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A Revision of the Milliped Genus *Cubodesmus* (Diplopoda: Polydesmida: Chelodesmidae)

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ABSTRACT

A preliminary revision of the genus *Cubodesmus* Chamberlin, 1918, revealed that the names *Cubodesmus latior*, *C. proximus*, *C. pelopleurus*, *C. princeps*, and *C. limoneus*, all proposed by Chamberlin in 1918, are considered to be junior subjective synonyms of *Cubodesmus ramsdeni* Chamberlin, 1918. *C. prominens* Loomis, 1938, is regarded as a valid species. Two new species are described from Cuba: *Cubodesmus mariana* from Guantánamo and *Cubodesmus yazminae* from Camagüey.

The genus *Cubodesmus* was proposed by Chamberlin in 1918 for six new species from the vicinity of Guantánamo, Cuba. In 1933, Loomis reported a female specimen from Camagüey as *C. proximus*, and in 1938 he commented on *C. limoneus* and *C. latior*, giving a drawing of the left gonopod of a paratype of the latter. In the same paper, he described *C. prominens* from eastern Oriente Province. Finally, in 1941, Loomis published gonopod drawings for the nominal species *C. ramsdeni* and *C. pleopleurus*, drawn from paratype specimens. No further additions have been made to the content of the genus, although in 1974 Torres gave a list of all species; Gonzáles & Golovatch (1990) included the same taxa in their catalog of Cuban diplopods; and Hoffman (1980) listed *Cubodesmus* in the Chelodesmidae and estimated a content of about six species.

Of the seven species of *Cubodesmus* thus far named, five are considered in the present paper to be junior synonyms of *C. ramsdeni*; the addition of two new species brings the number of recognized valid species to four, all endemic to the eastern third of the island of Cuba.

METHODS

Length was measured from front of head to tip of epiproct of carefully straightened specimens; width was measured at the 7th segment; all mensural data are presented as *mean* followed by (*range*). The number of specimens having a dentation on the scapuloral margin of paranota is given after the value corresponding to the number of the segments that may or may not show this character (in parentheses). For example: (2-3)-4-5(6) means that dentations are always present on segments 4 and 5, but may be absent from segments 2, 3, and 6. Line drawings of gonopods *in situ* were traced from microphotographs produced with a JEOL JSM-T330 scanning microscope. Representation of color patterns is schematic.

Type material of the two new species is deposited in the Museo Nacional de Historia Natural, La Habana, Cuba, with paratypes of each in the Museum of Comparative Zoology, Cambridge, Massachusetts. All collections were made by the author, except as otherwise specified.

TAXONOMIC CHARACTERS

As in most other diplopod genera, the diagnostic characters of the genus *Cubodesmus* are best expressed in the structure of the male genitalia as described under the following generic diagnosis. Specific characters occur in relative size and shape of the apical elements of the acropodite, although there is a slight amount of intraspecific variation in those parts.

Chamberlin (1918) relied heavily upon coloration in defining his six nominal species of *Cubodesmus*. I have found color patterns to be quite stable: variability between and within populations is practically nonexistent. The following patterns were observed:

a. dorsal surface uniformly reddish brown, sometimes dark brown or black (Fig. 15),

b. dorsal surface dark brown or black, with yellowish white paranota (Fig. 16),

c. dorsal surface mostly whitish, with dark pigment confined to area of segmental stricture (Fig. 18).

The collum may be uniformly dark reddish-brown to black, or may have light-colored corners, or otherwise show two dark central spots connected or not with the median line. Legs and antennae are yellowish, reddish, red, or reddish-brown. The "tooth" on the scapuloral arc of paranota may be present or absent: if present, the number of segments showing this charatcer is variable even within a single population. The posterior margin of the paranota is generally straight and smooth, although some specimens may show small granules.

The body form varies from somewhat dorsoventrally compressed to very convex.

TAXONOMY

Cubodesmus Chamberlin

Cubodesmus Chamberlin, 1918: 237. – Loomis, 1933: 361; 1938: 470; 1941: 38. – Attems, 1938: 197; 1940: 556. – Torre, 1974: 5. – González & Golovatch, 1990: 20.

