Scanning Electron Microscopy of the Gonopods of the Milliped, *Eurymerodesmus dubius* (Diplopoda: Polydesmida: Xystodesmidae)

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Abstract: Information on the gonopods of the polydesmid milliped, *Eurymerodesmus dubius*, have been described previously using light microscopy; however, nothing is known concerning their ultrastructural detail. The gonopods and gonopodal aperture of an adult male *E. dubius* collected in April 2011 from Beaver's Bend State Park, McCurtain County, Oklahoma, was examined using scanning electron microscopy (SEM). Compared to previous information from descriptions and line drawings, the morphology of the gonopods and gonopodal aperture of *E. dubius* via SEM is quite similar but the finer detail observed herein adds to earlier works. Here, for the first time, we provide new ultrastructural data on the gonopods of *E. dubius*.

Introduction

The former milliped family Eurymerodesmidae Causey, 1951, was the dominant representative of the order Polydesmida that occupied various habitats in the central, southcentral, and southeastern United States. However, a recent study by Shelley and Smith (2018) subsumed the families Eurymerodesmidae and Euryuridae Pocock, 1909, under Xystodesmidae Cook, 1895; this higher-level change was justified based solely on similarity of the male genitalic morphology. The genus *Eurymerodesmus* Brölemann, 1900, is a relatively speciose taxon with about 37 species (Shelley 1990; Hoffman 1999; Sierwald and Spelda 2021). One species of flat-backed milliped, *Eurymerodesmus dubius* Chamberlin, 1943 (syn. *Paresmus columbus* Causey, 1950), was described from Delight, Pike County, Arkansas (Chamberlin 1943). Since then, it has been reported from additional Arkansas counties as well as two southeastern counties in Oklahoma (Shelley 1990; McAllister et al. 2002a, 2002b, 2003, 2004, 2013; McAllister and Shelley 2003, 2008). An excellent color photograph of *E. dubius* from Arkansas is provided by Means et al. (2021, their fig. 1E).

In xystodesmids, the male copulatory organs or gonopods and the gonopodal apertures that occur around the seventh segment (body ring) hold taxonomic utility (Shelley 1990); previous information on gonopods from *E. dubius* includes a description and line drawings (Chamberlin 1943, his fig. 8; Shelley 1990, his figs. 46–50). Nothing, however, is available on the ultrastructure of gonopods of *E. dubius*. Here, we provide, for the first time, information using scanning electron microscopy (SEM) of the gonopods of *E. dubius*.

Methods

On 1 April 2011, a single adult (31 mm total length) *E. dubius* was collected by hand from under a rock in deciduous forest off the David Boren trail at Beaver's Bend State Park, McCurtain County, Oklahoma (34°07'43.7694"N, -94°41'11.3928"W). For SEM, it was preserved in 10% neutral-buffered formalin, dehydrated in a graded series of ethanols (70–100% v/v), transferred to amyl acetate transition solvent, critically point dried with a Autosamdri®–815 critical point drier (Tousimis Research Corporation, Rockville, MD; 31◦C, 1072 psi, ventilation rate ~100 psi/min), coated with a gold-palladium with a Cressington sputter coater (Cressington Scientific Instruments Ltd, Watford, UK), and viewed with a Vega TS 5136XM digital scanning SEM (Tescan USA Inc., Cranberry Township, PA) at an accelerating voltage of 20 kV. A voucher specimen is deposited in the North Carolina State Museum (NCSM), Raleigh, North Carolina.

Results and Discussion

The gonopodal aperture of *E. dubius* (Fig. 1) is mostly spheroidal with entire sides but without lobes and caudolateral pouches; a slight depression is found on the anterior margin of the aperture. The gonopods (Figs. 1A–B) slant inward toward the midline slightly curving with the apices virtually coming into contact; the telopodites are located completely over the aperture and are relatively short and vertical, terminating below the level of distal limits of hairs. The prefemur is relatively long. The gonopod acropodite is very short, broadly terminal and covered by prefemoral hairs, principally just short of a diminutive spur on the distal extremity of the prefemur, but continuous with and poorly delineated from the latter, curving gently dorsad with sides narrowing to acuminate tip.

Compared to information from descriptions and line drawings provided by Chamberlin (1943) and Shelley (1990), the morphology of the gonopods and gonopodal aperture of *E. dubius* provided by us via SEM is quite similar

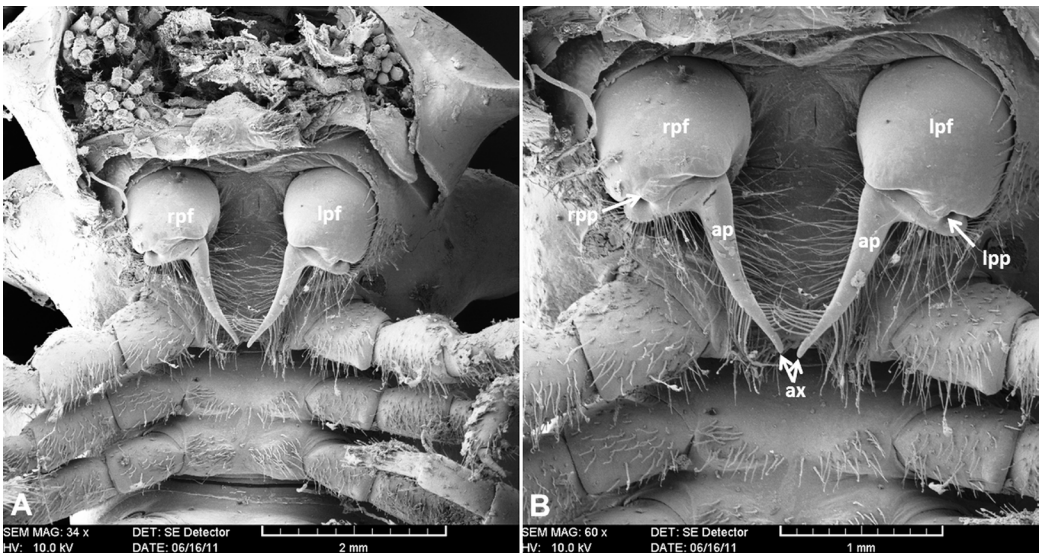

Figure 1. Scanning electron micrographs showing the ventral views of the gonopodal aperture and gonopods in situ on its first pair of legs on the seventh segment (8th leg pair) of a male *Eurymerodesmus dubius*. (A) View showing right and left gonopods. (B) Higher magnification showing right and left gonopods. Abbreviations: ap (acropodite); ax (acropodite apices); lpf (left prefemur); rpf (right prefemur); lpp (left prefemoral process); rpp (right prefemoral process).

but the finer detail observed herein adds to those earlier works. We suggest SEM of additional eurymerodesmids to help reveal details of male copulatory organs not observed in their classical line drawings and figures.

Acknowledgments

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