

TWO NEW SPECIES OF *LEPIDONOTOPODIUM*
(POLYCHAETA: POLYNOIDAE: LEPIDONOTOPODINAE)
FROM HYDROTHERMAL VENTS OFF THE GALAPAGOS
AND EAST PACIFIC RISE AT 21°N

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Abstract.—New collections from the hydrothermal vent areas at 21°N off Western Mexico and the Galapagos Rift included specimens of *Lepidonotopodium fimbriatum* Pettibone, 1983, and two new species: *L. riftense* and *L. williamsae*. The species are described and compared, including observations on their early stages. The species of *Lepidonotopodium* are unique among the Polynoidae in having well-developed bracts encircling the notopodia.

Among the unusual fauna clustered around the hydrothermal vents in the Galapagos region and the 21°N site on the East Pacific Rise, scale-worms of the family Polynoidae are well-represented. The abundant available material was collected by the Galapagos Rift Biology Expedition in 1979 and the OASIS group of Scripps Institution of Oceanography in 1982. Two reports on the polynoids from these areas have appeared: *Lepidonotopodium fimbriatum* in the new subfamily Lepidonotopodinae by Pettibone (1983) and *Branchipolynoe symmytilida*, commensal in the mantle cavities of the deep-sea vent mussels, in the new subfamily Branchipolynoinae by Pettibone (1984). Based on additional material received from J. F. Grassle and I. Williams of the Woods Hole Oceanographic Institution (WHOI), with preliminary sorting by I. Williams, the present study supplements the first of the reports above. In addition to more specimens of *L. fimbriatum*, numerous others are referred to two new species of *Lepidonotopodium*.

The various methods of collecting and sorting of the material have produced many adults, as well as many minute young specimens of polynoids, as noted by accompanying collecting labels: clam bucket wash, clam bucket with mussels, crab trap wash, bottom of Instant Ocean aquarium, washes of, and rubble samples with, *Alvinella*, clams or *Calyptogena*, vestimentiferans or *Riftia*, and mussels. As is well known, many species of polynoids are noted for their close associations with other invertebrates. The closeness of the association of the species of *Lepidonotopodium* with the invertebrates referred to above cannot be determined. However, possible hosts are the ampharetid polychaetes *Alvinella pompejana*, described by Desbruyères and Laubier (1980), the giant clams *Calyptogena magnifica*, by Boss and Turner (1980), the giant vestimentiferans *Riftia pachyptila*, by Jones (1981), and the deep-sea vent mussels, as yet unnamed, but to be described by Kenk and Wilson (in press). The latter definitely serves as the host for *Branchipolynoe symmytilida*, since the polynoids have been found in the mantle cavities of the mussels, as noted above.

Many of the specimens have foreign material attached to the parapodia, setae, and elytral surfaces, including epibiotic bacterial masses of different morphological

types—coccoïd, filamentous, terminal filaments, apical tufts or “hairs,” as observed also for *Alvinella pompejana* by Desbruyères *et al.* (1983).

Types and additional specimens are deposited in collections of the Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution (USNM).

Family Polynoidae

Subfamily Lepidonotopodinae Pettibone, 1983

The genus *Lepidonotopodium* Pettibone, 1983, with *L. fimbriatum* Pettibone, 1983, as the type-species, is emended to include two additional new species from the hydrothermal vents in the Galapagos area and the East Pacific Rise at 21°N.

Lepidonotopodium Pettibone, 1983, emended

Diagnosis.—Body short, flattened, up to 30 segments (first achaetous). Elytra and prominent elytriphores 11 pairs, on segments 2, 4, 5, 7, 9, 11, 13, 15, 17, 19, and 21, with dorsal cirri on posterior segments. Prostomium deeply bilobed; median antenna with ceratophore inserted in anterior notch, with short style; without lateral antennae but with small frontal filaments on anterior lobes of prostomium; paired palps cylindrical, smooth, with filamentous tips; without eyes. First or tentacular segment fused to prostomium, not visible dorsally; tentaculophores lateral to prostomium, each with pair of tentacular cirri, single aciculum, without setae; without facial tubercle. Second segment with first pair of elytra, biramous parapodia and ventral or buccal cirri attached to basal parts of parapodia lateral to mouth; styles longer than following ventral cirri. Parapodia biramous, with notopodia shorter than neuropodia. Notopodia subconical, with well-developed bracts encircling notopodia anteriorly and dorsally. Neuropodia diagonally truncate, deeply notched dorsally. Distal tips of notopodia, notopodial bracts and neuropodia fimbriated with slender papillae. Notosetae and neurosetae numerous, spinous. Dorsal cirri on segments lacking elytra with cylindrical cirrophores attached on posterodorsal sides of notopodia, with tapered styles; ventral cirri short, tapered, attached near middle of neuropodia. Dorsal tubercles on cirriferous segments large, inflated. Elytriphores, dorsal tubercles and their bases with numerous ciliated ridges. Ventral segmental papillae lacking or with 2 to 4 pairs of long papillae on some middle segments (11–14). Pygidium dorsal, bulbous, wedged between parapodia of posterior small segments, with or without pair of anal cirri. Pharynx with 7 or 9 pairs of papillae, 2 pairs of jaws with few (5–9) or numerous basal teeth.

Lepidonotopodium fimbriatum Pettibone

Fig. 1

Lepidonotopodium fimbriatum Pettibone, 1983:393, figs. 1–5.

Additional records.—Pacific Ocean off western Mexico, 20°50'N, 109°06'W, OASIS *Alvin* dives in 1982:—Dive 1213, 2617 m, 19 Apr, *Alvinella* wash, 1 young specimen (USNM 81998).—Dive 1214, 2633 m, 20 Apr, vestimentiferan wash, 2 young specimens (USNM 81999).—Dive 1223-11, 2616 m, 7 May, coarse

