

ADDITIONAL BRANCHIATE SCALE-WORMS
(POLYCHAETA: POLYNOIDAE) FROM GALAPAGOS
HYDROTHERMAL VENT AND RIFT-AREA
OFF WESTERN MEXICO AT 21°N

Marian H. Pettibone

Abstract. — A new subfamily of Polynoidae, Branchinotogluminae, is established for *Branchinotogluma*, new genus, for three new species: *B. hessleri*, *B. sandersi*, and *B. grasslei*, and *Opisthotrochopodus alvinus*, new genus, new species, all from hydrothermal vents in the eastern Pacific. They are characterized by the presence of well-developed arborescent brachiae and notopodial bracts on some or all of the elytrigerous segments. The posterior segments of *O. alvinus* are greatly modified, having most unusual wheel organs.

The present paper deals with the third subfamily of Polynoidae from the hydrothermal rift-area off Western Mexico at 21°N and the Galapagos hydrothermal vent that is characterized by the presence of the well-developed brachiae, an unusual feature in the family. The two previously described branchiate groups include *Branchipolynoe symmytilida* in Branchipolynoinae, commensal with the deep-sea vent mussels in the Galapagos Rift (Pettibone 1984a) and *Branchiplicatus cupreus* in Branchiplicatinae from the hydrothermal rift-area at 21°N (Pettibone, 1985). Two new genera and four new species, collected in the same two areas, are referred herein to a third new subfamily.

The available material was collected by the Galapagos Rift Biology Expedition in 1979, and by the OASIS group of Scripps Institution of Oceanography in 1982. The specimens were received from J. F. Grassle of the Woods Hole Oceanographic Institute (WHOI), with preliminary sorting by I. Williams. Numerous specimens, including many young, were collected in the Mussel Bed, Garden of Eden, and Rose Garden areas of the Galapagos Rift, in 2451 to 2493 meters, from washings, slurp samples, and residues of mussels and vestimentiferans (*Riftia pachyptila* Jones). From 21°N, specimens were collected in 2612 to 2633 meters, associated with washings and slurp samples of vestimentiferans (*Riftia pachyptila* Jones), giant clams (*Calypptogena magnifica* Boss and Turner) and ampharetid polychaetes (*Alvinella pompejana* Desbruyères and Laubier).

The types and additional specimens are deposited in the National Museum of Natural History, Smithsonian Institution (USNM). This is OASIS Expedition Contribution number 26 and Galapagos Rift Biology Expedition number 54, supported by the National Science Foundation.

Family Polynoidae
Branchinotogluminae, new subfamily

General Characteristics

The body is short, flattened, slightly tapering anteriorly and posteriorly, with 21 segments, the first achaetous. The parapodia are longer than the body width.

The posterior few segments may be unmodified (*B. hessleri*, *B. grasslei*; Figs. 1C, D, 5E, F), the posterior 3 segments may be somewhat modified (*B. sandersi*; Fig. 4B–H) or the posterior 4 segments may be greatly modified, including wheel organs (*O. alvinus*; Fig. 9A–N).

There are 10 pairs of elytra attached on prominent bulbous elytriphores on segments 2, 4, 5, 7, 9, 11, 13, 15, 17, and 19. The elytra are large, overlapping and cover the dorsum. They are oval, delicate, usually with branched "veins" arising from their place of attachment to the elytriphores; tubercles and papillae are lacking (Fig. 5G). Dorsal cirri are borne on segments 3, 6, 8, 10, 12, 14, 16, 18, 20, and 21. The cirrophores are short, cylindrical, attached posteriorly on the notopodia; the styles are long, filiform, smooth, extending to the tips of the neurosetae or far beyond (Fig. 2D). Dorsal tubercles on the cirriferous segments, in line with the elytriphores, are inflated and indistinct (*B. grasslei*, *B. sandersi*) or elongate and tapered (*B. hessleri*, *O. alvinus*; Figs. 1B, C, 7C, E). The dorsum has transverse ciliated bands, 2 per segment, extending onto the elytriphores and dorsal tubercles Fig. 1A–C).

Compact arborescent branchiae, with short (*B. sandersi*, *B. grasslei*; Figs. 3E, 6C, D) or long (*B. hessleri*, *O. alvinus*; Figs. 2D; 7E) terminal filaments, are present as 2 main groups attached to the lateral sides of the elytriphores or dorsal tubercles and on the dorsal sides of the notopodia beginning on segment 3 (Fig. 2B–D). The branchiae continue to the posterior end (*B. hessleri*; *B. grasslei*; Figs. 1C, 5D), except for the species with modified posterior ends where the branchiae are absent on the posterior 3 (*B. sandersi*; Fig. 4B) or 4 (*O. alvinus*; Fig. 9A) modified segments.

The prostomium is oval, bilobed, with triangular or cylindrical anterior lobes with delicate frontal filaments (Figs. 1A, 3A). A median antenna with a bulbous ceratophore is inserted in the anterior notch. Paired palps are stout, smooth and tapered. Lateral antennae and eyes are absent. The first or tentacular segment is not visible dorsally. Tentaculophores, lateral to the prostomium, are achaetous, each with a pair of long dorsal and ventral tentacular cirri (Fig. 1A). Ventrally the tentacular segments contributes to the anterior and lateral lips of the mouth (Fig. 5C). The second or buccal segment bears the first pair of elytriphores, elytra, biramous parapodia, and paired ventral or buccal cirri with short cirrophores inserted basally on the neuropodia; their styles are longer than the following ventral cirri, similar to the tentacular cirri (Figs. 5B, C, 7A, B). The buccal segment contributes to the posterior lip of the ventral mouth. The muscular pharynx is eversible, with 5 papillae around the opening: 3 dorsal and 2 ventral (Figs. 1F, 8H). The two pairs of hooked jaws are minutely denticled along the border (Figs. 1F, 5H, 8H, I).

The parapodia are biramous, with the notopodia shorter than neuropodia, both rami having projecting acicular processes (Fig. 2B–D). Prominent notopodial bracts enclosing the acicular lobes and notosetae are present only on elytriferous segment 2 (*B. sandersi*; *B. grasslei*; Figs. 3A, B, 5B, 6A) or on all the elytriferous segments (*B. hessleri*, *O. alvinus*; Figs. 1A–C, 7A, B, D). The notosetae are stouter than the neurosetae, straight, acicular, smooth (Fig. 6E) or with scattered spines (Fig. 1E). The neuropodia have longer flattened conical presetal lobes with projecting acicular processes and shorter, rounded postsetal lobes. The neurosetae are slender, finely spinous, with slightly hooked tips (Fig. 3G, H). The ventral

cirri are short, tapered, and attached on the middle of the neuropodia (Fig. 2B-D).

The pygidium is enclosed in the parapodia of the posterior few segments, with or without a pair of anal cirri (Fig. 1C, D, 4C). Ventral segmental papillae may be absent or variously developed, such as a pair of elongated papillae on segment 12, followed by 5 pairs of short rounded lamellae on segments 13-17 (*O. alvinus*; Fig. 9B); 4 pairs of long papillae on segments 12-15 and 3 pairs of rounded lamellae on segments 16-18 (*H. sandersi*; Fig. 4I); 6 pairs of small rounded lamellae on segments 11-16 (*B. hessleri*; Fig. 2H) or 5 pairs of small squarish papillae on segments 11-15 (*B. grasslei*; Fig. 6H).

Key to the Genera and Species of Branchinotogluminae

- 1. Posterior 4 segments (18-21) compressed, with parapodia greatly modified, including wheel organs on segment 20 (Fig. 9N). *Opisthotrochopodus*, new genus. Notopodia with prominent rounded bracts on elytrigerous segments 2-17 (Figs. 7A, D, 8A, C). Arborescent branchiae on segments 3-17, with rather long terminal filaments (Figs. 7A, C-E, 8A-C). Dorsal tubercles elongate, tapered (Figs. 7C, 8A). Notosetae stout, acicular, smooth or with 1-2 rows of spines (Fig. 7F). With pair of elongated ventral papillae on segment 12 and 5 pairs of short rounded lamellae on segments 13-17 (Fig. 9B) *O. alvinus*, new species
- Posterior 4 segments not compressed or only 3 posterior segments (19-21) slightly modified, without wheel organs on segment 20 *Branchinotogluma*, new genus 2
- 2. Prominent notopodial bracts on all elytrigerous segments (Figs. 1A-C, 2A, C). Arborescent branchiae with rather long terminal filaments (Fig. 2D). Posterior segments not modified, with branchiae on all segments from segment 3 on (Fig. 1A, C). Dorsal tubercles projecting posteriorly, with branchiae on lateral side, ciliated on posterior side (Fig. 1B). Notosetae stout, acicular, smooth or with 2 rows of spines (Fig. 2E). Ventral segmental lamellae 6 pairs, on segments 11-16, small rounded (Fig. 2H) *B. hessleri*, new species
- Notopodial bracts on segment 2 only (Figs. 3A, B, 5A, B, 6A). Arborescent branchiae with short terminal filaments (Figs. 3E, 6D). Dorsal tubercles inflated, indistinct. Notosetae stout, acicular, smooth (Figs. 3F, 6E) 3
- 3. Posterior 3 segments slightly compressed and modified, with branchiae absent from segments 19-21 (Fig. 4B-H). With 4 pairs of elongated ventral segmental papillae on segments 12-15 (Fig. 4I) and 3 pairs of rounded lamellae on segments 16-18 *B. sandersi*, new species
- Posterior segments not compressed or modified, with branchiae on all segments from segment 3 on (Fig. 5B, E, F). Without elongated ventral segmental papillae; with or without 5 pairs of small, squarish segmental papillae on segments 11-15 (Fig. 6H) *B. grasslei*, new species

Branchinotogluma, new genus

Type-species.—*Branchinotogluma hessleri*, new species. Gender: feminine.

