papilla, the hooks start on setiger 1, and the branchiae are located dorsolaterally (the norm). *Paraninoe simpla* M II has 5–6 teeth, and a nuchal papilla. *Paraninoe abyssalis* and *P. nageae* M II has 7 teeth. Both have a nuchal papilla, but *P. abyssalis* hooks start on setiger 1, while *P. nageae* hooks start from setiger 60–100.

The genus *Paraninoe* differs from *Ninoe* in that it lacks multilobed branchiae, and M III and M IV have smooth cutting edges instead of denticulations on one or both maxillae. *Paraninoe brevipes* differs from *N. nigripes* Verrill, 1873 in the shape of M IV, being riding-hat shaped in the former and irregular-shaped in the latter, and in the length of the anterior postsetal lobe, with it being equal to or less than its parapodium in *P. brevipes* and exceeding it in *N. nigripes*. As the juveniles of *N. nigripes* lack branchiae until they are 0.4–0.6 mm wide, it is the length of the postsetal lobe (setigers 3–13) that is used to separate juveniles of the two species. Both species have in common: limbate setae with long acute tips; long-bladed hooks starting on setiger 1; setae dark at their base with blades lighter; black aciculae; similar shaped parapodia including the mitten-shaped ones in median and posterior setigers; and 0–2 anal cirri.

Uebelacker (1984:Ch. 41, p. 21) noted that her specimens of *P. brevipes* have a “small, globular nuchal papilla located middorsally at the base of prostomium, concealed by anterior margin of peristomium.” The nuchal papilla was not discernable in our specimens.

*Distribution.* —Massachusetts to North Carolina, Gulf of Mexico, southern California, northwestern Spain; 65–6684 m. Grain size range from very fine sand to fine silt; greatest numbers in fine silt to coarse silt. TOC values from 3.0–20.5 mg/g.

*Scoletoma* Blainville, 1828, emended

*Type species.* —*Lumbricus fragilis* O. F. Müller, 1776; designated by Blainville, 1828.

*Diagnosis.* —Prostomium conical or globular, usually without papillae, occasionally with a singular papilla in nuchal fold. Parapodia uniramous, or with notopodial rudiments. Parapodia with simple limbate setae and simple, multidentate hooded hooks. M V free standing and displaced outward to M IV. Aciculae yellow or black, of lighter color in juveniles.

According to the literature the following species of *Scoletoma* are present in the northwestern Atlantic in addition to the ones found in this study: *S. atlantica* (sensu Hartman, 1965); *S. ernesti* (Perkins, 1979); *S. impatiens* (Claparède, 1868); *S. punctata* (McIntosh, 1885); and *S. verrilli* (Perkins, 1979).

Key to the Northwestern Atlantic species of *Scoletoma*

- 1. Maxillae III unidentate . . . . . 2
- Maxillae III bidentate . . . . . 6
- 2. Aciculae yellow . . . . . 3
- Aciculae black . . . . . *S. fragilis*
- 3. Hooks starting on setiger 1 . . . . . 4
- Hooks starting after setiger 1 . . . . . 5
- 4. Maxillae IV riding hat-shaped, 0–4 anal cirri . . . . . *S. hebes*
- Maxillae IV gum drop-shaped, 0–2 anal cirri . . . . . *S. verrilli*
- 5. Posterior parapodia with short postsetal lobes . . . . .
- . . . . *S. atlantica* sensu Hartman, 1965
- Posterior parapodia with long postsetal lobes . . . . . *S. tenuis*
- 6. Aciculae yellow . . . . . 7
- Aciculae black . . . . . *S. acicularum*
- 7. Hooks starting on setiger 1 . . . . .
- . . . . . *S. impatiens*
- Hooks starting after setiger 1 . . . . . 8
- 8. Prostomium long, acutely conical; with long medium setae . . . . . *S. punctata*

- Prostomium short, subconical;  
without long median setae . . . *S. ernesti*

*Scoletoma acicularum*  
(Webster & Benedict, 1887),  
new combination

Fig. 7

*Lumbrinereis acicularum* Webster & Benedict, 1887:725, pl. 4, figs. 55–59.

*Lumbrineris acicularum*.—Fauchald, 1970: 87, 218.

*Lumbrineris fragilis*.—Pettibone, 1963:262, fig. 69a–j.—Hartman & Fauchald, 1971: 82–83.—Day, 1973:62.—Gardiner, 1976: 197–198. (Not O. F. Müller, 1776.)

*Material examined*.—Northwestern Atlantic, Off NE U.S.A.: NEMP Sta. 2, 20 Jul 1980 (4), 31 Aug 1982 (1), 10 Jul 1983 (1), 12 Jul 1984 (1); NEMP Sta. 3, 14 Dec 1979 (1), 20 Jul 1980 (1), 6 Dec 1980 (3), 11 Jul 1981 (2), 10 Jul 1983 (2), 13 Jul 1984 (3); NEMP Sta. 7, 19 Apr 1978 (9), 24 Apr 1979 (10), 15 Dec 1979 (5), 20 Jul 1980 (5), 7 Dec 1980 (14), 12 Jul 1981 (4 ABF, 15), 8 Feb 1982 (6), 31 Aug 1982 (1); NEMP Sta. 8, 15 Dec 1979 (2 ABF, 4), 20 Jul 1980 (20), 7 Dec 1980 (2 ABF, 28), 12 Jul 1981 (6), 8 Feb 1982 (23), 30 Aug 1982 (3 ABF, 75), 10 Jul 1983 (109); NEMP Sta. 9, 19 Jul 1980 (62), 8 Dec 1980 (15), 13 Jul 1981 (10 ABF, 53), 9 Feb 1982 (38), 30 Aug 1982 (80), 9 Jul 1983 (8); NEMP Sta. 10, 21 Apr 1978 (1), 26 Apr 1979 (12); NEMP Sta. 11, 21 Apr 1978 (2, USNM 146110, 4 ABF), 21 Sep 1978 (2), 23 Apr 1979 (1), 26 Sep 1979 (2), 16 Dec 1979 (1 ABF, 2), 19 Jul 1980 (5), 8 Dec 1980 (1), 13 Jul 1980 (6), 9 Feb 1982 (11), 29 Aug 1982 (11), 9 Jul 1983 (12), 10 Jul 1984 (12); NEMP Sta. 12, 16 Dec 1978 (5 ZMUO, 1 ABF), 18 Jul 1980 (2), 9 Dec 1980 (9), 13 Jul 1981 (5), 9 Feb 1982 (19), 29 Aug 1982 (20), 9 Jul 1983 (13); NEMP Sta. 13, 22 Apr 1978 (6), 20 Sep 1978 (1), 22 Apr 1979 (5 ZMUC), 13 Sep 1979 (1), 17 Dec 1979 (3), 22 Jul 1980

(9), 9 Dec 1980 (9), 17 Aug 1981 (2), 10 Feb 1982 (13), 29 Aug 1982 (12), 9 Jul 1984 (10); NEMP Sta. 14, 19 Jul 1979 (2); NEMP Sta. 17, 26 Apr 1978 (3 USNM 146111, 4 ZMUC, 4 ZMUO, 7 ABF), 24 Sep 1978 (73), 21 Apr 1979 (40), 20 Jul 1979 (42), 22 Sep 1979 (32), 13 Dec 1979 (37), 2 Aug 1980 (41), 5 Dec 1980 (32), 14 Aug 1981 (50), 6 Feb 1982 (13), 14 Sep 1982 (11), 12 Jul 1983 (3 ABF, 31), 27 Aug 1984 (1 ABF), 17 Jun 1985 (3 ABF, 21); NEMP Sta. 18, 6 Jul 1984 (1); NEMP Sta. 20, 27 Sep 1978 (2), 11 Dec 1979 (1), 16 Jul 1980 (2), 28 Aug 1982 (12); NEMP Sta. 22, 11 Jul 1980 (1), 31 Jan 1982 (1); NEMP Sta. 23, 1 May 1978 (1), 29 Sep 1978 (1), 25 Jul 1979 (1 ABF), 17 Sep 1979 (2), 12 Jul 1980 (2), 18 Dec 1980 (2), 18 Jul 1981 (1 ABF), 31 Jan 1982 (1), 27 Aug 1982 (1 ABF, 4); NEMP Sta. 24, 30 Sep 1978 (4), 12 Jul 1980 (3); NEMP Sta. 25, 2 May 1978 (5 ABF); NEMP Sta. 26, 2 May 1978 (1); NEMP Sta. 28, 17 Dec 1980 (1), 20 Jul 1981 (1); NEMP Sta. 31, 21 Jul 1980 (14), 11 Jul 1983 (1), 10 Jul 1984 (1); NEMP Sta. 32, 21 Jul 1980 (2), 6 Dec 1980 (7), 11 Jul 1983 (1 ABF, 7), 10 Jul 1984 (8 ABF, 19), 18 Jun 1985 (5 ABF, 11); NEMP Sta. 33, 13 Dec 1979 (1), 1 Aug 1980 (1), 13 Aug 1981 (2), 6 Feb 1982 (4), 16 Jun 1985 (1 ABF); NEMP Sta. 36, 14 Jul 1980 (6), 2 Dec 1980 (3), 22 Jul 1981 (1 ABF), 26 Jan 1982 (1), 15 Sep 1982 (3), 1 Jul 1983 (2 ABF, 4), 2 Jul 1984 (2), 22 Jun 1985 (2 USMN 146112, 1 ZMUC, 4 ZMUO, 6 ABF); NEMP Sta. 37, 11 Dec 1980 (1), 28 Aug 1982 (1); NEMP Sta. 39, 12 Jul 1980 (2); NEMP Sta. 15A, 5 Oct 1978 (14), 20 Apr 1979 (7), 18 Jul 1979 (4), 21 Sep 1979 (1), 2 Sep 1982 (5), 13 Jul 1983 (5), 31 Aug 1984 (15), 14 Jun 1985 (10 ABF, 8); NEMP Sta. 16A, 24 Apr 1978 (2), 25 Sep 1978 (1), 20 Apr 1979 (1), 19 Jul 1979 (7), 12 Dec 1979 (1), 30 Jul 1980 (6), 5 Feb 1982 (2), 9 Sep 1982 (1), 13 Jul 1983 (2); NEMP Sta. 16C, 19 Jul 1979 (1), 12 Dec 1979 (6), 31 Jul 1980 (9), 5 Dec 1980 (6), 13 Jul 1983 (15), 29 Aug 1984 (3), 15 Jun