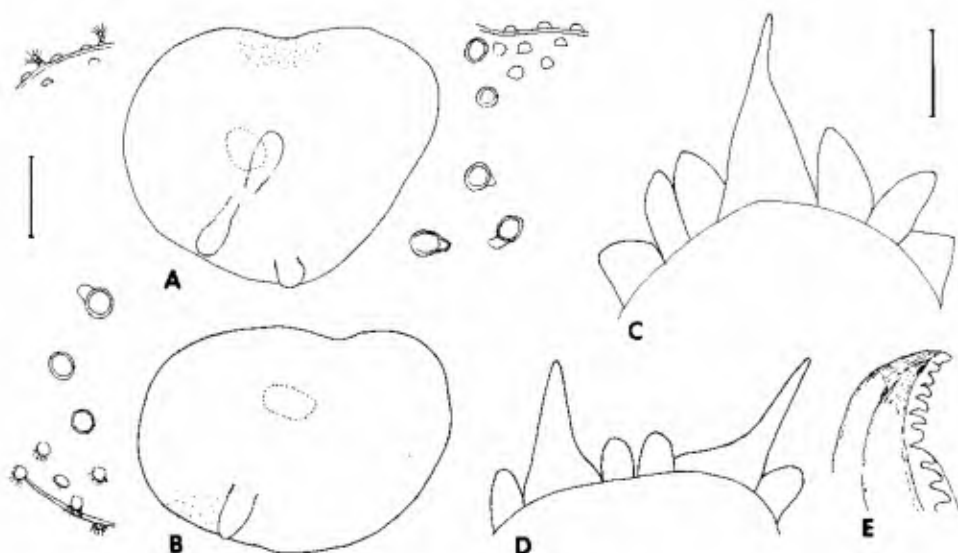


Fig. 1. *Lepidonotopodium fimbriatum*, A, B, elytra from young specimen of 9 mm long and 25 segments, USNM 81998; C-E, border papillae and jaw of extended pharynx from young specimen of 7 mm long and 24 segments, USNM 82000: A, Left first elytron from segment 2, with detail of few microtubercles and micropapillae; B, Left elytron 10 from segment 19, with same; C, Dorsal border papillae; D, Ventral border papillae; E, Jaw. Scales = 0.5 mm for A, B; 0.2 mm for C-E.

fraction, 15 adults and 12 young specimens (USNM 96482).—Dive 1226-7, 2616 m, 10 May, *Riftia*, *Calyptogena* and *Alvinella* wash, 4 adults and 14 young specimens (USNM 82000), and fine fraction, 2 young specimens (USNM 96483).

Supplementary description.—The 19 adult specimens agree with the previously described types except for the larger size of some of them: the largest specimen, 37 mm in length and 16 mm in width with 30 segments, the last 2 of which are minute, compared with the adult types, 23–24 mm in length, 12–13 mm in width, with 28 segments, the last segment small. Nine of the adults have similar ventral segmental papillae on segments 11 and 12 (fig. 3A, in Pettibone 1983) and 10 lack them.

Some of the young specimens have the usual 11 pairs of elytra with 22–26 segments, the last segment small, 5–9 mm in length and 3.5–5 mm in width. When present, the elytra show some signs of the characteristic raised macro-tubercles but lack the full number of 2 macro-tubercles per elytron (Fig. 1A, B; figs. 1, 2E–G, in Pettibone 1983). The elytra are thinner and more delicate, with scattered microtubercles and slightly larger round micropapillae; some fine “hairs” or “bacteria” are attached to the microtubercles (Fig. 1A, B). The pharynx was extended on a young specimen, 7 mm in length, 4 mm in width, with 24 segments; it is slightly different from that of the figured paratype: 7 dorsal papillae with the median one extra large and 6 ventral papillae, with 2 middle ones small and adjacent lateral ones large, and jaw with 9 basal teeth (Fig. 1C–E; 7 pairs of papillae, jaws with 5–7 basal teeth on paratype, fig. 3B, C, in Pettibone 1983).

The remaining young specimens have 6–10 pairs of elytra, with 12–21 segments,

the last 1 or 2 segments very small, 1.5–5 mm in length and 1.2–3 mm in width. The elytra are rather thin and lack the raised macrotubercles.

Distribution.—East Pacific Rise at 21°N, in 2616–2633 meters, appear to be associated with ampharetid polychaetes, *Alvinella pompejana*, giant clams, *Calyptogena magnifica*, and vestimentiferans, *Riftia pachyptila*.

Lepidonotopodium riftense, new species

Figs. 2–4

Material.—East Central Pacific, from dives of the *Alvin* on 3 vent areas along the Galapagos Rift in 1979:

MUSSEL BED, 00°47.89'N, 86°09.21'W:—Dive 880, 21 Jan, 2493 m, 8 paratypes (USNM 96008).—Dive 887, 12 Feb, 2488 m, 27 paratypes (USNM 96009).—Dive 888, 13 Feb, 2483 m, 8 paratypes (USNM 96010).—Dive 991-1, 8 Dec, 2490 m, clam bucket wash, 13 paratypes (USNM 96011).

GARDEN OF EDEN, 00°47.69'N, 86°07.74'W:—Dive 884, 25 Jan, 2482 m, clam bucket with mussels, 5 paratypes (USNM 96016).—Dive 993-7, 10 Dec, 2518 m, crab trap wash, 30 paratypes (26 young, USNM 96017).

ROSE GARDEN, 00°48.25'N, 86°13.48'W:—Dive 890, 15 Feb, 2447 m, bottom of Instant Ocean washings, 11 paratypes (USNM 96013).—Dive 894, 19 Feb, 2457 m, amphipod trap, holotype (USNM 80635) and 3 paratypes (USNM 80636, 80637).—Dive 896-22, 21 Feb, 2460 m, Instant Ocean washings, 3 paratypes (USNM 96014).—Dive 984-32, 1 Dec, 2451 m, mussel washings, 2 young paratypes (USNM 96012).—Dive 990-41, 7 Dec, 2451 m, vestimentiferan wash, young paratype (USNM 96015).

Pacific Ocean off Western Mexico, 20°50'N, 109°06'W, OASIS *Alvin* dives in 1982:—Dive 1214, 20 Apr, 2633 m, vestimentiferan wash, 90 paratypes, including many young (USNM 96021).—Dive 1215-5B, 21 Apr, 2616 m, slurp sample, young paratype (USNM 96485).—Dive 1218-15, 24 Apr, 2618 m, clam and crab trap wash, adult and 15 young paratypes (USNM 96486).—Dive 1219-1B, 1219-10, 25 Apr, 2612 m, *Riftia* and clam wash, coarse and fine fractions and slurp sample, 19 paratypes, including young (USNM 96018).—Dive 1221-15, 4 May, 2618 m, *Riftia* and *Calyptogena* wash, coarse and fine fractions, 117 paratypes, including many young (USNM 96022).—Dive 1222-5b, 6 May, 2614 m, rubble sample from *Calyptogena* residue, 4 paratypes (USNM 96019).—Dive 1223-11, 7 May, 2616 m, coarse and fine fractions, 2 adults and 35 young paratypes (USNM 96487).—Dive 1225-6A, 9 May, 2618 m, rubble, coarse fraction, 2 young paratypes (USNM 96488).—Dive 1225-7, coarse and fine fractions, 4 adults and 9 young paratypes (USNM 96489, 96490).—Dive 1226-7, 10 May, 2616 m, *Riftia*, *Calyptogena* and *Alvinella* wash, coarse fraction, 8 young paratypes (USNM 96020) and fine fraction, 6 young paratypes (USNM 96491).