Diagnosis.—Body short, with 21 segments, first achaetous. Elytra and elythro-

phores 10 pairs, on segments, 2, 4, 5, 7, 9, 11, 13, 15, 17, and 19. Dorsal cirri with short cylindrical cirrophores and long distal styles, and dorsal tubercles, in line with elytraphores, on segments 3, 6, 8, 10, 12, 14, 16, 18, 20, and 21. Arborescent branchiae attached to lateral sides of elytraphores, dorsal tubercles, and dorsal sides of notopodia beginning on segment 3 and continuing to near or end of body. Prostomium bilobed, with triangular anterior lobes bearing minute frontal filaments, with median antenna in anterior notch and paired palps; without lateral antennae or eyes. First or tentacular segment not visible dorsally; tentaculophores lateral to prostomium, each with pair of dorsal and ventral tentacular cirri, without setae. Second or buccal segment with first pair of elytra, biramous parapodia and ventral or buccal cirri attached to basal parts of parapodia lateral to ventral mouth; styles longer than following ventral cirri. Parapodia biramous, with notopodia shorter than neuropodia. Notopodia of elytrigerous segments with prominent rounded bracts enclosing flattened conical acicular lobes and notosetae (*B. hessleri*) or present only on elytrigerous segment 2 (*B. sandersi*, *B. grasslei*). Neuropodia with longer flattened conical presetal and shorter rounded postsetal lobes. Notosetae stouter than neurosetae, straight, acicular, smooth or with few spines. Neurosetae long, slender, finely spinous, with slightly hooked tips. Ventral cirri short, tapered. Posterior 4 segments not greatly modified, without wheel organs or posterior 3 segments slightly modified (*B. sandersi*). Pharynx with 5 papillae around opening, 3 dorsal and 2 ventral; 2 pairs of dorsal and ventral hooked jaws each with row of numerous minute teeth along edge.

Etymology.—*Branchi* from the Greek *branchia* for gills, plus *noto* from *notos*, Greek for back, and *gluma* from the Latin *gluma*, a bract, referring to the presence of branchiae and notopodial bracts.

Branchinotogluma hessleri, new species

Figs. 1, 2

Material examined.—Pacific Ocean off Western Mexico, 20°50'N, 109°06'W, OASIS *Alvin* dives in 1982: Dive 1214, 20 Apr, 2633 m, vestimentiferan wash, 19 paratypes including 6 young (USNM 97323). Dive 1218-15, 24 Apr, 2618 m, clam and crab trap wash, paratype (USNM 97324). Dive 1219-10A & B, 25 Apr, 2612 m, *Riftia* and clam wash, paratype (USNM 97325). Dive 1221-15, 4 May, 2618 m, *Riftia* and *Clayptogena* wash, coarse fraction, holotype (USNM 97321) and 7 paratypes (USNM 97322). Dive 1223-11, 7 May, 2616 m, *Riftia* and *Calyptogena* wash, coarse fraction, 4 paratype (USNM 97326).

East Central Pacific, from dive of the *Alvin* along the Galapagos Rift in 1979: ROSE GARDEN, 00°48'15"N, 86°13'28"W: Dive 984-32, 1 Dec, 2451 m, mussel washings, 3 paratypes (USNM 97327).

Description.—Length of holotype 14 mm, width 8 mm with setae, segments 21. Body flattened, tapering slightly anteriorly and posteriorly, with parapodia longer than body width. No color except for yellow amber-colored setae. Dorsum with transverse ciliated bands, 2 per segment, extending onto elytraphores and dorsal tubercles (Fig. 1A–C).

Elytra and prominent bulbous elytraphores 10 pairs (Figs. 1A–C; 2A, C). Elytra large, covering dorsum, round to oval, delicate, with branched “veins” (Fig. 1E). Dorsal cirri with short cylindrical cirrophores and long tapered smooth styles extending beyond tips of setae (Figs. 1A–D, 2B, D). Dorsal tubercles elongate.

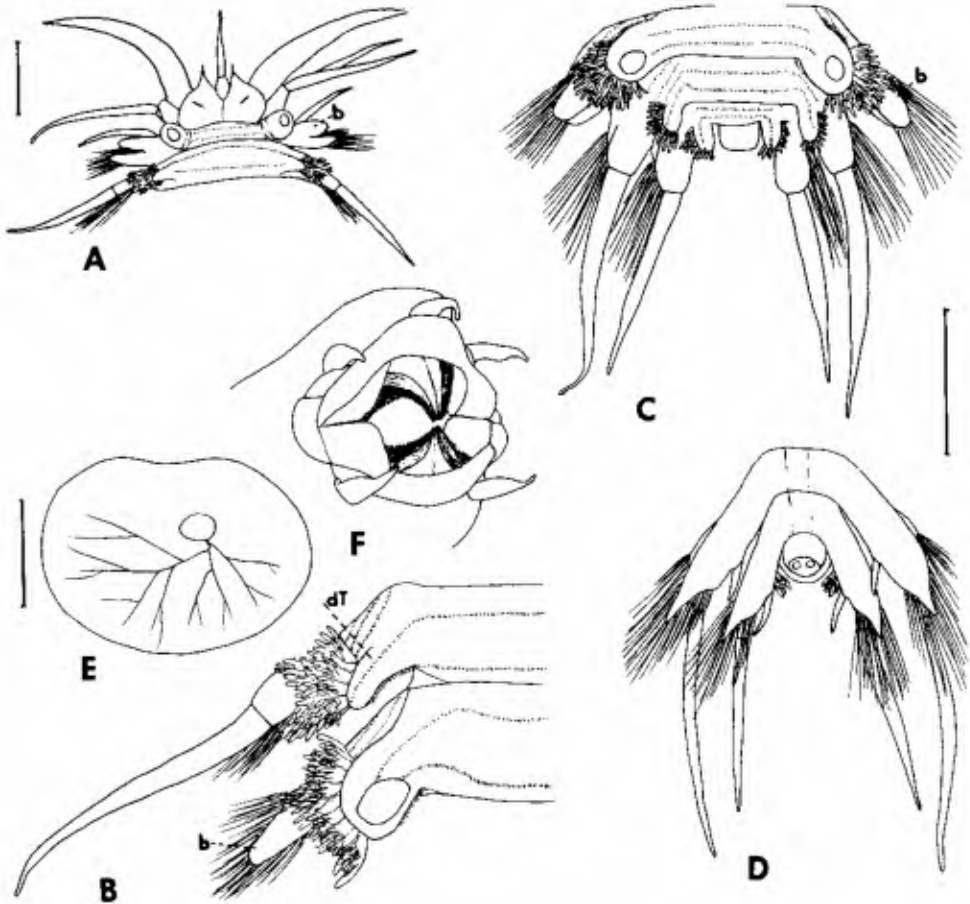


Fig. 1. *Branchinotogluma hessleri*, A–E, Holotype, USNM 97321; F, Paratype, USNM 97323: A, Dorsal view of anterior end, style of left dorsal tentacular cirrus missing; B, Dorsal view of left side of segments 8 (cirrigerous) and 9 (elytrigerous); C, Dorsal view of posterior end, including segments 19–21; D, Ventral view of posterior end, including segments 20 and 21; E, Right clytron from near posterior end; F, End view of opened pharynx, tipped slightly to left. b, notopodial bract; dT, dorsal tubercle. Scales = 1.0 mm for A; 1.0 mm for B–D, F; 1.0 mm for E.

Both elytophores and dorsal tubercles directed posterolaterally, with group of delicate arborescent branchiae attached on their lateral sides and additional small group of branchiae attached on bases of notopodia; branchiae compact, with rather long terminal filaments (Figs. 1A–C, 2B–D). Branchiae beginning on segment 3 as 2 small groups (Fig. 2B), becoming larger on following segments (Fig. 2C, D) and continuing to posterior end (Fig. 1C, D).

Prostomium bilobed, oval, anterior lobes triangular with delicate frontal filaments; median antenna with bulbous ceratophore in anterior notch, with style about as long as prostomium; palps stout, tapered, smooth; without eyes (pair of shaded areas sometimes appearing as “eyes”; Fig. 1A). Tentaculophores of first segment lateral to prostomium, with 2 pairs of tentacular cirri similar in length and slightly shorter than palps; ventrally tentacular segment forming anterior and lateral lips of mouth. Second or buccal segment forming posterior lip of mouth

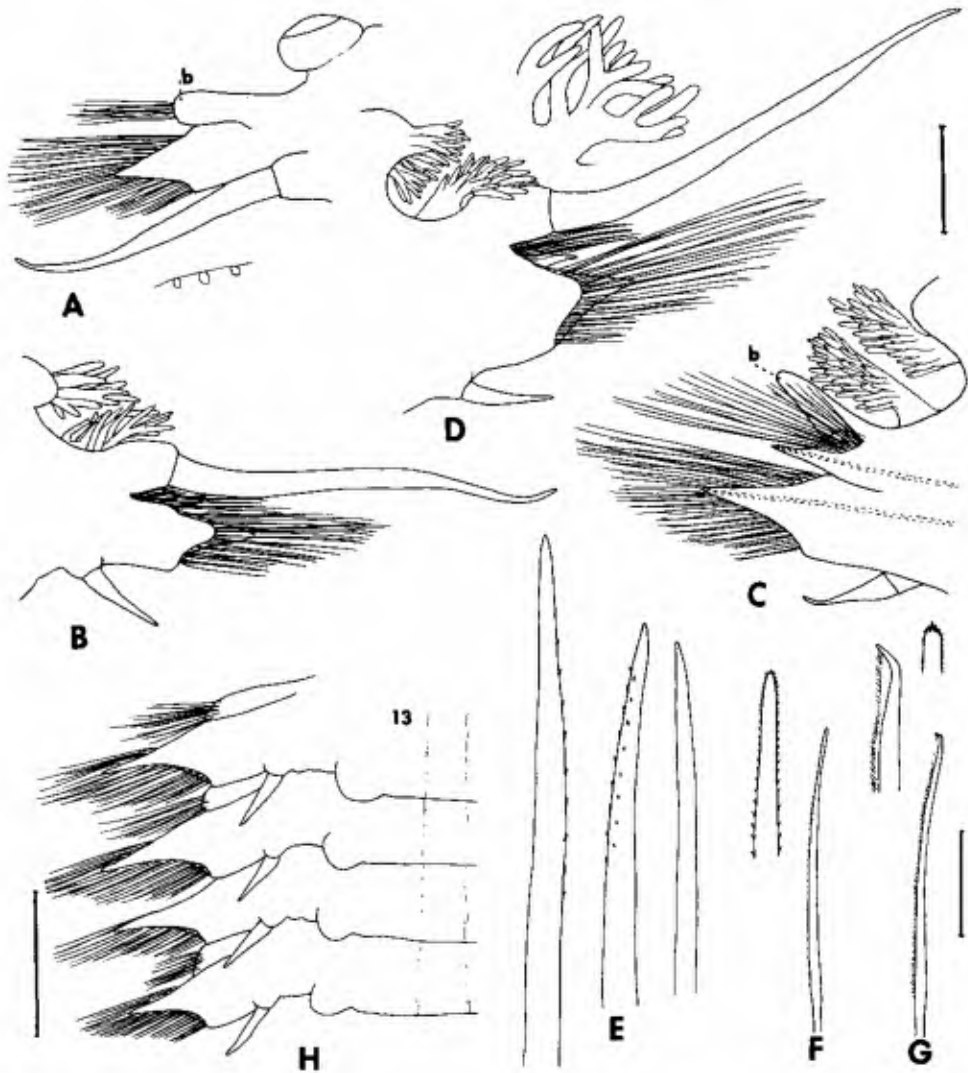


Fig. 2. *Branchinotoglyma hessleri*, holotype, USNM 97321: A, Right elytrigerous parapodium of segment 2, anterior view, with detail of neuropodial border papillae; B, Right cirriferous parapodium of segment 3, posterior view; C, Right elytrigerous parapodium of segment 9, anterior view, acicula dotted; D, Right cirriferous parapodium of segment 10, posterior view with detail of branchial tips; E, Three notosetae; F, Upper neuroseta, with detail of tip; G, Middle neuroseta, with detail of tips; H, Ventral view of right side of segments 13-16, showing ventral segmental lamellae. b, notopodial bract. Scales = 0.5 mm for A-D; 0.1 mm for E-G; 1.0 mm for H.

and bearing biramous parapodia and first pair of elythrofores; notopodium with hood or bract encircling small bundle of notosetae; conical neuropodium with globular micropapillae on distal border; ventral buccal cirri similar to tentacular cirri, longer than following ventral cirri (Figs. 1A, 2A).

