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On Some Species of Meiobenthic Worms of the Class Gnathostomulida from Barbados, West Indies

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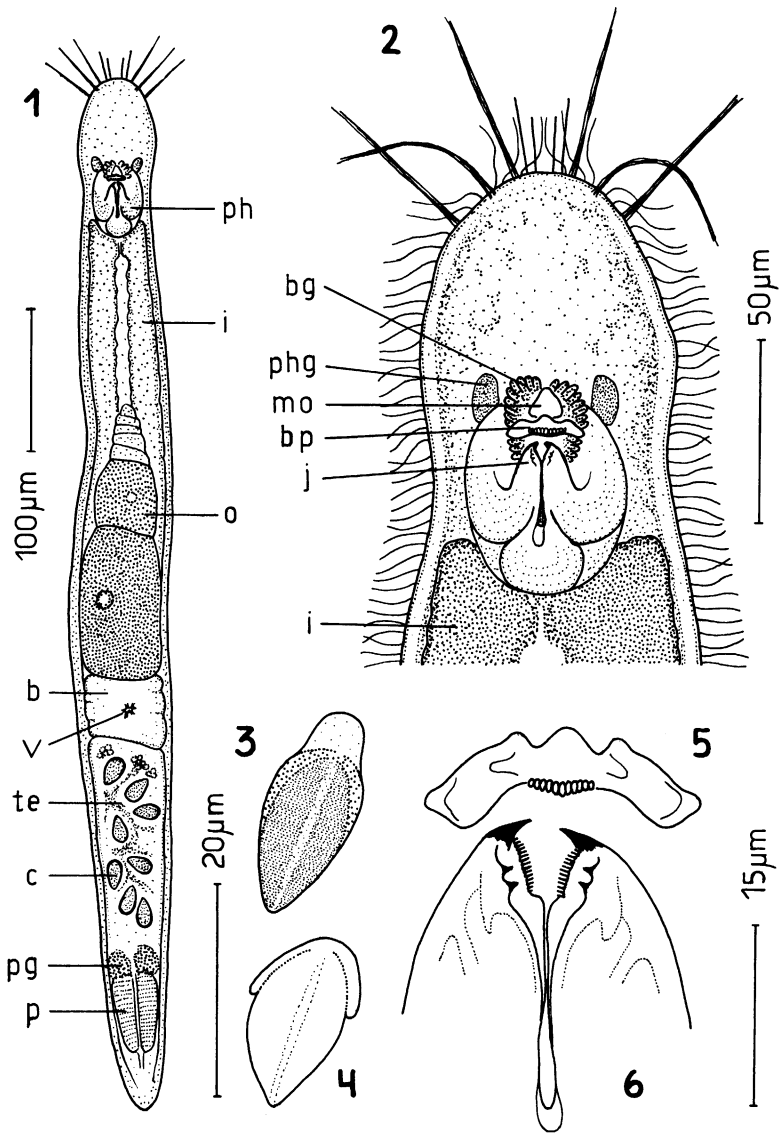
INTRODUCTION

Since Ax (1956) described the first species of Gnathostomulida, knowledge of this group of marine, meiobenthic worms has increased rapidly (see Riedl, 1969). Forty species representing 12 genera have been described (Sterrer, In press e), and the records indicate a worldwide distribution. Gnathostomulida are now known from the European coasts, the Red Sea, the Indian Ocean, and the West Atlantic. In the last area findings have been reported from North Carolina and Florida (Riedl, 1969, In press a,b,c; Sterrer, In press b,d), the Bahamas (Kirsteuer, 1969), Puerto Rico (Riedl, 1966), Venezuela (Kirsteuer, 1964), and Panama (Sterrer, personal commun.). The present study records Gnathostomulida for the first time from Barbados, West Indies.

