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Cheirodesmus, an enigmatic West African milliped genus (Polydesmida: Chelodesmidae)

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ABSTRACT

The West African prepodesmid genus *Cheirodesmus*, essentially unknown since its proposal by O. F. Cook in 1896, is redescribed and illustrated from the two originally included species *C. ater* and *C. discolor* from Liberia, and a closely related new species *C. aurelolus,* is described from a single male taken at Freetown, Sierra Leon. The genus is apparently related to *Prepodesmus* and *Tylodesmus*, but differs in the very simplified structure of the gonopod telopodite.

The collection of millipeds in "West Africa" began not long after colonization of that region was commenced by European countries and safe travel by naturalists was ensured. However, systematic inventory work was not conducted by a knowledgeable specialist until 1892, when O. F. Cook, then a recent graduate of Syracuse University arrived in Liberia. Engaged to assist in planning for a repatriation program envisaged by the New York State Colonization Society, Cook (then only 24 years old) had already published several papers on the classification of geophilomorph centipeds, and was well-informed in milliped classification as it stood at that time. In the spare time available to him Cook collected the soil and litter fauna assiduously, giving particular attention to the small organisms likely to be overlooked by all by the most dedicated collector. As a part of his travel itinerary during several trips to Liberia, Cook visited the museums in London and Berlin to examine diplopod material, with special emphasis on the faunas of Africa. He was the first student of Diplopoda to

visit European collections to study types of species named by Brandt, Gray, Newport, and Peters

As a result of his studies in both field and laboratory, Cook acquired a firsthand, specimen-based, knowledge of Diplopoda that was not to be achieved by his contemporaries Attems, Brolemann, Silvestri, and Verhoeff for many years to come. His prescient classification of Diplopoda, published in 1895 as a five-page footnote to another paper, was the first really significant organization of this class and reflected his talent as an "intuitive" taxonomist, able to visualize the attributes of a large group simply from knowing a few representatives.

In a burst of creativity, Cook published several papers relating to the diplopod fauna of West Africa during 1896, in which a large number of new families, genera, and species were proposed with minimal documentation and no illustrations. As a result, these new taxa have been the despair of all subsequent specialists on Diplopoda, most of whom either tacitly ignored them or declared them to be *nomina nuda*, beyond the limits of respectability. Yet, the point must be made that these preliminary diagnoses were no mere act of irresponsibility: Cook fully intended to follow them up with detailed descriptions and adequate drawings. To that end he produced an outstanding monograph of the family Gomphodesmidae (1899) and shorter revisionary papers on several other groups, and had accumulated drawings and notes for monographs on Oxydesmidae, Prepodesmidae, and Odontopygidae, based on his knowledge of type specimens in European collections. It was a great loss to science that Cook was unable to carry them to completion. More than any of his contemporaries, he was aware of the necessity for revisionary works, correct typification, and solution of nomenclatorial problems. .

But the great bulk of Cook's West African novelties was never treated in published works, and the task of making them adequately known has proceeded slowly and sporadically for the past several decades. The present memoir is another small step toward final enlightenment. It was commenced at the U. S. National Museum in 1959, shelved for some decades, and revived in 1999 by the opportunity to add a third species to *Cheirodesmus* while documenting the two original Cook species. Similar treatment for the taxa named by Cook under the term "Xyodesmidae" is presently in preparation.

R. V. Chamberlin (1952), in a short compilation entitled "An arrangement of the Prepodesmidae..." actually published gonopod drawings for some of Cook's species, including *Cheirodesmus ater*. At some point Cook had apparently reached an agreement from Chamberlin that he would work up Cook's original materials on the group, which were then turned over to him. What emerged however was a curious melange based almost exclusively on literature sources. Of the nine

drawings of gonopods, apparently four were adapted from papers by Attems and Carl, one was original, and only four are recognizable as Cook's work. These could only have been a tithe of the resources that Chamberlin inherited, and the "Arrangement" was a disappointing substitute for a real revision. The drawing provided for *C. ater* is from a ventral aspect, and adequate only for recognition of the genus.