Everted muscular pharynx showing 5 papillae around opening: 3 dorsal and 2 ventral; 2 pairs of prominent jaws, minutely denticled on inner border (Fig. 1F).

Biramous parapodia with notopodia shorter than neuropodia, both rami with light yellow amber-colored setae (Fig. 2A–D). Notopodia with short conical acicular lobes and, on elytrigerous segments, with prominent bracts enclosing notosetae dorsally and posteriorly (Figs. 1A–C, 2A, C). Notosetae forming radiating bundles, short to long, some almost as long as neurosetae, acicular, much stouter than neurosetae, smooth or with 1–2 rows of short spines (Fig. 2E). Larger neuropodia with subconical presetal lobes tapering to sharp tips; postsetal lobes shorter, rounded; some globular micropapillae on distal borders. Neurosetae slender, very numerous, forming fan-shaped bundles. Few upper neurosetae with more prominent spines, with tips flattened and finely spinous (Fig. 2F). Remaining neurosetae with borders finely spinous; tips slightly hooked, with finely spinous hood (Fig. 2G). Lower neurosetae shorter and more slender. Ventral cirri short, tapered, attached on middle of neuropodia (Fig. 2C, D).

Pygidium consisting of small squarish to rounded lobe wedged between bases of posteriorly-directed parapodia of posterior 2 segments, with pair of anal cirri (mostly broken off; Fig. 1C, D). Six pairs of small rounded segmental lamellae near ventral bases of neuropodia of segments 11–16 (Fig. 2H); only 2–3 pairs on segments 11–13 of smaller specimens.

Young specimens with 17 or fewer segments may be confused with *Opisthotrochopodus alvinus*. See below under *Branchinotogluma* sp. A.

Etymology.—The species is named for Robert R. Hessler, one of the observers on the OASIS *Alvin* dives.

Branchinotogluma sandersi, new species

Figs. 3, 4

Material examined.—East Central Pacific, from dives of the *Alvin* along the Galapagos Rift in 1979: MUSSEL BED, 00°47'53"N, 86°09'12"W: Dive 880, 21 Jan, 2493 m, mussel washings, paratype (USNM 97330). Dive 989, 6 Dec, 2482 m, bottle rack wash no. 1, paratype (USNM 97331). GARDEN OF EDEN, 00°47'41"N, 86°07'44"W: Dive 883, 25 Jan, 2493 m, slurp sample in mussel area, paratype (USNM 97332). Dive 884, 25 Jan, 2482 m, residue from vestimentiferan tubes, young paratype (USNM 97333). ROSE GARDEN, 00°48'15"N, 86°13'28"W: Dive 983-112, 30 Nov, 2457 m, washings, paratype (USNM 97329). Dive 990-41, 7 Dec, 2451 m, vestimentiferan wash, holotype (USNM 97328).

Pacific Ocean off Western Mexico, 20°50'N, 109°06'W, OASIS *Alvin* dives in 1982: Dive 1214, 20 Apr, 2633 m, vestimentiferan wash, 6 paratypes including 3 young (USNM 97334). Dive 1219-1B, 25 Apr, 2612 m, slurp sample in *Riftia* habitat, 3 paratypes (USNM 97335). Dive 1221-15, 4 May, 2618 m, *Riftia* and *Calyptogenia* wash, coarse fraction, 6 paratypes (USNM 97336).

Description.—Length of holotype from Galapagos Rift (USNM 97328) 26 mm, width 13 mm with setae, segments 21. Length of largest paratype from 21°N (*Alvin* dive 1214; USNM 97334) 16 mm, width 6 mm, segments 21. Body rectangular, flattened, tapering slightly anteriorly and posteriorly, with parapodia longer than body width. Posterior 3 segments (19–21) compressed, with parapodia modified, differing from more anterior parapodia as well as from one another (Fig. 4B–H). No color except for golden-colored setae. Dorsum with transverse ciliated bands, 2 per segment, extending onto elythrophones and dorsal tubercles (Fig. 4A).

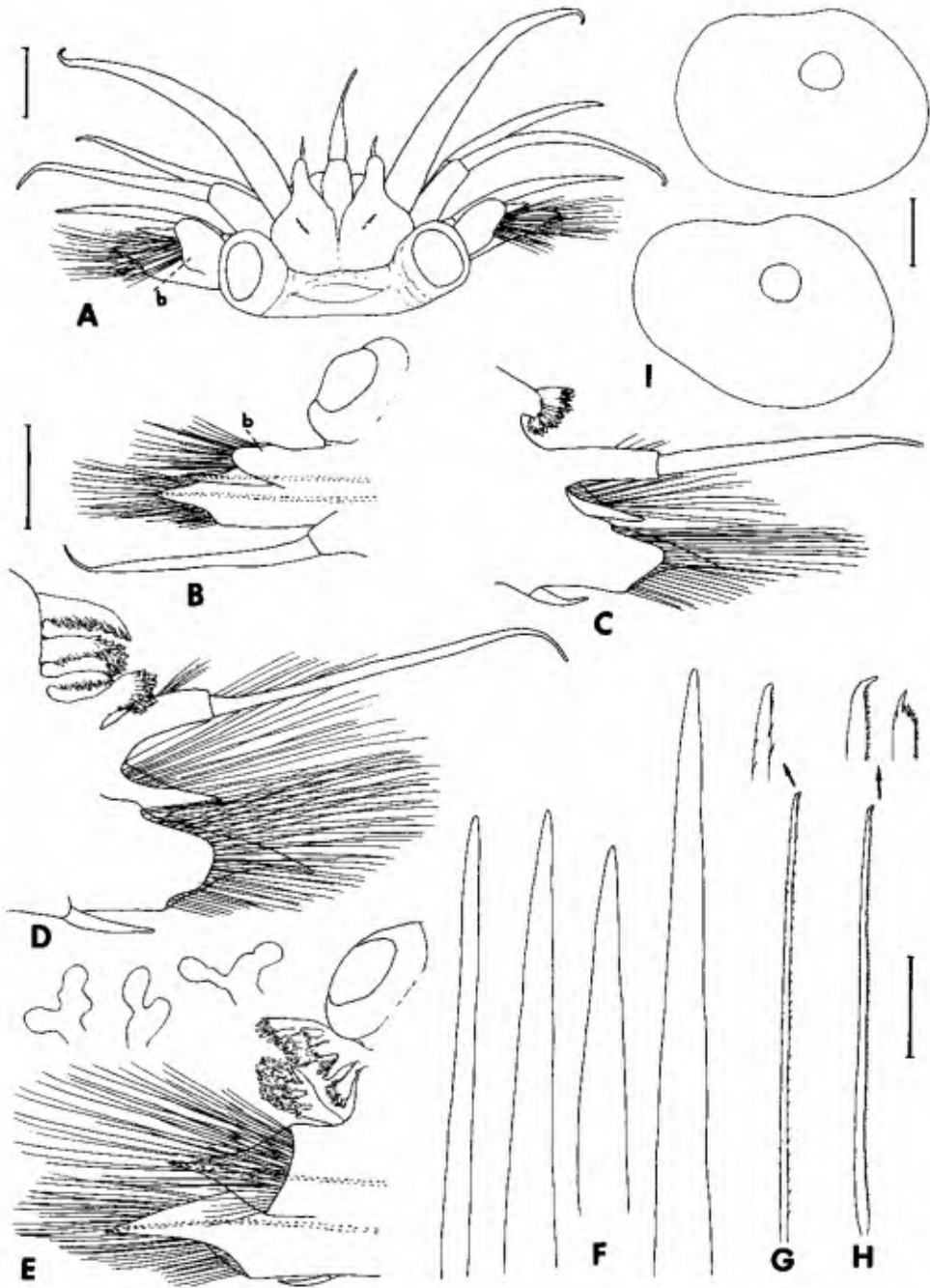


Fig. 3. *Branchinotoglumma sandersi*, holotype, USNM 97328: A, Anterior end, dorsal view; B, Right elytrigerous parapodium of segment 2, anterior view, acicula dotted; C, Right cirriferous parapodium of segment 3, posterior view; D, Right cirriferous parapodium of segment 8, posterior view; E, Right elytrigerous parapodium of segment 9, anterior view, acicula dotted, with detail of branchial tips; F, Four notosetae; G, Supraacicular neuroseta, with detail of tip; H, Subacicular notoseta, with detail of tips; I, Two right elytra. b, notopodial bract. Scales = 1.0 mm for A; 1.0 mm for B-E; 0.1 mm for F-H; 2.0 mm for I.

Elytra and prominent bulbous elytriphores number 10 pairs (Figs. 3A, B, E, 4A, B, D). Elytra large, covering dorsum, round to oval, stiff, opaque (Fig. 3I). Dorsal cirri with rather long cylindrical cirrophores and long tapered smooth styles extending beyond tips of setae (Figs. 3C, D, 4A, B). Dorsal tubercles inflated, indistinct. Both elytriphores and dorsal tubercles with delicate arborescent branchiae attached on their lateral sides, with additional smaller groups of branchiae attached on dorsal bases of notopodia. Branchiae short, compact, with numerous short, curled branches and short terminal filaments (Figs. 3C–E, 4A, B). Branchiae beginning on segment 3 as single small group (Fig. 3C), becoming larger more posteriorly and continuing to segment 18 (Fig. 4B).

