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Ophryotrocha lipscombae, a new species and a possible connection between ctenognath and labidognath-prionognath eunicean worms (Polychaeta)

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Abstract.—One new species of dorvilleid, *Ophryotrocha lipscombae,* is described based on material from the U.S. Atlantic slope. This new species is unique in its presence of 5 pairs of accessory plates, which are never found in any other dorvilleids, but are present in all labidognath-prionognath euniceans. A brief discussion of the phylogenetic position of *Ophryotrocha lipscombae* in the Eunicida is provided.

Ophryotrocha has been extensively studied by many polychaetologists (e.g., Jumars 1974, Åkesson 1984, Hilbig & Blake 1991, Eibye-Jacobsen & Kristensen 1994, Pleijel & Eide 1996); this may due to a number of factors: *Ophryotrocha* is common in both shallow and deep water environments; furthermore, it is easily cultured for study of reproductive and developmental patterns; in addition, its phylogenetic position within the Dorvilleidae has turned out to be interesting. As a part of the study of Eunicida phylogeny, a new *Ophryotrocha* species was found by chance. In a jar containing mixed small-sized eunicean specimens labeled only as "Eunicidae", not only one eunicid larva was found, but also two species of *Ophryotrocha* and one juvenile lumbrinerid could be identified. All specimens were observed using stereo and compound light microscopes; illustrations were made using a camera lucida.

Abbreviation.—Mx refers to maxillae. The species description is in a similar format as that used by Hilbig & Blake (1991).

Ophryotrocha lipscombae, new species
Figs. 1–4.

Material examined.—North Atlantic Ocean, United States, 110 miles south of Woods Hole, Massachusetts, 29 Jul 1977, 39°47′N, 70°40′W, *Alvin* Dive 773, STA DOS-1 (N-34), 1830 m (Holotype, USNM 186571; 7 paratypes, USNM 186572). North Atlantic Ocean, United States, 110 miles south of Woods Hole, Massachusetts, 15 Jun 1976, 39°47′N, 70°40′W, *Alvin* Dive 658, 1830 m (Paratype, USNM 186573).

Description.—Holotype complete with 31 chaetigers, 2.75 mm long, 0.41 mm wide (Fig. 1A). Other complete specimens 0.90–2.43 mm long, 0.17–0.44 mm wide (Figs. 1B, C; 2). Largest specimen incomplete with width of 0.77 mm. Body slender, oval in cross section. Chaetigers two times wider than long throughout body. One ciliary girdle present on each peristomial ring and each chaetiger. Color whitish in specimen collected in 1976 and brownish in specimens collected in 1977.

Prostomium distally bluntly triangular in smaller specimens (Fig. 1B), rounded in larger ones (Fig. 1A); two times longer than wide in holotype. Two short and stout, knob-like antennae, not reaching anterior end of prostomium. No evidence of palps and eyes observed in any specimen. Prostomium same length and width as peristomium. Peristomium consisting of two apo-

dous, achaetigerous rings, each ring slightly shorter than adjacent chaetigers. Distinct lateral incisions present between peristomial rings; first peristomial ring distinctly fused with prostomium.

Parapodia uniramous, with one acicular lobe; inferiormost simple chaetae in a separate chaetal lobe. Dorsal and ventral cirri absent. Chaetae of three types: type 1, 3–4 serrated cultriform simple chaetae (Fig. 1E) tapering to slender distal teeth in supra-acicular fascicle (Fig. 1D), their subdistal end finely serrated; type 2, 4–7 (the number variable in different body regions and different specimens) heterogomph bifid compound falcigers (Fig. 1F) arranged in two rows in subacicular fascicle, their blades short and serrated; type 3, single, slender, simple cultriform chaeta (Fig. 1G) emerging from long chaetal lobe in inferiormost position, forming an angle with acicula at the base. Each parapodium with one sharply pointed acicula distinctly deeper into parapodium than other chaetae. Pygidium relatively long, as long as last two chaetigers in 24-chaetiger specimen. Anal cirri easily broken, one small knob-like pair observed on 24-chaetiger specimen. No distinct middle pygidial stylus present.