DIAGNOSIS: Coxae of gonopods not attached by median sternal remnant, of moderate size, sternocoxal apodeme straight, no coxal apophysis nor paracannular setae, two macrosetae on dorsal side; telopodite set against coxa at about 45° angle. Prefemur relatively small, prefemoral process straight to sinuously curved (in mesal aspect), especially medially and basally, distally acuminate, with subterminal projection. Terminal element (acropodite) without torsion, somewhat laminate, flattened, reflexed proximad and forming nearly a 90° angle with prefemur, with prominent cingulum on ventral side; distally with small, curved solenomere and subapical medially-directed process. Prostatic groove visible for most of its length in mesal aspect.

Sternum of 4rd segment with medially contiguous conical processes between 3rd pair of legs. Hypoproct generally thickened.

Cubodesmus ramsdeni Chamberlin
(Figs. 3, 4, 11, 16, 19)

Cubodesmus ramsdeni Chamberlin, 1918: 238. – Loomis, 1941: 38, pl. 4, fig. g.– Attems, 1938: 197. -- Torre, 1974: 5.– González & Golovatch, 1990: 22.

Cubodesmus latior Chamberlin, 1918: 239. – Loomis, 1938: 470, fig. 23.– Attems, 1938: 97; 1940: 556. – Torre, 1974: 5.– González & Golovatch, 1990: 21. **New Synonymy!**

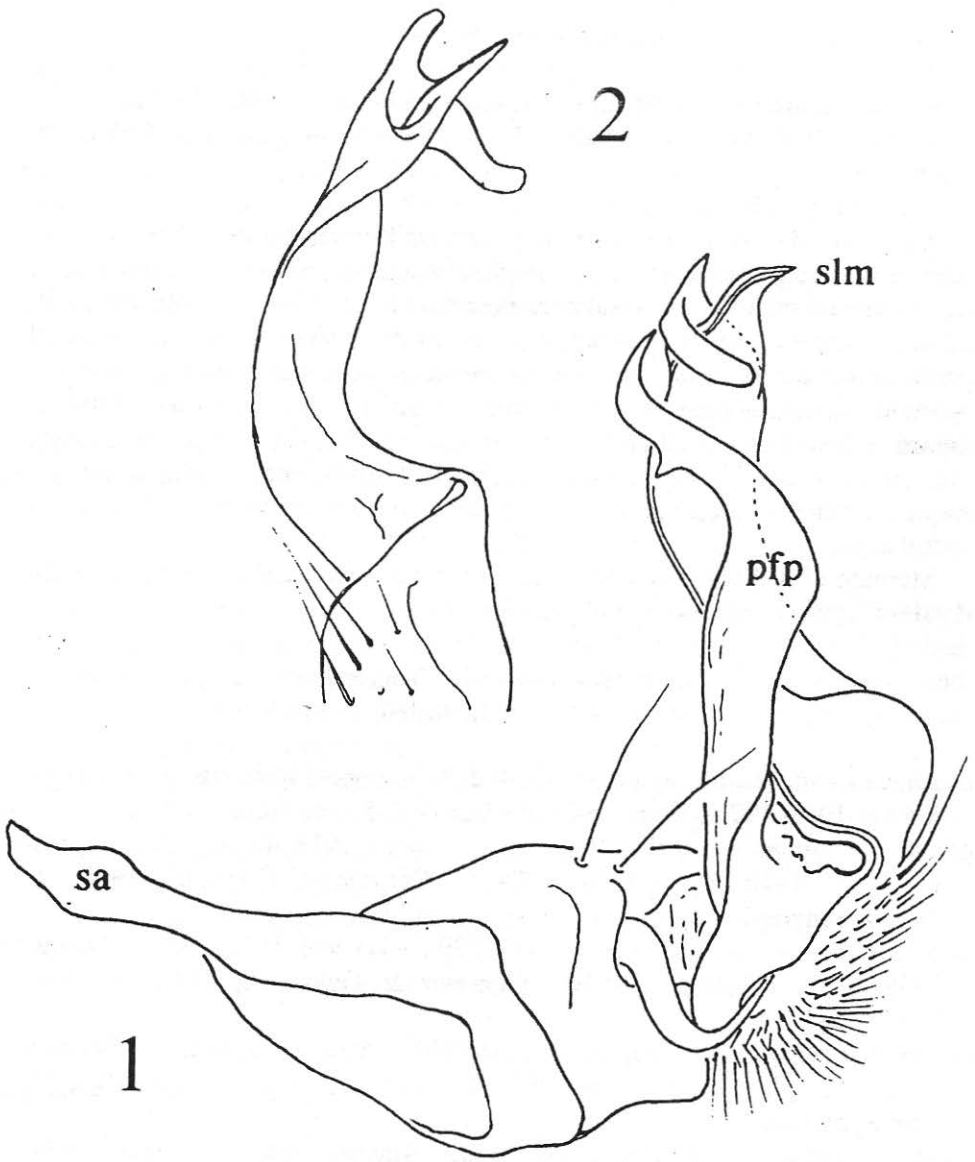
Cubodesmus proximus Chamberlin, 1918: 239 . – Loomis, 1933: 361. – Attems, 1938: 197. – Torre, 1974: 6.– González & Golovatch, 1990: 22. **New Synonymy!**