Description.—The holotype, from the Galapagos Rift (USNM 80635), has a length of 6 mm, a width of 4.5 mm, including the setae, with 23 segments. A slightly smaller paratype (USNM 80636) has a length of 5 mm, a width of 4 mm, with 22 segments. The largest paratype from the Galapagos Rift (USNM 96010) has a length of 10 mm, a width of 5 mm, with 24 segments. The largest paratype from the East Pacific Rise (USNM 96018) has a length of 13 mm, a width of 7 mm, with 25 segments. No color remains. The body is short, suboval in outline, flattened dorsoventrally, slightly tapered and rounded anteriorly and posteriorly.

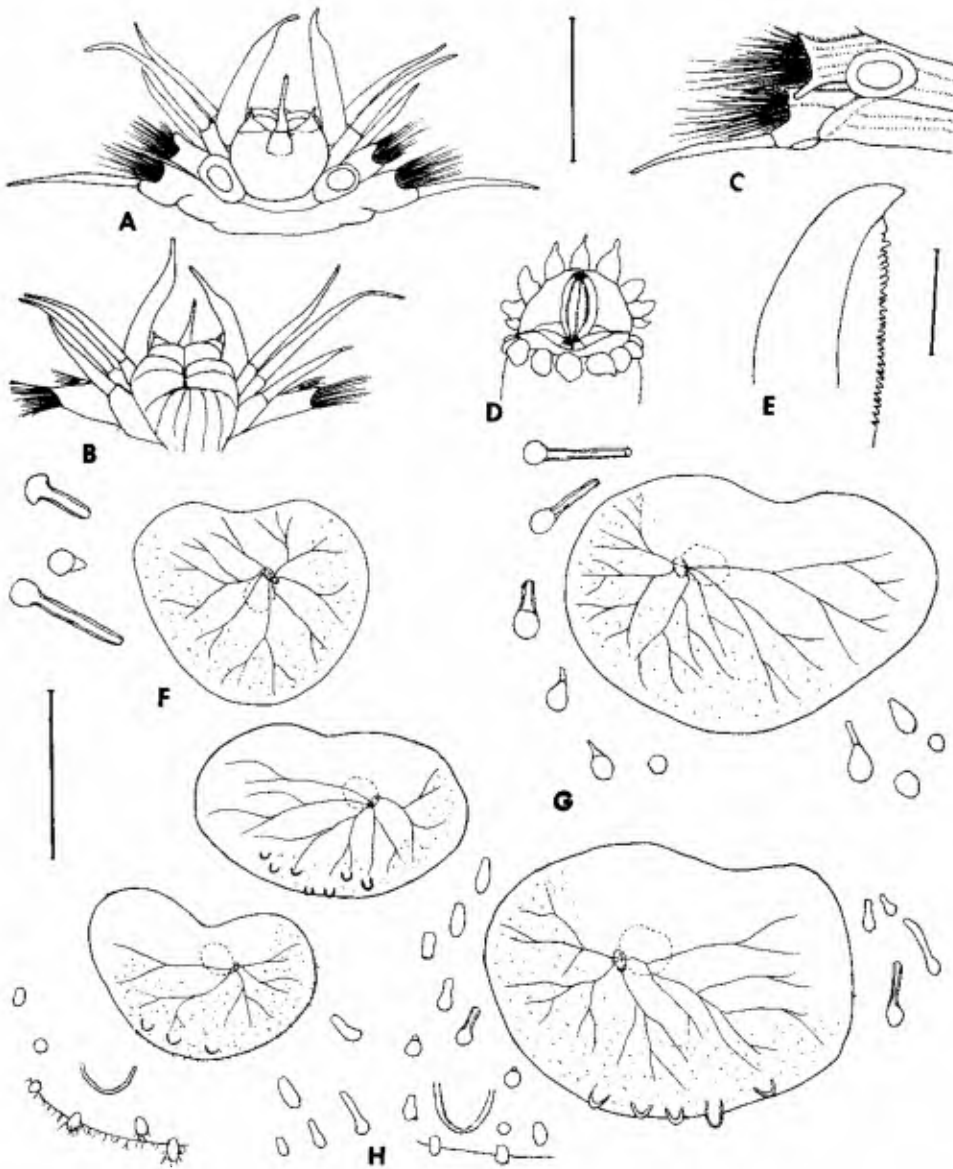


Fig. 2. *Lepidonotopodium riftense*, A-C, E-G, holotype, USNM 80635; D, paratype, USNM 96009; H, paratype, USNM 96021: A, Anterior end, dorsal view; B, Same, ventral view; C, Dorsal view of left segments 9 and 10; D, Ventral view of extended pharynx; E, Isolated jaw from pharynx; F, First right elytron, with detail of micropapillae; G, Left middle elytron, with same; H, Three elytra showing variable numbers of oval projections, with detail of micropapillae and projections. Scales = 1 mm for A-D; 0.1 mm for E; 1 mm for F-H.

The 11 pairs of elytra are attached eccentrically on prominent elytraphores, with dorsal cirri on the posterior segments (10 pairs of elytra on smaller juveniles with 19 segments). The elytra are oval to subreniform, imbricated, and cover the dorsum. They are opaque, smooth, with branching “veins” emanating from the place of attachment to the elytraphores. Near the posterior and lateral borders of