Although he was scrupulous about the concept of generic type species, Cook was less precise with actual type specimens. He never used the words "holotype" and "paratype", rather the ambiguous term "*type*", both in publications and in his collections (where scrawled on a tiny scrap of tissue paper) . Often only an asterisk symbol served to designate typical status. The case of *Cheirodesmus discolor* illustrates Cook's occasional extension of the type concept to include material examined after the original description was published.

Cook's material was deposited in the U. S. National Museum over a period of years, some of it only following his demise in 1950. Although most of the typical material was located and sorted out during my engagement at the museum in 1959-60, not all of the desirable type restrictions were made owing to uncertainty about the extent of syntype material.

Family CHELODESMIDAE Cook

Subfamily **Prepodesminae** Cook

Cheirodesmus

Cheirodesmus Cook, 1896, American Natur. 30: 416. Name published with one sentence of diagnostic information but no included species (May 1, 1896).

Cheirodesmus Cook, 1896, Proc. Acad. Nat. Sci. Philadelphia, [48]: 259. Name used in combination with two new species, neither designated as type, nor indication of generic attributes (May 26, 1986).

Cheirodesmus: Attems, 1940, Das Tierreich, 70: 488 (listed only).

Cheirodesmus: Chamberlin, 1952, Journ. Washington Acad. Sci., 42: 330. Designation of *C. ater* Cook as type species.

Cheirodesmus: Jeekel, 1971, Monogr. Nederlandse Entom. Veren. 5: 253 (listed only)

Cheirodesmus: Demange & Mauriès, 1975, Ann. Mus. Roy. Afrique centr., sci. zool.: 212: 145 (listed only).

Cheirodesmus: Hoffman, 1980, Classification of the Diplopoda, p. 155 (listed only).

NAME: A masculine neologism derived from the Greek *cheir* (hand) + *-desmus* ("the male genitalia resembling in shape a gloved hand": Cook)

DIAGNOSIS: A prepodesmine genus distinguished by the modification of the femoral region of the gonopod, extended into a broad, rounded, concave calyx, rotated about 180° mesodorsad which partly surrounds the primary region (acropodite); latter small and falciform, with prostatic groove on its inner surface.

COMMENTARY: *Cheirodesmus* is a member of the group of West African prepodesmids in which the body form is typically long and slender, with reduced telescoping of the prozona causing a somewhat distended appearance with the paranota of midbody segments widely separated. The legs and antennae are long and slender, paranota set high on sides yielding a nearly flat dorsum, peritremata ovoid and abruptly set off from lateral edge of segments; metaterga typically finely granular, with distinct transverse sulcus.

Although the body form in species of *Cheirodesmus* closely resembles that seen in other regional genera of Prepodesminae (such as *Prepodesmus, Tylodesmus, Paracordyloporus,* and *Triadesmus*), the structure of the gonopod telopodite is severely condensed relative to the complex form that occurs in those taxa. While it is always somewhat speculative to homologize those regions of the telopodite distad of the setose prefemur with podomeres of walking legs. Conventional wisdom has equated the course and termination of the prostatic groove with the so-called "acrópodite" which includes the femoral, tibial, and tarsal regions usually coalesced into a single unit, although often with lobes or processes associated with the presumptive podomere homologs.

In *Cheirodesmus*, the acropodite is apparently a notably reduced element with the groove on its inner surface, whilst the presumed femoral region is produced into a large conchiform structure rotated about 180° around to the medial side of the telopodite and concealing the acropodite in that aspect (Fig. 6).

DISTRIBUTION: West Africa: Sierra Leon, Liberia.