Cubodesmus pelopleurus Chamberlin, 1918: 240. – Attems, 1938: 197. – Loomis, 1941: 38, pl. 4, fig. 4.– Torre, 1974: 6. – González & Golovatch, 1990: 21. **New Synonymy**!

Cubodesmus princeps Chamberlin, 1918: 241. – Attems, 1938: 197. – Torre, 1974: 6.– González & Golovatch, 1990: 21. **New Synonymy**!

Cubodesmus limoneus Chamberlin, 1918: 242. – Loomis, 1938: 470. – Attems, 1938: 197. – Torre, 1974: 5. – González & Golovatch, 1990: 21. **New Synonymy**!

TYPE MATERIAL EXAMINED: Museum of Comparative Zoology: ♂ holotype of *Cubodesmus ramsdeni* (MCZ 4513); ♂ holotype of *Cubodesmus latior* (MCZ 4515); ♂ holotype of *Cubodesmus proximus* (MCZ 4517); ♂ holotype of *Cubodesmus*

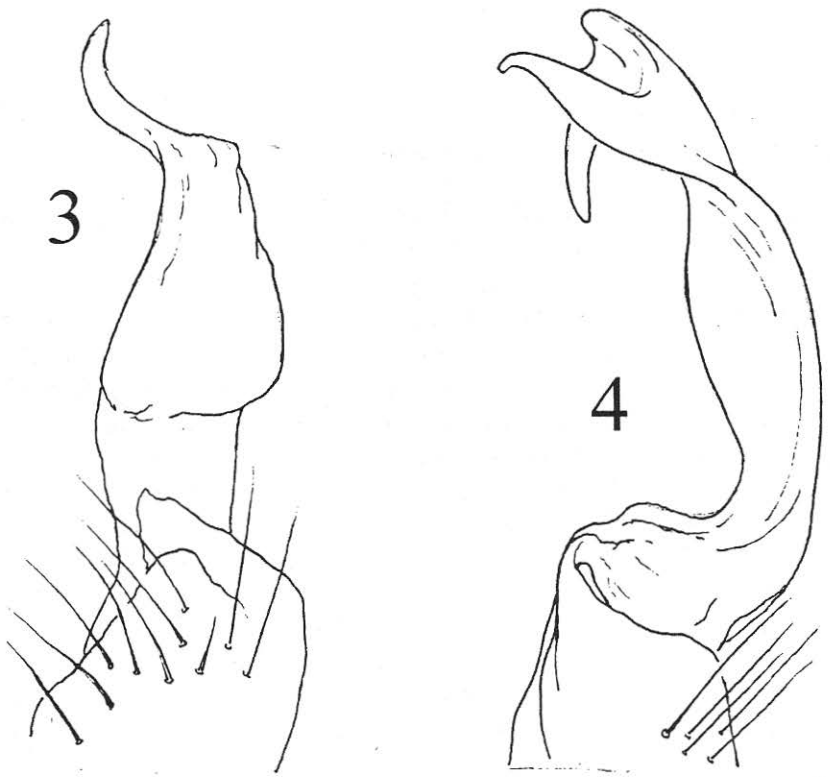


Figs. 1,2. *Cubodesmus prominens* Loomis. 1, left gonopod, mesal aspect. 2, right gonopod, ventral view. Abbreviations: pfp, prefemoral process; sa, sternal apodeme; slm, solenomere.

pelopleurus (MCZ 4519); ♀ holotype of *Cubodesmus princeps* (MCZ 4521); ♂ holotype of *Cubodesmus limoneus* (MCZ 4522).