Mandible rod-like, black, two pieces forming X-shape. In 0.17 mm-wide specimen, distal end of each mandible piece with about 20 small teeth (Fig. 3B); in 0.44 mm-wide specimen, distal end of mandible without teeth (Fig. 3C). Maxillae K-type, with 8 paired pieces in roughly four rows; on each side, MX-I, II, and V-VII each forming one main row, while Mx-III and Mx-IV each as a separate row sitting outside (Fig. 4A). Mx-I (Figs. 3A, 4A) heavy, generally ice-tong shaped and facing each other, with 3 large teeth in addition to main fang. Mx-II (Figs. 3A, 4A) thin plates, forming an arc over distal part of Mx-I. Mx-II with about 12 large teeth and a few irregularly placed small teeth in the middle. Mx-V to Mx-VIII (Fig. 4A) smaller than Mx-II, but structurally similar, plate shaped, with 4–8 large teeth and several small teeth. Mx-III and Mx-IV elongate and fang-shaped with additional 1 or 2 smaller teeth, sitting anterior to Mx-II and outside of Mx-V. One pair of short carriers (Figs. 3A, 4A) fused to each other, and to posterior end of Mx-I. Two rows of 5 sclerotinized black accessory plates (Fig. 4A) in erect position inside main maxilla row, each plate corresponds to Mx-II and Mx-V to VIII. Jaw structure symmetrical.

Remarks.—*Ophryotrocha lipscombae* can be easily distinguished from other *Ophryotrocha* species by the presence of 3 teeth in addition to the main fang on Mx-I, the presence of five accessory plates and the anterior end formed by the prostomium and the first peristomial ring. The above features are novel in dorvilleids, especially the accessory plates which have never been reported in the Dorvilleidae but are present in all other major families of the Eunicida (personal observation). When it is compared to other dorvilleids, such as *O. akessoni* and *O. geryonicola, O. lipscombae* appears to have a larger jaw apparatus for a similarly sized specimen; its maxillae can reach through the anterior four to five chaetigers, while those of the other species usually reach through the anterior two chaetigers. The over-all jaw structure is similar in all four *Ophryotrocha lipscombae* specimens dissected whose size ranged from 0.17 mm to 0.77 mm wide.

This species reaches a relatively large size (as wide as 0.77 mm) among dorvilleids. While no gametes have been observed, we do not believe these specimens to be juveniles of any other reported eunicean worms. The type material is deposited in the National Museum of Natural History, Smithsonian Institution, Washington D.C.

Geographic distribution.—110 miles south of Woods Hole, Massachusetts, Atlantic slope.

Etymology.—The species is named after Prof. Diana Lipscomb of George Washington University for her many contributions to systematic biology.

