

THREE NEW SPECIES OF *MYZOSTOMA* (MYZOSTOMIDA)

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Abstract. — *Myzostoma armatae*, new species, is an ectocommensal of *Analcidometra armata* (Pourtalès) in the Bahamas and Jamaica, and of *Davidaster discoidea* (Carpenter) in Jamaica. *Myzostoma attenuatum*, new species, is a widespread ectocommensal of diverse Indo-Pacific comatulids. *Myzostoma divisor*, new species, is an Antarctic and sub-Antarctic ectocommensal of *Pro-machocrinus kerguelensis* Carpenter and of *Notocrinus mortensenii* John. The post-settlement ontogeny of *M. divisor* is documented by scanning electron microscopy.

Myzostoma Leuckart is the largest genus of the Myzostomida, a group of obligately echinoderm-associated worms of unsettled zoological affinities. Currently 115 species of *Myzostoma* are recognized; most of them are ectocommensals of crinoids, although a few form galls on crinoids or infest ophiuroids. The last significant taxonomic paper on this genus was by Jägersten (1940a). My recent work on myzostomes isolated from several major crinoid collections has uncovered many undescribed species. Most of these are represented by few specimens, but the three new species described here are notable for their abundance.

Abbreviations for museums mentioned in the text include: National Museum of Natural History (USNM), British Museum (Natural History) (BMNH), Northern Territory Museum of Arts and Sciences (NTMAS).

Class Myzostomida Graff, 1877
Order Proboscidea Jägersten, 1940b
Family Myzostomatidae Graff, 1884
Genus *Myzostoma* Leuckart, 1836
Myzostoma armatae, new species

Fig. 1

Diagnosis. — Small species with flat, oval body, narrower toward rear, posterior end

truncate in uninjured specimens. Marginal zone narrow or poorly evident. About 10 pairs of short marginal cirri, gaps between them larger behind pair 8; supernumerary cirri common. Parapodia acirrate, restricted to anterior 70% of length. Manubrium of parapodial support rods truncate with distal lobes. Lateral organs about halfway from parapodia to margin. Cloacal opening several times farther from margin than proboscis opening. Proboscis unarmed.

Etymology. — Named for the usual host, *Analcidometra armata* (Pourtalès).

History. — McClendon (1907) included one myzostome from *Analcidometra armata* in his type lot of *Myzostoma cerriferoidum*, which otherwise occurred only on *Crinometra brevipinna* (Pourtalès). This type lot has since been pooled (USNM 5780), so the anomalous individual is no longer identifiable, but one very small, damaged specimen 0.90 mm long and 0.86 mm wide might actually be *M. armatae*.

Material. — Five Bahamian samples associated with *Analcidometra armata*: holotype (USNM 118208) and 16 paratypes (USNM 118209) with over 34 crinoids (USNM E17939), 5 Sep 1973, 1 km N350°E of South Bight IV, Goldring Cay, Andros Is., 24°13.9'N, 77°36.2'W, 14–17 m; one paratype (USNM 118210) with two cri-