- 1985 (6); NYB Sta. 2, 28 Jul 1980 (1 ABF); NYB Sta. 4, 2 Oct 1985 (8); NYB Sta. 7, 1 Oct 1985 (1); NYB Sta. 8, 15 Aug 1981 (6), 10 Sep 1982 (1), 23 Aug 1984 (5), 2 Oct 1985 (1); NYB Sta. 10, 15 Aug 1981 (1); NYB Sta. 11, 12 Aug 1981 (1), 12 Sep 1982 (4), 25 Aug 1984 (5), 2 Oct 1985 (4); NYB Sta. 12, 12 Aug 1981 (2), 13 Sep 1982 (8), 21 Jul 1983 (4), 25 Aug 1984 (2), 2 Oct 1985 (7); NYB Sta. 13, 31 Jul 1980 (3); NYB Sta. 14, 1 Aug 1980 (7), 13 Aug 1981 (3), 5 Sep 1983 (7), 28 Aug 1984 (1), 3 Oct 1985 (7); NYB Sta. 16, 30 Aug 1984 (2); NYB Sta. 17, 1 Aug 1980 (5), 5 Sep 1983 (1), 30 Aug 1984 (1); NYB Sta. 19, 3 Jul 1980 (1), 12 Sep 1982 (1), 21 Jul 1983 (1), 31 Aug 1984 (1); NYB Sta. 20, 30 Jul 1980 (5 ABF), 11 Sep 1982 (9), 19 Jul 1983 (7), 31 Aug 1984 (3), 30 Sep 1985 (2); NYB Sta. 21, 11 Sep 1982 (1), 20 Jul 1983 (2), 31 Aug 1984 (1), 30 Sep 1985 (1); NYB Sta. 22, 30 Jul 1980 (8), 11 Aug 1981 (1), 9 Sep 1982 (7), 5 Jul 1983 (8), 1 Oct 1985 (6); NYB Sta. 23, 14 Aug 1981 (2), 27 Aug 1984 (3); NYB Sta. 24, 20 Jul 1983 (8), 27 Aug 1984 (5), 4 Oct 1985 (5); NYB Sta. 25, 3 Aug 1980 (5), 20 Jul 1983 (7), 6 Sep 1983 (1), 4 Oct 1985 (1); NYB Sta. 26, 4 Oct 1985 (2); NYB Sta. 27, 3 Aug 1980 (7), 14 Aug 1981 (3), 14 Sep 1982 (2), 27 Aug 1984 (6 ABF), 4 Oct 1985 (5); NYB Sta. 28, 2 Aug 1980 (4), 13 Aug 1981 (4), 6 Sep 1983 (3), 28 Aug 1984 (2 ABF, 5), 3 Oct 1985 (1); NYB Sta. 29, 30 Jul 1980 (1), 31 Aug 1984 (3); NYB Sta. 30, 30 Jul 1980 (3), 12 Aug 1981 (3), 9 Sep 1982 (5), 6 Sep 1983 (9), 31 Aug 1984 (1 ABF, 3), 3 Oct 1985 (2); NYB Sta. 31, 1 Oct 1985 (2); NYB Sta. 32, 29 Jul 1980 (1), 15 Sep 1982 (2), 31 Aug 1984 (5), 1 Oct 1985 (6); NYB Sta. 33, 15 Sep 1982 (6), 30 Aug 1984 (7), 30 Sep 1985 (2 ABF); NYB Sta. 35, 9 Sep 1982 (1), 21 Jul 1983 (1), 30 Aug 1984 (2), 1 Oct 1985 (2); NYB Sta. 36, 1 Aug 1980 (1), 11 Aug 1981 (2), 6 Sep 1983 (2), 30 Aug 1984 (1), 3 Oct 1985 (1); NYB Sta. 37, 1 Aug 1980 (1), 11 Oct 1985 (1); NYB Sta. 38, 1 Aug 1980 (1), 11 Aug 1981 (4), 6 Sep 1983 (1), 3 Oct 1985 (2); NYB Sta. 39, 29 Jul 1980 (1), 12 Aug 1981 (2), 9 Sep 1982 (2), 6 Sep 1983 (1), 30 Aug 1984 (2), 3 Oct 1985 (4); NYB Sta. 40, 31 Jul 1980 (2), 9 Sep 1982 (5), 1 Oct 1985 (2); NYB Sta. 41, 4 Aug 1980 (2); NYB Sta. 42, 13 Sep 1982 (2), 20 Jul 1983 (2), 31 Aug 1984 (2), 2 Oct 1985 (8); NYB Sta. 43, 31 Aug 1984 (2 ZMUC, 3 ABF), 2 Oct 1985 (3); NYB Sta. 44, 15 Aug 1981 (9), 31 Aug 1984 (1 USNM 146113, 3 ABF), 2 Oct 1985 (4); NYB Sta. 63, 19 Aug 1981 (1), 7 Sep 1983 (2), 31 Aug 1984 (5), 30 Sep 1985 (3), NYB Sta. 64, 30 Sep 1985 (1); NYB Sta. 65, 19 Jul 1983 (8), 31 Aug 1984 (6), 30 Sep 1985 (1); NYB Sta. 158, 16 Aug 1981 (2), 5 Sep 1983 (2), 28 Aug 1984 (3), 3 Oct 1985 (1).—Massachusetts, Marblehead Harbor: 4 Apr 1954 (16), M. Pettibone ID as *Lumbrineris fragilis* (USNM 30097).
- Description.*—Preserved material colorless to salmon color, iridescent. Largest specimen (incomplete) 156 mm long, 4.5 mm wide, with 273 segments. Prostomium short, bluntly conical, basal width and length about equal (Fig. 7a). First peristomial segment longer than second, equal in width to first setiger. Body uniform in width to median region, then tapering gradually towards posterior end. Postsetal lobes of anterior parapodia (Fig. 7b) short, roughly conical or truncate, narrowing in median segments (Fig. 7c), becoming more digitate and longer in posterior parapodia (Fig. 7d). Postsetal lobes of posterior parapodia about a third longer than those of anterior parapodia. Presetal lobes low, rounded, wider than postsetal lobes throughout. Mature specimens with 4 anal cirri of equal size, juveniles usually with 2 anal cirri or a single lobe (Table 3).
- Anterior parapodia with up to 18 limbate setae, most numerous on setigers 6–9, superior setae longer than inferior setae; setae less numerous through median region, usually lacking after setigers 60–70. Simple hooded hooks with 8–9 teeth beginning on

Table 3.—*Lumbrineris acicularum*: relationship of pygidium appendages to size.

Width in mm	0.09– 0.13*	0.20– 0.24**	0.25– 0.29	0.30– 0.39	0.4– 0.49	0.5– 0.59	0.6– 0.69	0.7– 0.79***	0.8– 0.89	0.9– 2.3
Single lobe	2	3	3							
2 anal cirri				4	5	5	1	1		
4 anal cirri									1	6

\* Specimen: 0.4 mm by 0.9 mm; with 6 segments, 5 setigers; setiger 1 with 1 limbate seta; pygidium with single lobe.

\*\* Specimen: 1.15 mm by 0.2 mm; with 10 setigers; setiger 1 with 1 limbate seta and 1 bulbous hooded hook; pygidium with single lobe.

\*\*\* Specimen: 10 mm by 7.2 mm; with 52 setigers; setiger 1 with 4 limbate setae; setiger 5 with slender-bladed hooded hook (first occurrence) and 4 limbate setae; pygidium with 2 anal cirri.

setigers 35–40 in mature specimens (Fig. 7e), may be preceded on 1–2 setigers by a single hook with slightly longer blade. Teeth of hooded hooks decreasing in size apically above a subdivided main fang. Posterior hooks with 4–6 teeth above whole or subdivided main fang (Fig. 7f, g). In juveniles 5 mm long by 0.65 mm wide, hooks beginning on setiger 1; 12 mm by 1 mm, hooks beginning about setiger 6; hooks beginning further back with increasing size. Limbate setae and hooded hooks yellow. Aciculae black or dark brown basally, tips usually deep gold; color darker posteriorly in adults. Aciculae color gold to deep gold in juveniles, color darkest in median region. Aciculae numbering 3–5 in anterior, 1 in posterior parapodia. Faint poorly defined vascular loops discernable in some large specimens.

Mandibles hard, fused for half their length; upper edge flat in small adults 2 mm wide, with added calcareous plate in those of 4 mm (Fig. 7h). Maxillary apparatus deep brown, hard with calcified cutting edges. Maxillary carriers long, incised anteriorly in 2 mm wide specimens (Fig. 7i); incised at junction with M I in 4 mm wide specimens, much shorter in proportion to M I and usually folded together (Fig. 7j). M I falcate; M II usually with 4 sawlike teeth, smaller 5th tooth present between distal teeth in about 10% of specimens; M III bidentate (Fig. 7k); M IV unidentate, only slightly larger than

M III. M V free standing, displaced out to M IV, roughly oval.

*Remarks.*—The original description by Webster & Benedict (1887) is brief and incomplete. The color of aciculae or maxillary formula is not mentioned. However, in pl. 4, fig. 55 of the maxillary apparatus, M III appears bidentate on right side and unidentate on left. The first complete description of *S. acicularum* is given in Moore's unpublished manuscript, circa 1900. Moore briefly noted that *S. fragilis* (O. F. Müller, 1776) has a single tooth on M III, a large wing plate on M IV, and that Verrill (1873) had found it in the Woods Hole region, in the deeper waters off Vineyard Sound.

*Scoletoma acicularum* can be distinguished from *S. fragilis* in that *S. acicularum* has: two teeth instead of one on M III; a smaller and irregular-shaped M IV instead of the riding-hat shaped one; roughly conical postsetal lobes on anterior parapodia instead of the wide, flaplike or ear-shaped ones; slightly longer postsetal lobes in posterior parapodia; and 4 anal cirri in mature specimens instead of two. *Scoletoma fragilis* also has long capillary setae in the median parapodia, notopodial rudiments present on the presetal lobes to mid-body, and hook(s) present between the superior and inferior setae on numerous setigers in medium-size specimens.