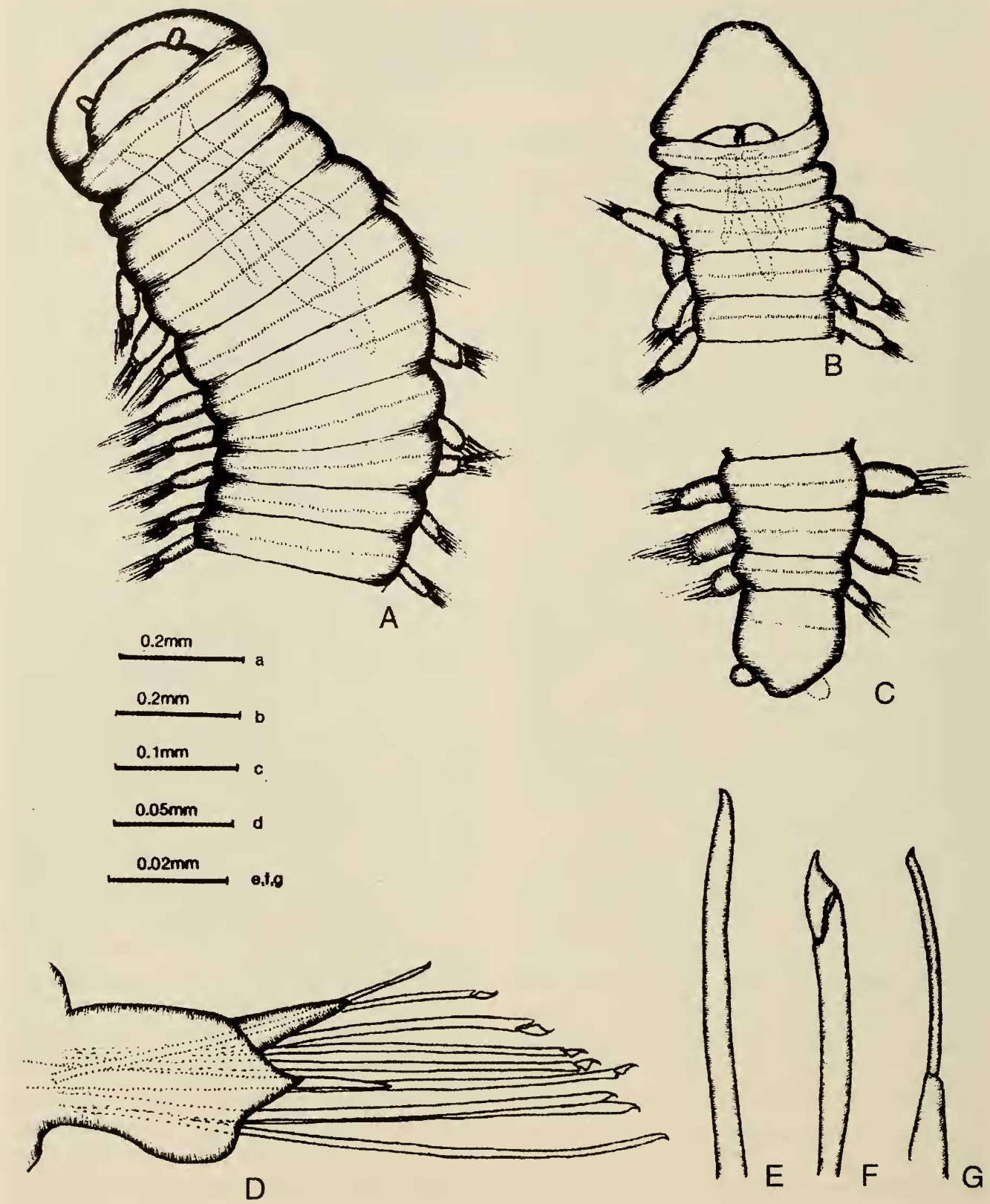

Fig. 1. *Ophryotrocha lipscombae:* A, anterior end, 31-chaetiger specimen, dorsal view; B, anterior end, 18-chaetiger specimen, ventral view; C, posterior end, 24-chaetiger specimen, ventral view; D, parapodium 3, anterior view; E, supra-acicular chaetae; F, compound falciger; G, most inferior simple chaeta.