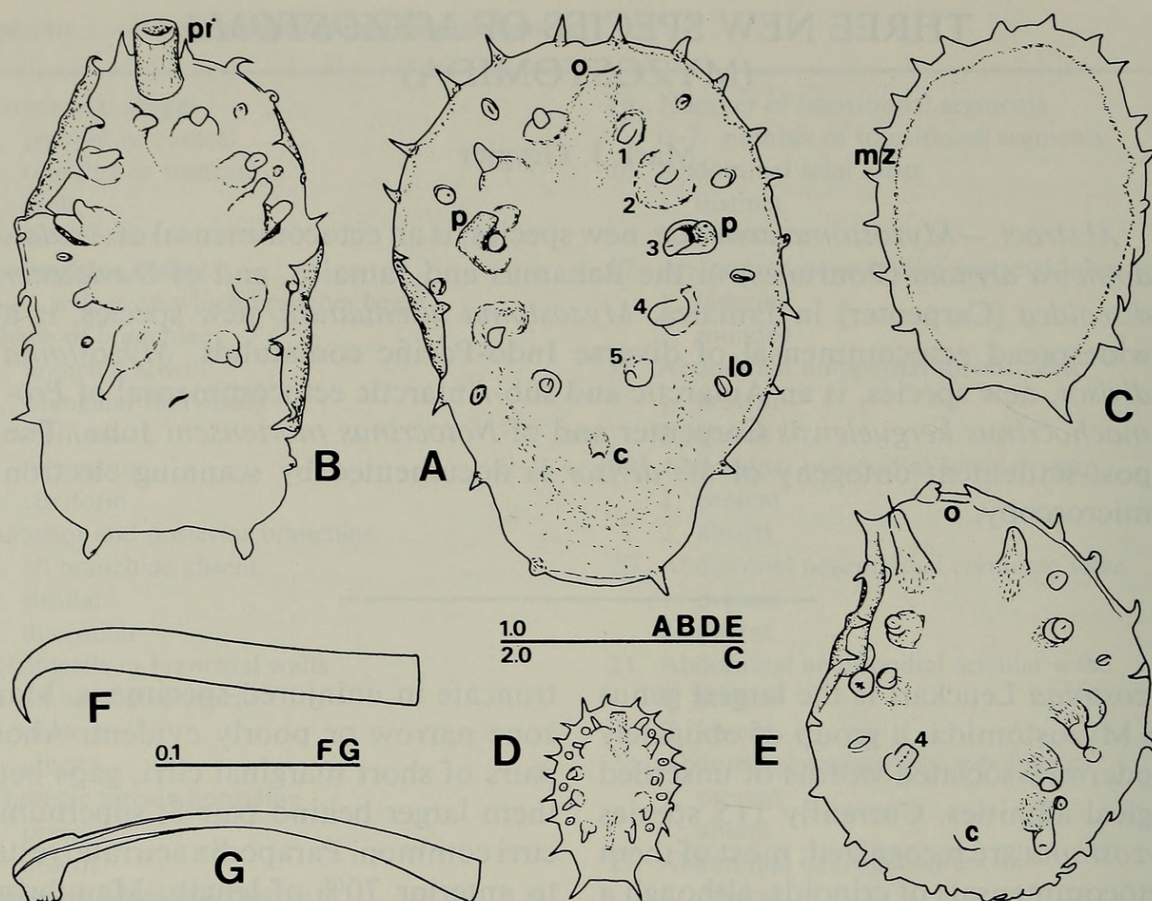


Fig. 1. *Myzostoma armatae*. A, Holotype (USNM 118208), ventral view; B, Paratype from type locality (from USNM 118209), ventral view; C, Large Jamaican paratype (from USNM 118216), dorsal view; D, small Jamaican paratype (from USNM 118220), ventral view; E, Aberrant paratype from type locality, ventral view, missing right parapodium 5 and lateral organ 4, numerous supernumerary cirri on abnormally short and rounded (due to injury?) rear margin of body; F, G, Parapodial hook and support rod, respectively, from a third paratype from type locality. Key: some parapodia numbered from the front in A and E; c, cloacal opening; lo, lateral organ; mz, marginal zone; o, proboscis opening; p, penis; pr, proboscis; scale bars in mm.

noids (USNM E17987), 25 Aug 1973, Marine Farm, Crooked Is., 22°50'N, 73°21'W, 40–52 m; one paratype (USNM 118211) with one crinoid (USNM E17749), 28 Aug 1973, South Long Cay, 22°36.1'N, 74°22.2'W, 15–18 m; six paratypes (USNM 118212) with five crinoids (USNM E17818), 9 Sep 1973, 2 km S118°E of South Bight IV, Goldring Cay, Andros Is., 24°12.4'N, 77°34.9'W, 43 m; 16 paratypes (USNM 118213) with over 20 crinoids (USNM E17951), 9 Sep 1973, same collection as previous entry except 11–12 m.

Seven samples collected by D. B. Macurda, Jr., at Discovery Bay, Jamaica, from *Analcidometra* sp. unless otherwise stated (presumably *A. armata*, since that is the only species currently recognized in the genus; Meyer et al. 1978): 24 paratypes (USNM

118214), W moat and knob in front of Dancing Lady Reef, 9 Jul 1974, 23–27 m; 5 paratypes (USNM 118215), LTS W of Dancing Lady Reef, and Pinnacle II, 10 Jul 1974, 21–27 m; 3 paratypes (USNM 118216), forereef escarpment, Dancing Lady Reef, 8 Jul 1974; 20 paratypes (USNM 118217) on *A. armata*, no detailed collection data; 21 paratypes (USNM 118218), NW edge of forereef terrace, Lynton's Mine, 7 Jul 1974, 21–24 m; 1 paratype (USNM 118219), SE side of Pinnacle I, front of Lynton's Mine, 6 Jul 1974, 24–27 m; 2 paratypes (USNM 118220) on *Davidaster discoidea* (Carpenter), E slope and sand channel E of Lynton's Mine, 9 Jul 1974, 12–17 m.

Description.—Holotype 2.25 mm long, 1.61 mm wide (Fig. 1A). Bahamian paratypes 0.90–2.31 mm long, mean of 16 from

USNM 118213 1.51 mm, of 15 from USNM 118209 1.80 mm, average length : width 1.7–1.8 but range 1.2–2.5 depending on contraction or enrollment. Jamaican paratypes larger (0.73–3.06 mm long, mean of 17 from USNM 118217 2.28 mm), but with same body shape (average length : width 1.7, range 1.2–2.6). Bahamian specimens (Fig. 1A, B, E) uncolored or yellowish, lateral edges of body often downturned; nearly smooth, rather thick cuticle; marginal zone poorly distinguished. Jamaican specimens (Fig. 1C) mostly light brown, sometimes with darker dorsal patches, body usually flat or saddle-shaped, dorsal texture leathery or minutely pebbled; narrow but distinct, translucent marginal zone present.

Following idealized description applies in full to minority of examined specimens; variability described afterwards.

Body oval with rounded front and narrower, often truncate rear, usually with distinct narrowing at level of cloacal opening or of ninth pair of marginal cirri. Fundamentally 10 pairs of marginal cirri, first 8 pairs equally spaced around anterior and lateral margins to level of last parapodia, last 2 pairs progressively farther apart, ninth just behind cloacal opening, tenth on rear corners (Fig. 1A–C). In small specimens tenth pair often at least twice as long and thick as other pairs (Fig. 1D), and first pair sometimes also long, but this distinction mostly lost in large specimens. Cirri usually equilaterally or acutely triangular, but longer and thinner in a few specimens of all sizes, or, especially in Jamaican specimens, reduced to little more than marginal thickenings.

Five pairs of parapodia forming oval in anterior two-thirds of ventral side, equally spaced and positioned about halfway from center of oval to anterior and lateral margins, third pair closest to edge (Fig. 1A, B, D). Parapodia small, with conical, acirrate base and stubby, finger-like distal part; latter extensible enough to overreach body margin, even in rear parapodia (only retracted ones illustrated). Parapodial hooks

moderately stout, nearly straight, tips evenly rounded and tapered, bending more than 90° (Fig. 1F). Support rods thinner and a little longer than hooks, manubrium expanded very little on rear side, front side truncate about 5 small, distal lobes (Fig. 1G). One or 2 replacement hooks present. Penes present as short, broad, cylindrical nozzles arising from lateral bases of third parapodia and sometimes reaching as far as body margin, diameter greater than that of distal part of parapodium (Fig. 1A, B, E). Four pairs of lateral organs alternating with parapodia and forming arcs parallel to body margin about halfway between parapodia and margin (Fig. 1A); lateral organs small, round or more usually radially oval, resembling short, cylindrical tubes when protruded. Proboscis opening ventral, about one-third of way from front margin to first parapodia; extended proboscis cylindrical, twice as long as thick, lacking papillae (Fig. 1B). Cloacal opening at level of ring of lateral organs, much closer to last parapodia than to rear body margin.