MATERIAL AND METHODS

In June, 1969 two mature specimens of a new species and four mature specimens of *Gnathostomula axi* were obtained from an intertidal sand sample taken from the beach in front of the Bellairs Research Institute in St. James, Barbados, West Indies. The animals were extracted from

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FIGS. 1-6. *Austrognathia hymanae*. 1. Dorsal aspect of living animal. 2. Head region. 3,4. Two types of conuli. 5. Basal plate. 6. Jaws.

the sample sediment (clean, carbonate sand) with the modified "Swed-mark-Technique" (Sterrer, 1968), and studied in squeezing preparations

with the aid of phase contrast microscopy. For the description of relative size and position of organs within the specimens the 100 unit system (i.e., 100 U equal total length of body) and terminology as used by Riedl and Sterrer in recent papers are adopted here.

ACKNOWLEDGMENTS

I wish to thank Dr. Thomas H. Carefoot, Acting Director of the Bellairs Research Institute in 1969, for his friendly help and hospitality during my stay on Barbados. I am also indebted to my friends Dr. Rupert Riedl (Chapel Hill, N.C.) and Dr. Wolfgang Sterrer (Bermuda) for kindly providing valuable information from papers in press. My work was supported by National Science Foundation Grant GB-7952.

SYSTEMATIC ACCOUNT

ORDER BURSOVAGINOIDEA STERRER
SUBORDER CONOPHORALIA STERRER
FAMILY AUSTROGNATHIIDAE STERRER
GENUS *AUSTROGNATHIA* STERRER, 1965

Austrognathia hymanae, new species

Figures 1-10, 14

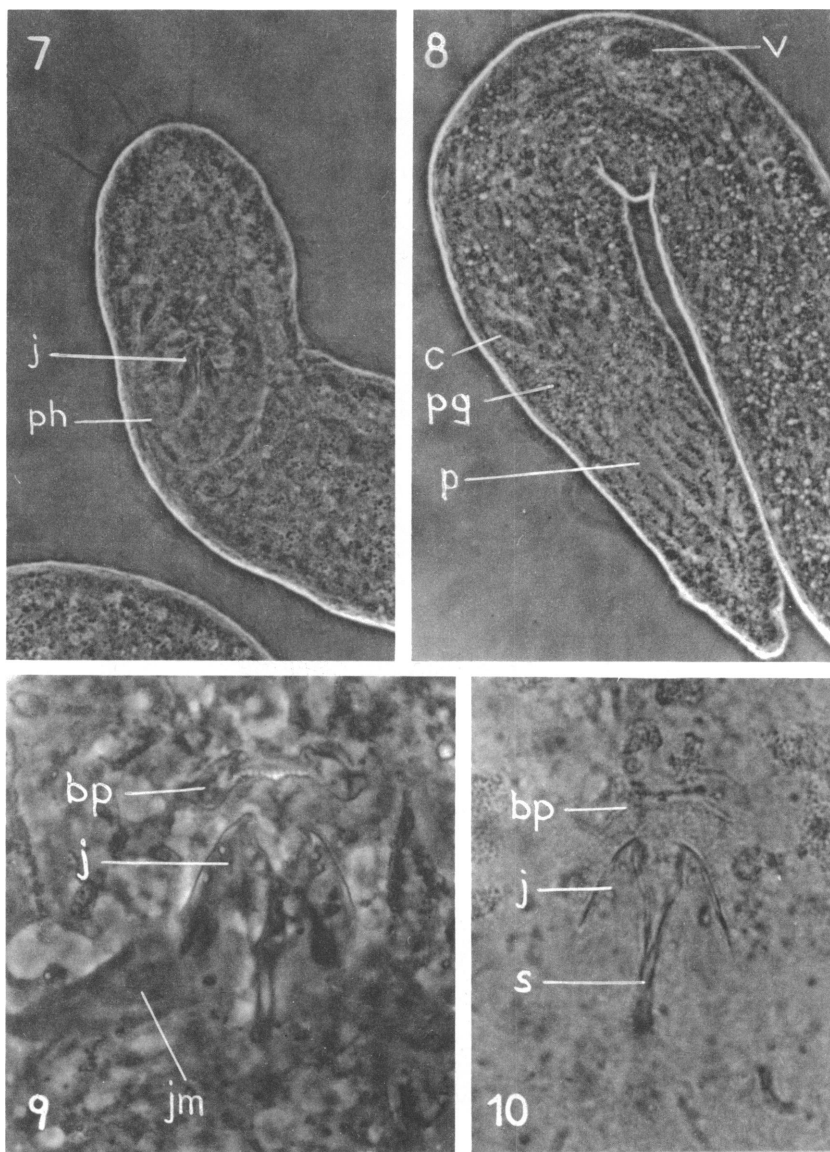
TYPE: Holotype, one specimen (squeezing preparation on slide), deposited at the American Museum of Natural History, New York, A.M.N.H. No. 672