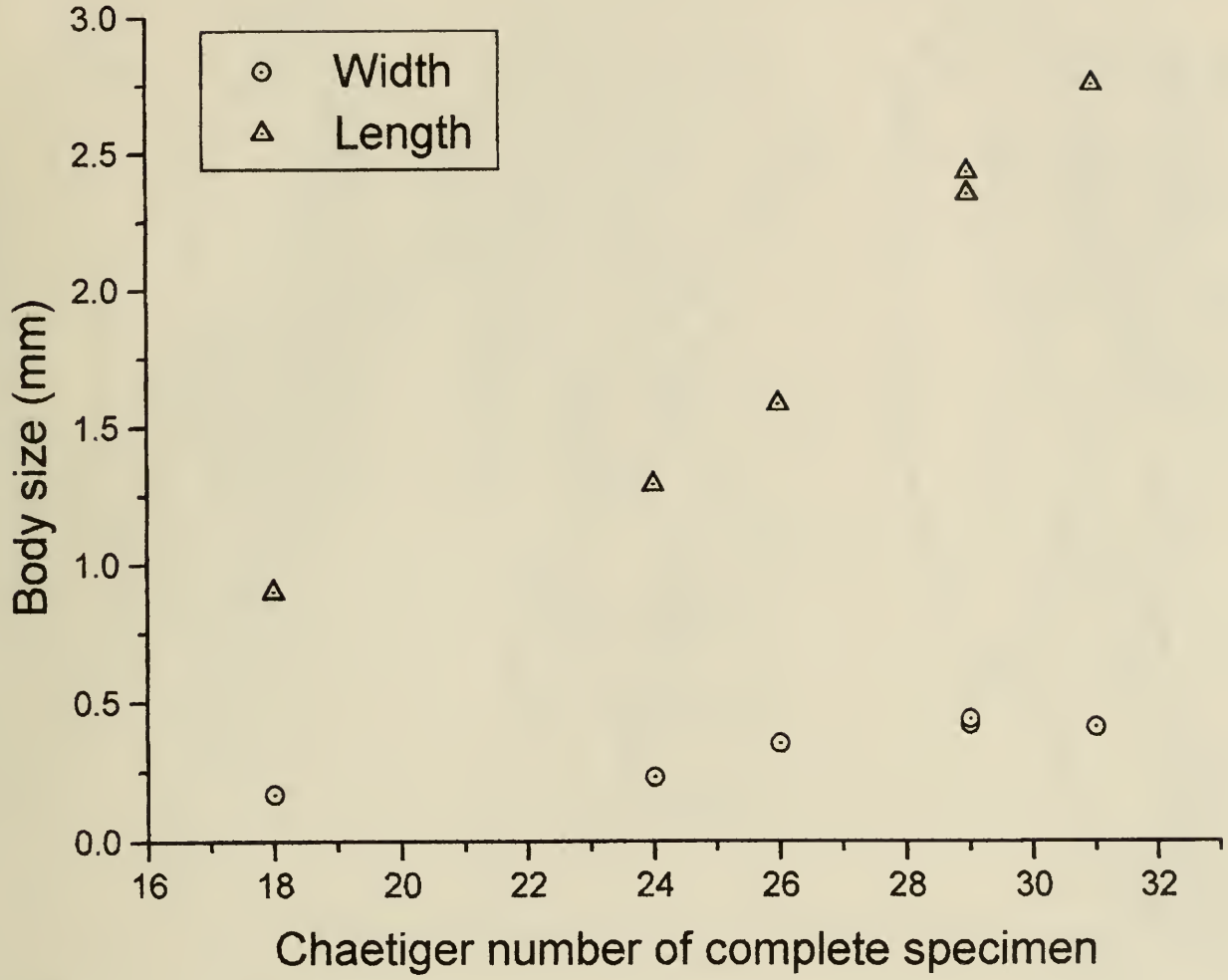

Fig. 2. Correlation between body size and chaetiger number in *Ophryotrocha lipscombae*.

Discussion

The eunicean worms share a set of complex jaws composed of a ventral mandible and dorsal maxillae, and they are classified into five types based on jaw morphology: labidognath (Ehlers 1868) includes Eunicidae, Onuphidae, Lumbrineridae and Hartmaniellidae. This type has a pair of well separated short carriers; Oenonidae have prionognath jaws (Colbath 1989, Fauchald & Rouse 1997) characterized by the presence of a median plate inside the muscular bulb; Dorvilleidae has 4 rows of maxillae and is called ctenognath; xenognath (Mierzejewski & Mierzejewska 1975) and placognath (Kielan-Jaworowska 1966) are represented only by fossil taxa. The above classification of eunicean jaws might be arbitrary if cladistic tree-thinking is applied. Usually ctenognath is considered as monophyletic, and it is a sister group of labidognath-prionognath taxa (Kielan-Jaworowska 1966, Kozur 1970, Jumars 1974, Orensanz 1990). The assessment of jaw homology can be relatively easily made between prionognath and labidognath (Orensanz 1990), but both are generally considered difficult to compare to the ctenognath. The overall phylogenetic construction of Eunicida by Tzetlin (1980) may be problematic when a cladistic analysis is performed based on additional evidence (unpublished data); however, his scheme connecting the K-type *Ophryotrocha* jaw with those of labidognath-prionognath jaws is reasonable based on the following evidence: first, the Mx-I of labidognath-prionognath is homologous with the Mx-I of both P- and K-type