Variability.—Body outline and marginal cirri subject to much variability, apparently due to injury from predators; lateral edges and more often rear end often showing evidence of healing of large wounds and sometimes missing parapodia (Fig. 1E). Rear often deeply notched on right or left side, sometimes entire postanal region missing. In a few cases, rear split lengthwise. Ten marginal cirri on each side of body in only 30% of 70 specimens from 4 lots, unilateral cirral count 4–21, but 8–12 86% of the time. Low cirral counts due to injury except in a few apparently undamaged Jamaican specimens simply lacking cirri towards rear. Commonly from one to two supernumerary cirri of usual form. If more cirri present, extra ones most often found in healed posterior areas, less often laterally (Fig. 1E); such cirri smaller than normal and generally appearing in closely spaced rows.

Remarks.—Of described Caribbean myzostomes, only *Myzostoma rotundum* Graff, 1883, has an oval body with an eccentric

ring of parapodia (Graff 1884). The body form and size (1.7×1 mm), the small parapodia excluded from the rear part of the body, and the position of the proboscis opening match *M. armatae*. But the wide marginal zone of *M. rotundum* ($\frac{1}{6}$ of body diameter), and its much larger hemispherical lateral organs that are very close to the margin (in the marginal zone itself), are different. So are the high number (22 along one side of the body), equal spacing, and rather filiform shape of its marginal cirri and the wider spacing of the parapodia towards the rear.

Except for two specimens found with *Davidaster discoidea*, *Myzostoma armatae* seems to be restricted to *Analcidometra* (presumably always *A. armata*) as a host, and this new species is currently known from the Bahamas and Jamaica at 12–52 m. The specimens from *D. discoidea* co-occurred with another undescribed species of *Myzostoma*.

Myzostoma attenuatum, new species

Fig. 2

Diagnosis. — Body elongate, up to 4.5 mm long, with tapered, postanal, caudal region in undamaged specimens. No translucent marginal zone. Numerous short, irregularly sized, closely spaced marginal cirri back to level of cloacal opening, sparser in caudal region. Parapodia acirrate, usually confined to front half of body, a little closer to margin than midline. Parapodial hooks very thick, manubrium of support rods hatchet-shaped. Round lateral organs halfway from parapodia to margin, half parapodial diameter when protruded. Proboscis opening closer to first parapodia than margin, proboscis unarmed.

Etymology. — Named for the drawn out, attenuated caudal region of undamaged specimens.

Type material. — Unless otherwise specified, all specimens loose in jars with sup-

posed hosts. Holotype (USNM 118221) with one *Capillaster sentosa* (Carpenter) (USNM 34844), Albatross stn. 5146, 5.7 km SE of E Sulade Is., near Siasi, Sulu Archipelago, Philippines, $5^{\circ}46'40''$ N, $120^{\circ}48'50''$ E, 44 m, 16 Feb 1908; 2 paratypes (USNM 118222) with 3 *Comaster multifida* (J. Müller) (USNM E34538), collected by D. L. Meyer, Lizard Is., Queensland, Australia; 3 paratypes (USNM 118223) with 2 *Colobometra perspinosa* (Carpenter) (USNM E34765), collected by D. L. Meyer, E side of Ta Bui Is., Indonesia, 6–18 m, 29 Mar 1975; 10 paratypes (USNM 118224) with 2 *Oxy-metra finschi* (Hartlaub) (USNM E34861), collected by D. L. Meyer, Malaysia; 20 paratypes (USNM 118225) with 2 *O. finschi* (USNM E34576), collected by D. L. Meyer, Singapore; 1 paratype (USNM 118226) found halfway out along arm of *Pontiom-etra andersoni* Carpenter (USNM 35222), same collection as holotype; 3 paratypes (USNM 118227) with 1 *P. andersoni* (USNM E3130), New Harbour, Singapore, 1899; 9 paratypes (USNM 118228) with 2 *Pontiom-etra* sp. (USNM G2605), collected by D. L. Meyer, Lizard Is., Queensland, Australia, 1975; 1 paratype (USNM 118229) with 2 *Decametra mylitta* A. H. Clark (USNM E11628), International Indian Ocean Expedition, R/V *Anton Bruun* cr. 1, stn. 47B, northern Bay of Bengal, $19^{\circ}50'$ N, $92^{\circ}55'$ E, 22–30 m, 5 Apr 1963; 10 paratypes (NTMAS Ref. no. W326), collected from *Cenometra cornuta* A. H. Clark by R. Lockyer, Cootamundra Shoal, Timor Sea, Northern Territory, Australia, stn. 2/43, $10^{\circ}50'$ S, $129^{\circ}13'$ E, 20 m, 10 May 1982; 1 paratype (author's collection), host unknown, collected by A. Pietsch, Maldives, 1985.