Prostomium bilobed, anterior lobes prominent, cylindrical, with terminal filaments; median antenna with cylindrical ceratophore in anterior notch, with style short, subulate, with long terminal filament; palps stout, tapered, smooth; without eyes (pair of shaded areas sometimes appearing as eyes; Fig. 3A). Tentaculophores with 2 pairs of tentacular cirri, dorsal ones about length of palps, ventral ones slightly shorter; ventrally tentacular segment forming anterior and lateral lips of mouth. Second or buccal segment forming posterior lip of mouth and bearing biramous parapodia and first pair of elytriphores; notopodia with rounded thickened bract on anterodorsal side of large bundle of notosetae; ventral buccal cirri similar to tentacular cirri, longer than following ventral cirri (Fig. 3A, B).

When everted, muscular pharynx showing 5 papillae around opening: 3 dorsal and 2 ventral; 2 pairs of prominent jaws minutely denticled on inner border.

Parapodia of segments 2 to 18 biramous, with notopodia shorter than neuropodia, both rami with golden-colored setae (Fig. 3A–E). Notopodia conical with projecting acicular process, without bracts except on segment 2. Notosetae numerous, short to long, forming radiating bundle, much stouter than neurosetae, tapered, straight, smooth, acicular (Fig. 3F). Neuropodia with long conical presetal acicular lobes; postsetal lobes shorter, rounded. Neurosetae very numerous, slender, forming fan-shaped bundles. Supraacicular neurosetae with 2 rows of more prominent spines; distal part finely spinous with tip slightly hooked (Fig. 3G). Subacicular neurosetae decreasing in length ventrally, finely spinous up to hooked tip, with flattened finely spinous hood (Fig. 3H). Ventral cirri short, tapered, attached on middle of neuropodia (Fig. 3D, E).

Parapodia of posterior 3 segments modified, directed posteriorly and enclosed in parapodia of cirriferous segment 18, all with ventral cirri but with branchiae lacking (Fig. 4B, C). Parapodia of elytriferous segment 19 biramous, with rami similar in length; notopodia with thickened dorsal bract (Fig. 4B, D).

Parapodia of segment 20 much smaller and enclosed in parapodia of segment 19 (Fig. 4B, C, E). Notopodial acicular lobe fused to cirrophore of dorsal cirrus, with short distal style; notosetae few (about 9), short, stout, curved, with 2 rows of spines on distal part (Fig. 4F). Neuropodia subconical, rounded distally, with small bundle of neurosetae: upper ones stouter with scattered long spines and rounded tips; few lower ones slender, capillary, with single basal spine (Fig. 4G).

Parapodia of segment 21 (Fig. 4B, C, H) with notopodia similar to that of 20, formed of fused acicular lobe and dorsal cirrophore, with very short distal style and with notosetae lacking. Neuropodia formed of short conical acicular lobe with small group of delicate neurosetae.

Pygidium squarish, wedged between parapodia of segments 19 to 21, with pair

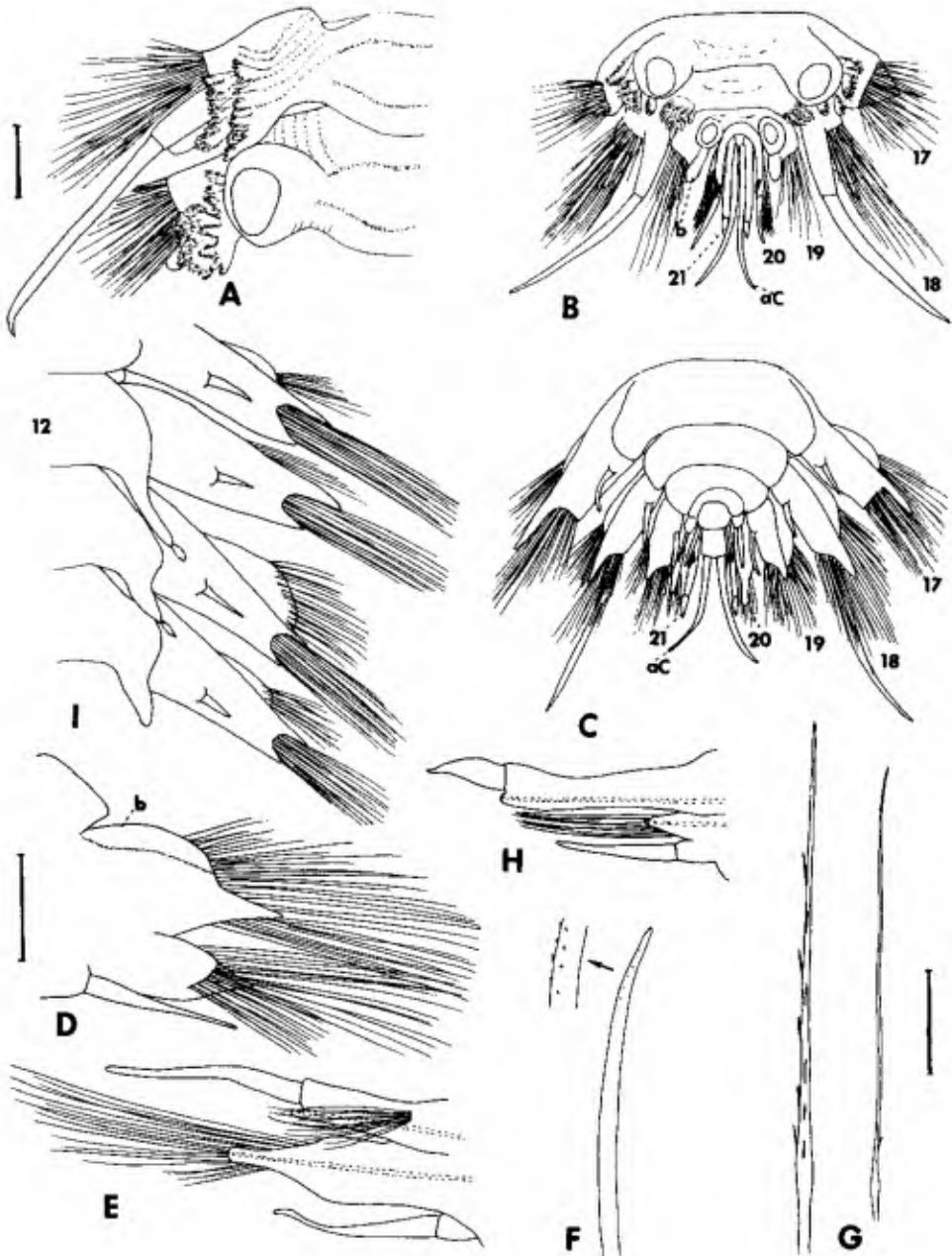


Fig. 4. *Branchinotogluma sandersi*, holotype, USNM 97328: A, Dorsal view of left parapodia of segments 8 (cirriferous) and 9 (elytrigerous); B, Dorsal view of posterior end including segments 17-21; C, Same, ventral view; D, Right elytrigerous parapodium of segment 19, posterior view; E, Right cirriferous parapodium of segment 20, anterior view, acicula dotted; F, Notoseta from same, with detail of part; G, Upper and lower neurosetae from same; H, Right cirriferous parapodium of segment 21, anterior view, acicula dotted; I, Ventral view of left side of segments 11-14, showing long segmental papillae; aC, anal cirrus; b, notopodial bract. Scales = 1.0 mm for A-C, I; 0.5 mm for D, E, H; 0.1 mm for F, G.

of long anal cirri (Fig. 4C). Four pairs of long segmental ventral papillae on segments 12 to 15, becoming shorter posteriorly, some showing "secretion" emanating from papillar opening (Fig. 4I). Three pairs of rounded ventral lamellae on following segments 16 to 18. On juveniles, small developing papillae on segment 12 to 13 or 14.

Young specimens with 17 or fewer segments may be confused with *Branchinotogluma grasslei*. See below under *Branchinotogluma* sp. B.

Etymology.—The species is named for Howard L. Sanders, one of the observers on the OASIS *Alvin* dives.

Branchinotogluma grasslei, new species

Figs. 5, 6

Material examined.—Pacific Ocean off Western Mexico, 20°50'N, 109°06'W, OASIS *Alvin* dives in 1982: Dive 1214, 20 Apr, 2633 m, vestimentiferan wash, 7 paratypes (USNM 97317). Dive 1215-6A, 21 Apr, 2616 m, slurp sample, paratype (USNM 97318). Dive 1219-1A, 10A & B, 25 Apr, 2612 m, slurp sample in *Riftia* habitat, *Riftia* and clam wash, 4 paratypes (USNM 97319). Dive 1221, 4 May, 2618 m *Riftia* and *Calyptogena* wash, coarse fraction, holotype (USNM 97314) and 11 paratypes (USNM 97315, 97316).

East Central Pacific, from dive of the *Alvin* along the Galapagos Rift in 1979: MUSSEL BED, 00°47'53"N, 86°09'12"W: Dive 989, 6 Dec, 2482 m, bottle rack wash no. 1, paratype (USNM 97320).

Description.—Length of holotype from 21°N (USNM 97314) 19 mm, width 11 mm with setae, segments 21. Length of large paratype from Galapagos Rift (USNM 97320) 31 mm, width 20 mm, segments 21. Body flattened, tapering slightly anteriorly and posteriorly, with parapodia longer than body width. No color except for golden- or bronze-colored setae. Dorsum with transverse ciliated bands, 2 per segment, extending onto elytophores and dorsal tubercles (Fig. 5B, D).

Elytra and prominent bulbous elytophores number 10 pairs (Figs. 5A, B, D, E, 6C). Elytra large, covering dorsum, round to oval, delicate, with branched "veins" (Fig. 5G). Dorsal cirri with cylindrical cirrophores and long tapering smooth styles extending to about tips of setae or beyond (Figs. 5B, D, E, 6B). Dorsal tubercles inflated, indistinct. Both elytophores and dorsal tubercles with group of delicate arborescent branchiae attached on their lateral sides and additional smaller group of branchiae on bases of notopodia; branchiae short, compact, with numerous short, curled branches (Figs. 5D, E, 6B–D). Branchiae beginning on segment 3 as 2 small groups (Fig. 5B), becoming larger on following segments (Fig. 6B–D) and continuing to posterior end (Fig. 5E).

Bilobed prostomium with prominent cylindrical anterior lobes with terminal filaments; median antenna with bulbous ceratophore in anterior notch, with short tapered style; palps stout, tapered, smooth; without eyes (shaded areas may appear as pair of eyes; Fig. 5A, B). Tentaculophores with 2 pairs of tentacular cirri, dorsal pairs longer than palps, ventral pairs slightly shorter; ventrally tentacular segment forming anterior and lateral lips of mouth (Fig. 5A–C). Second or buccal segment forming posterior lip of mouth and bearing biramous parapodia and first pair of elytophores; notopodia with hood or bract encircling bundle of notosetae; ventral buccal cirri similar to tentacular cirri, longer than following ventral cirri (Figs. 5A–C, 6A).