NEW MATERIAL: Museo Nacional de Historia Natural, La Habana: Jagüeyón, Río Cuzco. Guantánamo, under stones or limestone rocks in humus, 15 June 1990 (MNHNCu 1862-1866). Sierra de Canasta, Guantánamo, in deep soil, R. Thomas, 16 June 1990 (MNHNCu 1896-1898). Camino de La Maravilla a La Somanta, SW of Santa Catalina, Meseta del Guaso, Guantánamo, in forest leaf litter, A. R. Estrada & A. R. Pérez-Asso, 17 June 1990 (MNHNCu 1904-1907). La Maravilla, Lajas, near La Tagua, Guantánamo, leaf litter, 17 June 1990 (MNHNCu 1911). Monte Líbano, Meseta del Guaso, Guantánamo, leaf litter, forest in karst, 18 June 1990 (MNHNCu 1919); same locality, E. Gutiérrez, 26 June 1990 (MNHNCu 2046-2047).

DIAGNOSIS: Central region of prefemoral process very wide, apical region hamate; acropodite notably curved basally, apically with three digitiform processes, the largest acute, with an additional spiniform projection (Figs. 3, 4, 11). Dorsum brown or black, paranota yellowish-white (Fig. 16); legs and antennae yellow. Scapuloral dentation generally present (3)-4-6-(7-10), sometimes absent or weakly developed. Posterior edge of paranota straight, without tubercle or nodule; posterior corner rectangular or almost so on poreless segments. Peritreme abruptly broadened



Figs. 3,4. *Cubodesmus ramsdeni* Chamberlin. 3, prefemoral process of right gonopod, ventral aspect. 4, telopodite of left gonopod, ventral aspect.

at posterior third of length to accomodate ozopore, which is placed near posterior corner. Dorsum of metaterga sometimes with small dark granules in 2-3 transverse series. Basal three podomeres with numerous small setiferous granules. Hypoproct slightly thickened apically.

VARIATION: Males (n=5), length 41-48 (46.4), width 5.5-6.9 (6.4); females (n=4), length 42-52 (47.2), width 5.8-7.9 (6.9). Collum with a central dark spot. Dorsal surface brown, reddish-brown, or black medially as far as base of paranota, the latter and narrow transverse metatergal band yellowish white; prozona and sides of metazona brown to black; apex of epiproct with light spot; sterna brown to yellowish white; legs and antennae yellow.

DISTRIBUTION: Meseta del Guaso and Sierra de Canasta, Oriente Province, Cuba (Fig. 19).

SYNONYMY: The six species names proposed by Chamberlin in 1918 and here considered as junior synonymy of *ramsdeni*, were based on specimens from the Guaso plateau and vicinity of Guantánamo City. The examination of type material did not disclose any convincing species-level differences in either gonopod structure or coloration.

