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On the identity of *Duoporus*, an enigmatic
Mesamerican milliped genus
(Polydesmida: Holistophallidae)

By Richard L. Hoffman

ABSTRACT

The poorly-known monotypic genus *Duoporus* Cook, 1901, is described and figured from specimens from Oaxaca considered to be conspecific with the type species *D. barretti* Cook. Characters reflecting the relationship of the families Holistophallidae and Sphaeriodesmidae are discussed.

Duoporus was proposed by O. F. Cook in 1901 to accommodate a small polydesmoid milliped from Cuernavaca, Mexico, unusual for having ozopores on the fifth body segment (ring) only. The validating description was reasonably detailed and accurate, but did not include any illustrations nor did Cook express an opinion on the family position of his genus.

In one of his frequent flashes of insight, Pocock (1909: 172) tentatively allied *Duoporus* with the rhachodesmids in his treatment of Mesamerican Diplopoda, seizing on the single character mentioned by Cook that might provide an indication: "...the shape and position of the genital processes of the second legs in the male, which in being conical and sharp and projecting backwards . . . resemble these same processes in *Rhachodesmus*, *Strongylodesmus*, and other genera referred by Carl to the Rhachidesminae. . ."

Subsequent classifications of the Polydesmida published by Brolemann (1916) and Attems (1940) accepted Pocock's deduction, and there the matter rested for several decades pending the following sequence of events:

In 1966 I received from Professor George E. Ball an extensive collection of Mexican millipeds assembled by him and Dr. Donald R. Whitehead; this material contained several samples of a small species that conformed in all respects to Cook's diagnosis of *Duoporus*. On the basis of studies that I had commenced a few years earlier, I could confidently associate the genus with *Holistophallus* (Silvestri, 1909) and several other genera that collectively composed a taxon of family rank apparently related to Rhachodesmidae.

On learning that a checklist of Mesamerican diplopod was being compiled by my colleague H. F. Loomis, and realizing that my own work on holistophallids might not be completed for some years, I proposed that he should enter the family in his manuscript to provide a preliminary revalidation of the name in a new and broader sense than Silvestri's original. Mr. Loomis's document appeared in 1968, with the genera *Duoporus*, *Elcarmenia*, *Holistophallus*, *Pammicrophallus*, *Synthodesmus*, *Tunodesmus*, and *Zeuctodesmus* listed, but no definition of the group provided beyond what could be deduced from the shared characters of its membership. Loomis's statement that the group ". . . is being reviewed. . ." could not have anticipated that the review would be extended and neglected for decades. At least some points of interest were extracted and published from time to time. My "Classification" of 1980 listed the same genera as in Loomis's list, but did allude to similarities between the families Holistophallidae and Sphaeriodesmidae, and proposed a new superfamily to accommodate them. In 1982, I provided formal descriptions of these two taxa, to which was added a third presumptive sphaeriodesmoid group, the West African endemic Campodesmidae.

Subsequent publication of the new genus and species *Proeilodesmus mecistonyx* (Hoffman, 1990) offered further amplification of the superfamily, with information from a sphaeriodesmid having some holistophallid characters. A modest cladistic analysis used the shared characters of profuse gonocoxal setation, long gonopophyses, and similar gonopod patterns to justify the superfamily, and several autapomorphies were suggested to define the two families.

The following illustrated account of *Duoporus* provides the opportunity to confirm placement of this genus in the Holistophallidae with illustrations of important structural characters and some attention to those traits that reflect a close relationship between the two families. The long-deferred "review" of the Holistophallidae remains to be finalized in the, it is hoped, not distant future.

SUPERFAMILY SPHAERIODESMOIDEA

Sphaeriodesmoidea Hoffman, 1978, Abh. & Verh. Naturw. Ver. Hamburg, NF 21/22: 24; 1980, Classification of the Diplopoda, p. 161.

FAMILY HOLISTOPHALLIDAE

Holistophallidae Silvestri, 1909, Boll. Mus. Torino, 24(615): 1.

Stigmata displaced from normal position: the anterior located near front edge of stricture, posterior just above anterior dorsal condyle. Paranota thin and flat, with only minimal development of marginal thickening and peritremata, anterior paranota not enlarged. Gonopods lacking a median sternal remnant, exceptionally variable in form, ranging from "normal" polydesmoid structure to monarticular objects lacking all traces of the original components including cannula and prostatic groove.