SPECIES: Three, one of them new, distinguished as follows:

Key to the species of *Cheirodesmus*

1. Metaterga uniformly black; gonopod, Fig. 8. . . . . *C. ater*
– Metaterga ornamented with yellow 2

2. Metaterga with edges of all paranota narrowly yellow, peritremata and adjacent surface yellow; legs and antennae pink; gonopod, Fig. 9. . . . . *C. aureolus*
– Metaterga with large triangular middorsal spot and poriferous paranota yellow, legs and antennae yellow; gonopod, Fig. 7 . . . . . *C. discolor*

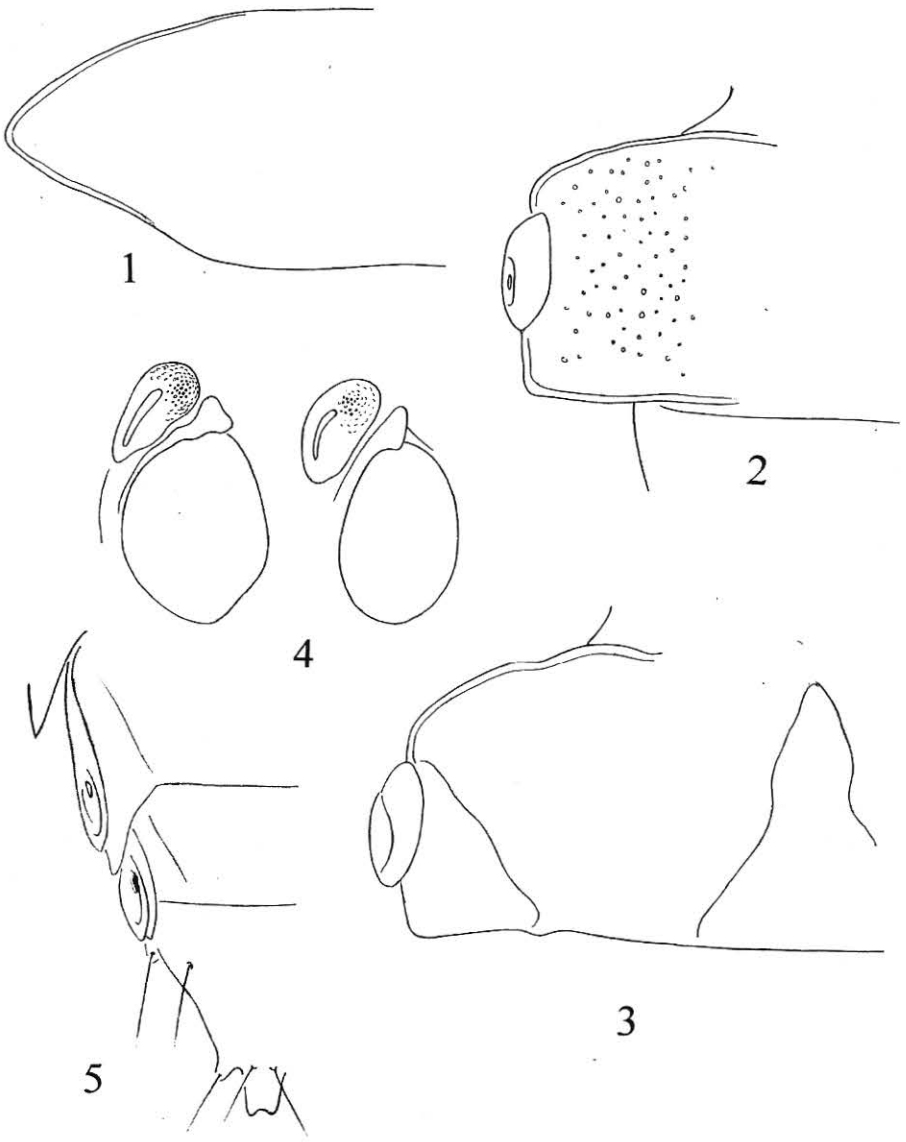


Fig. 1. *Cheirodesmus ater*, left side of collum, dorsal aspect. Fig. 2. *C. ater*, left paranotum of 9th segment, dorsal aspect. Fig. 3. *C. discolor,* left side of metatergum of 9th segment, dorsal aspect, distribution of yellow coloration indicated. Fig. 4. *C. ater,* stigmata and coxal condyles from midbody segment. Fig. 5. *C. aureolus*, left side of segments 18-20, dorsal aspect.