Additional material. — 3 partial specimens (USNM 118230) with *Stephanometra oxyacantha* (Hartlaub) (USNM E34854), collected by D. L. Meyer, Singapore; 1 specimen (USNM 118231) with 1 *Comaster gracilis* (Hartlaub) (USNM E35356), collected by D. L. Meyer, Lizard Is., Queens-

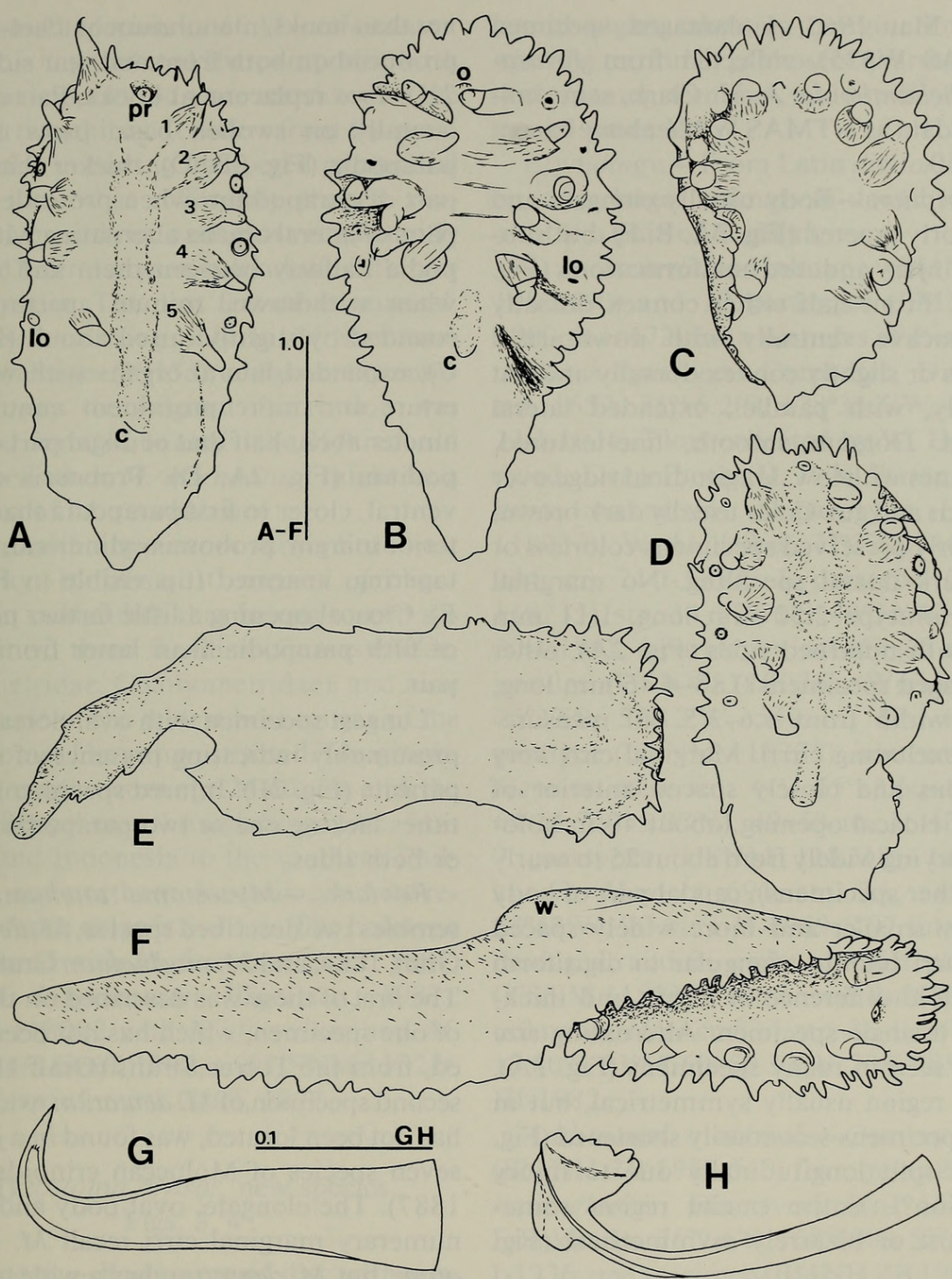


Fig. 2. *Myzostoma attenuatum*. A, Holotype (USNM 118221), ventral view, some lateral organs not visible due to upturned body margin; B, Paratype, ventral view (personal collection); C, Unusually short paratype (from USNM 118228), ventral view; D, Posterolaterally injured paratype (from USNM 118227), ventral view; E, Paratype (from USNM 118225) showing abnormal development of caudal part of body, presumably due to injury, dorsal view; F, Longest paratype (from USNM 118223), body twisted, lateral organs not shown; G, H, Parapodial hook and support rod, respectively, from specimen in same lot as C. Key: as in Fig. 1, except w, lump apparently caused by endoparasitic worm; scale bars in mm.

land, Australia; 1 specimen (USNM 118232), host unknown, from International Indian Ocean Expedition, R/V *Anton Bruun* cr. 1, stn. 47B (details above); 15 specimens

(USNM 118233), host unknown, from International Indian Ocean Expedition, R/V *Anton Bruun* cr. 1, stn. 18A, Andaman Sea off Phuket, Thailand, 7°34'N, 98°00'E, 77

m, 21 Mar 1963; 1 damaged specimen (NTMAS W325), collected from *Petasma helianthoides* A. H. Clark, same collection data as NTMAS W326 above except stn. 2/50.

Description.—Body usually elongate and posteriorly tapered (Fig. 2A, B, F), but subject to injury-induced malformations (Fig. 2D, E). Front half either convex dorsally and concave ventrally with downturned margins or slightly convex dorsally and flat ventrally, with parallel, extended lateral margins. Dorsum smooth, fine-textured, sometimes with low, longitudinal ridge over proboscis and gut. Color usually dark brown, but poorly preserved specimens colorless or with dark dorsal speckling. No marginal zone. Holotype 2.50 mm long, 1.11 mm wide, with upturned sides (Fig. 2A), other undamaged specimens 0.88–4.46 mm long, length:width from 1.6–3.5 (all measurements excluding cirri). Marginal cirri very numerous and closely spaced anterior of level of cloacal opening (about 40 in holotype, varying widely from about 25 to nearly 50 in other specimens), caudal part of body lined by smaller and more widely spaced cirri. Cirri bluntly triangular to digitiform with 3-fold difference in length and thickness in a single specimen. Alternating size pattern seen in many specimens (Fig. 2A). Caudal region usually symmetrical, but in many specimens secondarily shortened (Fig. 2C), or split longitudinally due to injury (predation?). Entire caudal region sometimes lost or bizarrely asymmetrical (Fig. 2E).