Juveniles of *S. acicularum* and *S. fragilis* can be confused with juveniles of *Paraninoe*

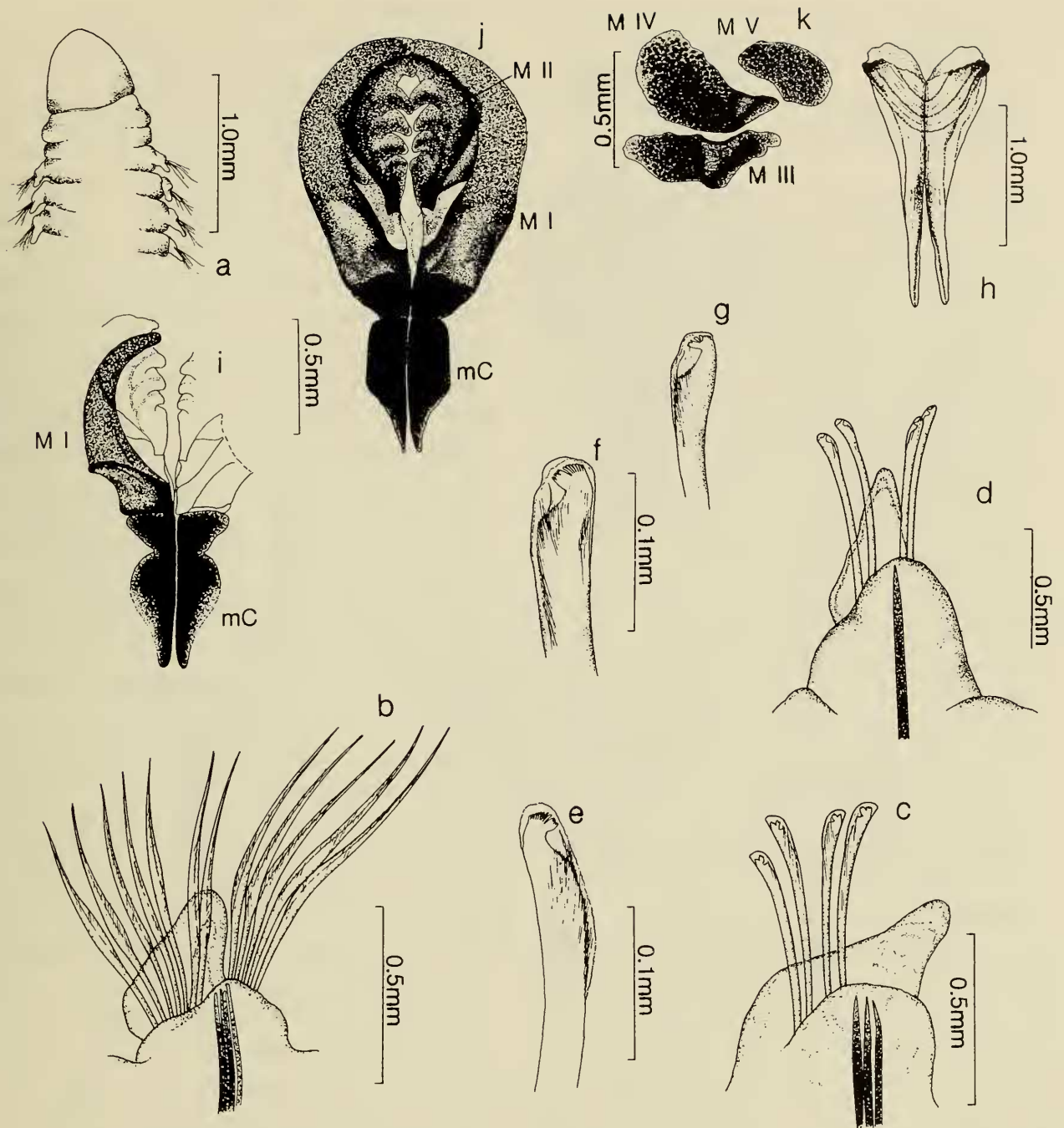


Fig. 7. *Scoletoma acicularum*: a, Prostomium; b, Right parapodium 4; c, Parapodium 83; d, Posterior parapodium from juvenile; e, Hooded hook from setiger 67; f, Hook from posterior parapodium from 4 mm specimen; g, Hook from posterior parapodium of juvenile; h, Mandibles; i, Maxillary carriers, M I and M II from 2 mm specimen; j, Maxillary carriers, M I and M II from 4 mm specimen; k, Right M III, M IV and M V from 4 mm specimen.

*brevipes* (McIntosh, 1885) and *Ninoe nigripes* Verrill, 1873 (*N. nigripes* lacks branchiae until it is 0.4–0.6 mm wide). However, the anterior postsetal lobes of *S. acicularum* and *S. fragilis* are of different shape than the digitate lobes of *P. brevipes* and *N. nigripes*.

*Distribution.*—Nova Scotia to North Carolina; low water–244 m. Grain size range from granular to coarse clay; greatest numbers in very coarse sand to medium sand. TOC values from 0.3–24.0 mg/g. Most abundant at stations with TOC values less

than 4 mg/g, usually absent from stations with high organic content.

*Scoletoma fragilis* (O. F. Müller, 1776)

Fig. 8

*Lumbricus fragilis* O. F. Müller, 1776:216; 1779:45, figs. 1–3; 1781:83.

*Scoletoma fragilis*.—Blainville, 1828:492.

*Lumbrinereis fragilis*.—Verrill, 1881:297, 299, 301, 304, 308, 311, 316.—Webster & Benedict, 1887:725.

*Lumbriconereis fragilis*.—McIntosh, 1903:158.—Fauvel, 1923:430, fig. 171k, 1.—Wesenberg-Lund, 1950a:27; 1950b:69–70, charts 19, VIII, d, H; 1951:55–56, chart 28; 1953:51.—Ushakov, 1955:242 (not McIntosh, 1910:372–376, pl. 62, fig. 1–1a, pl. 73, fig. 8–8c, pl. 82, fig. 2–2b).

*Lumbrineris fragilis*.—Hartman, 1944a:139.—Fauchald, 1970:217.—Hartmann-Schröder, 1971:255, fig. 85a–g.—Campoy, 1982:611–612.—George & Hartmann-Schröder, 1985:128–129, fig. 40a–e (not Pettibone, 1963:262, fig. 69.—Hartman & Fauchald, 1971:82–83.—Day, 1973:62.—Gardiner, 1976:197–198).

*Material examined*.—Northwestern Atlantic, Off NE USA: NEMP Sta. 13, 17 Dec 1979 (1 USNM 146114); NEMP Sta. 19, 10 Dec 1979 (2 ZMUC, 2 ABF), 15 Jul 1980 (1 USNM 146115), 10 Dec 1980 (5 ABF), 15 Jul 1981 (2), 2 Sep 1982 (2 ZMUC), 5 Jul 1984 (2 ZMUC, 2 ZMUO, 3 ABF); NEMP Sta. 20, 11 Dec 1979 (1 ABF); NEMP Sta. 28, 4 Dec 1979 (1 ABF), 17 Dec 1980 (1 USNM 146116, 1 ABF), 28 Jan 1982 (1 ABF); NEMP Sta. 35, 4 Dec 1979 (12 ABF), 14 Jul 1980 (3 USNM 146117, 1 ZMUO), 15 Dec 1980 (5 ABF), 21 Jul 1981 (22 ABF), 29 Jan 1982 (7 ABF), 16 Sep 1982 (18 ABF), 3 Jul 1984 (3 ZMUC, 3 ABF), 25 Jun 1985 (1 ABF); NEMP Sta. 37, 28 Aug 1982 (3 ABF), 27 Jan 1983 (2 ZMUC, 2 ABF), 5 Jul 1984 (5 USNM 146118); NYB Sta. 21, 28 Jul 1980 (1 ABF).—Gulf of Maine: EPA Sta. 8, 42°20.75'N, 70°39.24'W, 21 Sep 1990, 36 m, B. Dinkins ID.

*Description*.—Preserved material colorless, tan or salmon color, slightly iridescent. Largest specimen (incomplete) 120 mm long, 4.3 mm wide, with 273 segments. Body tapering posteriorly, posterior segments about  $\frac{2}{3}$  width of anterior ones; segment lengths similar throughout. Prostomium (Fig. 8a) short, bluntly conical, about as long as wide. First peristomial segment equal in length to setiger 1, second segment slightly shorter. Anterior postsetal lobes short, obliquely truncate, flaplike, or ear-shaped (Fig. 8b); conical, reduced in width and height medially (Fig. 8c); conical in posterior parapodia, with height about equal to those of anterior (Fig. 8d). In juveniles (less than 1 mm wide) anterior postsetal lobes rounder, narrower and flaplike. Presetal lobes round, with notopodial rudiment to mid-body. Specimens 2 mm wide with 2 anal cirri; juveniles and smaller specimens with 2 anal cirri or a single lobe.