Duoporus Cook

Duoporus Cook, 1901, Proc. Ent. Soc. Washington, 4: 404. Proposed with a new species. Type species, *Duoporus barretti*, by original designation and monotypy. - Pocock, 1909, Biol. Centr.-Amer., Chilopoda & Diplopoda, p. 172. - Brolemann, 1916, Ann. Soc. ent. France, 84: 558. - Attems, 1940, Das Tierreich, 70: 480. - Loomis, 1968, Bull. U. S. Nat. Mus., 266: 27. - Hoffman, 1980, Classification, p. 162; 1999, Va. Mus. Nat. Hist. Spec. Pub. 8: 415.

Metaterga convex, smooth, paranota wide, nearly horizontal, edges thin, without marginal thickening, posterior edge deeply concave, posterior corners acute on all segments, increasingly so posteriad; *ozopores present on segment 5 only*. Metasterna with small acutely conical processes at base of legs. Epiproct subtriangular, the apex narrow. *Anterior sterna and legs of males without modifications*. Gonopod aperture small, suboval, partly displaced into prozonum anterior of stricture. Gonopods without trace of median sternal remnant, coxae elongate-cylindric, with field of paracannular setae. Telopodite simple, without prefemoral process, "acropodite" region unbranched, arcuately curved anterodorsad, prostatic groove visible for entire length in mesal aspect.

Only one species is referable to this genus.

Duoporus barretti Cook

Figures 1-10

Duoporus barretti Cook, 1902, Proc. Ent. Soc. Washington, 4: 403. Location of type material uncertain, may not exist, from Cuernavaca, Morelos, Mexico, O. W. Barrett leg..

Material: MEXICO: *Oaxaca*: 27.5 miles south of Valle Nacional, Hy 175, 5600 ft., 15-16 August 1965, (VMNH 2/0); 60.6 miles south of Valle Nacional, Rt. 175, 7400 ft., 18 August 1965, (VMNH 2/2); 88.5 miles south of Valle Nacional, 2 May 1966, (3/0); 22.2 miles south of Juchatengo, 22 July 1966, (VMNH, several fragmented males and females). All collections by G.E. Ball and D.R. Whitehead.

Descriptive notes: The external structure of this species is adequately covered in the foregoing generic diagnosis and the adjoining figures. Attention may be directed to Cook's statement that the color of recently preserved specimens is a uniform light pink, and that the species is relatively small with a length up to 18 mm and width about 3.3 mm. The posterior corners of all paranota are acutely produced (Fig. 4), and the stigmata are placed on slightly elevated pedestals in the stricture (Fig. 8).

Distribution: Highlands of south-central Mexico, recorded from the Sierra Transvolcanico Occidental (Morelos), the Sierra Madre de Oaxaca, and the Sierra de Miahuatlan (Oaxaca). The species probably occurs in intervening areas at altitudes above 5000 feet.

Site descriptions for collections by Ball and Whitehead have been published by those authors (1967); those relevant to *Duoporus barretti* are abstracted here: 5600 ft., cloud forest with tree ferns and epiphytes; 7400 ft., rather dry oak forest, grading into pine; 8000 ft., dry madroño-oak-pine woods; 5800 ft., montane tropical forest with dense understory. The species apparently tolerates a wide range of biotic variables.

Commentary: One of the most surprising features noted in connection with *Duoporus barretti* is the presence on the paranotal margins of numerous fine tubules extending from the parenchymatous interior through the solid edge to the surface, as shown in Fig. 1. To my knowledge, this character has been noted amongst diplopods only in the sphaeriodesmid *Proeilodesmus mecistonyx*, in my 1997 description of that species and thus represents another intimation of close phylogenetic affinity between the two families represented. To provide a descriptor for this possibly important trait, its function totally unknown, I suggest the nonspecific term "*micraulidia*" (Greek, *micros*, small + *aulidion*, a tube) for the very fine channels. The condition