Cheirodesmus ater Cook.
Figs. 1, 2, 4, 8

Cheirodesmus ater Cook, 1896, Proc. Acad. Nat. Sci. Philadelphia, [48]: 259. Syntypes (USNM) from Mt. Coffee, Liberia [see commentary, below], O. F. Cook leg. 1892.

Cheirodesmus ater: Chamberlin, 1952, Journ. Washington Acad. Sci.,42: 330, fig. 5.

DIAGNOSIS: Readily distinguished from the other two known species by the uniformly black body and by the shape of the gonopod acropodite.

DESCRIPTIVE NOTES: "Color uniform black, legs and antennae yellowish; length 30 mm.; width 3.75 mm." (Cook). Male syntype: body widest across paranota of segment 2, thence narrowed back to segment 5, gradually widening again to midbody. Collum transversely ellipsoidal, the lateral ends subacute (Fig. 1). Metazona finely granular, metazonal sulcus distinct. Prozona smooth, stricture deep and well-defined but weithout sharp edges. Paranota set high on sides, nearly horizontal, all edges set off by a distinct marginal rim, peritremata large, sharply set off from lateral edge, pores directed lateral (Fig. 2), ovoid at midbody, becoming increasingly elongated posteriad, with pore displaced nearly to apex. Metazona of segments 18-19 with a series of 10-12 acute tubercles along caudal margin. Posterior sterna glabrous but for a row of long intercoxal setae, no subcoxal spines; anterior sterna with more numerous scattered setae. Sides of metazona with numerous small scattered acute tubercles. Stigmata large, tumid, subpyriform, finely granular (Fig. 4).

Gonopod (Fig. 8) of the form typical for this genus, acropodite (lateral aspect) distinctly broader than in *discolor*, and with marginal angulation not present in *aureolus*.

COMMENTARY: Cook (1896b) specified that Mount Coffee is "a cluster of hills in western Liberia, reaching an altitude of about 300 feet, and covered with dense forest. Topographically the site is located at 6°01'N, 10°42'W, 17 miles northeast of Monrovia.

Cheirodesmus discolor Cook.
Figs. 3, 6, 7.

Cheirodesmus discolor Cook, 1896, Proc. Acad. Nat. Sci. Philadelphia [48]: 259. Two syntypes (USNM D-41), from "Muhlenberg Mission" , Liberia, O. F. Cook leg. February 1892.

MATERIAL: Male lectotype (USNM D-41) from *Liberia*: Muhlenberg Mission .O. F. Cook leg. 1892; also one. male (USNM D-554) from "White Plains", O. F. Cook, February 1894. *Sierra Leon*: Joro, 1 July 1963, Vibeke Schiøtz , one male (ZMUC); Kenema, 12 July 1963, Schiøtz, one male (ZMUC).

DIAGNOSIS: Distinguished from the two congeneric species by the presence of large middorsal triangular metatergal spots (forming a nearly continuous median band), the slender subovoid outline of the telopodite calyx, and extension of the peritreme on the 18th segment as far as the apex of the peritreme itself. A slight emargination of the anterior paranotal edge (Fig. 3, →) may also prove distinctive if confirmed in additional material.

DESCRIPTIVE NOTES: Dorsum black but with "...an area around each pore and a moderately broad median line, yellow; legs and antennae reddish-yellow" (Cook), confirmed in fresh specimens from Sierra Leon. The median band is composed of a large triangular spot on each metazonum (Fig. 3). Lectotype male ca 31 mm long, 4.0 wide at midbody. Generally similar to *C. ater* in structure, but peritremata on segment 19 extend posteriad as far as tip of paranotum ; sterna distinctly more setose.