Superior limbate setae of anterior parapodia longer than inferior setae. Number of limbate setae per fascicle increases from 9 on setiger 1, to 11 on setiger 4, and 14 on setiger 8; thereafter decreasing, none after setigers 25–32. In specimens of 1.5 mm or more wide, longer limbate setae present on setigers 20–40 (18–79) with long, slender blades and whiplike tips (Fig. 8e). Short bulbous hooded hooks beginning on setigers 26–35 in specimens 2–4 mm wide; beginning on setiger 1 in specimen 0.2 mm wide. Hook(s) with longer slender blade (Fig. 8f) between the superior and inferior setae (Fig. 8g), present on specimens of 0.6–3 mm wide, absent in specimens wider than 3 mm, starting as a single hook, numbering 1–3 (rarely 4) per fascicle. Specimen 2.2 mm wide with 1 long hooded hook on setiger 13, 1 on 14, 3 on 15, 2 on 16–19, and 1 on 20; specimens 0.75 mm wide usually with single long hooded hook per parapodium. Each hook with 6–8 teeth decreasing apically in size; main fang occasionally entire in median parapodia (Fig. 8h), otherwise subdivided (Fig. 8i). Mature specimens with 2–3 (rarely



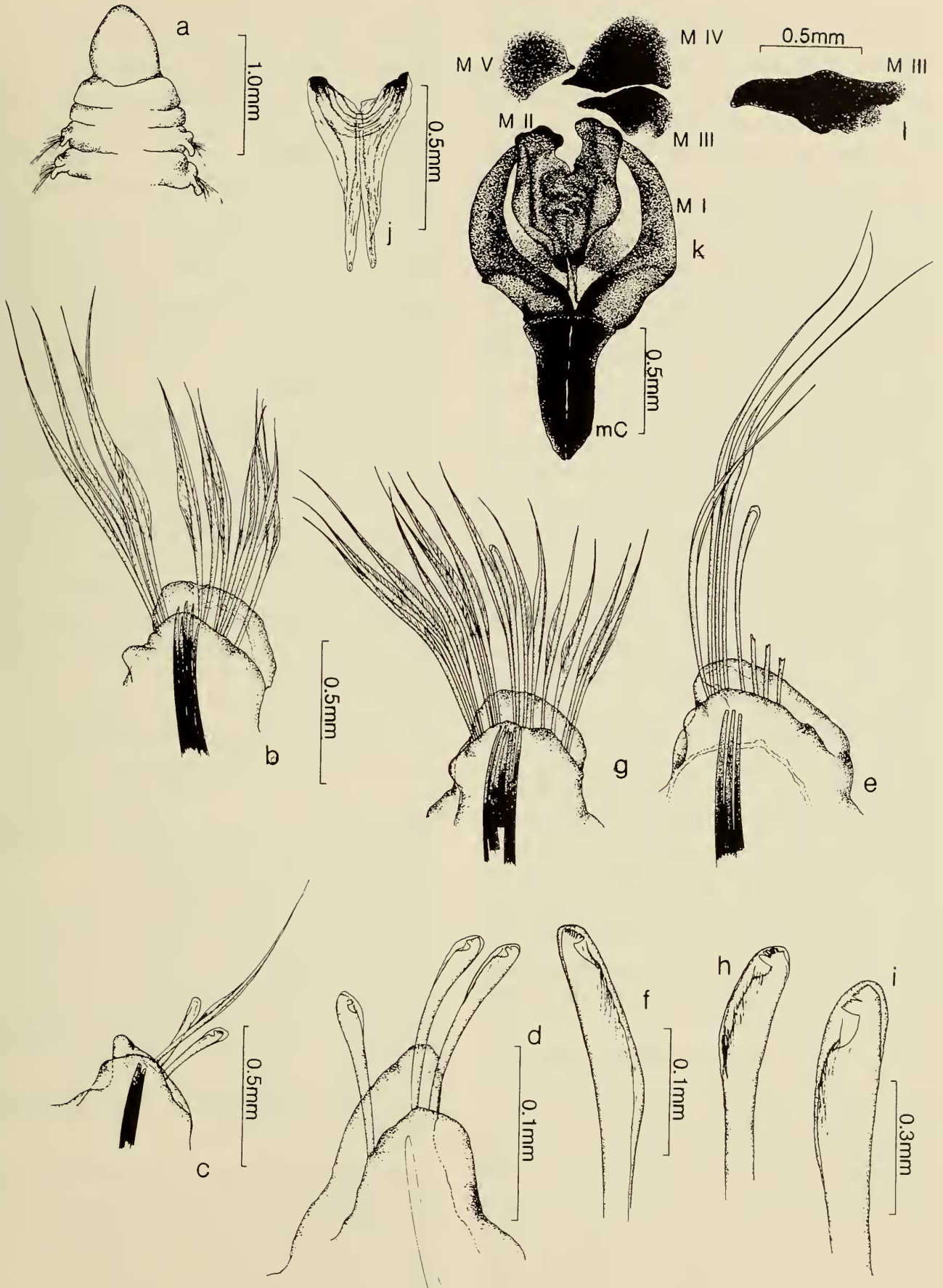


Fig. 8. *Scoletoma fragilis*: a, Prostomium; b, Right parapodium 6; c, Parapodium 94; d, Posterior parapodium from juvenile; e, Parapodium 35, inferior hooks broken; f, Hooded hook from parapodium 9; g, Parapodium 9; h, Hook from parapodium 65; i, Hook from posterior parapodium of juvenile; j, Mandibles; k, Maxillae; l, M III.

4) hooks per fascicle in median parapodia and 3–5 in posterior ones. In anterior parapodia basal tips of limbate setae and hooks usually yellow with shafts a deeper shade of gold; in median parapodia shafts dark gold; and in posterior parapodia blades as well as shafts dark gold, setae absent. Aciculae dark brown, distal tips and sometimes basal tips light gold. Juveniles 0.65 mm wide, hooks and limbate setae yellow throughout, aciculae deep gold in anterior parapodia and beginning of middle ones, yellow (Fig. 8d) in more posterior ones. Vascular loops visible in some presetal lobes as well as in postsetal lobes of large specimens.

Mandibles (Fig. 8j) hard, fused for half their length. Maxillary apparatus (Fig. 8k) dark brown. Maxillary carriers long and broad, slightly constricted medially. M I with broad base and falcate tips; M II with 4 teeth, wide gap between distal teeth, distal tooth largest; M III with long, blunt tooth (Fig. 8l); M IV riding hat-shaped, much larger than M III; M V free standing, displaced outward to M IV.

*Remarks.*—Hartman (1959:334) noted that the type locality for *S. fragilis* is Denmark. However, according to Dr. Mary E. Petersen, Zoological Museum, University of Copenhagen (pers. comm.), O. F. Müller clearly indicates in later writings (1779:45, 1781:83) that the type locality was near Drøbak, on the Oslofjord, where the animal lived in blue clay. She also noted that there are no extant polychaete types of O. F. Müller.

Dr. Inger M. Winsnes (1980) of the Zoological Museum, University of Oslo, collected specimens of *S. fragilis* from the vicinity of Drøbak. Comparisons were made between 5 specimens from Drøbak, Norway, 1 from Lodingen, Lofoten, Norway and 13 from our surveys. Examined were the setigers with short slender hooks and long slender setae, the setigers on which the bulbous hooded hooks began and the shape of the parapodia. The Drøbak specimens and

ours were alike, having similar shaped parapodial lobes with notopodial rudiments; similar limbate setae, including the long, slender setae from median parapodia; similar hooded hooks, including the hooks with the slender blades present in specimens of 0.6–3.0 mm wide; similar maxillary apparatus; and a maximum of 2 anal cirri. However, the specimen from Lodingen had a much longer slender hook (similar in appearance to the anterior hook of *S. hebes*) on setiger 20 in the inferior setae bundle, instead of the shorter, slender blade between the two setal groups.

*Distribution.*—The species described herein has been found from Maine to New Jersey; *S. fragilis* has been reported from Nova Scotia, Iceland, Greenland, Norway, Sweden, Denmark, North Pacific, Mediterranean and English Channel; 21–4250 m. Grain size range in our survey from medium sand to coarse clay; greatest numbers in medium silt to fine sand. TOC values from 0.6–17.0 mg/g.

*Scoletoma hebes* (Verrill, 1879),  
new combination  
Figs. 9, 10

*Lumbriconereis obtusa* Verrill, 1874:383;  
1875:39 (not Kinberg, 1865).

*Lumbrineris hebes* Verrill, 1879:174.

*Lumbrineris hebes.*—Webster & Benedict, 1887:725.—Moore, 1900:470–472, figs. 45–46; 1909:138.—Pettibone, 1963:264 (in part, not *Lumbriconereis tenuis* Verrill, 1873), fig. 70g–j.—Perkins, 1979:436–439, figs. 8, 9a–c.

*Lumbrineris near tenuis.*—Hartman & Fauchald, 1971:83–84.

*Material examined.*—Northwestern Atlantic, Off NE USA: NEMP Sta. 2, 14 Dec 1979 (4), 20 Jul 1980 (9); NEMP Sta. 8, 28 Apr 1978 (31), 15 Dec 1979 (25 ABF, 82), 20 Jul 1980 (19), 7 Dec 1980 (22), 12 Jul 1981 (208), 8 Feb 1982 (14), 30 Aug 1982 (18), 10 Jul 1983 (15); NEMP Sta. 9, 19 Jul