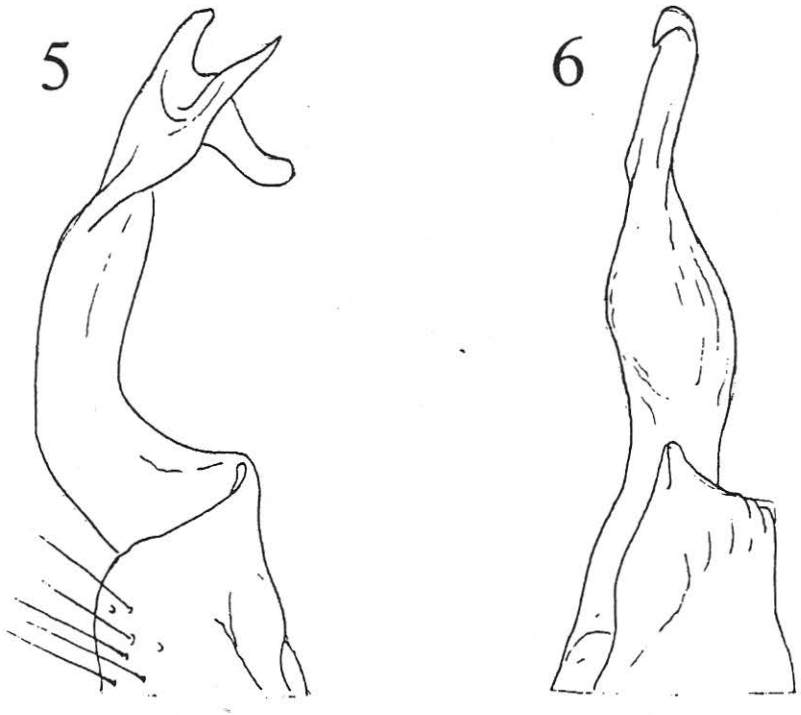
Cubodesmus prominens Loomis
(Figs. 1, 2, 5, 6, 12, 15, 19)

Cubodesmus prominens Loomis, 1938: 471, fig. 24a, b. — Attems, 1940: 556. — Torre, 1974: 6. — González & Golovatch, 1990: 21.

TYPE MATERIAL EXAMINED: MCZ: ♂ holotype (unnumbered), Los Llanos, Oriente Province, Cuba; P. J. Darlington, 16-18 July 1936.

NEW MATERIAL: Museum Nacional de Historia Natural, La Habana: Loma del Mulo, near Río Yarey, Yateras, Guantánamo, under fallen Royal Palm fronds, degraded montane rainforest, 14 March 1989 (MNHNCu 370-373). Abra de Yumurí, Maisí, Guantánamo, in humus and under stones, karst forest, A. R. Pérez-Asso, 26 July 1989 (MNHNCu 848-856). Base of Yunque de Baracoa, Guantánamo, 200 m ASL, under leaf litter and palm fronds, A. R. Pérez-Asso, A. R. Estrada, and E. Alfaro, 28 July 1989 (MNHNCu 938-939); same locality, A. R. Pérez-Asso and E. Alfaro, 29 July 1989 (MNHNCu 1040-1042); same locality, leaf litter on karst cliffs, 335 m ASL, 28 July 1989 (MNHNCu 961-962). Monte Líbano, Meseta del Guaso, Guantánamo, karst forest, 18 June 1990 (MNHNCu 1918). Author's personal collection): La Melba, near Arroyo Bueno, Moa, Holguín, forest leaf litter, A. R. Estrada, 7 March 1986 (ARPA 156); same data, but in coffee plantation, 9 March 1986 (ARPA 170-171); same locality, inside rotting tree trunk, G. Peña, 8 March 1986 (ARPA 161-163). La Melba, Río Jaguaní, leaf litter in montane rainforest, 6 April 1987 (ARPA 805-807); same locality, A. R. Pérez and A. R. Estrada, September 1987 (ARPA 1501-1504).

DIAGNOSIS: Acropodite of gonopod with three digitiform apical processes, the largest thick and obtuse (Figs. 1, 2, 5, 12). Dorsum reddish brown to black (Fig. 15),



Figs. 5,6. *Cubodesmus prominens* Loomis. 5, telopodite of the right gonopod, ventral aspect. 6, prefemural process of the left gonopod, ventral aspect.

legs and antennae nearly red. Scapuloral dentation usually absent. Hypoproct notably incrassate distally. Sternal processes of 4th segment (between 3rd legs) very small, conical.

VARIABILITY: Males (n=8), length 35.8 (35-37), width 5.5 (5.25-5.70); females (n=10), length 40.5 (38-45), width 6.45 (5.9-7.1). Dorsal surface, including apex of epiproct, uniform reddish brown to black; hypoproct generally yellowish white (sometimes blackish); sterna pale reddish brown to pink or yellowish white; legs and antennae pink, reddish, or red. Dorsum convex in males, even more so in females, smooth and lustrous, only rarely with transverse rows of tiny granules on posterior segments. Normally no tooth at anterior corner of anteriormost paranota, rarely one present on segment 3 and/or 4. Posterior edge of paranota straight, without nodules. Posterior angle of paranota straight or almost so at non-poriferous segments. Peritremata pronounced; margin much thickened around the pore. Females generally have much reduced paranota. Hypoproct generally much swollen, entirely or at the apical region. Articles 1-3 of the legs with tiny and numerous setiferous tubercles or granules; less evident towards rear of body; this character is less marked here than in *Cubodesmus ramsdeni* and article 1 (coxa) has very few granules; only article 3