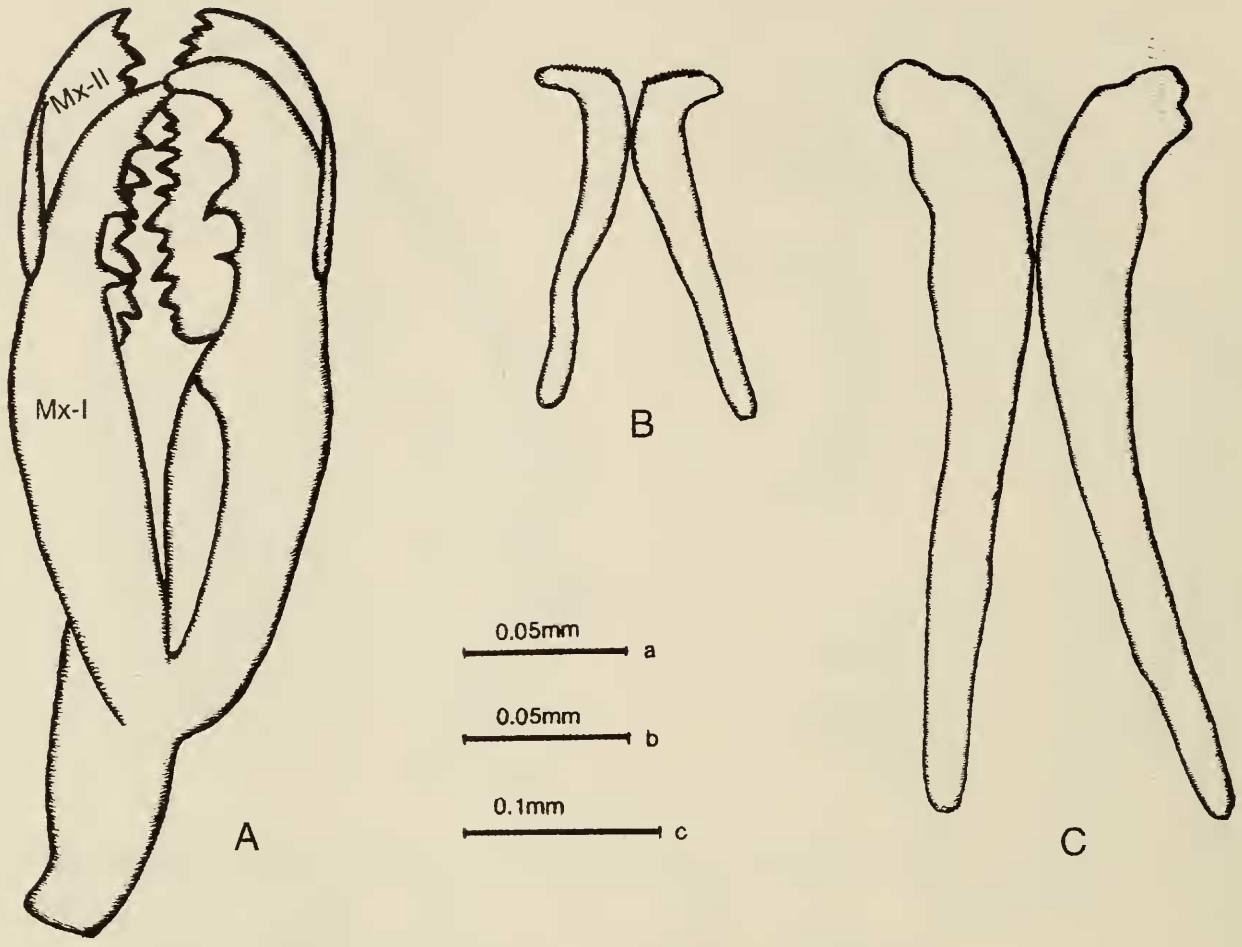

Fig. 3. *Ophryotrocha lipscombae:* A. jaw structure in dorsal view, only Mx-I, Mx-II and the carrier are depicted; B. mandible of 18-chaetiger specimen, dorsal view; C. mandible of 31-chaetiger specimen, dorsal view.

Ophryotrocha, based on extensive studies of larval and adult jaw morphology of Dorvilleidae, Onuphidae and Oenonidae (H. L., unpublished data); second, the accessory plates, or attachment lamellae (Paxton 1986), are present in all members of the labidognath-prionognath taxon (personal observation), and the presence of such plates in *Ophryotrocha lipscombae* is the first record for any dorvilleid. Accessory plate numbered 5 pairs in *O. lipscombae,* 3 pairs in Oenonidae (Fig. 4B) and Lumbrineridae (Fig. 4C), and 2–3 in Onuphidae and Eunicidae. All accessory plates are located median to the corresponding maxillae in erect position; no plate corresponds to Mx-I.

The presence of accessory plates may provide a substantial primary homology for *O. lipscombae* and the labidognath-prionognath taxa; the relationship will be tested in a systematic study of Eunicida based on morphology, ontogeny and fossil data. At present, the new species is considered as a member of *Ophryotrocha* based on its overall morphological characters. Though the phylogenies of *Ophryotrocha* (Pleijel & Eide 1996) and Dorvilleidae (Jumars 1974, Westheide 1982, Hilbig & Blake 1991, Eibye-Jacobsen & Kristensen 1994) have been studied using various methods, better overall understanding might be gained from a relatively broader study of the phylogeny of the order Eunicida, including detailed studies of members of all major groups.