1980 (363), 8 Dec 1980 (699), 13 Jul 1981 (113 ABF, 433), 9 Feb 1982 (460), 30 Aug 1982 (158), 9 Jul 1983 (411), 25 Aug 1984 (99 ABF, 100); NEMP Sta. 10, 26 Apr 1979 (1); NEMP Sta. 11, 21 Apr 1978 (60), 21 Sep 1978 (32), 23 Apr 1979 (13), 20 Jul 1979 (8), 26 Sep 1979 (19), 16 Dec 1979 (457), 19 Jul 1980 (28), 8 Dec 1980 (43), 13 Jul 1981 (15), 9 Feb 1982 (100), 29 Aug 1982 (67), 9 Jul 1983 (153), 10 Jul 1984 (178); NEMP Sta. 12, 16 Dec 1979 (18 ZMUO, 5 ABF, 233), 18 Jul 1980 (667), 9 Dec 1980 (320), 13 Jul 1981 (191), 9 Feb 1982 (526), 29 Aug 1982 (471), 9 Jul 1983 (613); NEMP Sta. 13, 22 Apr 1978 (191), 20 Sep 1978 (77), 22 Apr 1979 (115), 13 Sep 1979 (40 USNM 146119, 11 ZMUO, 27 ABF), 17 Dec 1979 (746), 22 Jul 1980 (266), 9 Dec 1980 (55 ABF, 260), 17 Aug 1981 (56 ABF, 148), 10 Feb 1982 (237), 29 Aug 1982 (300), 9 Jul 1984 (304); NEMP Sta. 17, 14 Aug 1981 (11); NEMP Sta. 18, 9 Dec 1979 (2 ABF, 56), 1 Jul 1980 (143), 2 Dec 1980 (7), 8 Jul 1981 (41), 5 Feb 1982 (35), 2 Sep 1982 (24), 6 Jul 1984 (34); NEMP Sta. 19, 15 Jul 1981 (1), 27 Jan 1982 (19); NEMP Sta. 22, 31 Jan 1982 (1), 5 Jul 1984 (2 ABF); NEMP Sta. 23, 17 Sep 1979 (6); NEMP Sta. 31, 10 Jul 1984 (1 ABF); NEMP Sta. 33, 13 Dec 1979 (550), 1 Aug 1980 (532), 5 Dec 1980 (177), 13 Aug 1981 (361 USNM 146120, 694 ABF), 6 Feb 1982 (6 ABF, 839), 1 Sep 1982 (822), 29 Aug 1984 (497), 16 Jul 1985 (149); NEMP Sta. 34, 9 Dec 1979 (62), 14 Jul 1980 (202), 2 Dec 1980 (70), 7 Jul 1981 (40), 27 Jan 1982 (107), 8 Sep 1982 (57), 7 Jul 1983 (91), 22 Jun 1985 (119); NEMP Sta. 35, 14 Jul 1980 (5), 21 Jul 1981 (7), 29 Jan 1982 (5), 16 Sep 1982 (2), 3 Jul 1984 (3), 25 Jun 1985 (14); NEMP Sta. 36, 2 Dec 1980 (110), 22 Jul 1981 (86), 26 Jan 1982 (95), 15 Sep 1982 (64), 1 Jul 1983 (177), 22 Jun 1985 (35); NEMP Sta. 37, 10 Jul 1980 (112), 11 Dec 1980 (37 ABF, 8), 16 Jul 1981 (67 ABF, 98), 27 Jan 1982 (27 USNM 146121, 76 ABF, 165), 28 Aug 1982 (1 ABF, 334), 6 Jul 1983 (583), 3 Jul 1984 (1 USNM 146122, 27 ZMUO, 125 ABF), 24 Jun 1985 (239); NEMP Sta. 39, 12 Jul 1980 (36); NEMP Sta. 15A, 23 Apr 1978 (4), 18 Jul 1979 (1), 11 Dec 1979 (1), 4 Dec 1980 (5), 2 Sep 1982 (12), 31 Aug 1984 (16), 14 Jun 1985 (21); NEMP Sta. 16B, 30 Jul 1980 (1), 12 Aug 1981 (2), 9 Sep 1982 (2); NEMP Sta. 16C, 12 Dec 1979 (25), 31 Jul 1980 (9 ABF, 73), 5 Feb 1982 (10); NYB Sta. 1, 28 Jul 1980 (11), 10 Aug 1981 (15), 12 Sep 1982 (123), 20 Jul 1983 (125), 24 Aug 1984 (88), 1 Oct 1985 (75); NYB Sta. 2, 28 Jul 1980 (6 ABF, 3), 10 Aug 1981 (3), 11 Sep 1982 (18), 20 Jul 1983 (6), 24 Aug 1983 (13), 15 Aug 1984 (15), 30 Sep 1985 (26); NYB Sta. 3, 28 Jul 1980 (3), 12 Sep 1982 (1); NYB Sta. 4, 2 Oct 1985 (1); NYB Sta. 5, 4 Aug 1980 (1), 9 Sep 1982 (1), 31 Aug 1984 (2), 1 Oct 1985 (4); NYB Sta. 8, 31 Jul 1980 (9), 15 Aug 1981 (7), 10 Sep 1982 (333), 20 Jul 1983 (38), 26 Aug 1983 (23), 2 Oct 1985 (1); NYB Sta. 9, 30 Jul 1980 (4), 12 Aug 1981 (1), 10 Sep 1982 (128), 25 Aug 1984 (199), 1 Oct 1985 (7); NYB Sta. 10, 30 Jul 1980 (321), 15 Aug 1981 (12), 13 Sep 1982 (52), 20 Jul 1983 (56), 25 Aug 1982 (62), 2 Oct 1985 (74); NYB Sta. 11, 30 Jul 1980 (21 ZMUO, 20 ABF), 12 Aug 1981 (8), 13 Sep 1982 (32), 25 Aug 1984 (18), 2 Oct 1985 (17); NYB Sta. 12, 30 Jul 1980 (142), 25 Aug 1984 (8); NYB Sta. 13, 31 Jul 1980 (625), 12 Aug 1981 (68), 13 Sep 1982 (1280), 21 Jul 1983 (437), 31 Aug 1984 (129), 2 Oct 1985 (153); NYB Sta. 14, 1 Aug 1980 (123), 13 Aug 1981 (20), 14 Sep 1982 (124), 5 Sep 1983 (112), 28 Aug 1984 (113), 3 Oct 1985 (175); NYB Sta. 16, 1 Aug 1980 (109), 12 Aug 1981 (11), 13 Sep 1982 (276), 20 Jul 1983 (14), 5 Sep 1983 (339), 30 Aug 1984 (27 ABF, 142), 2 Oct 1985 (85); NYB Sta. 17, 1 Aug 1980 (1 ABF, 10), 12 Aug 1981 (28), 13 Sep 1982 (140), 20 Jul 1983 (213), 5 Sep 1983 (118), 30 Aug 1984 (49), 2 Oct 1985 (42); NYB Sta. 18, 31 Jul 1980 (38), 10 Sep 1982 (93), 19 Jul 1983 (47), 25 Aug 1983 (14), 31 Aug 1984 (2), 1 Oct 1985 (65); NYB

Table 4.—*Lumbrineris hebes*: relationship of pygidium appendages to size.

Width in mm	0.09*	0.01– 0.14	0.15– 0.19**	0.20– 0.24	0.25– 0.29***	0.30– 0.35	0.35– 0.39	0.4– 0.44	0.45– 0.49	0.5– 0.59	0.6– 0.69	0.7– 0.72
1–4 lobes	2	4	9	16	5	3	1	1	1	1	1	1
1 anal cirrus			2	4	3	2						
2 anal cirri		1	8	20	8	15	1	7	4	2	1	
3 anal cirri			1	1		1	1	1	1	1		
4 anal cirri				1	2	1	4	4		4	4	3

\* Specimen: 0.9 mm by 0.09 mm; with 8 setigers; setiger 1 with 2 limbate setae; posterior postsetal lobe not elongated; pygidium with single lobe.

\*\* Specimen: 1.9 mm by 0.2 mm; with 14 setigers; setiger 1 with 2 limbate setae and 1 slender-bladed, hooded hook; posterior postsetal lobe not elongated; pygidium with 4 lobes.

\*\*\* Specimen: 3.6 mm by 0.25 mm; with 48 setigers; setiger 1 with 2 limbate setae and 1 long, slender hooded hook; posterior postsetal lobe elongated; pygidium with 2 anal cirri.

Sta. 21, 13 Sep 1982 (4), 31 Aug 1984 (1), 30 Sep 1985 (3); NYB Sta. 22, 9 Sep 1982 (64), 5 Jul 1983 (12), 31 Aug 1984 (10), 1 Oct 1985 (7); NYB Sta. 24, 3 Aug 1980 (31), 14 Aug 1981 (28), 14 Sep 1982 (16); NYB Sta. 28, 13 Aug 1981 (11), 14 Sep 1982 (18), 28 Aug 1984 (2 ABF); NYB Sta. 31, 1 Oct 1985 (6); NYB Sta. 32, 1 Oct 1985 (1); NYB Sta. 33, 15 Sep 1982 (2), 30 Aug 1984 (1), 30 Sep 1985 (10); NYB Sta. 34, 29 Jul 1980 (1), 9 Sep 1982 (14), 7 Sep 1983 (23), 30 Aug 1984 (19), 1 Oct 1985 (25); NYB Sta. 35, 29 Jul 1980 (5 ABF), 9 Sep 1982 (2), 21 Jul 1983 (2), 30 Aug 1984 (2), 1 Oct 1985 (3); NYB Sta. 37, 9 Sep 1982 (2); NYB Sta. 39, 1 Aug 1980 (29), 11 Aug 1981 (37), 9 Sep 1982 (44), 6 Sep 1983 (29), 30 Aug 1984 (11), 3 Oct 1985 (20); NYB Sta. 40, 31 Jul 1980 (304), 12 Aug 1981 (2 ABF, 68), 9 Sep 1982 (696), 19 Jul 1983 (9), 1 Oct 1985 (33); NYB Sta. 42, 4 Aug 1980 (20), 15 Aug 1981 (101), 2 Oct 1985 (3); NYB Sta. 43, 31 Jul 1980 (179), 15 Aug 1981 (381), 13 Sep 1982 (69), 13 Jul 1983 (34); NYB Sta. 44, 31 Jul 1980 (55), 14 Sep 1982 (61), 21 Jul 1983 (18), 2 Oct 1985 (1); NYB Sta. 64, 31 Aug 1984 (1); NYB Sta. 65, 11 Sep 1982 (326).—Off Delaware, Philadelphia Dumpsite: EPA Sta. 201, 38°20'N, 74°18'W, 51 m, Jun 1983 (12), coll. Cove Corporation, Lusby, Maryland, N. K. Mountford ID.

*Description.*—Preserved material colorless. In life color pale yellow, intestines yellow, orange or blood red (Moore, 1900:472).

NYB specimen (USNM 146122) 15 mm long, 0.6 mm wide, with 121 setigers. Body width increases slightly in first 10–15 setigers then tapers gradually towards posterior end. Prostomium about as long as wide, either acorn-shaped (Fig. 9a) or conical. Peristomial rings equal to each other and to first setiger. Postsetal lobes bluntly conical and slightly longer than presetal lobes in anterior (Fig. 9b) and median setigers (Fig. 9c), much longer, digitate in posterior setigers and directed obliquely upwards (Fig. 9d). Presetal lobes rounded throughout. About 30–40% of mature specimens with an indistinct notopodial rudiment on first 25–30 setigers. Pygidium varying greatly from juveniles to adults, having from 4 lobes (Fig. 10a) to 1–4 anal cirri (Fig. 10b–e), with 4 or 2 anal cirri most common (Table 4).