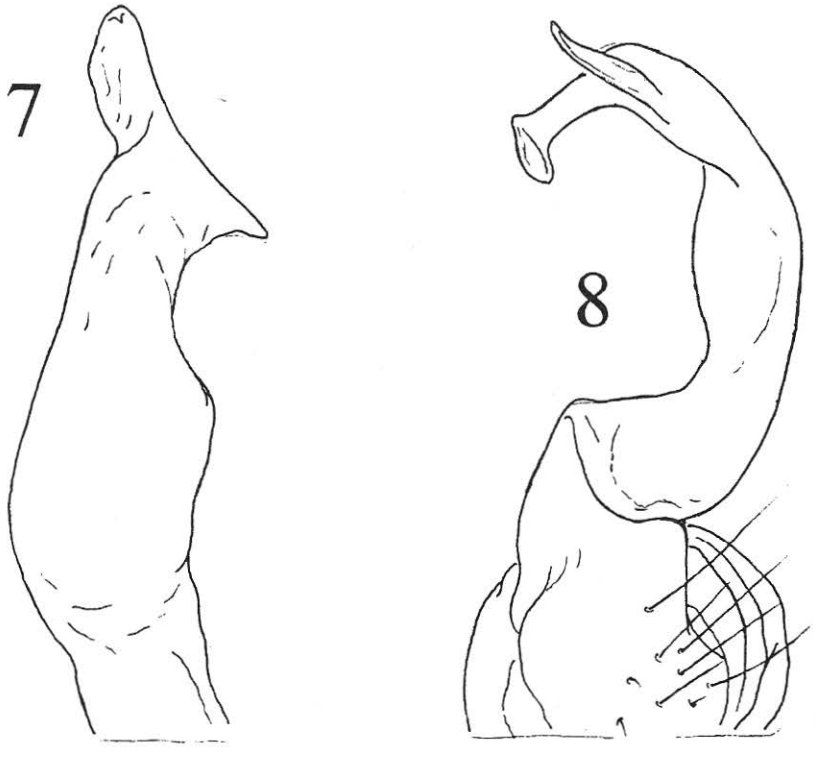
presents numerous granules. Coxa of second pair of legs of males with a pronounced ventral tubercule and with tiny conical tubercules at the sternum, between the third pair of legs, and rarely with conical tubercules at the fourth pair, since they are generally rounded. Females may also show small conical tubercules on the third pair of legs.

TERATOLOGY: Male 1040, collum with anterior margin twisted towards the right side.

DISTRIBUTION: Yunque de Baracoa Mountains. Cuchillas del Toa and Guaso Plateau, in the provinces of Guantánamo and Holguín (Fig. 19).

Cubodesmus mariana n. sp.
(Figs. 7, 8, 13, 17, 19)

TYPE: MNHNCu.: Male holotype, 1922, male paratypes 1921, 1923-1940, 1942-1943, female paratypes 1944-1955, 1957-1978, juveniles 1979-1980, from Limoncito (200- 500 m ASL), Sierra de Mariana, Guantánamo, leaf litter in a forest over karst, A. R. Pérez-Asso, June 19, 1990. MCZ: Paratypes, male 1941, female 1956.



Figs. 7,8. *Cubodesmus mariana* n. sp. 7, prefemoral process of right gonopod, ventral aspect. 8, telopodite of left gonopod, ventral aspect.

NAME: The specific epithet alludes to the Sierra de Mariana, type locality of this new species.

DIAGNOSIS: Gonopods with central portion of prefemoral process wide; apical portion flattened, narrow and curved; internal margin with an acute prominent lobe near the subterminal portion; femur notable curved at its inferior portion, with but 2 digitform appendices at the terminal portion, the larger appendix is bulky at the apex (Figs. 7, 8, 13). Dorsal surface reddish brown or dusky; legs and antennae reddish or red. Tooth may or not be present at the anterior corner of the paranota. Small conical tubercules at the sternum, in males, between the third pair of legs.