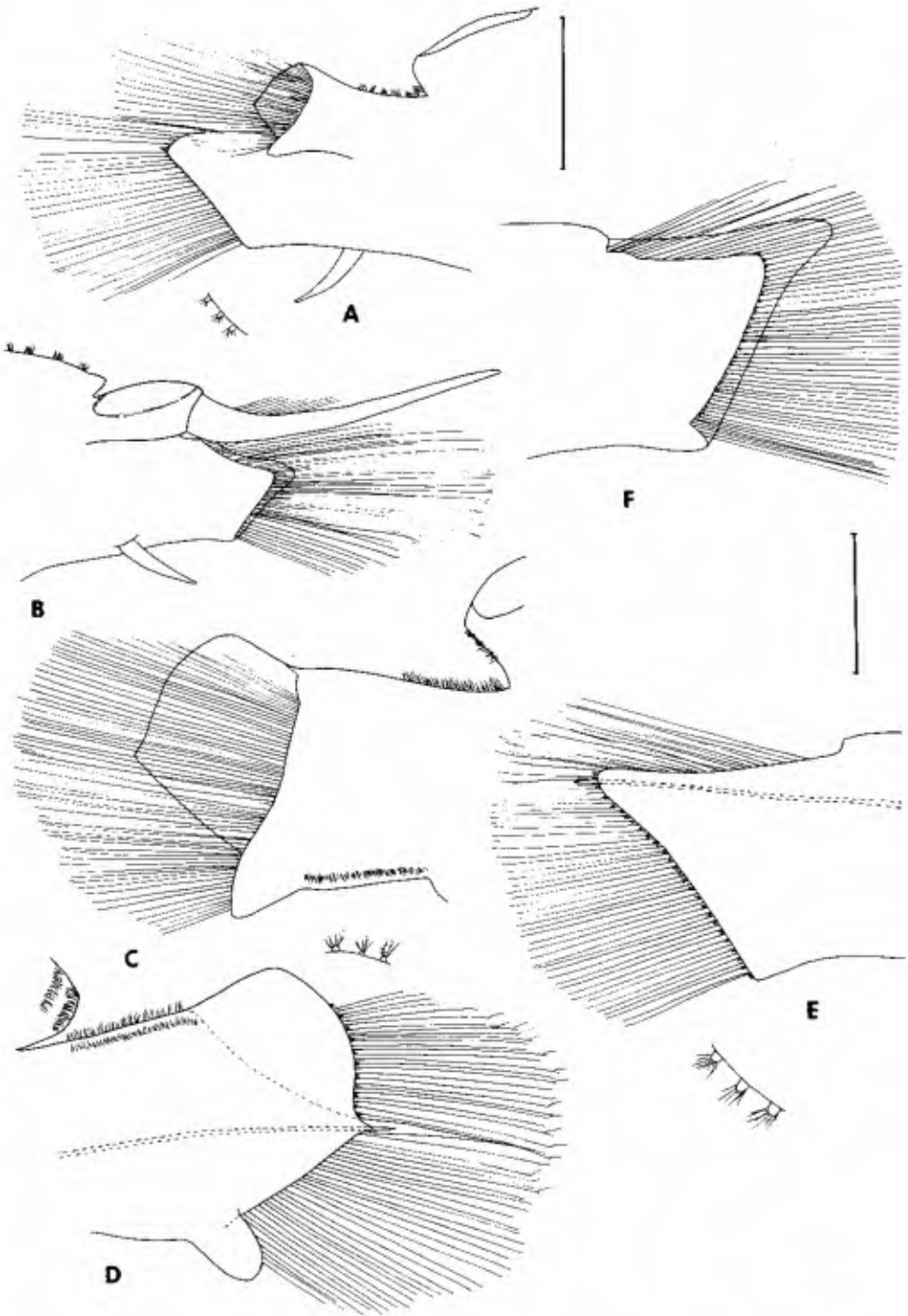


Fig. 3. *Lepidonotopodium riftense*, holotype, USNM 80635: A, Right elytrigerous parapodium from segment 9, anterior view, with detail of distal papillae; B, Right cirriferous parapodium from segment 10, posterior view; C, Enlarged view of right notopodium of elytrigerous parapodium, anterior

the elytra, scattered globular micropapillae with short to longer tapered or cylindrical bases are found on the surface (Fig. 2F, G). Numerous fine branched "hairs" or "bacteria" are found on the borders and surfaces of the elytra. On some specimens from the East Pacific Rise, the elytra have a variable number of oval projections near the posterior border, similar to the well-developed macrotubercles of *L. fimbriatum* (Fig. 2H). The dorsal cirri are attached dorsoposteriorly on the notopodia; they have cylindrical cirrophores with a blister-like lobe on the posterior side; the styles are tapering and extend to about the tips of the neurosetae (Figs. 2A, C; 3B). The dorsal tubercles on the cirriferous segments are large and inflated. The surfaces of both the elytriphores and dorsal tubercles have bands or tufts of cilia (Figs. 2C; 3A–D).

The prostomium is bilobed, the anterior lobes subtriangular, each with a small frontal filament; lateral antennae are absent (Fig. 2A, B). The median antenna is inserted in the anterior notch, having a short cylindrical ceratophore and short tapering style. The palps are cylindrical, with tapered tips, about one and a half times the length of the prostomium. Eyes are lacking. The tentaculophores of the tentacular segment are lateral to the prostomium and lack setae; the styles of the 2 pairs of dorsal and ventral tentacular cirri are similar in length, smooth, tapered, and subequal in length to the palps.

The second or buccal segment bears the first pair of large elytriphores, biramous parapodia, and ventral or buccal cirri attached basally on prominent cirrophores lateral to the ventral mouth; their styles are similar to the tentacular cirri and longer than the following ventral cirri (Fig. 2A, B). The mouth is enclosed in upper, lateral and posterior lips between segments 1 to 3 (Fig. 2B). The opening of the extended pharynx is encircled by 9 pairs of bulbous papillae, with the lateral one small or with only 7 pairs of subequal papillae (Fig. 2D). The 2 pairs of dorsal and ventral hooked jaws are minutely serrated with numerous teeth (about 26; Fig. 2D, E).

The biramous parapodia have shorter notopodia located on the anterodorsal sides of the longer neuropodia (Fig. 3A). The notopodium is subconical, with a projecting acicular lobe hidden anteriorly by the very numerous notosetae and enclosed by well-developed flaring anteroventral and posterodorsal bracts attached basally to the acicular lobe (Fig. 3A, C, D). The neuropodium is diagonally truncate and deeply cleft on the upper part. The presetal acicular lobe projects dorsally beyond the shorter rounded postsetal lobe (Fig. 3E, F). The distal margins of the notopodial bracts and neuropodial lobes are fimbriated with short papillae, with "hairs" or "bacteria" attached. The notosetae are very numerous, forming thick radiating bundles. They vary in length, are mostly slightly stouter than the neurosetae and have relatively few (7–8), widely-spaced spines along one side and blunt rounded tips; many of them had long strands of foreign material attached subdistally ("bacteria"?; Fig. 4A). The neurosetae are numerous, forming fan-shaped bundles. They are all similar, with slightly hooked bare tips and 2 rows

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view; D, Same, posterior view, with detail of distal papillae, notoaciculum dotted; E, Enlarged view of right neuropodium, anterior view, with detail of distal papillae, neuroaciculum dotted; F, Same, posterior view. Scales = 0.5 mm for A, B; 0.2 mm for C–F.