Anterior parapodia of mature specimens with 4 (rarely 5) limbate setae in superior position, then 1–2 long slender simple hooded hooks followed by a single limbate seta. Limbate setae less numerous after setiger 10, totally lacking after setigers 17–24. Setigers 10–11 with transitional shorter hooks with slender blades; setigers 12 through posterior with 2–3 short hooks with bulbous tips. Hooks of anterior setigers (Fig. 8e) with 8–9 teeth of equal size, main fang slightly larger than adjacent tooth. Hooks become bulbous with 8–9 teeth in median setigers (Fig. 9f), and 6–7 teeth in posterior ones (Fig. 9g); teeth decreasing apically in

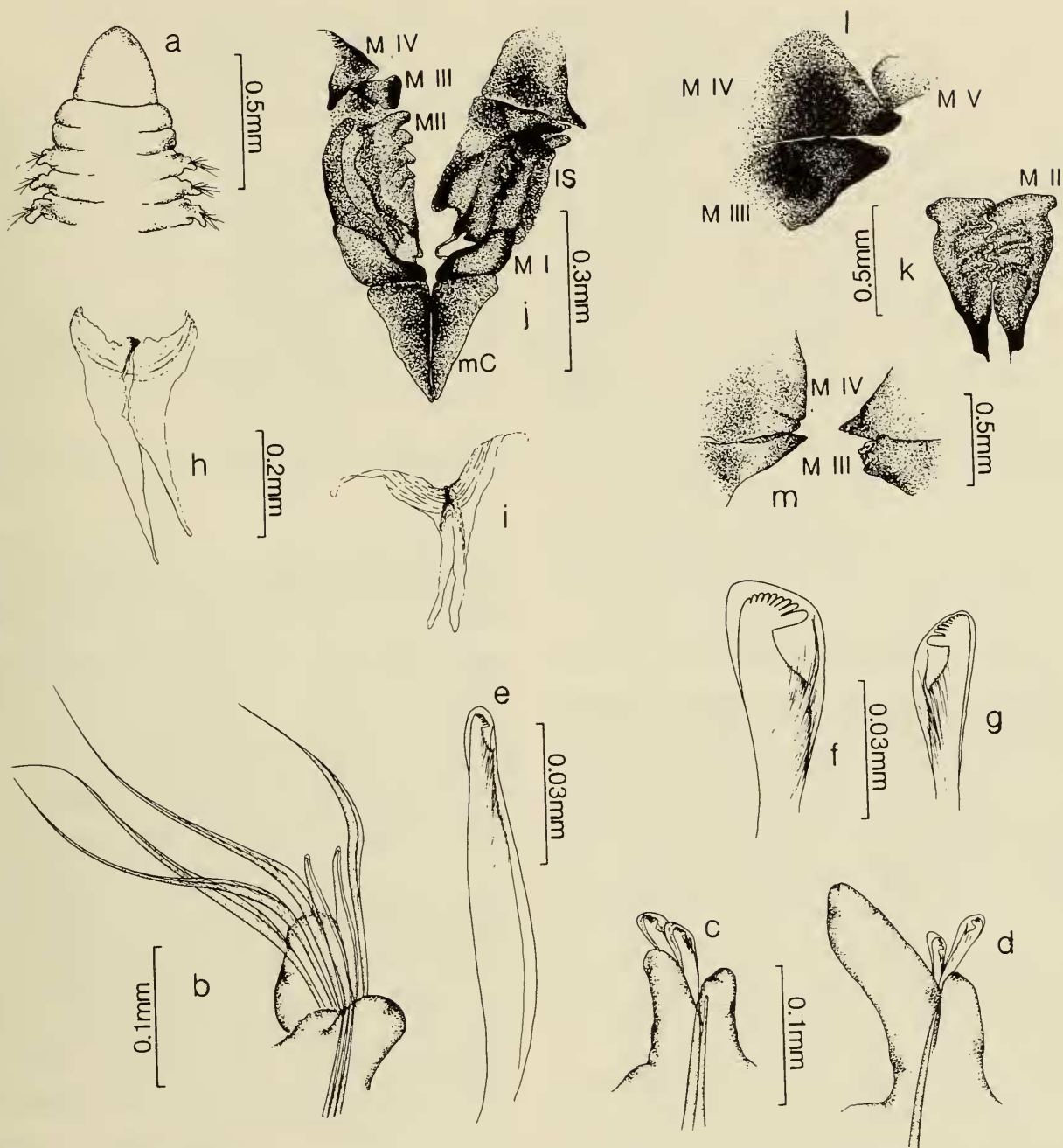


Fig. 9. *Scoletoma hebes*: a, Prostomium; b, Right parapodium 3; c, Parapodium 27; d, Posterior parapodium; e, Hooded hook from parapodium 4; f, Hook from parapodium 27; g, Hook from posterior parapodium; h, Mandibles; i, Mandibles combined with fleshy material; j, Maxillae; k, M II; l, Right M III, M IV and M V; m, M III and M IV, showing tooth dentition and erosion (from same specimen).

size, main fang usually entire. Aciculae yellow, 3 (rarely 4) in anterior setigers, 1 in posterior setigers.

Mandibles (Fig. 9h) paper thin, fragile and translucent invisible in some individuals. Anterior flared wings of many mature individuals cannot be entirely separated from fleshy parts (Fig. 9i). Mandible blades divided for one third to two thirds of their length. Maxillary apparatus brown and frag-

ile, especially M III and M IV. Maxillary carriers broad, slightly constricted near distal end, permanently divided (Fig. 9j); M I forceps stout with smooth border below falcate tip with strong lateral supports; M II asymmetrical with 4 (3-5) teeth, distal tooth largest, tooth below almost as large (Fig. 9k); M III and M IV with long blunt tooth (Fig. 9l). Occasionally in specimens found in coarse sands, tooth of M III and/or M IV

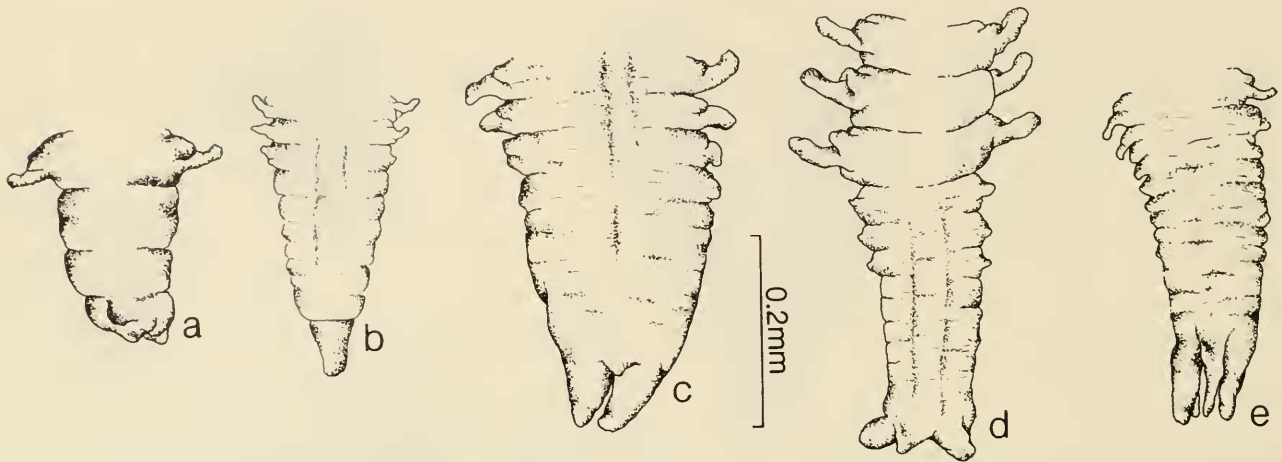


Fig. 10. Growth variations of pygidium in *Scoletoma hebes*: a, 4 lobes; b, Single lobe; c, 2 anal cirri; d, 3 anal cirri; e, 4 anal cirri.

worn down or broken, giving appearance of more than one tooth (Fig. 9m). M V lightly joined to M IV just above blunt tooth.

*Remarks.*—Identification of this species is difficult due to the confusion existing in the literature. Verrill's original description lacked illustrations, and did not mention the mouthparts or the number of anal cirri. Moore (1900) described *S. hebes* as having 1 larger tooth and 2–3 smaller teeth on M III and 1 or 2 teeth on M IV. His illustrations of the maxillary apparatus show the same fragmentation of M III and IV as we have observed in specimens from coarse sands.

Pettibone (1963:264) used Moore's illustration of *S. hebes* as part of her figures of *S. tenuis*, with the description of *S. tenuis* reading: "Simple hooded hooks beginning on or about setiger 9 (1–17)."

Perkins (1979:436–439) reexamined the syntypes and published a fairly complete redescription of *S. hebes*; however, due to the limited number (7) of specimens available for examination, the pygidium was described as having four rounded lobes. As also pointed out by Perkins, *S. hebes* may be distinguished from *S. tenuis* by the long slender hooded hooks which start on setiger 1; *S. tenuis* has short bulbous hooks, which start on setigers 10–13 in adults and on setigers 8–9 in juveniles.

Separation of the northern *S. hebes* and

the southern *S. verrilli* (Perkins, 1979) is more difficult and requires examination of M III and M IV. In *S. verrilli*, the distal silhouette of M IV is conical or gum drop-shaped (Perkins 1979, fig. 11f) rather than riding hat-shaped; the inferior midway point of M IV touches at M III. Perkins described M IV as having a large semi-oval M V (not drawn), but the M V was not present in 12 specimens from Biscayne Bay, Florida (Florida Department of Environmental Regulation, Sta. 36, 25°46'N, 80°11'W, 2.5 m, Oct 81 (24), H. D. Rudolph ID, ABF coll.) or in 1 specimen from Texas, off Port Isabel, BLM Sta. IV-I, 20°10'N, 97°01'W, 27 m, fall 1977 (53), J. M. Uebelacker ID, USNM 90992. The specimens from Biscayne Bay were thinner in proportion to length compared to *S. hebes*, and had 0, 1 or 2 anal cirri.

*Scoletoma hebes* is sometimes confused with *S. impatiens* (Claparède, 1868), which has a similar long slender hook starting on setiger 1, but *S. impatiens* has 2 teeth on M III and a short posterior postsetal lobe.