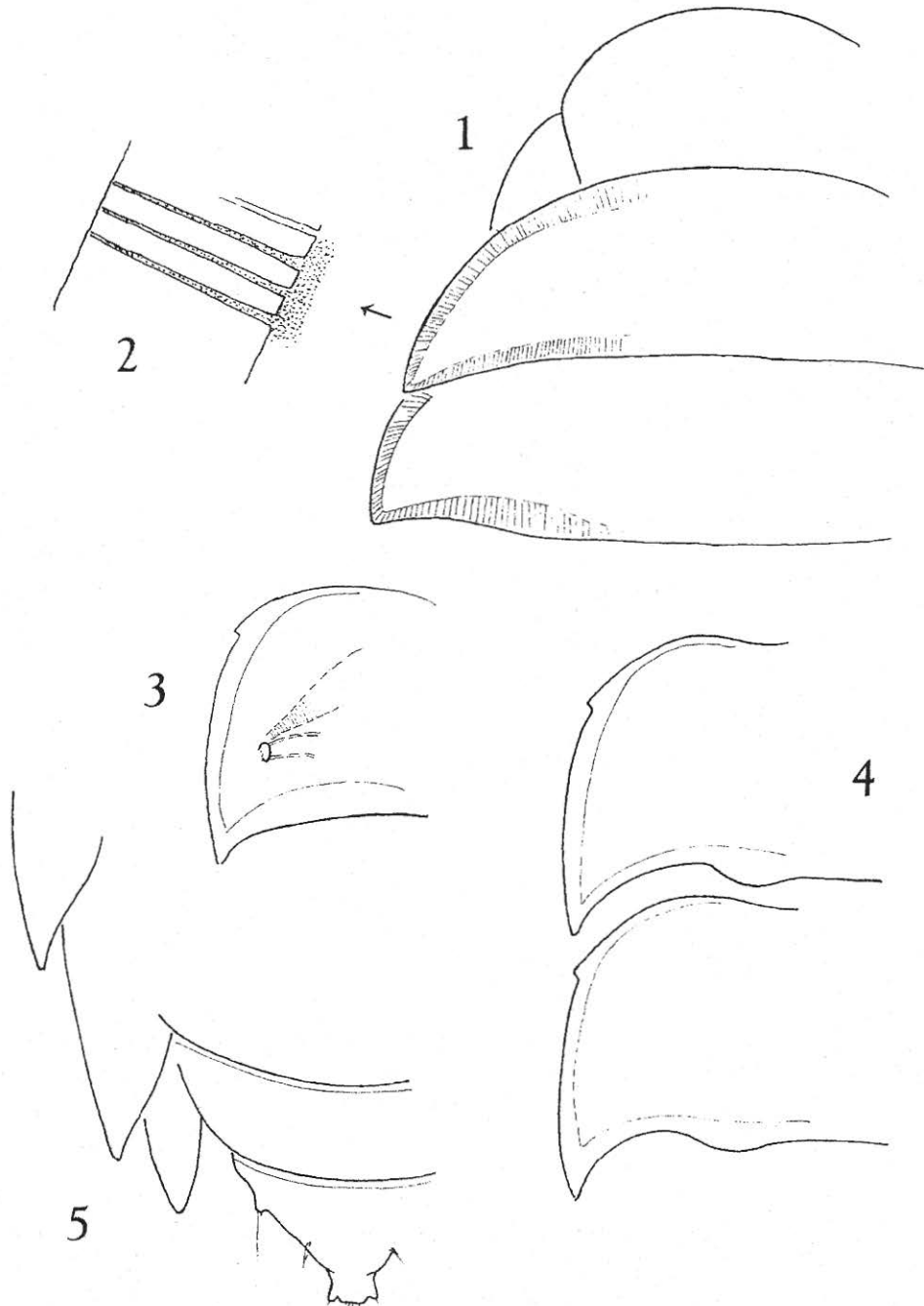


Fig. 1. Left side of head and first two metaterga, dorsal aspect. Fig. 2. Greatly enlarged optical section of the marginal cuticle showing several micraulidia, parenchyma stippled. Fig. 3. Left paranotum of 5th segment, dorsal aspect, showing ozopore with duct and a valvar muscle indicated. Fig. 4. Left paranota of two midbody segments, dorsal aspect. Fig. 5. Left paranota of segments 18-19 and epipect, dorsal aspect.