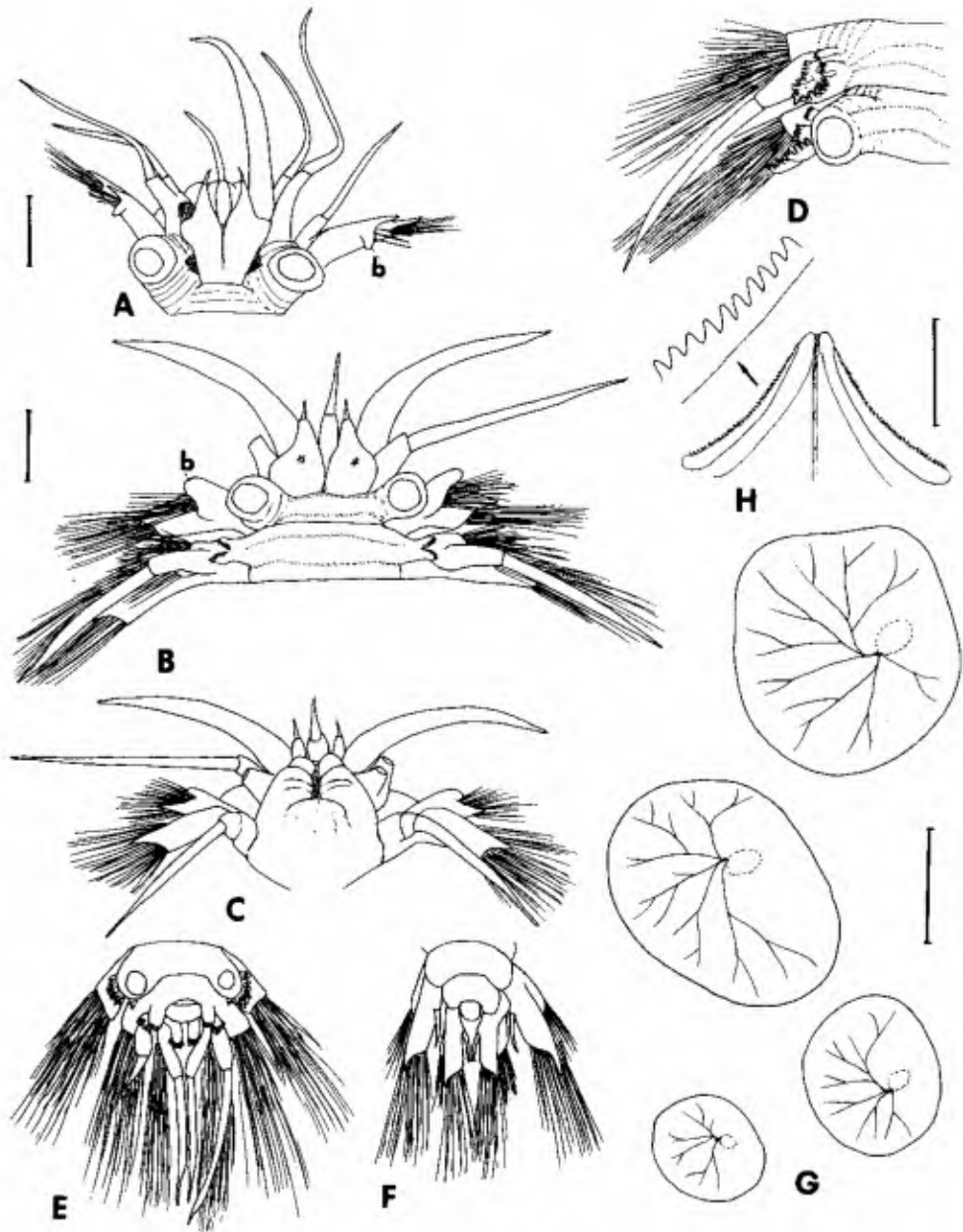


Fig. 5. *Branchinotogluma grasslei*. A, paratype, USNM 97320; B-G, holotype, USNM 97314; H, paratype, USNM 97315: A, Anterior end, dorsal view, pharynx partially extended; left palp missing; B, Anterior end, dorsal view, right ventral, left dorsal and ventral tentacular cirri missing; C, Same, ventral view; D, Dorsal view left parapodium of segments 10 (cirriferous) and 11 (elytriferous); E, Dorsal view posterior end, including segments 19-21, left dorsal cirrus of segment 20 short, regenerating; F, Ventral view posterior end, including segments 20 and 21; G, Four elytra; H, Dorsal jaws spread apart, with detail of part b, notopodial bract. Scales = 2.0 mm for A; 1.0 mm for B-F; 2.0 mm for G; 0.5 mm for H.

Everted muscular pharynx showing 5 papillae around opening: 3 dorsal and 2 ventral; 2 pairs of prominent jaws, minutely denticled on inner border (Fig. 5H).

Biramous parapodia with notopodia shorter than neuropodia, both rami with golden- or bronze-colored setae (Fig. 6A–C). Notopodia conical, with prominent projecting acicular process; notopodia with notopodial bract on segment 2 only (Fig. 5A). Notosetae numerous, short to long, not as long as neurosetae, tapered, straight, acicular, smooth, much stouter than neurosetae (Fig. 6E). Larger neuropodia with conical presetal lobes tapering to sharp tips, diagonally truncate dorsally, rounded on ventral half; postsetal lobes shorter, rounded. Neurosetae slender, very numerous, forming fan-shaped bundle. Supraacicular neurosetae with 2 rows of prominent spines, with tips flattened and finely spinous (Fig. 6F). Subacicular neurosetae finely spinous along border, with tips slightly hooked and with finely spinous hood (Fig. 6G). Few lower neurosetae with capillary tips. Ventral cirri short, tapering, attached on middle of neuropodia (Fig. 6B, C).

Pygidium consisting of small squarish lobe wedged between posteriorly-directed parapodia of posterior 2 segments (20, 21), with pair of anal cirri (all missing; Fig. 5E, F). With or without 5 pairs of small squarish segmental ventral papillae near ventral bases of neuropodia on segments 11–15 (Fig. 6H).

Young specimens with 17 or fewer segments may be confused with *Branchinotogluma sandersi*. See below under *Branchinotogluma* sp. B.

Etymology.—The species is named for J. Frederick Grassle, one of the observers on the OASIS *Alvin* dives.

Opisthotrochopodus, new genus

Type-species.—*Opisthotrochopodus alvinus*, new species. Gender: masculine.

Diagnosis.—As in *Branchinotogluma* with following additions: Notopodia of elytrigerous segments 2–17 with prominent rounded bracts enclosing subconical acicular lobes and notosetae. Posterior 4 segments (18–21) without branchiae, compressed, with parapodia directed posteriorly and greatly modified, including expanded delicate lamellae, elongated cylindrical notopodia fused with dorsal cirrophores and distal styles on segments 20 and 21; achaetous notopodia on segments 19–21; achaetous neuropodia on segments 18 and 19; unique neuropodial wheel organs on segment 20, including stout acicular and hooked neurosetae.

Etymology.—The name is derived from Greek: *opistho*, behind, plus *trocho* from *trochos*, a wheel, and *podus* from *podos*, foot, referring to the modified posterior parapodium forming a wheel organ.

Opisthotrochopodus alvinus, new species

Figs. 7–9

Material examined.—East Central Pacific, from dives of the *Alvin* on 3 vent areas along the Galapagos Rift in 1979: MUSSEL BED, 00°47'53"N, 86°09'12"W: Dive 880, 21 Jan, 2493 m, mussel washings, paratype (USNM 97253). GARDEN OF EDEN, 00°47'41"N, 86°07'44"W: Dive 884, 25 Jan, 2482 m, clam bucket with mussels, paratype (USNM 97254). ROSE GARDEN, 00°48'15"N, 86°13'28"W: Dive 983-112, 30 Nov, 2457 m, mussel washings, holotype (USNM

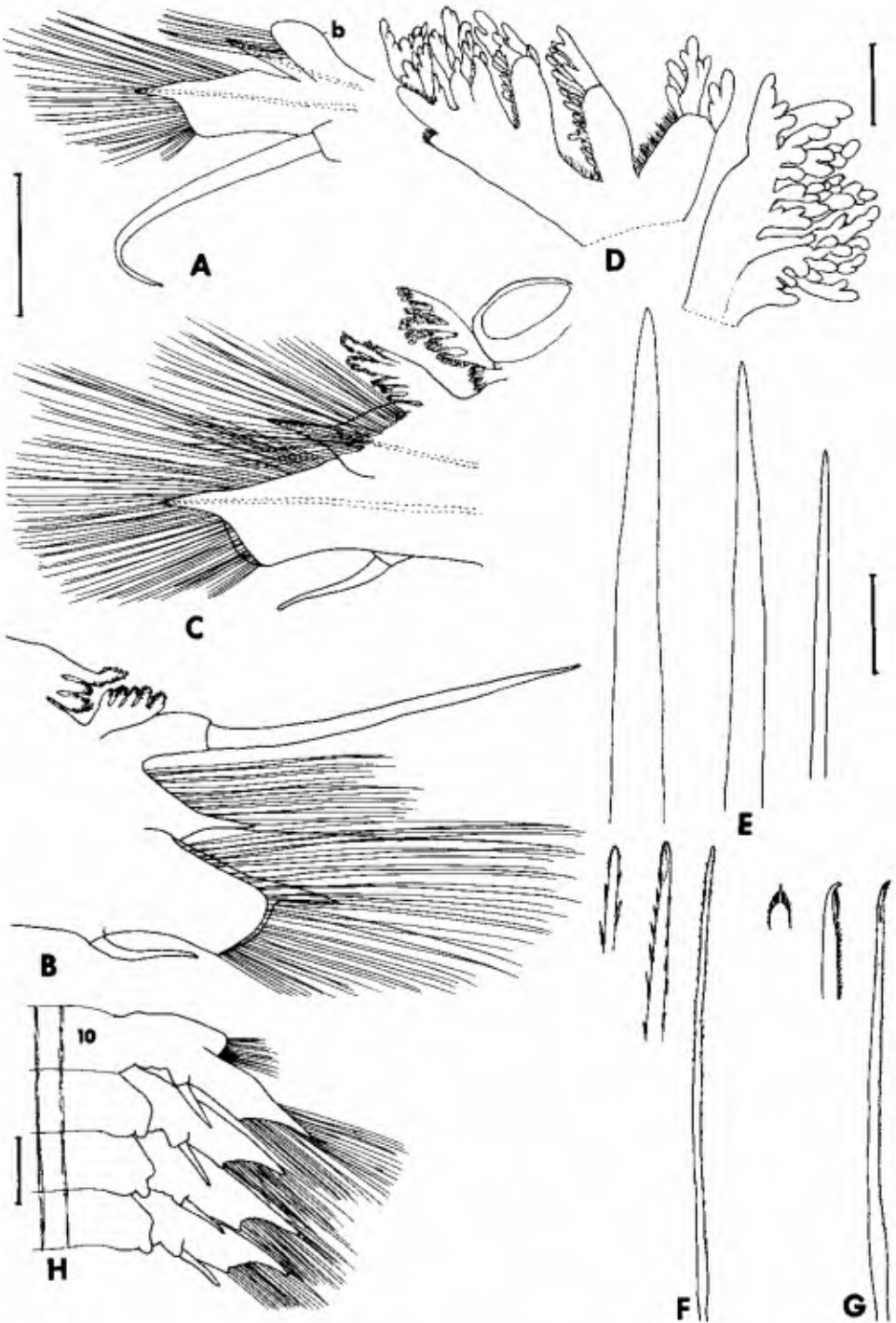


Fig. 6. *Branchinotogluma grasslei*, holotype, USNM 97314: A, Right elytrigerous parapodium of segment 2, anterior view, acicula dotted; elythrofore not shown; B, Right cirriferous parapodium of segment 6, posterior view; C, Right elytrigerous parapodium of segment 7, anterior view, acicula dotted; D, Upper and lower branchiae from same; E, Three notosetae; F, Supraacicular neuroseta,