*Distribution.*—Gulf of Maine to Gulf of Mexico; 8–110 m. Grain size range from granular to very fine silt; greatest numbers at NYB Stations in very fine sand. TOC values from 0.3–34.4 mg/g; most abundant at stations where TOC values are greater than 7.0.

*Scoletoma tenuis* (Verrill, 1873),  
new combination

*Lumbriconeris tenuis* Verrill, 1873:594–595;  
1879:49.

*Lumbrineris tenuis*.—Webster & Benedict,  
1884:594–595; 1879:49.

*Lumbrineris tenuis*.—Hartman, 1944b:340,  
pl. 49, figs. 3–5.—Pettibone, 1963:264 (in  
part), fig. 70a–d.—Gardiner, 1976:199,  
fig. 26p–r.—Perkins, 1979:433–436, fig.  
7a–j.—Uebelacker, 1984:26–28, figs. 21,  
22a–g.

*Lumbrineris bassi*.—Hartman, 1944a:150–  
151, pl. 10, figs. 217–222.

*Material examined*.—Northwestern At-  
lantic, Off NE USA: NEMP Sta. 2, 6 Dec  
1980 (1 ABF); NEMP Sta. 3, 11 Jul 1981  
(1 ABF).—Connecticut, Off Noank: Long  
Island Sound Survey, Sta. 139, 41°00.02'N,  
72°00'W, 21 m, 14 Aug 1972 (4 ABF).—  
New Jersey, Manasquan River: New Jersey  
Department Fish, Game and Wildlife,  
Manasquan River Survey, 1 m, Oct 1986  
(9 ABF), C. Idelberger ID.

*Remarks*.—Moore (1900:463–465) was  
the first to provide a complete description  
and drawings of *S. tenuis*. Excellent recent  
descriptions are given in Perkins (1979:433–  
436) and Uebelacker (1984:Ch. 41, pp. 26–  
28). Differences between *S. tenuis* and *S.*  
*hebes* are given under the remarks of *S.*  
*hebes*.

*Distribution*.—Massachusetts to Gulf of  
Mexico; intertidally–24 m. Grain sizes in  
our survey range from fine sand to very fine  
sand. TOC values 1.3–5.9 mg/g.

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#### Literature Cited

- Audouin, J. V., & H. Milne Edwards. 1833. Classi-  
fication des Annélides, et description de celles  
qui habitent, les côtes de la France.—Annales  
des Sciences Naturelle 28:187–247, pls. 9–10.
- Averincev, V. G. 1972. Benthic polychaetes Errantia  
from the Antarctic and Subantarctic collected  
by the Soviet Antarctic Expeditions.—Issledo-  
vaniya Fauny Morei 10(19):88–293 (in Rus-  
sian).
- Blainville, H. De. 1828. Dictionnaire des Sciences  
naturelles dans lequel on traite methodique-  
ment des differens êtres de la nature, considerés  
soit en eux-mêmes, d'après l'état actuel de nos  
connaissances; soit relativement a l'utilité qu'en  
peuvent retirer la médecine, l'agriculture, le  
commerce et les arts. Suivi d'une biographie des  
plus célèbres naturalistes. Vol. 57, 628 pp.
- Campoy, A. 1982. Fauna de España. Fauna de ane-  
lidos poliquetos de la Península Iberica.—Pu-  
blicaciones de Biología de la Universidad de  
Navarra, serie Zoológica 7(1,2):xxi + 1–781.
- Chiarelli, S. della. 1841. Descrizione a notomia degli  
animali invertebrati della Sicilia ceteriore os-  
servati vivi negli anni 1822–1830.—Naples, 5  
vols., 137 pls. (Annelids in vol. 3).
- Claparède, E. 1868. Les Annélides Chetopodes du  
Golfe de Naples.—Mémoires de la Société de  
Physique et d'Histoire Naturelle de Genève 19:  
313–584, 16 pls.
- Clark, R. B. 1952. New records of sub-littoral poly-  
chaetes from the Clyde Sea area, with descrip-  
tion of a new species.—Proceedings of the Royal  
Society of Edinburgh, Section B (Biology) 65:1–  
26.

- Day, J. H. 1973. New Polychaeta from Beaufort, with a key to all species recorded from North Carolina.—National Oceanography and Atmospheric Administration, Technical Report, National Marine Fisheries Service Circular 375, xiii and 140 pp.
- Ehlers, E. 1897. Polychaeten. *In* Ergebnisse der Hamburger Magalhaensischen Sammelreise 1892–93. Hamburg, Friedrichsen & Company 3:1–148, 9 pls.
- . 1900. Magellanische Anneliden gesammelt während der schwedischen Expedition nach den Magellansländern.—Königlichen Gesellschaft der wissenschaften zu Göttingen, Nachrichten, Mathematisch-physikalischen klasse 1900:206–223.
- . 1901. Die Polychaeten des magellanischen und chilenischen Strandes. Ein faunistischer Versuch. *In* Festschrift zur Feier des Hunderfünfzigjährigen Bestehens des königlichen Gesellschaft der Wissenschaften zu Göttingen (Abhandlungen der Mathematisch-physikalischen klasse). Berlin, Weidmannsche Buchhandlung, 232 pp., 25 pls.
- Fauchald, K. 1970. Polychaetous annelids of the families Eunicidae, Lumbrineridae, Iphitimidae, Arbellidae, Lysaretidae and Dorvilleidae from western Mexico.—Allan Hancock Monographs in Marine Biology 5:1–335.
- . 1972. Benthic polychaetous annelids from deep-water off western Mexico and adjacent areas in the eastern Pacific.—Allan Hancock Monographs in Marine Biology 7:1–575.
- . 1974. Errant polychaetes from Hardangerfjorden.—*Sarsia* 57:1–31.
- Fauvel, P. 1923. Polychètes errantes.—*Fauna de France*, Paris 5:1–488.
- . 1936. Polychètes. Expedition antarctique “Belgica.” Resultats du voyage de la “Belgica” en 1897–1899, sur le commandement de A. de Gerlach de Gomery. Anvers, J. E. Bushman, 46 pp., 1 pl.
- . 1940. Annélides polychètes de la Haute Adriatique.—*Thalassia* 4(1):1–24.
- Fauvel, P., & F. Rullier. 1959. Annélides Polychètes. (Résultats des Scientifiques des Campagnes de la Calypso fascicule IV).—*Annales de l’Institut Océanographique*, New Series; Monaco 37:143–205.
- Gallardo, V. A. 1968. Polychaeta from the Bay of Nha Trang, South Viet Nam.—*NAGA Report* 4(3):35–279.
- Gardiner, S. L. 1976 [1975]. Errant polychaete annelids from North Carolina.—*The Journal of the Elisha Mitchell Scientific Society* 91(3):77–220.
- George, J. D., & G. Hartmann-Schröder. 1985. Polychaetes: British Amphinomida, Spintherida and Eunicida. Synopses of the British Fauna (New Series) 32:1–221 (edited by Doris M. Kermack, published for the Linnean Society of London and The Estuarine and Brackish-Water Sciences Association by E. J. Brill/Dr. W. Backhuys).
- Grube, A. E. 1840. Actinien, Echinodermen und Würmen des Adriatischen-und Mittelmeers nach eigenen Sammlungen beschrieben. Verlag von J. H. Bon, Königsberg, 92 pp., 1 pl.
- . 1878. Annulata Semperiana. Beitrage zur Kenntnis de Anneliden-fauna der Philippinen nach der von Herrn Prof. Semper mitgebrachten Sammlungen.—*Memoires de l’Academie Imperiale des Sciences de Saint-Petersbourg* 25:IX and 300 pp.
- Hartman, O. 1942a. A review of the type specimens of polychaetous annelids at the Peabody Museum of Natural History, Yale University.—*Bulletin of the Bingham Oceanographic Collection Yale University* 8:1–98.
- . 1942b. The identity of some marine annelids in the United States National Museum.—*Proceedings of the United States National Museum*.
- . 1944a. Polychaetous annelids. Part V. Eunicaea.—*Allan Hancock Pacific Expedition* 10:1–238.
- . 1944b. New England Annelida. Part 2, including the unpublished plates by Verrill with reconstructed captions.—*Bulletin of the American Museum of Natural History* 82:327–343.
- . 1948. The marine annelids erected by Kinberg with notes on some other types in the Swedish State Museum.—*Arkiv for Zoologi* 42A(1):1–137, 18 pls.
- . 1959. Catalogue of the polychaetous annelids of the world.—*Allan Hancock Foundation Occasional Paper* 23:1–628, Supplement and Index.
- . 1964. Polychaeta Errantia Antarctica.—*American Geo-physical Union (Publication Number 1226), Antarctic Research Series* 3:1–131, 39 pls., map.
- . 1965. Deep-water benthic polychaetous annelids off New England to Bermuda and other North Atlantic areas.—*Allan Hancock Foundation Publications Occasional Paper* 28:1–378.
- , & K. Fauchald. 1971. Deep-water benthic polychaetous annelids off New England to Bermuda and other North Atlantic areas Part 2.—*Allan Hancock Monographs in Marine Biology* 6:1–327, 1 chart.
- Hartmann-Schröder, G. 1962. Zur Kenntnis des Eulitorals der chilenischen Pazifikküste und ders argentinischen Küste Südpatagoniens unter besonderer Berücksichtigung der Polychaeten und Ostracoden. Teil II. Die Polychaeten des Eulitorals.—*Mitteilungen aus dem Hamburgischen Zoologischen Museum und Institut* 60 (Suppl.):67–167, 228 figs.
- . 1965. Zur Kenntnis des Sublitorals der chi-