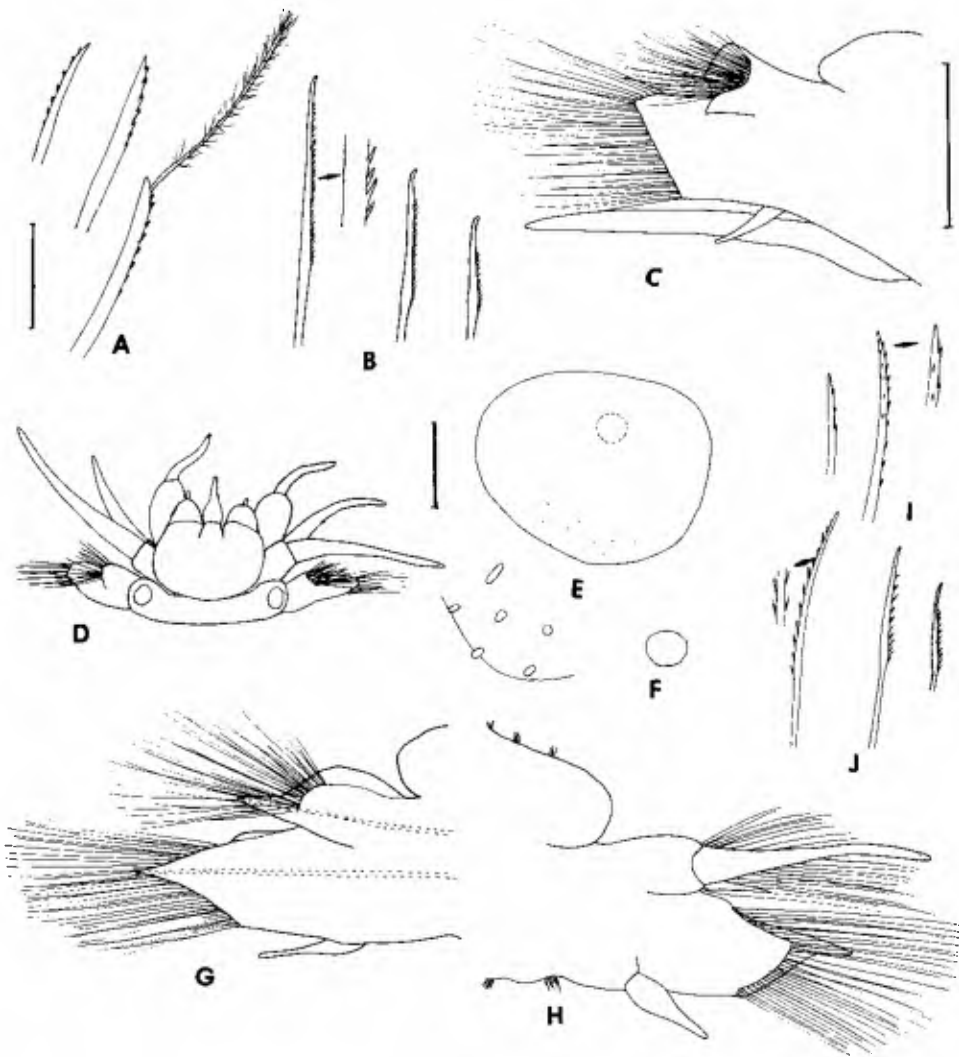


Fig. 4. *Lepidonotopodium riftense*, A, B, holotype, USNM 80635; C, paratype, USNM 80636; D–J, young paratype of 13 segments, 1.5 mm long, 1.5 mm wide, USNM 96008: A, Three notosetae, one with strand of attached "bacteria"; B, upper, middle and lower neurosetae, with detail of middle part; C, Right parapodium from segment 11, anterior view, showing elongated segmental papilla; D, Anterior end, dorsal view; E, Right middle elytron, with detail of some micropapillae; F, Right posterior elytron from segment 13 (incompletely developed); G, Right elytrigerous parapodium, anterior view, acicula dotted; H, Right cirriferous parapodium, posterior view; I, Short and longer notosetae, with detail of tip; J, Upper, middle and lower neurosetae, with detail of middle part. Scales = 0.1 mm for A, B, G–J; 0.5 mm for C; 0.2 mm for D–F.

of numerous spines along one side; the upper neurosetae are longer, with longer spinous regions (Fig. 4B). The ventral cirri are short, tapered, smooth and attached on the middle of the posterior face of the neuropodia (Fig. 3A, B).

Segmental or nephridial papillae are not obvious. On about half of the adult specimens there are 2 pairs of elongate papillae on segments 11 and 12, attached

basally on the ventroposterior sides of the neuropodia and extending to the tips of the lower neurosetae (Fig. 4C). Such papillae are lacking on the holotype. On some of the juveniles the papillae are present but shorter and incompletely developed. The pygidium is visible dorsally as a bulbous lobe wedged between the parapodia of the 2 posterior smaller segments, with a pair of long ventral anal cirri, similar to the posterior dorsal cirri.

Numerous young specimens were collected at the Galapagos Rift from washings of mussels and in crab and amphipod traps and from the East Pacific Rise from washings of *Riftia*, *Calyptogena* and *Alvinella*, coarse and fine fractions, rubble, clam and crab trap wash, and slurp sample. Juveniles with 17 to 20 segments, with less than 11 pairs of elytra, have lengths of 2.5 to 4 mm and widths of 2 to 3 mm. Young specimens with 10 to 15 segments have lengths of 1 to 2 mm and widths of 1 to 1.5 mm. A young specimen of 13 segments, 1.5 mm long and 1.5 mm wide, has 7 pairs of elytra (USNM 96008; Fig. 4D–J). Compared with the adult specimens, the anterior end is similar except that the palps are bulbous on the proximal half and filiform distally (Fig. 4D). The elytra are oval, delicate, with few scattered oval micropapillae; the posterior elytra on segment 13 are very small and incompletely developed (Fig. 4E, F). The bracts on the notopodia are not as well developed and the neuropodia have more prominent subtriangular presetal lobes (Fig. 4G, H). The notosetae and neurosetae are fewer in number and more slender (Fig. 4I, J).

Etymology.—The species is named *riftense* for its association with the rifts in the region of the hydrothermal vent areas of the Galapagos and 21°N.

Distribution.—East Central Pacific in Galapagos Rift, in 2447–2518 meters, associated with the unnamed deep-sea mussels and vestimentiferans, *Riftia pachyptila*. Also in East Pacific Rise at 21°N, in 2612–2633 meters, associated with ampharetid polychaetes, *Alvinella pompejana*, giant clams, *Calyptogena magnifica*, and vestimentiferans, *Riftia pachyptila*.

Comparisons.—*Lepidonotopodium riftense* is close to *L. fimbriatum* (see Key to the species of *Lepidonotopodium*). It differs in its smaller size (up to 13 mm in length, 7 mm in width, up to 25 segments, compared to up to 37 mm in length, 16 mm in width and up to 30 segments). The elytra are more delicate, with only scattered micropapillae, compared with the thick, leathery elytra with the characteristic raised macrotubercles and numerous microtubercles of *L. fimbriatum*. The jaws of *L. riftense* have numerous minute basal teeth, compared with the relatively few and larger basal teeth of *L. fimbriatum*.

Lepidonotopodium williamsae, new species

Figs. 5–7

Material.—East Central Pacific, from dives of the *Alvin* on 3 vent areas along the Galapagos Rift in 1979:

MUSSEL BED, 00°47.89'N, 86°09.21'W:—Dive 880, 21 Jan, 2493 m, mussel washings, paratype (USNM 96026).

GARDEN OF EDEN, 00°47.69'N, 86°07.74'W:—Dive 884, 25 Jan, 2482 m, clam bucket from mussels, paratype (USNM 96027).

ROSE GARDEN, 00°48.25'N, 86°13.48'W:—Dive 984-32, 1 Dec, 2451 m, mussel washings, holotype (USNM 96023), paratype (USNM 96024), 2 paratypes (USNM 96025).