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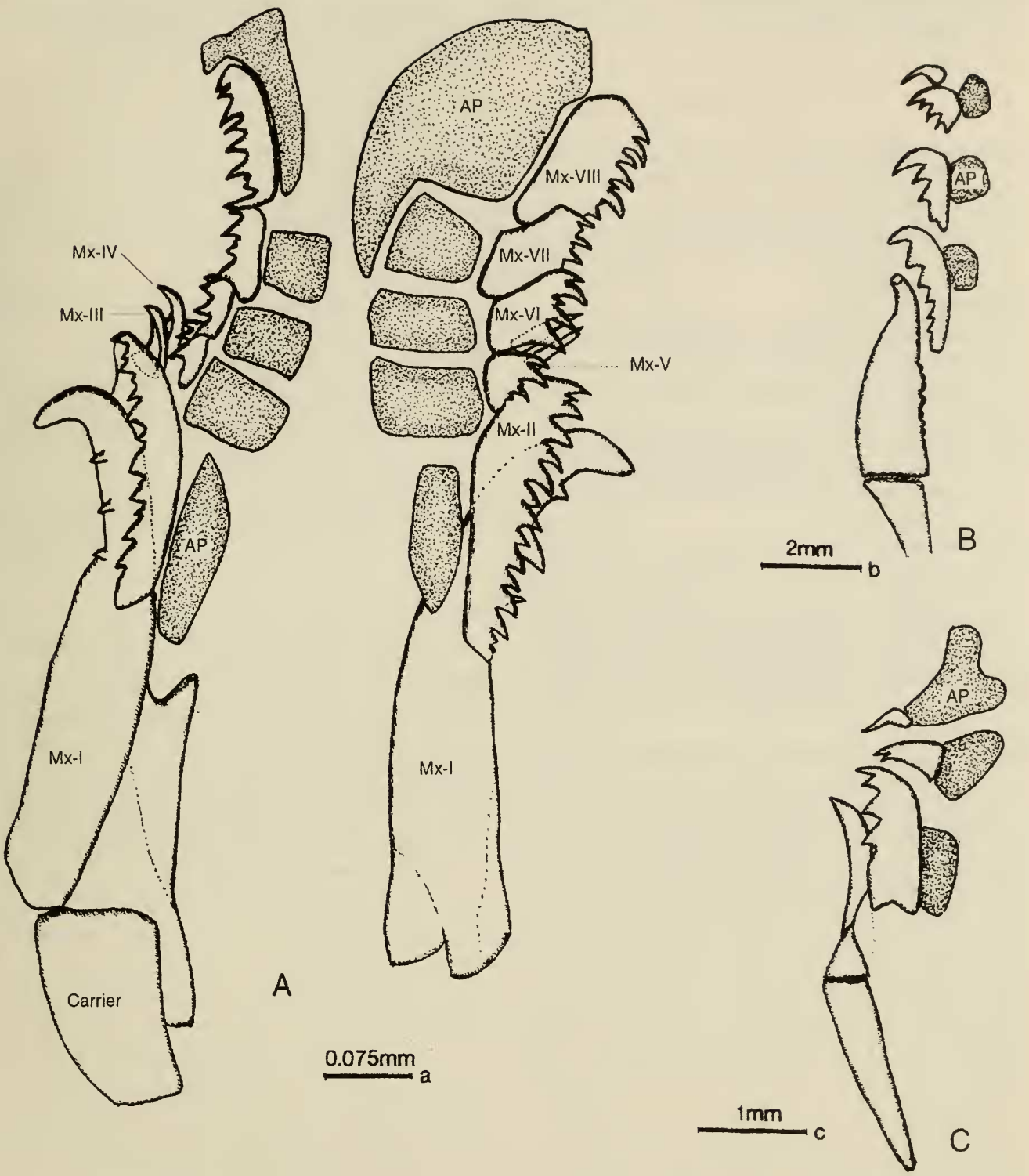

Fig. 4. A. Detailed jaw structure of 31-chaetiger specimen, *Ophryotrocha lipscombae,* in ventral view; note that left and right sides are cut apart, the carrier is broken, and the whole structure is displayed in an unnatural way in order to show the detailed structure; B. jaw structure in ventral view, *Arabella iricolor* (USNM 10355); C. jaw structure in ventral view, *Lumbrineris zonata* (USNM 30611).

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