80639) and paratype (USNM 97251). Dive 984-32, 1 Dec, 2451 m, mussel washings, 2 young paratypes (USNM 97252).

Pacific Ocean off Western Mexico, 20°50'N, 109°06'W, OASIS *Alvin* dives in 1982: Dive 1214, 20 Apr, 2633 m, vestimentiferan wash, 21 paratypes including 8 young (USNM 97255). Dive 1219-2A, 25 Apr, 2612 m, slurp sample from *Alvinella* habitat, paratype (USNM 97256). Dive 1221-15, 4 May, 2618 m, *Riftia* and *Calyptogena* wash, 8 paratypes (USNM 97257). Dive 1223-11, 7 May, 2616 m, *Riftia* and *Calyptogena* wash, coarse fraction, 10 paratypes including 6 young (USNM 97258; 97259). Dive 1225-7, 9 May, 2618 m, *Riftia* and *Calyptogena* wash, fine fraction, paratype (USNM 97260). Dive 1226-7, 10 May, 2616 m, *Riftia*, *Calyptogena* and *Alvinella* wash, coarse and fine fractions, 2 paratypes (USNM 97261).

Description.—Length of holotype from Galapagos Rift (USNM 80639) 10 mm, width 5 mm with setae, segments 21. Length of largest paratype from 21°N (USNM 97258) 14 mm, width 6 mm, segments 21. Body subrectangular, flattened, tapering posteriorly, with parapodia longer than body width. Posterior 4 segments (18–21) compressed, with parapodia greatly modified, differing from more anterior parapodia as well as from one another (Fig. 9A, B). No color except for yellow amber-colored setae. Dorsum with transverse ciliated bands, 2 per segment, extending onto elythrophones and dorsal tubercles (Figs. 7A, 8A).

Elytra and prominent bulbous elythrophones number 10 pairs (Figs. 7A, D, 8A, C, 9A). Elytra large, covering dorsum, round to oval, last pair elongate-oval, nearly covering posterior modified parapodia (Figs. 8D–G, 9A, B, E). Elytra delicate, with branched “veins.” Dorsal cirri with short cylindrical cirrophores and long tapered smooth styles extending beyond tips of setae (Figs. 7A, C, E, 8B). Dorsal tubercles elongate and tapered (Figs. 7C, E, 8A). Both elythrophones and dorsal tubercles with delicate arborescent branchiae attached on their lateral sides, with additional smaller group of branchiae on bases of notopodia; branchiae compact with rather long terminal filaments (Figs. 7A, C–E). Branchiae beginning on segment 3 as 2 small groups (Fig. 7A), becoming larger more posteriorly, with long terminal filaments, and continuing to segment 17 as single small group (Fig. 9A).

Prostomium bilobed, anterior lobes triangular with delicate frontal filaments; median antenna with bulbous ceratophore in anterior notch, with tapered style and long slender tip; palps stout, tapered, smooth; without eyes (Fig. 7A, B). Tentaculophores with 2 pairs of tentacular cirri, dorsal pair about length of palps, ventral pair slightly shorter; ventrally tentacular segment forming anterior and lateral lips of mouth (Fig. 7A, B). Second or buccal segment forming posterior lip of mouth and bearing biramous parapodia and first pair of elythrophones; notopodia with hood or bract encircling small bundle of notosetae; ventral buccal cirri similar to tentacular cirri, longer than following ventral cirri (Fig. 7A, B).

When everted, muscular pharynx showing 5 papillae around opening: 3 dorsal

←

with detail of tips; G, Subacicular neuroseta, with detail of tips; H, Ventral view left side of segments 10–13, showing segmental papillae. b, notopodial bract. Scales = 1.0 mm for A–C; 0.2 mm for D; 0.1 mm for E–G; 1.0 mm for H.

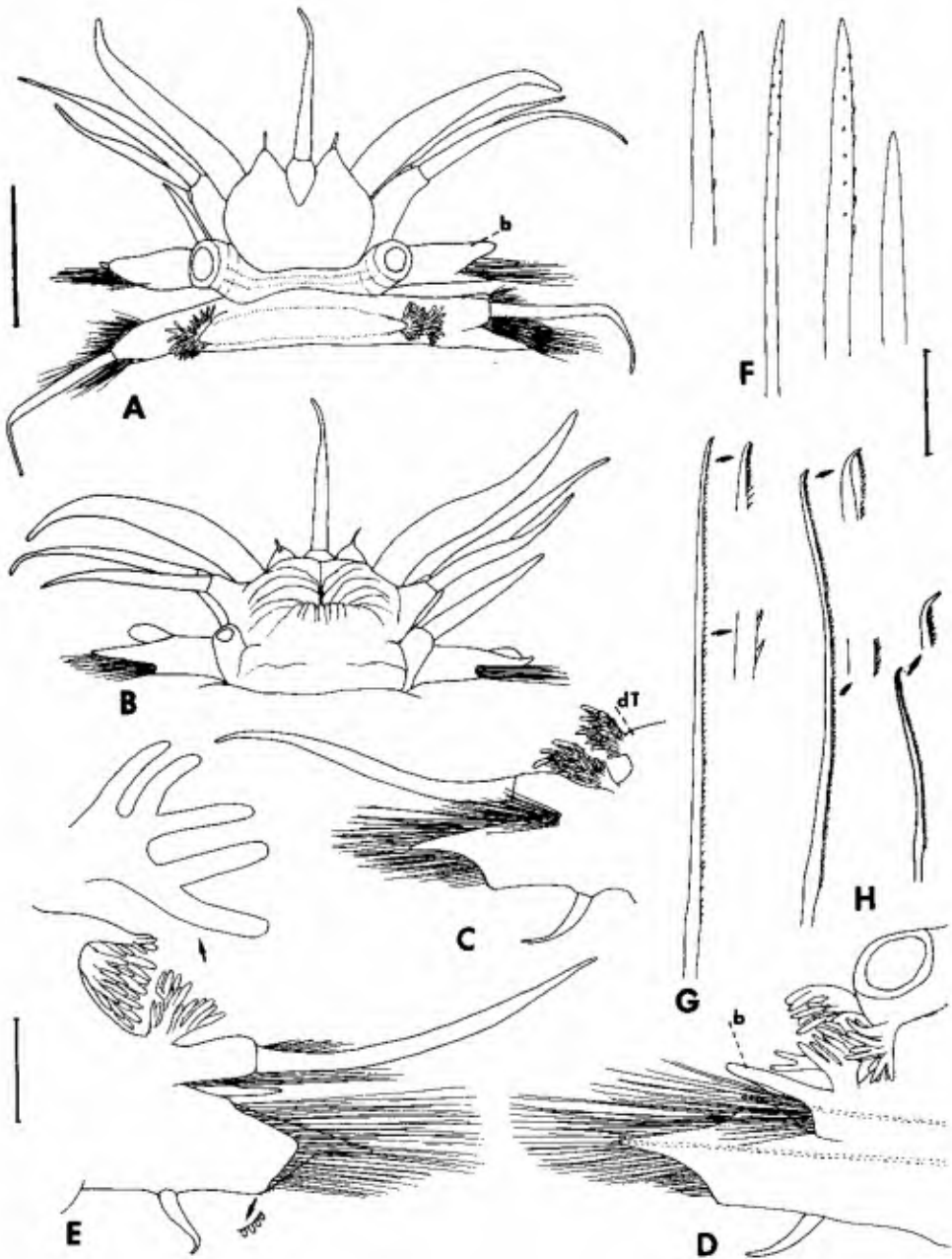


Fig. 7. *Opisthotrochopodus alvinus*, holotype, USNM 80639: A, Anterior end, dorsal view; B, Same, ventral view, style of right buccal cirrus missing; C, Right cirriferous parapodium of segment 3, anterior view; D, Right elytrigerous parapodium of segment 7, anterior view, acicula dotted; E, Right cirriferous parapodium of segment 8, posterior view, with detail of branchial tips and neuropodial papillae; F, Four notosetae; G, Supraacicular neuroseta, with detail of part; H, Middle and lower subacicular neurosetae, with detail of part. b, notopodial bract; dT, dorsal tubercle. Scales = 1.0 mm for A, B; 0.5 mm for C-E; 0.1 mm for F-H.