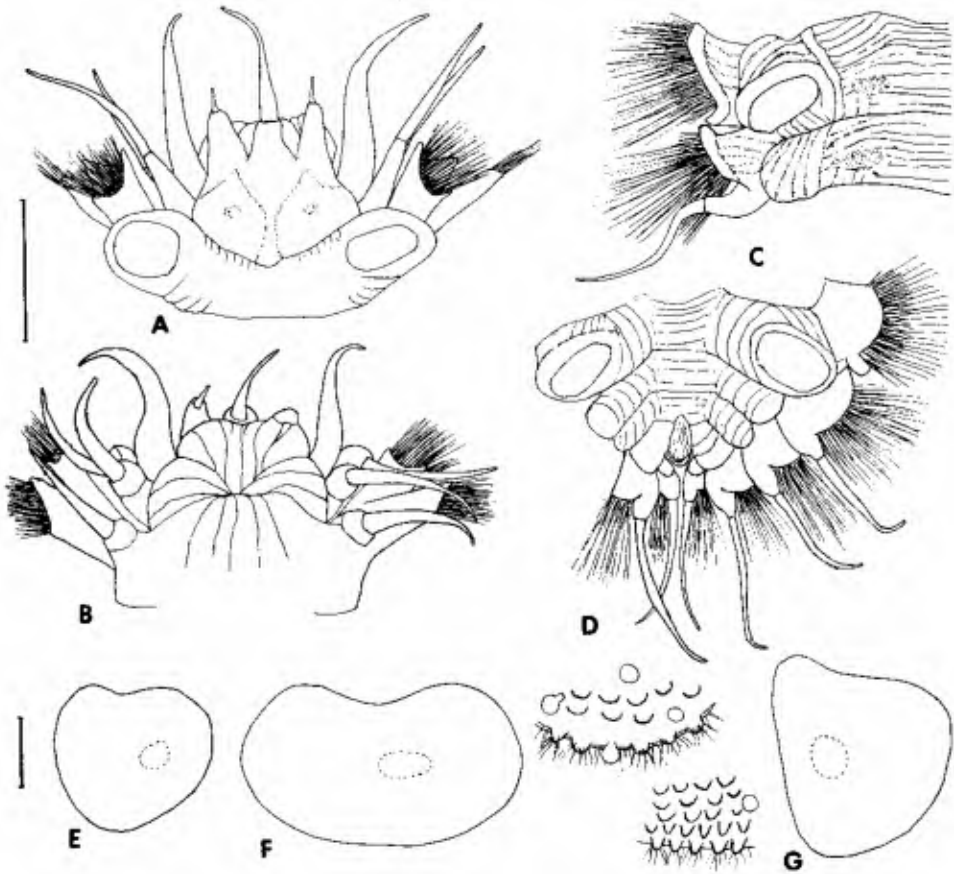


Fig. 5. *Lepidonotopodium williamsae*, holotype, USNM 96023: A, Anterior end, dorsal view; B, Anterior end, ventral view; C, Dorsal view of left segments 13 (elytrigerous) and 14 (cirrigerous); D, Dorsal view of posterior end showing right parapodia of segments 21 to 25 and left parapodia of segments 24 and 25; E, Right first elytron from segment 2; F, Right fifth elytron from segment 9, with detail of microtubercles and scattered micropapillae; G, Right eleventh elytron from segment 21, with detail of same. Scales = 2 mm for A-D; 2 mm for E-G.

Pacific Ocean off Western Mexico, 20°50'N, 109°06'W, OASIS *Alvin* dives in 1982:—Dive 1214, 20 Apr, 2633 m, vestimentiferan wash, 64 paratypes (USNM 96032).—Dive 1219-10A & B, 25 Apr, 2612 m, *Riftia* and clam wash, coarse fraction, 5 paratypes (USNM 96028).—Dive 1221-15, 4 May, 2618 m, *Riftia* and *Calyptogena* wash, coarse fraction, 5 paratypes (USNM 96033).—Dive 1223-17, 7 May, 2616 m, rubble, 3 small paratypes (USNM 96029).—Dive 1225-7, 9 May, 2618 m, fine fraction, paratype (USNM 96484).—Dive 1226-7, 10 May, 2616 m, *Riftia*, *Calyptogena* and *Alvinella* wash, coarse fraction, 2 paratypes (USNM 96030).—Dive 1227-3, 11 May, 2616 m, slurp sample, paratype (USNM 96031).

Description.—The holotype, from the Galapagos Rift area, has a length of 26 mm, a width of 13 mm, including setae, with 25 segments. The adult paratypes from this area range in size from 11 to 26 mm in length, 6 to 14 mm in width, with 25 segments. The largest paratype from 21°N has a length of 36 mm, a

width of 14 mm, with 26 segments. The adult paratypes from this area range in size from 10 to 36 mm in length, 5 to 14 mm in width, with 24 to 26 segments. They are brownish to tan in color, elongate-oval, flattened ventrally and arched dorsally, rounded anteriorly and posteriorly. The 11 pairs of elytra are attached eccentrically on prominent elytraphores, with dorsal cirri on the posterior segments (Fig. 5A, C, D). The elytra are large, imbricate, covering the dorsum, oval, subreniform to subtriangular in shape (Fig. 5E–G). They are thick, stiff, opaque, without raised macrotubercles. Their surface is nearly covered with rounded to conical microtubercles, along with scattered globular micropapillae; fine “hairs” or “bacteria” may be attached to the microtubercles (Fig. 5F). The dorsal cirri have cylindrical cirrophores, wider basally, attached dorsoposteriorly on the notopodia; the styles are tapering and extend slightly beyond the neurosetae (Figs. 5C, D; 6B). The dorsal tubercles on the cirrigerous segments are elongated and inflated (Figs. 5C; 6B). The surfaces of both the elytraphores and dorsal tubercles have numerous ciliated ridges (Figs. 5C, D; 6A, B).

The prostomium is bilobed, the anterior lobes prominent, cylindrical, extending anteriorly, each with a small frontal filament; lateral antennae are absent (Fig. 5A, B). The median antenna is inserted in the anterior notch, having a short cylindrical ceratophore and subulate style extending to about the tips of the palps. The palps are cylindrical, smooth, tapering, about one and a half times the length of the prostomium. Eyes are lacking, although a pair of tannish spots on a whitish area on the posterior half of the prostomium, each with a darker spot, may suggest a pair of “eyes” (Fig. 5A). The tentaculophores of the tentacular segment are lateral to the prostomium, each with a single aciculum, without setae. The styles of the 2 pairs of tentacular cirri are subequal in length to the palps, the ventral tentacular cirri slightly shorter than the dorsal ones (Fig. 5A, B).