Gonopods (Figs. 6, 7) very similar to those of *ater*, but with the calyx proportionately longer and more oviform (lateral aspect!); tibiotarsal region distinctly more slender, with an acute marginal angle.

DISTRIBUTION: This species is known to me only from the localities cited above under "Material".

COMMENTARY: The original description of this species was based upon two specimens only. Another male taken by Cook at White Plains, Liberia, is labeled "type" in Cook's writing, but not being mentioned in proposal of the name and coming from a different locality, can not be designateded a lectoparatype.

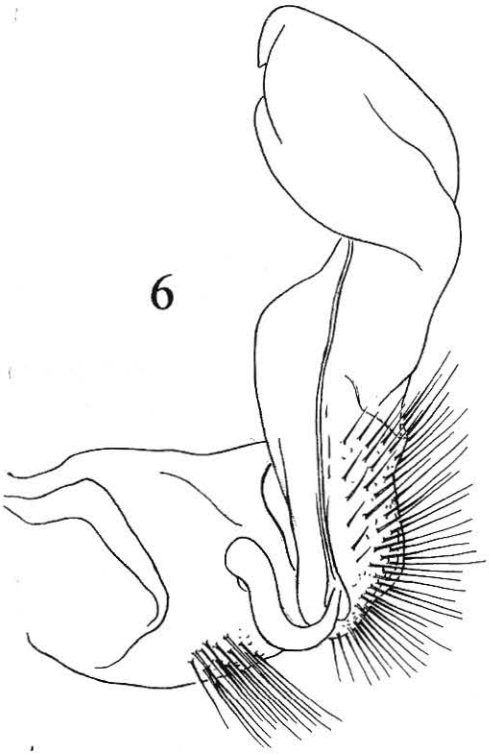
I have been unable to locate the site of either Muhlenberg Mission or White Plains, but presume that both are in the immediate vicinity of Mount Coffee.

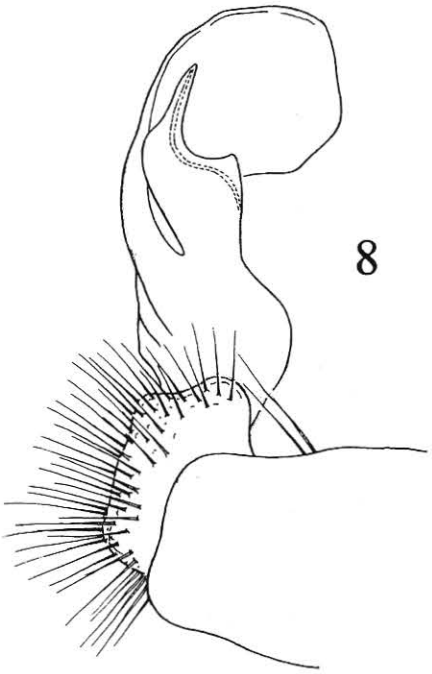
Cheirodesmus aureolus, new species.
Figs. 5, 9

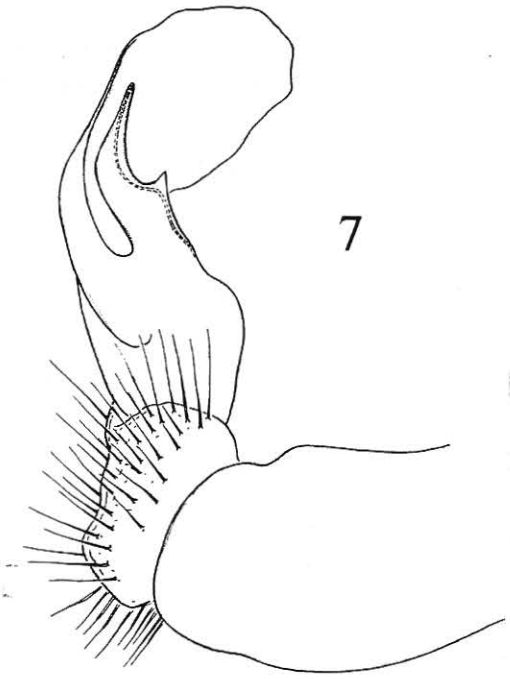
MATERIAL: Male holotype (ZMUC), from Fourah Bay College Botanical Garden, Freetown, Sierra Leon, Vibeke Schiøtz leg. 9 May 1965.