In undamaged specimens, five pairs of parapodia arranged in two nearly parallel rows or shallow arcs on anterior half or one-third of ventral side, slightly closer to margin than to midline (Fig. 2A–D, F). Obliquely conical base of parapodium lacking medial cirrus; distal part of parapodium a stubby, rounded process up to twice as long as thick. Parapodial hooks very stout, evenly tapered, tip bent at 90° (Fig. 2G). Support rods of same length but much thin-

ner than hooks, manubrium hatchet-shaped, produced on both front and rear sides (Fig. 2H). Two replacement hooks. Pair of penes laterally on swollen basal parts of third parapodia (Fig. 2B, D), thicker than distal part of parapodium when protruded. Four pairs of lateral organs alternating with parapodia halfway between them and margin; when withdrawn, minute apertures surrounded by slightly raised annuli (Fig. 2B, C); expanded lateral organs with wide aperture and more prominent annulus, diameter about half that of distal part of parapodium (Fig. 2A, D). Proboscis opening ventral, closer to first parapodia than to anterior margin, proboscis cylindrical, slightly tapering, unarmed (tip visible in Fig. 2A, F). Cloacal opening a little farther posterior of fifth parapodia than latter from fourth pair.

Longest specimen with oval dorsal hump presumably indicating presence of internal parasite (Fig. 2F). Injured specimens sometimes lacking one or two parapodia on one or both sides.

Remarks.—*Myzostoma attenuatum* resembles two described species, *M. dentatum* Graff, 1884, and *M. moebianum* Graff, 1884. The first of these was described on the basis of one specimen, which has not been located, from the Torres Straits (Graff 1884). A second specimen of *M. dentatum*, which also has not been located, was found in a jar with seven species of Moluccan crinoids (Graff 1887). The elongate, oval body and supernumerary marginal cirri recall *M. attenuatum*, but *M. dentatum* has a wide, distinct marginal zone, the proboscis opening closer to the front margin, the parapodia closer to the midline and not particularly confined to the front half of the body, and a rounded, untapered rear.

Myzostoma moebianum, a species described on the basis of collector's notes and nearly useless microscopical preparations, is from an unknown host at Fouquet Is. southeast of Mauritius (Graff 1884). Its body outline and parapodial placement are sim-

ilar to small specimens of *M. attenuatum*; the rear is tapered and the parapodia, with very thin support rods, are restricted to the anterior two-thirds. It differs from the present species in having untapered parapodial hooks, somewhat differently shaped support rod manubria, and most importantly a pair of lateral organs behind the fifth pair of parapodia. This last feature is unusual, otherwise occurring only in *M. costatum* sensu Boulenger (1913a), and given the unorthodox way the original description was prepared, it might be a mistake. If this could be proved, then *M. attenuatum* might be a synonym of *M. moebianum*.

Myzostoma attenuatum shows little host specificity. It infests 10 species of oligophreatan comatulids that belong to two superfamilies, three families (Comasteridae, Mariametridae, Colobometridae), and nine genera, one of the widest host ranges of the myzostomes I have investigated. Geographically it ranges from the Maldives and the Bay of Bengal east through Singapore, Malaysia, and Indonesia to the southern Philippines and northern Australia, and its recorded depth range is 6–30 m. The holotype co-occurred with *M. furcatum* Graff, 1887, and *M. longimanum* (Jägersten, 1937); USNM 118222 with *M. furcatum* and *M. ambiguum* Graff, 1887; and USNM 118226 with *M. sp. cf. triste* Graff, 1877.

Myzostoma divisor, new species

Figs. 3, 4

Diagnosis.—Body a round disc with posterior pair of cylindrical caudal processes up to 1.75 times longer than body diameter. Nine pairs of moderately long, equal cirri around disc, additional pair at ends of caudal processes. Parapodia two-thirds of way from center of disc to margin, basal part with pointed medial cirrus, distal part in two sections, extremely extensible. Parapodial hooks and support rods very long and slender, manubrium of latter digitiform. Four pairs of relatively large, round

lateral organs abutting margin. Proboscis opening terminal, proboscis unarmed. Cloacal opening terminal, on papilla between caudal processes.

Etymology.—From Latin *divisor*, a divider, since larger animals in dorsal view resemble a pair of dividers.

Type material.—Holotype (BMNH ZB 1980.460) and 12 paratypes (BMNH ZB 1980.461–472) from pinnules of *Promachocrinus kerguelensis* Carpenter, Discovery stn. 1652, 75°56.2'S, 178°35.5'W, 567 m, 23-I-1936. 3 lots collected by W. H. Littlewood, Deep Freeze II, R/V *Staten Island*, hosts unknown: 1 paratype (USNM 118234), Weddell Sea, 77°32'S, 44°45'W, 284 m, 21-I-1957; 1 paratype (USNM 118235), stn. 24, 77°21'S, 44°30'W, 300 m, 20-I-1957; 5 paratypes including 2 early juveniles (USNM 118236), Weddell Sea, 75°27'S, 57°12'W, 549 m, 17-I-1957. 1 paratype (USNM 118237), host unknown, *Hero* cr. 824, stn. 4-1, 65°13.60–13.67'S, 64°14.72–15.07'W, 49–58 m, 16-III-1982; 7 paratypes (USNM 118238), host unknown, *Hero* cr. 691, stn. 2A, 64°49.5'S, 63°47'W, 70 m, 1-II-1969; 107 intact, 272 damaged, and 26 early juvenile paratypes (USNM 118239), some used for SEM, host unknown, *Hero* cr. 824, stn. 26-1, 64°14.30–13.80'S, 61°57.60–58.30'W, 238–285 m, 24-III-1982.