The second or buccal segment bears the first pair of large elytraphores, biramous parapodia and ventral or buccal cirri attached basally on prominent cirrophores lateral to the mouth; their styles are similar to the tentacular cirri and longer than the following ventral cirri (Fig. 5A, B). The ventral mouth is enclosed in upper, lateral and posterior lips between segments 1 and 2 (Fig. 5B). The opening of the large muscular pharynx is encircled by 7 pairs of bulbous papillae, subequal in size (Fig. 7B). The 2 pairs of dorsal and ventral jaws are fused medially and the basal parts are serrated with 5–7 teeth (Fig. 7B–D).

The biramous parapodia have shorter notopodia located on the anterodorsal sides of the longer neuropodia (Fig. 6A). The notopodia are subconical with projecting acicular lobes hidden by the numerous notosetae and enclosed anterodorsally by well-developed large flaring bracts (Fig. 6A–C). The neuropodia are diagonally truncate and deeply notched on the upper part. The presetal acicular lobes project dorsally beyond the rounded postsetal lobes (Fig. 6A, B, D). The distal margins of the notopodial acicular lobes, notopodial bracts and neuropodial lobes are fimbriated with slender papillae to which numerous “hairs” or “bacteria” are attached. The notosetae are very numerous, forming radiating bundles; they vary in length from short to longer, much stouter than the neurosetae, with spinous rows on the distal part and blunt tapered bare tips; most of the notosetae have numerous fine “hairs” or “bacteria” attached (Fig. 6E). The neurosetae are numerous, forming fan-shaped bundles. The few upper supracicular neurosetae have 2 rows of prominent spines and tapered bare tips (Fig. 6F). The very numerous

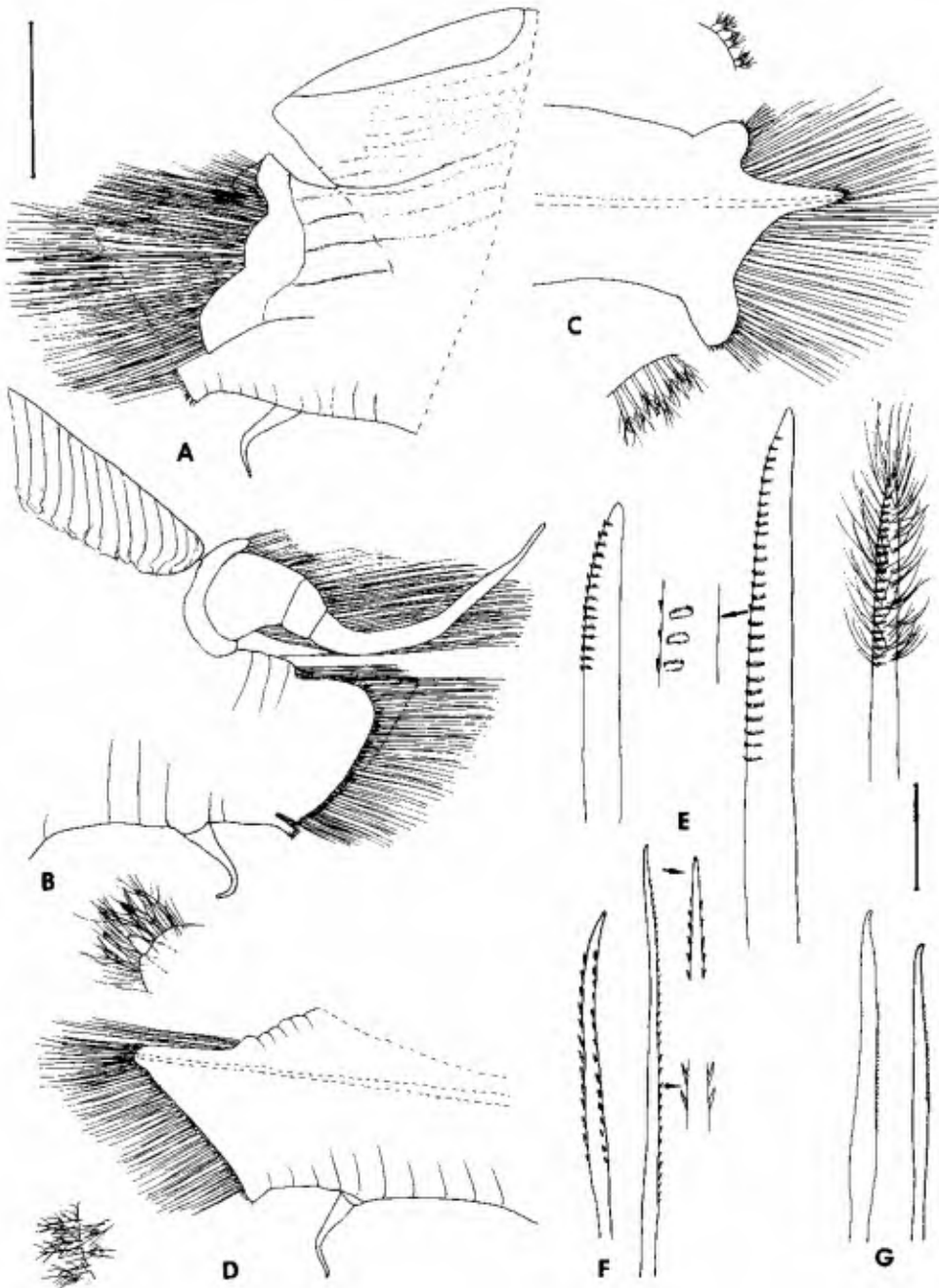


Fig. 6. *Lepidonotopodium williamsae*, holotype, USNM 96023: A, Right elytrigerous parapodium, anterior view; B, Right cirriferous parapodium, posterior view; C, Right notopodium, posterior view, with detail of distal papillae, notoaciculum dotted; D, Right neuropodium, anterior view, with detail of papillae, neuroaciculum dotted; E, Short and long notosetae and one thickly covered with "hairs" or "bacteria"; F, Two upper neurosetae, with detail of tip and middle part; G, Middle and lower neurosetae. Scales = 1 mm for A-D; 0.1 mm for E-G.