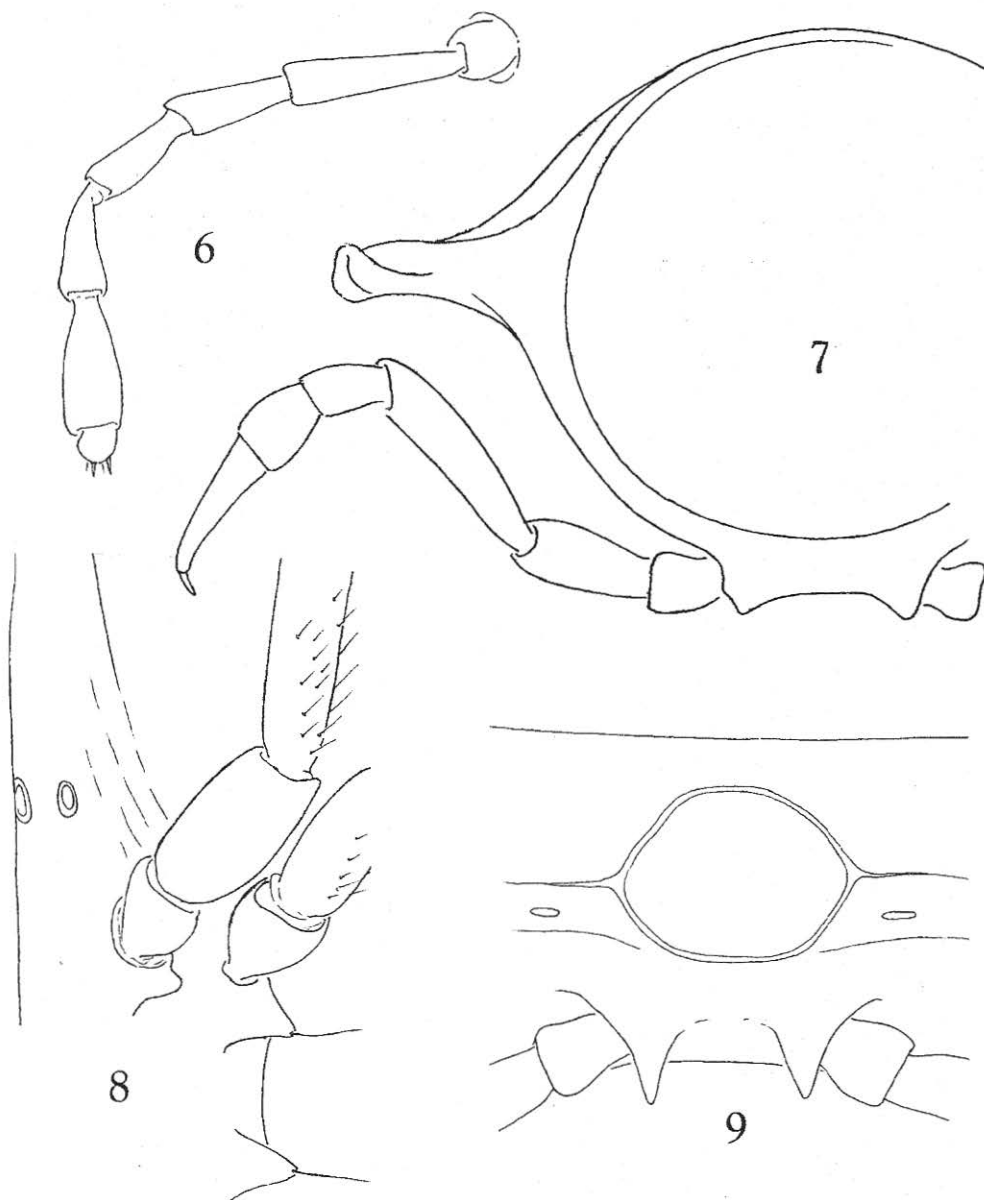


Fig. 6. Antenna. Fig. 7. Left side of midbody segment, posterior aspect, showing enlarged postfemur and tibia of leg. Fig. 8. Sternal region of midbody segment, oblique ventrolateral aspect, showing location of stigmata. Fig. 9. Ventral side of 7th segment of male showing shape and position of gonapertures and subcoxal sternal cones.