Additional material.—One specimen (BMNH ZB 1980.540) from pinnules of *P. kerguelensis*, Discovery stn. 1658, off Franklin Is., 76°9.6'S, 168°40'E, 520 m, 26-I-1936; one specimen (BMNH ZB 1980.547) from genital pinnules of female *Notocrinus mortenseni* John, Discovery stn. 187, NeuMayr Channel, Palmer Archipelago, 64°48'30"S, 63°31'30"W, 259–354 m, 18-III-1927; five specimens (BMNH ZB 1980.543–546) from pinnules of *P. kerguelensis*, Discovery stn. 156, 53°51'00"S, 36°21'30"W, 200–236 m, 20-I-1927; two specimens (BMNH ZB 1980.541–542) free on lower parts of arms of *P. kerguelensis*, Discovery stn. 42, off mouth of Cumberland

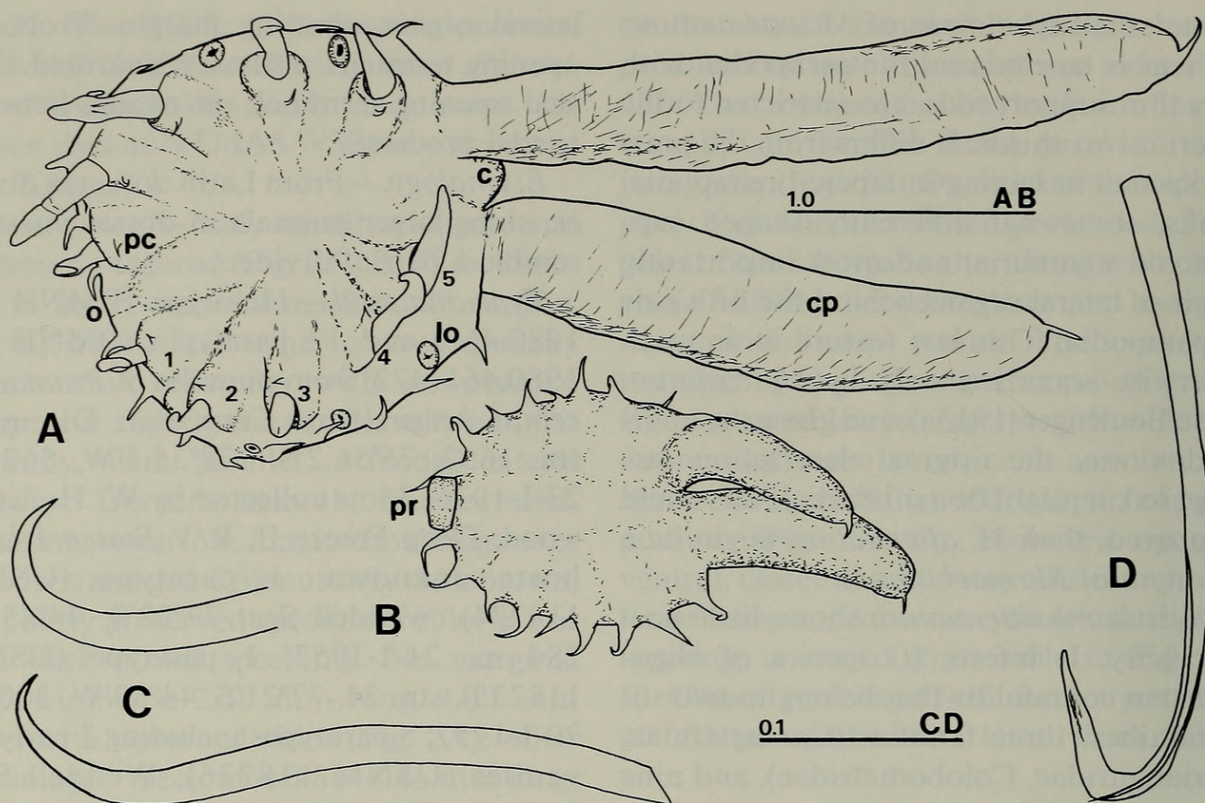


Fig. 3. *Myzostoma divisor*. A, Holotype (BMNH ZB 1980.460), ventral view; B, Paratype from type locality (from BMNH ZB 1980.461-472), dorsal view; C, Parapodial hook and distal part of another from paratype (from USNM 118239); D, Parapodial support rod from same specimen as C. Key: as in Fig. 1, except cp, caudal process; pc, parapodial cirrus; scale bars in mm.

Bay, South Georgia, 10.5 km N89°E of Jason Lt. to 6.7 km N39°E, 120-204 m, 1-IV-1926; two specimens (USNM 118240), host unknown but one specimen from gorgonian washings, *Hero* cr. 824, stn. 14-1, 64°48.63-48.20'S, 64°4.00'W, 70-150 m, 19-III-1982; one specimen (USNM 118241) from crinoid washings, *Hero* cr. 824, stn. 26-1, 64°14.30-13.80'S, 61°57.60-58.30'W, 238-285 m, 24-III-1982.

Description of adults.—Body a round, flat disc with pair of cylindrical caudal processes and nine pairs of marginal cirri. Specimens from type locality larger than others. Holotype disc diameter 1.79 mm, right and left caudal processes (omitting terminal cirri) 2.44 and 3.12 mm long, respectively (Fig. 3A). Largest paratype with disc diameter 2.12 mm, longer caudal process 2.82 mm. Maximum ratio of caudal process length to disc diameter 1.75 in specimen 1.10 mm across; caudal processes generally, but with

many exceptions, relatively longer in larger individuals (Fig. 4; see ontogeny section below).