- lenischen Küste unter besonderer Berücksichtigung der Polychaeten und Ostracoden. Teil II. Die Polychaeten des Sublitorals.—Mitteilungen aus dem Hamburgischen Zoologischen Museum und Institut 62 (Suppl.):59–305, 300 figs.
- . 1971. Annelida, Borstenwürmer, Polychaeta.—Die Tierwelt Deutschlands 58:1–594.
- . 1979. Zur Kenntnis des Eulitorals der australischen Küsten unter besonderer Berücksichtigung der Polychaeten und Ostracoden (Teile 2 und 3). Mitteilungen aus dem Hamburgischen Zoologischen Museum und Institut 80:123–167.
- Imajima, M., & M. Higuchi. 1975. Lumbrineridae of polychaetous annelids from Japan, with descriptions of six new species.—Bulletin of the National Science Museum Toyko, Series A (Zoology) 1:5–37.
- Intes, A., & P. Le Locuff. 1975. Les annélides polychètes de Côte d'Ivoire—1. Polychètes errantes—Compte rendu systématique.—Cahiers Océanographie 13(4):267–331.
- Kinberg, J. G. H. 1865. Annulata nova.—Öfversigt af Kongliga Vetenskaps-Akademiens Förhandlingar (Stockholm) 21:559–574.
- Knox, G. A., & K. M. Green. 1972. The polychaetous annelids of New Zealand. Part 2: Lumbrineridae.—Journal of the Royal Society of New Zealand 2(1):69–81.
- Levenstein, R. Ya. 1977. A new genus and species of Polychaeta (Family Lumbrineridae) from the deep-water trenches of the North Pacific. Pp. 189–198 in D. J. Reish & K. Fauchald, eds., Essays on polychaetous annelids in memory of Dr. Olga Hartman. Allan Hancock Foundation, Los Angeles.
- Malmgren, A. J. 1867. Annulata Polychaeta Spetsbergiae, Groenlandiae, Islandiae et Scandinaviae hactenus cognita.—Öfversigt af Kongliga Vetenskaps-Akademiens Förhandlingar (Stockholm) 24:127–255.
- McIntosh, W. C. 1885. Report on the Annelida Polychaeta collected by H.M.S. "Challenger" during the years 1873–76.—Challenger Reports, vol. 12, pp. 1–554, pls. 1–55 and 1a–39a.
- . 1903. Notes from the Gatty Marine Laboratory, St. Andrews, no. 25. 1. On the Eunicidae dredged by H.M.S. "Porcupine" in 1869 and 1870. 2. On Canadian Eunicidae dredged by Dr. Whiteaves of the Canadian Geological Survey in 1871–1873. 3. On Norwegian Eunicidae collected by Canon Norman, D.C.L., F.R.S.—Annals and Magazine of Natural History ser. 7, 12: 128–166, pls. 10–13, 9 text figs.
- . 1910. A monograph of the British marine annelids. II. Polychaeta. Syllidae to Ariciidae.—Ray Society of London, pp. 233–524, pls. 51–61 and 71–87.
- Miura, T. 1980. Lumbrineridae (Annélides Polychètes) abyssaux récoltés au cours de campagnes du Centre Océanologique de Bretagne dans l'Atlantique et la Méditerranée.—Bulletin du Muséum National d'Histoire Naturelle, Paris, Serie 4, 2A(4):1019–1057.
- Monro, C. C. A. 1930. Polychaete worms.—Discovery Reports 2:1–222.
- . 1936. Polychaete worms II.—Discovery Reports 12:59–198.
- Moore, J. P. (circa) 1900. The polychaetous annelids of the Woods Hole region. Pp. 1–1032, unpublished manuscript, deposited and available at United States National Museum of Natural History.
- . 1905. New species of polychaetes from the north Pacific, chiefly from Alaska waters.—Academy of Natural Science of Philadelphia Proceedings 57:523–554.
- . 1909. The polychaetous annelids dredged in 1908 by Mr. Owen Bryant off the coasts of Labrador, Newfoundland, and Nova Scotia.—Proceedings of United States National Museum 37(1703):133–146.
- . 1911. The polychaetous annelids dredged by the U.S.S. ALBATROSS off the coast of southern California in 1904. III. Euphrosynidae to Goniadidae.—Academy of Natural Science of Philadelphia Proceedings 63:234–318.
- Müller, O. F. 1776. Zoologia Danicae Prodromus seu animalium Daniae et Norvegiae indigenarum characteres nomina et synonyma imprimis popularium. Havniae, XXXII + 282 pp.
- . 1779. Zoologia Dania seu animalium Daniae et Norvegiae rariorum ac minus notorum. Descriptiones et historia. Volumen primum. Explicationi iconum fasciculi primi ejusdem operis inserviens. Sumtibus Weygandinis, Havniae et Lipsiae, 64 pp.
- . 1781. Zoologia Danica eller Danmarks og Norges seildne og ubekjendte dyrs historie. Forste Bind, exemplarer med kobberne Tab. I–XL. Morten Hallager, Kiobenhavn, 170 pp. + 4 pp. index.
- Orensanz, J. M. 1973. Los anélidos poliquetos de la provincia biogeográfica Argentina. IV. Lumbrineridae.—Physis Sección A, Buenos Aires 32(85): 343–393.
- . 1976. Los anélidos poliquetos de la provincia biogeográfica magallánica. I. Catálogo de las especies citadas hasta 1974. Contrones Tec. Lab. Comunidades Bentónicas, no. 1:83 pp.
- . 1990. The eunicemorph Polychaeta from Antarctic and Subantarctic Seas, with addenda to the Eunicemorphs of Argentina, Chile, New Zealand, Australia and the Southern Indian Ocean.—Antarctic Research Series 52:1–183.
- Perkins, T. H. 1979. Lumbrineridae, Arabellidae, and Dorvilleidae (Polychaeta), principally from Florida, with descriptions of six new species.—

- Proceedings of the Biological Society of Washington 92:415–465.
- Pettibone, M. H. 1963. Marine polychaete worms of the New England area. 1. Aphroditidae through Trochochaetidae. — Bulletin of the United States National Museum 227:1–356.
- Renier, S. A. 1804. Prospetto della Classe dei Vermi, nominati e ordinati secondo il Sistema di Bosc. — Padua, 38 pp.
- Savigny, J. S. 1818. Section on Annelida in Lamarck, 1818.
- Théel, H. L. 1879. Les annélides polychètes des Mer de la Nouvelle-Zemble. — Kongliga Svenska Vetenskaps-Akademiens Handlingar 16(3):3–75.
- Treadwell, A. W. 1921. Leodicidae of the West Indian region. — Published by the Carnegie Institution of Washington 293:127–170.
- Uebelacker, J. M. 1984. Family Lumbrineridae (Chapter 41). In J. M. Uebelacker & P. G. Johnson, eds., Taxonomic guide to the polychaetes of the northern Gulf of Mexico. Final Report to the Minerals Management Service, contract 14-12-001-29091. Barry A. Vittor & Associates, Inc., Mobile, Alabama. Vol. VI, 45 pp.
- Ushakov, P. V. 1950. Mnogoshchetinkovye chervi (Polychaeta) Okhotskogo morya (Polychaeta of the Sea of Okhotsk). — Issledovaniya Dal'nevostochnykh Morei SSSR 2:140–234.
- . 1955. (Polychaeta annelids of the far eastern seas of the USSR (in Russian). — Akademyia Nauk SSSR. Keys to the Fauna of the USSR 56:1–445 (translated 1965 by the Israel Program for Scientific Translation, Jerusalem).
- Verrill, A. E. 1873 [1874]. Report upon the invertebrate animals of Vineyard Sound and the adjacent waters, with accounts of the physical characters of the region. — Report of the United States Commission of Fish and Fisheries for 1871–1872:295–852, 39 pls.
- . 1874. Explorations of Casco Bay by the U.S. Fish Commission in 1873. — Proceedings of the American Association for the Advancement of Science, Portland Meeting, August 1873:340–395, 6 pls.
- . 1875. Brief contributions to zoology from the Museum of Yale College. Results of dredging expeditions off the New England coast in 1874. — American Journal of Science and Arts 10:36–43, pls. 3, 4.
- . 1879. Notice of recent additions to the marine Invertebrata, of the northeastern coast of America, with descriptions of new genera and species and critical remarks on others. Part 1 — Annelida, Gephyraea, Nemertina, Nematoda, Polyzoa, Tunicata, Mollusca, Anthozoa, Echinodermata, Porifera. — Proceedings of the United States National Museum 2:165–205.
- . 1881. New England Annelida Part 1. Historical sketch, with annotated lists of the species hitherto recorded. — Transactions of the Connecticut Academy of Arts and Science 4:285–324, 324a–e, pls. 3–12.
- Webster, H. E., & J. E. Benedict. 1884. The Annelida Chaetopoda from Provincetown, and Wellfleet Massachusetts. — Report of the United States Commission of Fish and Fisheries for 1881:699–747, 8 pls.
- . 1887. The Annelida Chaetopoda from Eastport, Maine. — Report of the United States Commission of Fish and Fisheries for 1885:707–754, 757–758, 8 pls.
- Wesenberg-Lund, E. 1950a. Polychaeta. — The Danish Ingolf Expedition 4(14):1–92, 10 pls., 1 table.
- . 1950b. The Polychaeta of West Greenland, with special reference to the fauna of Norde Stromfjord, Kvane, and Bredefjord. — Meddelelser om Grønland 151(2):1–171, charts 1–37, A–Q.
- . 1951. The zoology of Iceland. Polychaeta. — Ejnar Munksgaard, Copenhagen 2(Part 19):1–182.
- . 1953. The zoology of East Greenland. Polychaeta. — Meddelelser om Grønland 122(3):1–169, 27 charts.
- . 1962. Polychaeta errantia. — Reports of the Lund University Chile Expedition 1948–49, Lunds Universitets Arsskrift, N.F., 137 pp., 49 figs., 2 tpls.
- Winsnes, I. 1980. En systematisk og dyregeografisk undersøkelse over familiene Eunicidae og Lumbrineridae (Polychaeta) fra Norge. Unpublished Ph.D. dissertation, University of Oslo, xxxiii + 151 pp. (in Norwegian).
- . 1981. A new species of *Lumbrineris* (Polychaeta) and a new subspecies of *Lumbrineris scopae* Fauchald from the coast of Norway. — Zoologica Scripta 10:91–94.
- . 1991. In Invertebrates of Scandinavia (in press).
- U.S. Dept. of Commerce, Northeast Fisheries Center, Sandy Hook Laboratory, Highlands, New Jersey 07732, U.S.A.