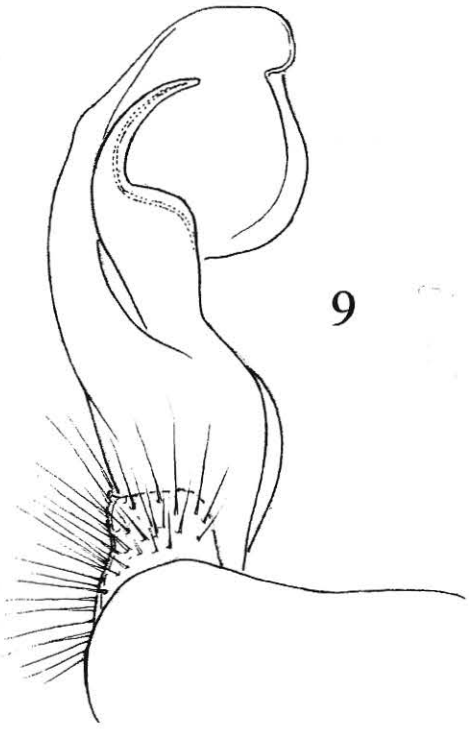
NAME: For the type locality: the Botanical Garden is located on Mount Aureole, a small hill at Freetown

DIAGNOSIS: This species is distinguished by the color pattern (yellow peritremata, no middorsal spots) and by the reflexed apical edge of the telopodite calyx (Fig. 9).









DESCRIPTIVE NOTES: Length of preserved specimen, ca 32 mm, maximum width ca 4.2 mm on segments 5 through 10, thereafter very gradually narrower posteriad. Antennae 9.0 mm, reaching back to 6th segment, interantennal space 0.9 mm. Segments 3 and 4 less narrowed than in *ater*. Paranota set high on sides, dorsum flat, metaterga finely granulate, with caudal row of small tubercles only on 18th; sulcus visible on segments 3-18. Paranota quadrately transverse on segments 5-8, beyond which anterior edge becomes increasing rounded-oblique, posterior edge transverse back to segment 11, afterwards increasingly oblique imparting triangular profile to paranota. Peritremata large, subovoid, close to anterior corner on segments 5-7, after which increasingly displaced posteriad, and correspondingly narrow-elongate. Posteriormost segments (Fig. 5) of typical prepodesmid structure, subterminal tubercles of epiproct prominent, digitiform. Sterna glabrous except for row of intercoxal setae, 1.3 mm wide. Stigmata of the form shown for *C. ater*; sides of metazona finely granulate, with single row of small elongated tubercles along posterior margin.

Gonopod aperture a regular transverse oval with rounded lateral ends. Gonopod (Fig. 9 distinct in the recurved apical edge of calyx and large acropodite without angular marginal projection.

DISTRIBUTION: This species is known to me only from the type locality.

ACKNOWLEDGEMENT

The type specimen of *Cheirodesmus aureolus* was found among material loaned to me by Prof. Dr. Henrik Enghoff, director of the Zoological Museum, University of Copenhagen. to whom I express my appreciation.

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Fig. 6. *Cheirodesmus discolor*, left gonopod, mesal aspect. Fig. 7. The same gonopod, lateral aspect. Fig. 8. *C. ater*, left gonopod, lateral aspect. Fig. 9. *C. aureolus*, left gonopod, lateral aspect.

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