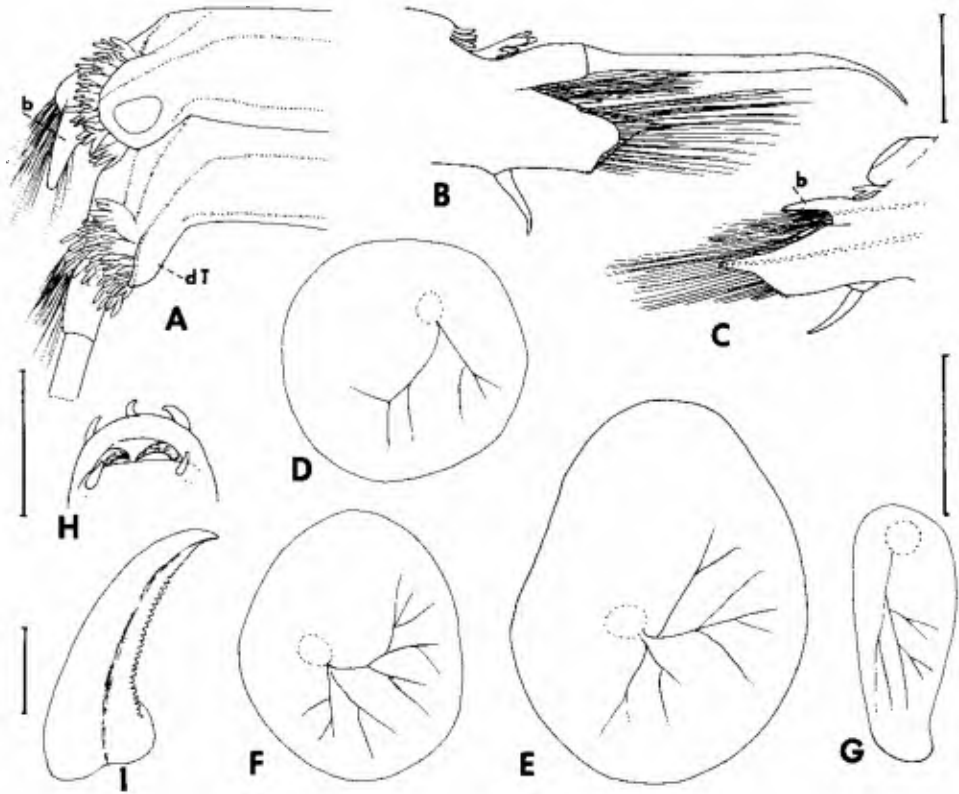
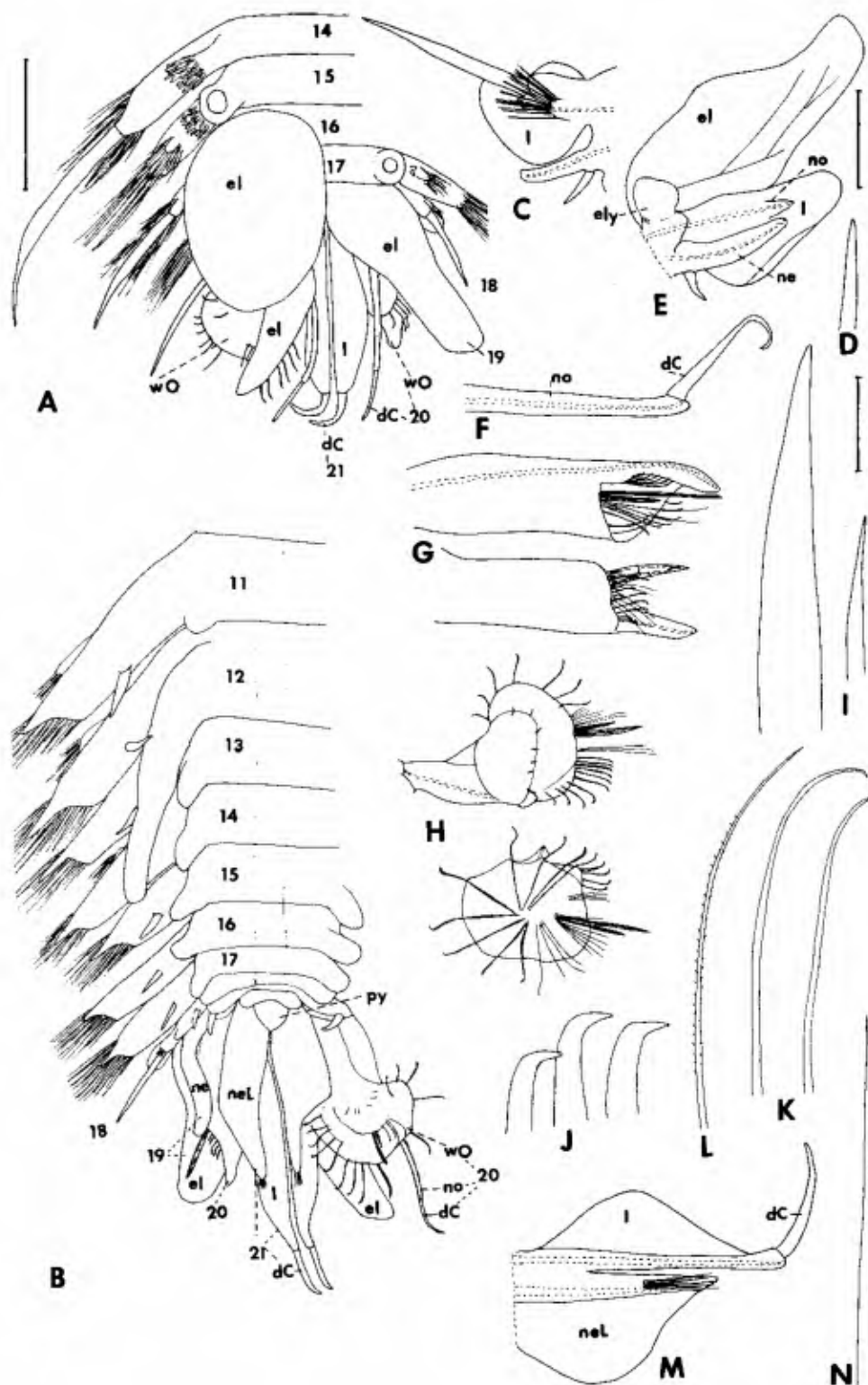


Fig. 8. *Opisthotrochopodus alvinus*. A, paratype, USNM 97255; B–G, I, holotype, USNM 80639; H, paratype, USNM 97254: A, Dorsal view left side of segments 9 (elytrigerous) and 10 (cirriferous), base of style of dorsal cirrus only shown; B, Right cirriferous parapodium of segment 16, posterior view; C, Right elytrigerous parapodium of segment 17, anterior view, acicula dotted. D, Right elytron 4 of segment 7; E, Left elytron 8 of segment 15; F, Left elytron 9 of segment 17; G, Right elytron 10 of segment 19; H, Distal end of extended pharynx, ventral view; I, Isolated jaw. b, notopodial bract; dT, dorsal tubercle. Scales = 1.0 mm for A, H; 0.5 mm for B, C; 1.0 mm for D–G; 0.2 mm for I.

and 2 ventral; 2 pairs of prominent jaws minutely denticled on inner border (Fig. 8H, I).

Parapodia of segments 2 to 17 biramous, with notopodia shorter than neuropodia, both rami with light yellow amber-colored setae (Figs. 7A–E, 8B, C). Notopodia with short tapered acicular lobes and, on elytrigerous segments, prominent rounded bracts enclosing notosetae dorsally and posteriorly (Figs. 7D, 8C). Notosetae moderate in number, stouter than neurosetae, straight, acicular, tapered, smooth or with 1–2 rows of spines (Fig. 7F). Larger neuropodia with long flattened conical presetal lobes with projecting acicular processes; postsetal lobes shorter, rounded; with some micropapillae on distal borders (Fig. 7C–E). Neurosetae very numerous, forming fan-shaped bundles. Supraacicular neurosetae longer, with more widely-spaced spines extending to near distal tip, more finely spinous distally (Fig. 7G). Subacicular neurosetae decreasing in length ventrally, finely spinous up to hooked tips, sometimes showing delicate flattened distal part



(Fig. 7H). Ventral cirri short, tapered, attached on middle of neuropodia (Fig. 7C–E).

Parapodia of posterior 4 segments (18–21) modified and directed posteriorly, differing from one another (Fig. 9A, B). Parapodia of cirriferous segment 18 (Fig. 9A–C) smaller than preceding (Fig. 8C) and following parapodia (Fig. 9E). Notopodium represented by small acicular lobe, dorsal cirrus with cirrophore fused to acicular lobe, with distal style, bundle of short smooth acicular notosetae (Fig. 9D), and delicate, rounded, flattened lamella (l); neuropodium forming small tapered acicular lobe with small ventral cirrus; without neurosetae (Fig. 9C).

Modified parapodia of elytriferous segment 19 lacking both notosetae and neurosetae (Fig. 9A, B, E). Notopodium with short acicular lobe (no), enclosed in large delicate lamella (l), with small elytriphore (ely) and elongate-oval elytron (el) extending posteriorly and covering more posterior parapodia; neuropodium forming tapering acicular lobe (ne) with small ventral cirrus, similar to neuropodium of segment 18.

Parapodia of segment 20 greatly modified and nearly covered dorsally by elongated elytra of segment 19 (Fig. 9A, B, F–H). Notopodium represented by achaeous elongated cylindrical acicular lobe with distal style of dorsal cirrus (Fig. 9F). Neuropodium forming large cylindrical lobe with projecting conical acicular process and enclosing circle of neurosetae of several types (Fig. 9G): stout reddish amber-colored neurosetae, 2 stout, tapered pointed setae—one long, one short (Fig. 9I) and about 14 stout strongly hooked setae (Fig. 9J), few slender smooth neurosetae with curved tips (near stout acicular setae; Fig. 9K), and delicate curved spinous setae (Fig. 9L). Ventral cirri lacking. Neuropodia capable of being flared and flattened distally, with neurosetae radiating like spokes of wheel (Fig. 9H). On holotype, neuropodium on left side expanded (Fig. 9A, B, H) and on right side not expanded (Fig. 9A, B, G). On other paratypes, both wheel organs found extended and flared, neither one flared, both only partially exposed or completely withdrawn into body and not visible.

Segment 21 with right and left parapodia closely approximated medially and directed posteriorly (Fig. 9A, B, M, N). Notopodium consisting of expanded thin lamella (l) and thickened acicular lobe fused with cirrophore of dorsal cirrus, with distal style (dC); without notosetae. Neuropodium also with expanded thin lamella

←

Fig. 9. *Opisthotrochopodus alvinus*, holotype, USNM 80639: A, Posterior end, dorsal view, showing left side of segments 14–21 and right side of segments 17–21; parapodial wheel organ of segment 20 expanded on left side, unexpanded on right side; B, Same, ventral view, showing right side of segments 11–21 and left side of segments 20 and 21; C, Right cirriferous parapodium of segment 18, anterior view, acicula dotted; D, Noto seta from same; E, Right elytriferous parapodium of segment 19, posterior view, acicula dotted; F, Right notopodium with dorsal cirrus of segment 20, aciculum dotted; G, Two views of right unexpanded neuropodial wheel organ from same, aciculum dotted; H, Left neuropodium of segment 20 showing ventral and posterior views of expanded wheel organ, aciculum dotted; I, Two stout acicular neurosetae from same; J, Three hooked neurosetae from same; K, Two curved smooth neurosetae from same; L, Curved spinous neuroseta from same; M, Right cirriferous parapodium of segment 21, posterior view, acicula dotted; N, Neuroseta from same. dC, style of dorsal cirrus; el, elytron; ely, elytriphore; l, notopodial lamella; ne, neuropodial acicular lobe; neL, neuropodial lamella; no, notopodial acicular lobe; py, pygidium; wO, neuropodial wheel organ. Scales = 1.0 mm for A, B; 0.5 mm for C, E–H, M; 0.1 mm for D, I–L, N.