TYPE LOCALITY: Intertidal (near low water line) of beach in front of Bellairs Research Institute, St. James, Barbados, West Indies.

DIAGNOSIS: *Austrognathia hymanae*, new species: *Austrognathia* with jaws 20 μ long and with only two prominent teeth on the ventral dental ridge. Basal plate, 7.5 μ long and 21 μ wide (index 0.36), with 11 rather equal teeth. Conuli, 17 to 20 μ long.

DESCRIPTION: The living animals (fig. 1) are 700 to 720 μ long, with a maximum width of 65 μ and the body index (length : width) is 10.8. They are greenish white in color with the darker, ripe oocytes and the male genital organs shining through. The head region is slightly demarcated from the remainder of the body by a sulcus at the level of the jaws (about U 11). At approximately U 60 the body begins to taper gradually toward its blunt posterior end.

The sensorium (figs. 2, 7) consists of two pairs of stiff sensory cilia, or apicalia, one 14 μ long, the other 20 μ long, and three pairs of compound sensory bristles, the rostralia, the dorsalia, and the lateralia, which



FIGS. 7-10. *Austrognathia hymanae*. 7. Head region with some of the sensory bristles and pharynx. 8. Posterior portion of body. 9. Basal plate and jaws with two strong teeth on dorsal ridge. 10. Jaws showing fine teeth on ventral ridge.

are all $45\ \mu$ long. A fourth pair of sensory bristles, the ventralia, could not be ascertained; they were probably overlooked because the ventralia and dorsalia are positioned close together in representatives of the Austrognathiidae (Sterrer, In press e). The epithelium averages $4\ \mu$ in thickness, and the cilia are generally $10\ \mu$ long but reach 13 to $14\ \mu$ in length around the tip of the head.

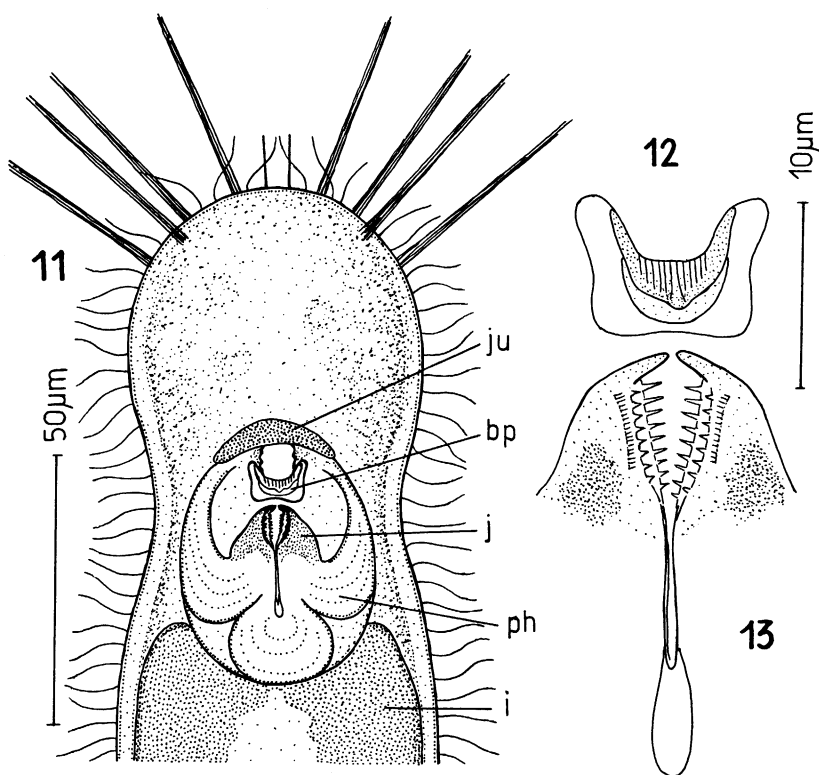
The almost triangular mouth opening, situated at U 9, is surrounded by buccal glands, dark in appearance because of the densely packed secretory granules. The bulbous pharynx with its tripartitioned musculature (figs. 1,2,7) measures $53\ \mu$ in length and extends from U 9 to U 16. On its anterolateral sides two pharyngeal glands are present.