Color yellowish brown, no translucent marginal zone. Dorsum smooth or with longitudinal swelling, and sometimes with radial grooves between parapodial muscle masses (Fig. 3B). Nine pairs of evenly spaced, equally long marginal cirri, similar pair at ends of caudal processes, though these often broken off; in holotype marginal cirri about 0.14 mm long, terminal ones on caudal processes about 0.16 mm long. Caudal processes cylindrical or somewhat flattened dorsoventrally, diameter about one-fifth that of body disc (Fig. 3A, B).

Five pairs of parapodia equally spaced in arcs at least two-thirds of way from center of body disc to margin, members of first pair and especially fifth pair widely separated compared to spacing within arcs (Figs. 3A, 4C, D). Basal part of parapodium an

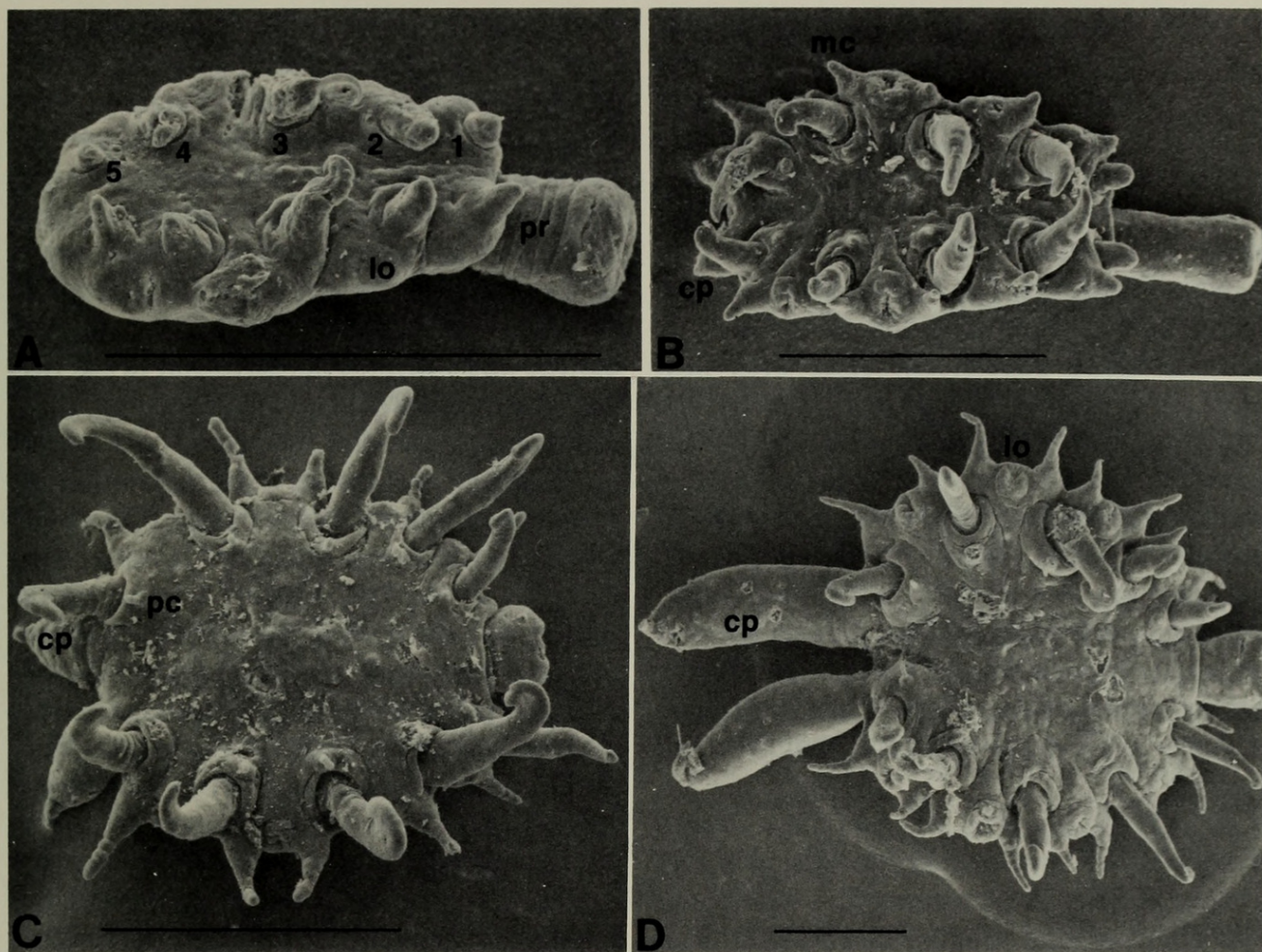


Fig. 4. *Myzostoma divisor*. A–D, Successively later stages in early, post-settlement ontogeny, scanning electron micrographs of paratypes (from USNM 118239). Key: as in Fig. 1 except mc, marginal cirrus; cp, caudal process; pc, parapodial cirrus; scale bars 0.2 mm.

obliquely truncate, radially inclined cylinder with slender cirrus near apex of medial side (Figs. 3A, 4D). Long, slender, apparently bipartite distal part of parapodium projecting radially, either straight or medially curved, extremely extensible and capable of doubling length. Parapodial hooks long, slender, weakly sigmoid, tips exhibiting range of curvatures (Fig. 3C), apparently most broadly rounded in third pair (cf. Fig. 4A). Support rods same length, slightly thinner than hooks, manubrium a long, digitiform process (Fig. 3D). One or two replacement hooks. Penes present as small buttons at lateral bases of third parapodia. Four pairs of lateral organs alternating with parapodia, outer edges nearly or actually abutting body margin, inner edges just inside outer edges of parapodial bases

(Figs. 3A, 4B). Lateral organs round, with same or greater diameter as distal parts of parapodia, low mounds with radially elongate, stellate apertures when retracted, round pads with depressed centers when protruded. Proboscis opening on anterior margin, proboscis a short, unarmed cylinder almost as thick as caudal processes (Figs. 3B, 4D). Large cloacal papilla on rear margin of body between bases of caudal processes (Fig. 3A).