(neL) and thickened acicular lobe on upper side and joined basally to notopodium; small group of needle-like neurosetae extending slightly beyond tips of neuro-podium, their tips mostly broken (Fig. 9M, N). Ventral cirri lacking.

Pygidium (py) consisting of small oval lobe wedged between bases of parapodia of last segment (21), without anal cirri (Fig. 9B). Ventral segmental nephridial areas on bases of neuropodia of segments 4 to 11 low, rounded, with greatly elongated papillae on segment 12, extending posteriorly to segment 15, and with short rounded lamellae on segments 13 to 17 (Fig. 9B).

Young specimens with 17 or fewer segments may be confused with *Branchinotogluma hessleri*. See below under *Branchinotogluma* sp. A.

Etymology.—The species is named for the submersible *Alvin*, which has been the means of collecting so many unusual animals.

Young of Branchinotogluminae

Young specimens of 17 or fewer segments belonging to this subfamily are difficult to separate to species, since the diagnostic posterior segments and ventral segmental papillae or lamellae are not yet developed. Based on their anterior ends, they may be separated into two groups, herein designated as *Branchinotogluma* sp. A or B, based on the following characters:

	<i>Branchinotogluma</i> sp. A = Young of <i>B. hessleri</i> or <i>Opisthotrochopodus alvinus</i>	<i>Branchinotogluma</i> sp. B = Young of <i>B. grasslei</i> or <i>B. sandersi</i>
Notopodial bracts	On all elytrigerous parapodia of segments 2 to 17	On elytrigerous parapodia of segment 2 only
Notosetae	Both smooth and with 1-2 rows of spines	All smooth
Arborescent branchiae	With rather long terminal filaments	With short terminal filaments
Dorsal tubercles	Elongate, tapered	Inflated, indistinct

Branchinotogluma sp. A

Young of *Branchinotogluma hessleri* or *Opisthotrochus alvinus*

Material examined.—East Central Pacific, from dive of the *Alvin* along the Galapagos Rift in 1979: ROSE GARDEN, 00°48'15"N, 86°13'28"W: Dive 990, 7 Dec, 2451 m, slurp gun, 1 young (USNM 97341).

Pacific Ocean off Western Mexico, 20°50'N, 109°06'W, OASIS, *Alvin* dives in 1982: Dive 1214, 20 Apr, 2633 m, vestimentiferan wash, 13 young (USNM 97342). Dive 1221-15, 4 May, *Riftia* and *Calypptogena* wash, coarse fraction, 4 young (USNM 97343).

Branchinotogluma sp. B

Young of *B. grasslei* or *B. sandersi*

Material examined.—East Central Pacific, from dives of the *Alvin* along the Galapagos Rift in 1979: MUSSEL BED, 00°47'53"N, 86°09'12"W: Dive 991-1,

8 Dec, 2490 m, clam bucket wash, 2 young (USNM 97339). GARDEN OF EDEN, 00°47'41"N, 86°07'44"W: Dive 884, 25 Jan, 2482 m, clam bucket with mussels, 1 young (USNM 97337). ROSE GARDEN, 00°48'15"N, 86°13'28"W: Dive 984-32, 1 Dec, 2451 m, mussel washings, 5 young (USNM 97338).

Pacific Ocean off Western Mexico, 20°50'N, 109°06'W, OASIS *Alvin* dive in 1982: Dive 1214, 20 Apr, 2633 m, vestimentiferan wash, 34 young (USNM 97340).

Remarks.—The subfamily Branchinotogluminae agrees with Branchipolynoinae Pettibone (1984a) and Branchiplicatinae Pettibone (1985) in having well-developed branchiae, an unusual feature in the Polynoidae. The above three subfamilies agree with Macellicephalinae Hartmann-Schröder (Pettibone 1976) and Lepidonotopodinae Pettibone (1983, 1984b) in the structure of the prostomium and tentacular segment in having a median antenna, paired palps, lacking lateral antennae and eyes, with two pairs of tentacular cirri on tentaculophores lateral to the prostomium.

Notopodial bracts are rare in the Polynoidae. The notopodial bracts of Branchinotogluminae, in the form of oval projections enclosing the notopodial acicular lobes and notosetae on the elytrigerous parapodia only, differ markedly from the notopodial bracts in the Lepidonotopodinae where they are truncate and are found on all the setigerous segments (Pettibone 1983, 1984b). The pharynx with serrated or denticulated jaws is also rare in the Polynoidae but is found in some members of the Macellicephalinae and Bathyedithinae (Levenstein 1971; Pettibone 1976, 1979) and in the Lepidonotopodinae (Pettibone 1983, 1984b).

The greatly modified posterior four segments in *Opisthotrochopodus alvinus* set it apart from all other members of the Polynoidae, especially with the development of extra lamellae and the wheel organs on segment 20, with large acicular and hooked neurosetae. Except for this unusual feature, it agrees with species of *Branchinotogluma* and is placed in the same subfamily.

The branchiate subfamilies of Polynoidae from the hydrothermal rift areas may be separated according to the following key:

Key to three Branchiate Subfamilies of Polynoidae

- 1. Prostomium truncate anteriorly, not bilobed, without frontal filaments; median antenna with ceratophore in middle of prostomium. Segments up to 35, first achaetous. Elytra 12 pairs, on segments 2, 4, 5, 7, alternate segments to 23. Dorsal cirri on segments 3, 6, 8, alternate segments to 22 and on up to 12 posterior segments from 24 on. Branchiae beginning on segment 3, flattened elongate sacs, deeply folded and convoluted, attached to flattened elytriphores and dorsal tubercles, both with extra lobes. Elytra large, oval, covering dorsum. Parapodia biramous, both rami with projecting acicular processes. Notopodia without well-developed bracts. Paired palps, tentacular, buccal and dorsal cirri all long. Pharynx with 5 pairs of unequal papillae; 2 pairs of jaws, minutely denticled BRANCHIPLICATINAE Pettibone, 1985 (see *Branchiplicatus cupreus* Pettibone, figs. 1–4, in Pettibone (1985))
- Prostomium bilobed, anterior lobes with minute or filiform frontal filaments. Segments 21, first achaetous. Elytra 10 pairs on segments 2, 4, 5, 7, alternate segments to 19. Dorsal cirri on segments 3, 6, 8, alternate

- segments to 20, 21. Elytrophores and dorsal tubercles not flattened, without extra lobes. Branchiae arborescent, in 2 main groups lateral to ely-trophores and dorsal tubercles and on dorsal sides of notopodia 2
2. Bilobed prostomium with minute frontal filaments; ceratophore of median antenna indistinct, with short style. Elytra small, leaving middorsum un-covered. Elytrophores and dorsal tubercles low, indistinct. Parapodia sub-biramous. Notopodia small digitiform, without notopodial bracts. No-tosetae few, stout, acicular. Neuropodia short, truncate, without projecting acicular processes. Arborescent branchiae beginning on segment 2, with long terminal filaments. Paired palps, tentacular, buccal and dorsal cirri all short. Pharynx with 5 pairs of jaws entire, not denticled. Associated with deep-sea mussels BRANCHIPOLYNOINAE Pettibone, 1984a (see *Branchipolynoe symmytilida* Pettibone, figs. 1–8, in Pettibone (1984a))
- Bilobed prostomium with filiform frontal filaments; median antenna with distinct ceratophore in anterior notch. Elytra large, covering dorsum. Ely-trophores prominent, bulbous; dorsal tubercles inflated, indistinct or elongate, tapered. Parapodia biramous, both rami with projecting acicular processes. Notopodia with prominent notopodial bracts on elytrigerous segment 2 or on all elytrigerous segments. Notosetae numerous, stout, acicular. Arborescent branchiae beginning on segment 3, compact, with short terminal filaments. Paired palps, tentacular, buccal and dorsal cirri all long. Pharynx with 5 papillae: 3 dorsal and 2 ventral; 2 pairs of jaws minutely denticled BRANCHINOTOGLUMINAE, new subfamily (see *Branchinotogluma*, new genus; *Opisthotrochopodus*, new genus)

Acknowledgments

My thanks go to the members of the Galapagos Rift Biology Expedition in 1979, the OASIS group of Scripps Institution of Oceanography in 1982 to the East Pacific Rise at 21°N, and especially to J. F. Grassle and I. Williams of the Woods Hole Oceanographic Institution for the preliminary sorting and material on which this study is based. My colleague, Kristian Fauchald, kindly reviewed the manuscript.

Literature Cited

- Levenstein, R. J. 1971. [Polychaete worms of the genera *Macellicephala* and *Macellicephaloides* (Family Aphroditidae) from the Pacific Ocean. — *In* Fauna of the Kurile-Kamchatka Trench.]—Trudy Institut Okeanologii P.P. Shirshov Akademiia Nauk SSSR 92:18–35. [In Russian, English summary].
- Pettibone, M. H. 1976. Revision of the genus *Macellicephala* McIntosh and the subfamily Macellicephalinae Hartmann-Schröder (Polychaeta: Polynoidae). — *Smithsonian Contributions to Zoology* 229:1–71.
- . 1979. Redescription of *Bruunilla natalensis* Hartman (Polychaeta: Polynoidae), originally referred to Fauveliopsidae. — *Proceedings of the Biological Society of Washington* 92(2):384–388.
- . 1983. A new scale-worm (Polychaeta: Polynoidae) from the hydrothermal rift-area off Western Mexico at 21°N. — *Proceedings of the Biological Society of Washington* 96(3):392–399.
- . 1984a. A new scale-worm commensal with deep-sea mussels on the Galapagos hydrothermal vent (Polychaeta: Polynoidae). — *Proceedings of the Biological Society of Washington* 97(1):226–239.

- . 1984b. Two new species of *Lepidonotopodium* (Polychaeta: Polynoidae: Lepidonotopodinae) from hydrothermal vents off the Galapagos and East Pacific Rise at 21°N.—*Proceedings of the Biological Society of Washington* 97(4):849–863.
- . 1985. An additional new scale-worm (Polychaeta: Polynoidae) from the hydrothermal rift-area off Western Mexico at 21°N.—*Proceedings of the Biological Society of Washington* 98(1): 127–149.

Department of Invertebrate Zoology, National Museum of Natural History,
Smithsonian Institution, Washington, D.C. 20560.