HOLOTYPE: Dimensions 34 x 9.2. Posterior margin of segments 13-15 with a tiny nodule. No tooth at the anterior corner of the paranota. Dorsal surface reddish brown, prozonites and pleurites a darker reddish brown; legs and antennae reddish. Dorsal surface with minute scattered granules over some segments.

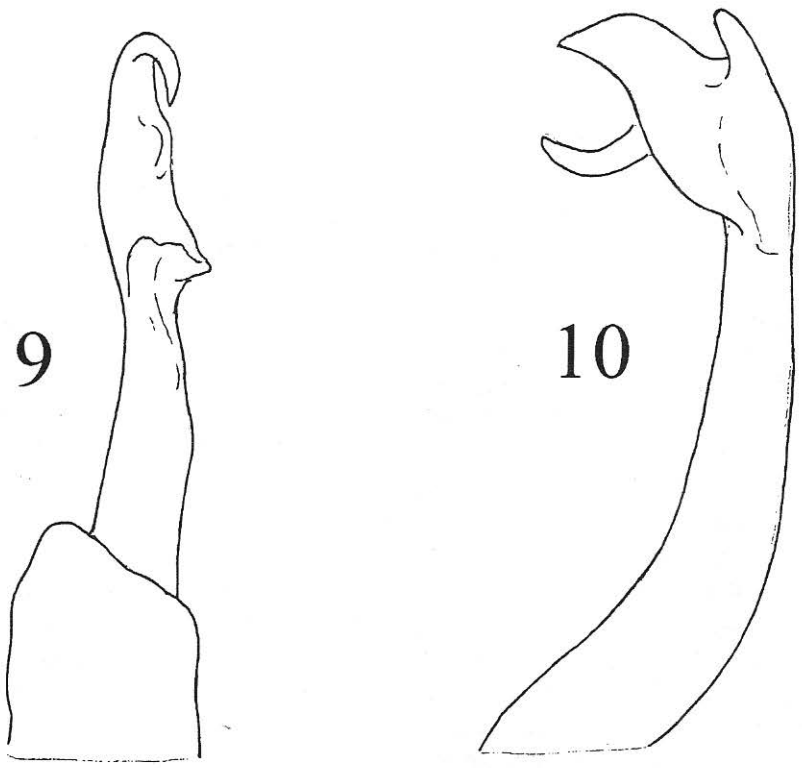
VARIABILITY: Males (n=21), length 31.09 (29-37), width 4.34 (3.95-4.75); females (n=34), length 34.70 (30-39), width 4.84 (4.35-5.35). Dorsal surface uniform reddish brown to dusky, or somewhat paler towards the central region of the posterior margin; prozonites and pleurites reddish brown, always darker than the metazonite; prozonites of rear half of body can be lighter at the anterior portion; metazonites can be pale at their rear half; segments 2-4 sometimes have pale paranota; peritremata hypoproct yellowish white; antennae red. Dorsal surface convex, smooth, lustrous, sometimes with small granules. Males without tooth at the anterior corner of paranota, or with a small tooth in segment 4, sometimes only barely visible; Posterior margin of paranota straight , without nodules, or sometimes only barely visible; females have tooth in segments 3-4, or barely insinuated, or only at segment 4. Posterior margin of paranota straight, without nodules, or sometimes with a minute nodule in isolated segments of the body. Females with very reduced paranota. Peritremata present, prominent in males and very much marked and prominent in females. Hypoproct not thickened. Articles 1-3 of legs without granules or prominent ventral nodules on coxae of second pair of legs; small conical tubers on sternum, between the third pair of legs.

TERATOLOGIES: Male 1925, left legs 4-8, 11-12 atrophied, right ones normal. Male 1931, segment 13 with posterior right leg atrophied. Female 1965, segment 13 with posterior left leg atrophied. Females 1963, segment 14 with posterior left leg much atrophied. Females 1952, segment 5 and 10 with left paranota atrophied, and without peritremata or pore; segment 6 with frontal left leg atrophied; segments 9 and 10 with left legs atrophied; segment 12 with left legs atrophied and only one, atrophied, leg on left side.