Ontogeny.—Seven minute to small paratypes from USNM 118239 were examined by SEM (Fig. 4) after critical point drying and sputter coating with carbon and gold.

Earliest stage (Fig. 4A) with oval body 200 μ m long not counting proboscis, widest behind third parapodia, tapering more towards front than rear. No marginal cirri or caudal processes developed. Third para-

podia largest, others smaller towards front and rear, last pair much smaller than first, no parapodial cirri present. Lateral organ apertures small, on sides of body. Apparently non-retractile proboscis 60–80 μm long. Cloacal opening not seen (nor in any other SEM specimen).

Next stage (Fig. 4B) represented by specimen 430 μm long (310 μm of main body plus extended proboscis); body 0.21 mm wide at level of third pair of lateral organs. Most marginal cirri present as blunt, tapered processes, last pair (caudal process rudiments) thicker than others. Articulation groove between basal and distal part of parapodium deeper and more nearly circular than in preceding stage, parapodial cirri now clearly present. First pair of parapodia much smaller than other 4 pairs. Lateral organs visible as raised annuli around small pores.

In later stages (Fig. 4C, D) body round, marginal cirri and distal parts of parapodia elongate. Caudal processes first thickened into cones as long as marginal cirri (Fig. 4C); illustrated specimen the smallest of its type, wider but slightly shorter than specimen in Fig. 4B. Caudal processes becoming elongate (Fig. 4D) and proboscis retractable.

Remarks.—The only described species similar to *M. divisor* are *M. bicaudatum* Graff, 1883, and the species described under the name *M. filicauda* by Graff (1884). *Myzostoma bicaudatum* was collected in the Gulf of Mexico, and the unique specimen, which has been lost, was most fully described by Graff (1884). It has a round body 0.45 mm across with a pair of caudal processes. However, there are 10 pairs of marginal cirri, not 9, the front and rear cirri are considerably longer than the lateral ones, the caudal processes lack a “terminal thread” (=terminal cirrus), and the proboscis opening is ventral; no parapodial cirri are reported, but in such a small animal they may have been overlooked.

Myzostoma filicauda was most fully described by Graff (1884) from specimens col-

lected by the *Corvin* off Sandkey; these specimens have also been lost. Graff (1883, 1884) has accidentally caused a nomenclatural confusion between this species and *M. filiferum* Graff, 1884 (from the Torres Straits), because his 1883 original diagnosis of *M. filicauda* agrees with the 1884 description only in terms of size and host, while the characterization of the caudal processes fits the 1884 original description of *M. filiferum* (terminal threads longer than body diameter). Since the type specimen of the latter species is also missing, it is now impossible to resolve this apparent lapsus of Graff's, so I assume that Graff's actual conceptions of the two species are those presented in the *Challenger* Report (Graff 1884), from which the 1883 paper was abstracted. *Myzostoma filicauda*, as here understood, differs from *M. divisor* in having 10 pairs of marginal cirri as well as the pair on the caudal processes, and the lateral cirri are distinctly shorter than the anterior and posterior ones. The proboscis may have papillae, although the latter may be folds in the wall of the proboscis opening, to judge from the illustration. *M. filicauda* also has large, radially oval, lateral organs instead of round ones. Finally, it is hard to imagine that a single species of myzostome could range from Antarctica to the subtropical and tropical shallows of the Atlantic or Pacific.

Few studies of myzostome post-settlement ontogeny have been conducted. Jägersten (1940b) has given the most complete account, based on *Myzostoma cirriferum* Leuckart, 1836, and Kato (1952) studied a species identified as *M. ambiguum* Graff, 1887; both authors reviewed the scanty literature. The earliest observed stage in *M. divisor* corresponds to Jägersten's (1940b) fig. 4 of *M. cirriferum* and fig. 7 of *M. alatum* Graff, 1884, and Kato's (1952) fig. 41 of *M. ambiguum* in having an oval body, all 5 pairs of parapodia developed, the proboscis unretracted, and no marginal cirri. There are no obvious identifying features at this stage, and the present minute

juveniles are identified as *M. divisor* on the basis of their association with hundreds of older, positively identifiable specimens. In *M. cirriferum* the first pair of parapodia is apparently the last to arise; in *M. ambiguum* the first and last pairs appear after the middle three. The first pair is small compared to the middle three pairs in the present juveniles, but in the youngest ones the sixth pair is even smaller, suggesting that it may have appeared last, and the first pair second to last. The progressive envelopment of the proboscis (actually the anterior part of the body; Jägersten 1940b) by the larger posterior part of the body is well exhibited by *M. divisor*.

Until now, only three species of myzostomes have been reported from Antarctic waters, one each of *Myzostoma* (*M. antarcticum* Stummer-Traunfels, 1908), *Cystiomyzostomum* (*C. cysticolum* Graff, 1883), and an unnamed *Asteromyzostomum* (cf. Stummer-Traunfels 1908, Boulenger 1913b, Grygier 1988). Of these, only *C. cysticolum* is known from *Promachocrinus kerguelensis*, where it occupies soft cysts on the oral disc, and none are known from *M. divisor*'s other identified host, *Notocrinus mortenseni*. *Promachocrinus* and *Notocrinus* belong to different suborders of the Comatulida, so *M. divisor* is probably not at all host specific. Its currently known geographical and depth range includes the Ross Sea, Weddell Sea, waters northwest of the Antarctic Peninsula, and South Georgia, at 49–567 m.

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