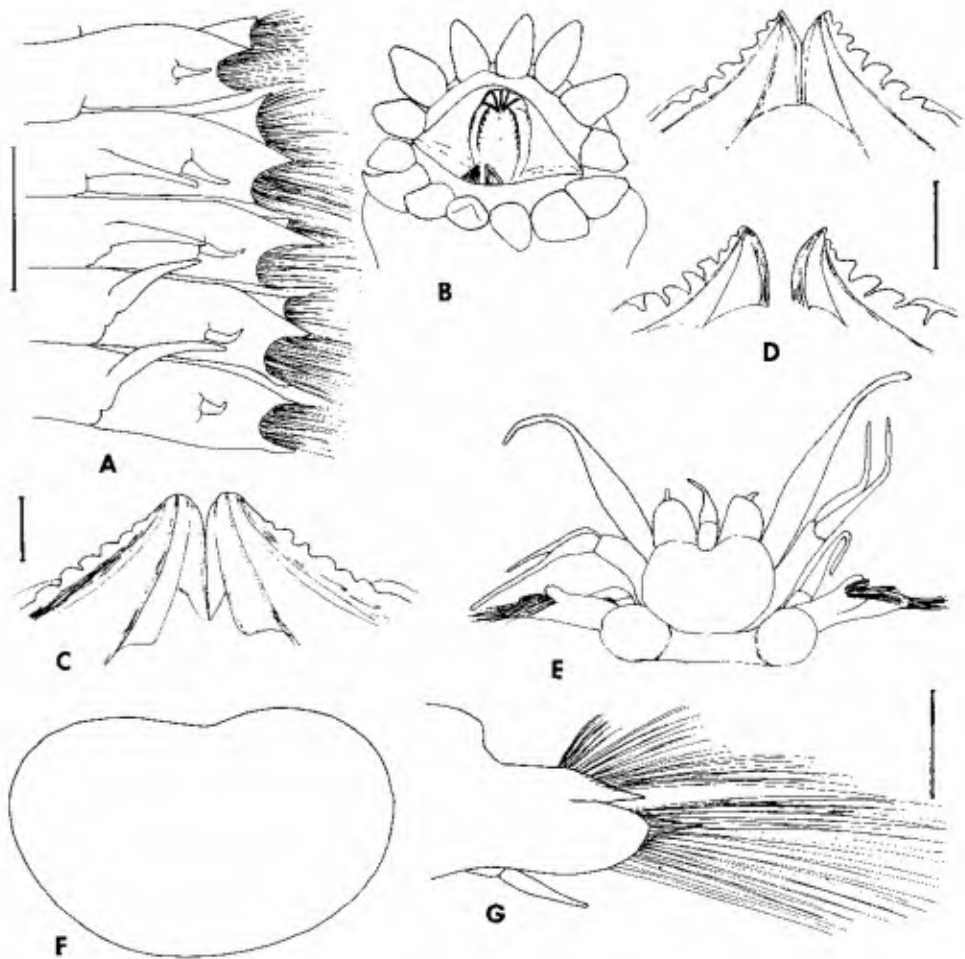


Fig. 7. *Lepidonotopodium williamsae*. A, paratype, USNM 96024; B, C, paratype, USNM 96032; D, small paratype, USNM 96028; E-G, young paratype of 13 segments, 1.5 mm long, 1.5 mm wide, USNM 96029; A, Ventral view of left segments 11-15; B, End view of distal end of extended pharynx; C, Dorsal jaws of same, spread apart; D, Dorsal and ventral jaws of smaller specimen, spread apart; E, Dorsal view of anterior end; F, Right middle elytron; G, Right elytrigerous parapodium, posterior view. Scales = 2 mm for A, B; 0.2 mm for C; 0.2 mm for D, E; 0.1 mm for F, G.

subacicular neurosetae have slightly hooked bare tips and small areas with finely spinous rows on the cutting edge (Fig. 6G). The ventral cirri are short, tapered, smooth, attached on the middle of the posterior face of the neuropodia (Fig. 6A, B).

Segmental or nephridial papillae are not obvious. On about half of the adult specimens, there are 4 pairs of elongate ventral papillae on segments 12, 13, 14, and 15, attached on the middle of the bases of the neuropodia and extending to near the bases of the ventral cirri (Fig. 7A). The pygidium is visible dorsally as a bulbous lobe wedged between the parapodia of the 3 posterior smaller segments (23-25); anal cirri are lacking (Fig. 5D).

Numerous young specimens were collected on the East Pacific Rise at 21°N, in vestimentiferan wash and in rubble. The smallest specimens have a length of 1.5 to 2 mm, a width of 1.5 mm, with 11 to 16 segments (Fig. 7E–G). The anterior end is similar to the adults in shape except that the palps, tentacular cirri and buccal cirri are wider basally, with longer distal filamentous regions (Fig. 7E). The notopodial bracts are not as well developed (Fig. 7E, G). The notosetae are similar to the adults except that the larger ones are more slender. The neurosetae are similar to the upper neurosetae of the adults, having 2 prominent spinous rows. The elytra are delicate, lacking microtubercles and micropapillae (Fig. 7F).

Etymology.—The species is named for Isabelle Williams of the Woods Hole Oceanographic Institution in recognition of her careful work in separating and retrieving the numerous polynoids on which this study is based.

Distribution.—East Central Pacific on the Galapagos Rift, in 2451–2493 meters, associated with the unnamed deep-sea mussels. Also on the East Pacific Rise at 21°N, in 2612–2633 meters, associated with ampharetid polychaetes, *Alvinella pompejana*, giant clams, *Calyptogenia magnifica*, and vestimentiferans, *Riftia pachyptila*.

Comparison.—*Lepidonotopodium williamsae* may be separated from the other two species of *Lepidonotopodium* by the following key to the species.

Key to the Species of *Lepidonotopodium*

1. Prostomium with prominent cylindrical anterior lobes (Fig. 5A). Elytral surface covered with numerous conical microtubercles and scattered micropapillae, without raised macrotubercles (Fig. 5E–G). Notosetae much stouter than neurosetae, with spinous rows on distal part (Fig. 6E). Upper neurosetae with 2 rows of prominent spines (Fig. 6F); lower neurosetae minutely spinous (Fig. 6G). Pharynx with 7 pairs of papillae, subequal in size; jaws with 5–7 basal teeth (Fig. 7B–D). Without anal cirri (Fig. 5D). Some specimens with 4 pairs of elongate ventral papillae on segments 12–15 (Fig. 7A) *L. williamsae*, new species
- Prostomium with subtriangular anterior lobes (Fig. 2A; fig. 2A, in Pettibone, 1983). Notosetae similar in width to neurosetae, with relatively few (4–9) widely-spaced spines along one side (Fig. 4A; fig. 4E, in Pettibone, 1983). Upper neurosetae not markedly differing from lower ones (Fig. 4B; fig. 4F, in Pettibone, 1983). With pair of anal cirri (fig. 2D, in Pettibone, 1983). Some specimens with long ventral papillae on segments 11 and 12 (Fig. 4C; fig. 3A, in Pettibone, 1983) 2
2. Elytra with 2 raised macrotubercles per elytron, numerous microtubercles and scattered globular micropapillae (figs. 1, 2E–G, in Pettibone, 1983). Pharynx with 7–9 pairs of papillae, unequal in size; jaws with few basal teeth (5–9; Fig. 1C–E; fig. 3B, C, in Pettibone, 1983) *L. fimbriatum* Pettibone, 1983
- Elytra without raised macrotubercles, with scattered clavate micropapillae, with or without variable number of small projections (Fig. 2F–H). Pharynx with 7–9 pairs of papillae; jaws with numerous basal teeth (Fig. 2D, E) *L. riftense*, new species

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