The basal plate (figs. 2,5,9,10) is $7.5\ \mu$ long and $21\ \mu$ wide (index 0.36). The rostralateral wings are less pronounced than the rostromedian lobe. Along the mediocaudal edge a row of 11, strongly cuticularized teeth are clearly discernible (figs. 5, 9), which are almost equal in diameter; their length, however, decreases somewhat from the median tooth toward the lateral ends of the row.

The jaws (figs. 2,6,7,9,10) are $20\ \mu$ long measured from the tip of the terminal tooth to the posterior end of the symphysis. Each jaw is provided with two dental ridges. The ventral ridge bears only two strong teeth (figs. 6, 9), whereas the curved dorsal ridge (figs. 6, 10) consists of several very fine teeth standing close together (thus making it difficult to establish the exact number). A short cauda is attached to the posterior end of the symphysis (fig. 6).

The single ovary occupies a dorsal position between U 32 and U 58, and is immediately followed by a soft, saclike bursa (fig. 1). The opening of the vagina (figs. 1, 8) is situated at U 61 and surrounded by five or six tiny lips. The lumen of the vagina widens slightly toward the interior of the bursa, which appeared to be empty in both specimens examined.

The male genital organs (figs. 1, 8) comprise the testis between the posterior end of the bursa (at U 64) and U 84, and the copulatory organ, beginning at U 84 and reaching back almost to the end of the body. In the region of the testis (figs. 1,8) eight to 10 conuli of two different types were observed. The more slender conuli (figs. 3,14) are $9\ \mu$ in maximum width and $20\ \mu$ long, including the rounded protuberance in the hat region. The second type of conuli lacks this protrusion (figs. 4,14), is 10 to $11\ \mu$ wide and $17\ \mu$ long. In both instances the conus, or body, is dark (optically dense) with a lighter median core, the hat, however, is lighter in the longer conuli and very dark in the shorter ones. The copulatory organ is present in the form of a 58 to $60\ \mu$ long, thick-walled,



FIGS. 11-13. *Gnathostomula axi*. 11. Head region with jugum and pharynx. 12. Basal plate. 13. Jaws.

muscular penis, with glands arranged around its proximal, wider end (figs. 1, 8). From the distal end of the penis a narrow, delicately lined canal continues to the male opening on the ventral side of the body.

ETYMOLOGY: The new species described here is named in memory of Dr. Libbie Henrietta Hyman.

DISCUSSION: *Austrognathia hymanae* is the second species in the genus *Austrognathia*, *sensu* Sterrer (In press a) in which, as a result of Sterrer's revision, only the type of the genus *Austrognathia riedli* Sterrer, 1969, remained.

Austrognathia hymanae differs from *A. riedli* in the shape and dimensions of the basal plate (7.5 µ by 21 µ, index 0.36, compared with 8 µ by 26 µ, index 0.31, in *A. riedli*). The median tooth on the posterior edge of the basal plate is also less pronounced than that in *A. riedli*. Differences in regard to the jaws are the small number of teeth on the ventral dental

ridge in *A. hymanae*, and although less significant, the length of the jaws ($20\ \mu$ compared with $22\ \mu$ in *A. riedli*). A further difference lies in the sizes of the conuli which have a maximum length of $20\ \mu$ in *A. hymanae* and $45\ \mu$ in *A. riedli*.