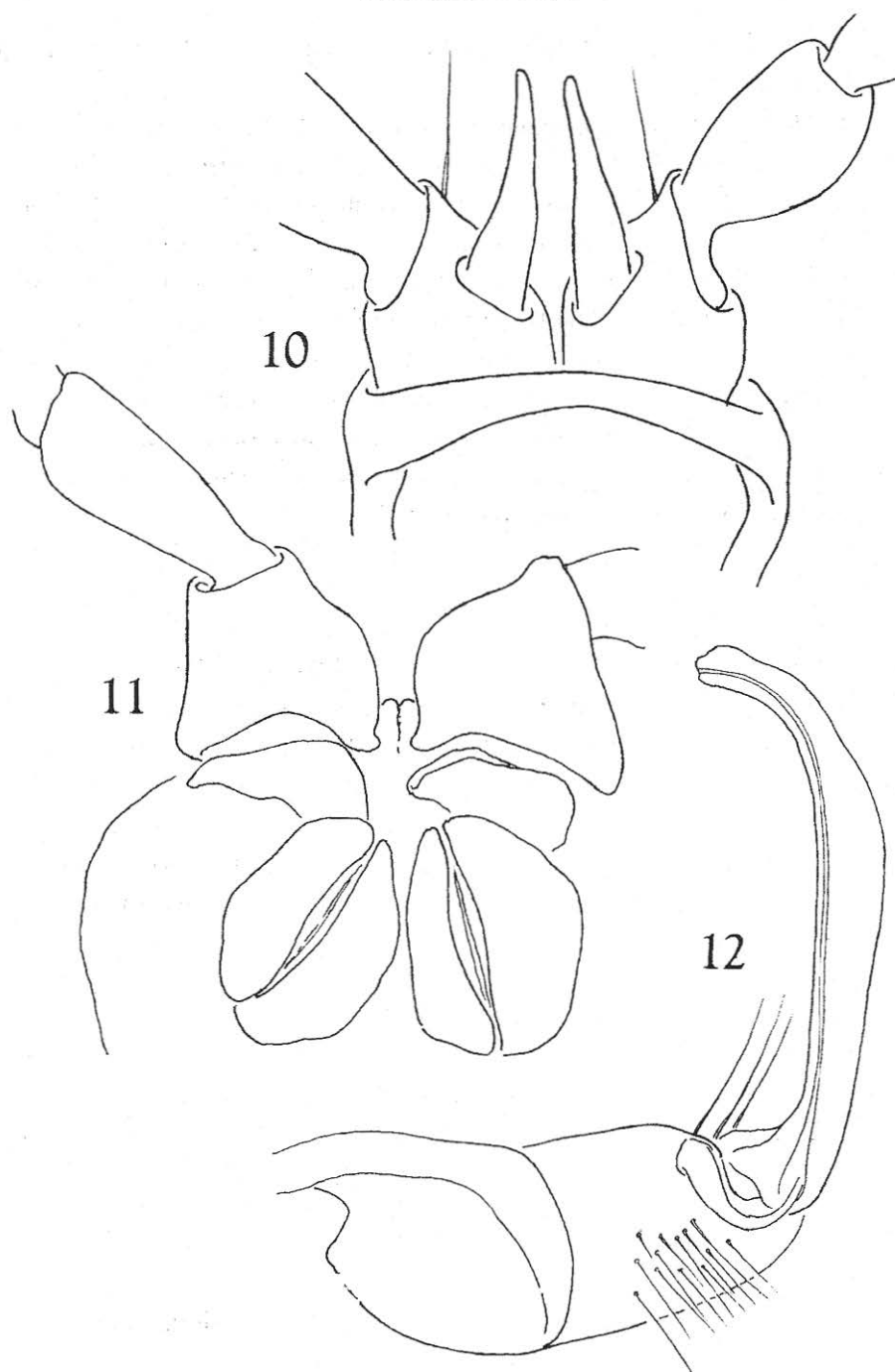


Fig. 10. Base of 2nd pair of legs of male, posterior aspect, showing shape of gonapophyses and their flexible attachment to posterior side of coxae. Fig. 11. Base of 2nd legs of female and cyphopods, posterior aspect. Fig. 12. Left gonopod, mesal aspect.

resulting from their presence would thus be *micraulidiate*, as in "paranotal margins micraulidiate".

Since *Duoporus* and *Proeilodesmus* are in nearly all other respects structurally typical of their families, thus not closely related, it is difficult to deduce the reason for their shared expression of an obviously derived character. That it is a symplesiomorphy lost by all other members of the respective taxa seems implausible. Another possibility invokes homoplasy resulting from random genetic release of a suppressed (recessive, latent) expression of the trait "micraulidiate vs. not-micraulidiate" condition occurring in an ancestral genome..

The only other notable apparent autapomorphy in *barretti* is the absence of dense hairpads on the ventral side of shortened tarsi (present in all other known holistophallids). This seems more likely to represent a simple "loss character" against the backdrop of holistophallid conformity.

ACKNOWLEDGMENT

The extensive collections made by Drs. Ball and Whitehead in Mexico resulted in far more than major contributions to the knowledge of Mesamerican carabid beetles. The willingness of those ardent naturalists to pick up (and distribute) specimens in other, non-insect groups, has generated publications on a variety of soil-inhabiting animals not the least among which are both diplopods and chilopods. The present solution of a century-long problem is thus one outcome of the consideration of the two collectors who encountered *Duoporus barretti* 65 years after its initial discovery.

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Address of the author:

Dr. Richard L. Hoffman
Virginia Museum of Natural History
21 Starling Ave.
Martinsville, Virginia 24112