SUBORDER SCLEROPERALLIA STERRER
FAMILY GNATHOSTOMULIDAE STERRER

GENUS *GNATHOSTOMULA* AX, 1956

Gnathostomula axi Kirsteuer, 1964

Figures 11–13, 15–18

Gnathostomula axi KIRSTEUEER, 1964, p. 437, figs. 1–9. STERRER, 1965, p. 791, fig. 6. RIEDL, 1966, p. 152, figs. 7, 8. KIRSTEUEER, 1969, p. 4, figs. 3, 4.

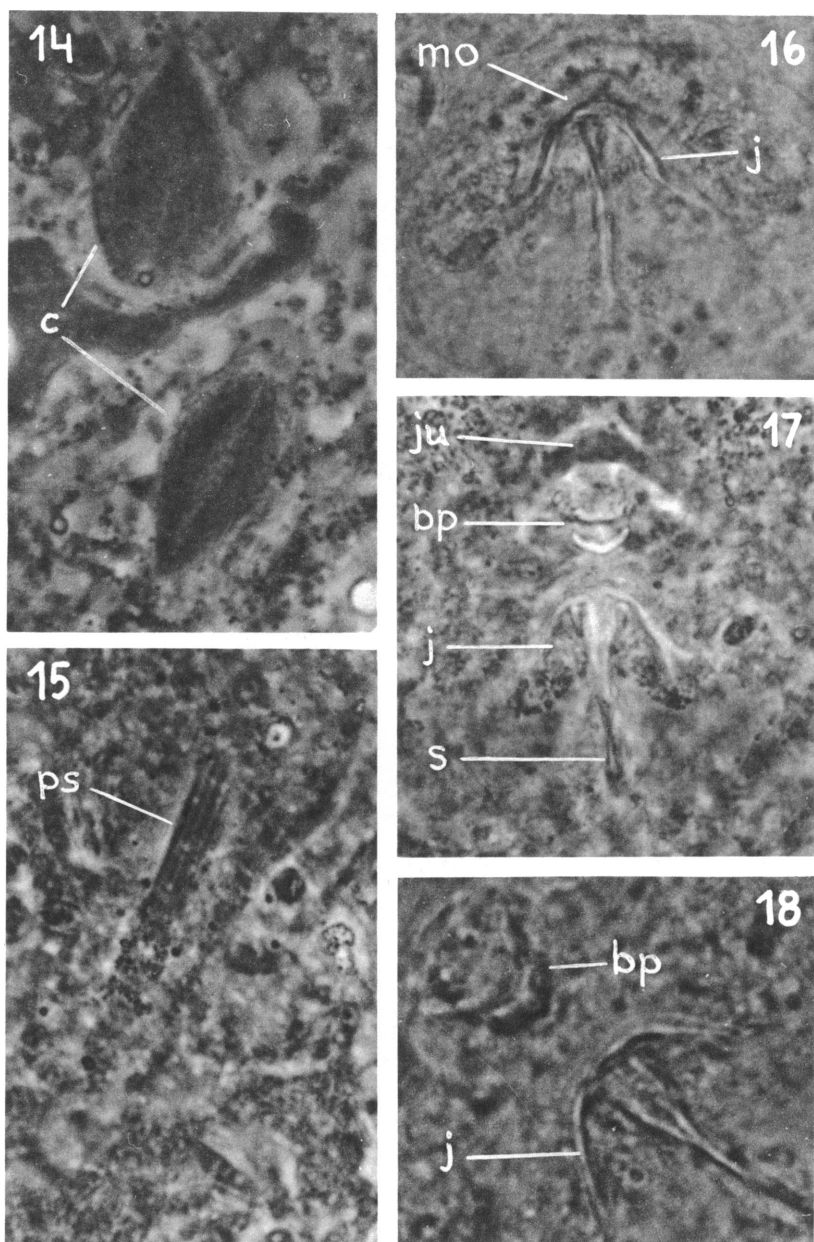
DESCRIPTION: The living animals are 700 to 800 μ long, including the slender, most characteristic caudal appendage, which accounts for about 30 per cent of the total length. The width of the body is 53 to 55 μ . In color, general body shape, and internal organization, the specimens from Barbados agree with earlier descriptions (Kirsteuer, 1964, 1969). Additional information given in the present paper concerns mainly features that can only be accurately ascertained with the use of phase contrast microscopy.

The sensorium (fig. 11) comprises one pair of short, stiff sensory cilia (apicalia 10 μ long) and four pairs of compound sensory bristles (frontalia, 35 μ ; ventralia and dorsalia, 40 μ ; lateralia, 42 μ). The epidermal cilia are about 15 μ long.

At the anterior margin of the 48 to 50 μ long pharynx bulbus and anterodorsally from the mouth opening (at about U 7) lies the crescent-shaped, cartilaginous jugum (figs. 11, 17). It measures 18 μ wide, and it is medially 4.5 μ thick. This structure is, as Sterrer (In press e) already assumed, a support for the mouth opening and prevents the latter from collapsing when the jaws are protracted by the contractions of the lateral pharynx muscles (fig. 16).

The basal plate (figs. 11, 12, 17, 18) is 8 μ long and 10 μ wide (index 0.8). Its stronger cuticularized central portion is divided into an anterior section (7 μ wide) with a longitudinally riffled surface (no individual tooth formation was observed) and a homogenous, sickle-shaped posterior part (5.5 μ wide).

The jaws (figs. 13, 16, 17, 18) are 17 to 18 μ long, from the tip of the very prominent terminal tooth to the end of the symphysis. In continuation of the symphysis a 6 μ long cauda is present (fig. 13). Each jaw is provided with three dental ridges. Two of them, the ventral and median ridge, are quite distinct and have thus far invariably been observed in



FIGS. 14-18. 14. *Austrognathia hymanae*. Two types of conuli. 15-18. *Gnathostomula axi*. 15. Penis stylet partly surrounded by secretion. 16. Jaws protruding into mouth opening. 17. Jugum, basal plate and jaws. 18. Basal plate and jaws.

the species. They measure $6.5\ \mu$ and $5.5\ \mu$ in length respectively. The third, dorsal ridge, is only $4\ \mu$ long, and difficult to discern even with the aid of phase contrast optics. The ventral and median ridges are provided with eight or nine teeth. It was, however, not possible to ascertain the number of teeth on the dorsal ridge. The jaws appear partly dark because of the granules (pigment?) embedded between the jaw lamellae (fig. 17).

The ovary and the paired follicular testes show no deviations from earlier observations. A bursa was found in three of the four specimens examined. It is $45\ \mu$ long and has a form and texture as was originally described for the species (Kirsteuer, 1964, fig. 9). The male copulatory organ is provided with a straight stylet composed of 10 or 11 cuticular rods surrounding a central canal (fig. 15). The stylet has a maximum diameter of $5\ \mu$ at the proximal end and reaches a length of $45\ \mu$, thus being $15\ \mu$ shorter than the stylets observed in specimens from Bimini (Kirsteuer, 1969).

DISCUSSION: The finding of a third dental ridge on the jaws of *Gnathostomula axi* Kirsteuer, 1964, makes it necessary to again compare the species with *G. paradoxa* Ax, 1956, for which Ax later (1965) also described three dental ridges. The remaining differences, which still justify the separation of the two species lie in: the extremely long caudal appendage in *G. axi*; the form and dimensions of the basal plate; the length of the jaws and the dentation of at least the ventral and median ridges, which have more and finer teeth in *G. paradoxa*; the size and arrangement of secretory granules around the penis stylet, and the length of the sperms, which is $3\ \mu$ in *G. paradoxa* and 5 to $5.3\ \mu$ in *G. axi*.

ABBREVIATIONS USED IN FIGURES

b, bursa	o, ovary
bg, buccal glands	p, penis
bp, basal plate	pg, penis glands
c, conulus	ph, pharynx
i, intestine	phg, pharynx glands
j, jaws	ps, penis stylet
jm, jaw muscle (lateral)	s, symphysis
ju, jugum	te, testis
mo, mouth opening	v, vagina

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