DISTRIBUTION: Known only from type locality (Fig. 19).

Cubodesmus yazminae n. sp.
(Figs. 9, 10, 14, 18, 19)

TYPES: MNHNCu.: Male holotype 1585, male paratypes 1576-1580, 1582-1584, 1586-1602, females 1603-1607. 1609, juveniles 1610-1616, Paredones de



Figs. 9,10. *Cubodesmus yazminae* n. sp. 9, prefemoral process of right gonopod, ventral aspect. 10, telopodite of left gonopod, ventral aspect.

Sierra de Cubitas, Camagüey, under leaf litter in forest over karst, among karst walls, A. R. Pérez-Asso and J. Pareta, November 2, 1989. MCZ: Paratypes, male 1581, female 1608.

ASSOCIATED MATERIAL: MNHNCu.: Males 1550-1562, females 1563-1575; Finca La Escalera, Sierra de Cubitas, Camagüey; under leaf litter, in forest over karst, among karst walls; A. R. Pérez-Asso and J. Pareta; November 2, 1989.

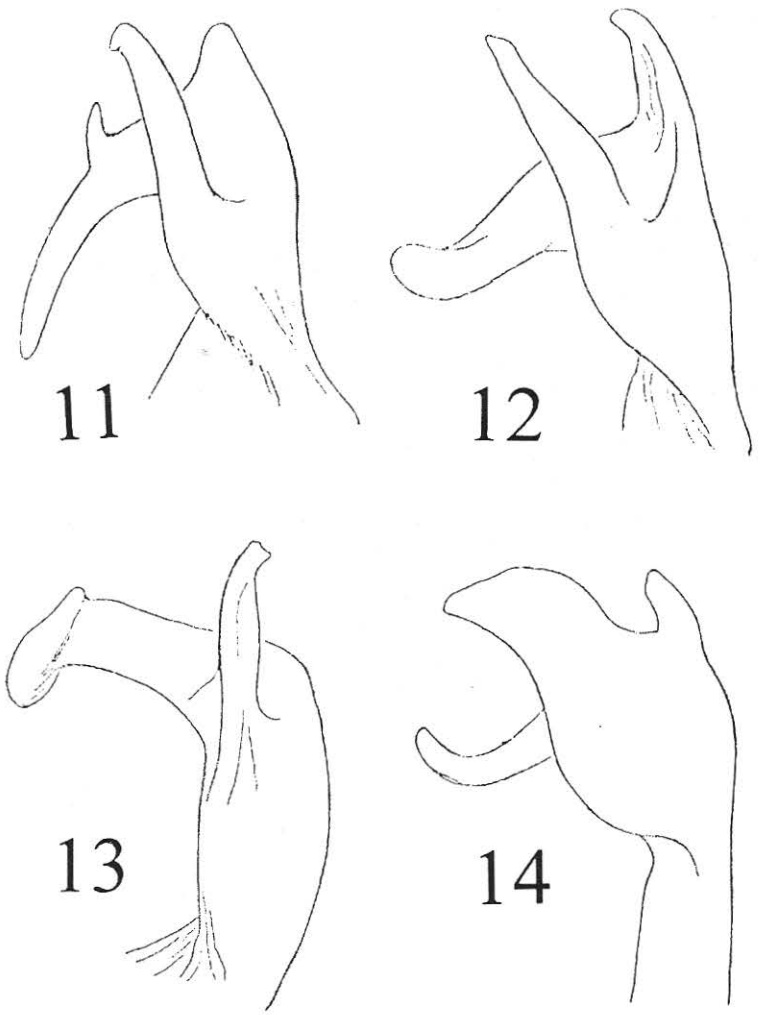
NAME: The specific epithet in honor of Yazmín Peraza Diez, Director of the MNHNCu., who discovered this new species during a visit to Sierra de Cubitas in 1989.

DIAGNOSIS: Gonopods with cylindrical prefemoral process; apical portion thin and curved, with a subterminal nodule near the internal margin; femur cylindrical, only slightly curved at the inferior portion, with three digitform appendixes on the terminal portion, the largest appendix very wide, subtriangular, the apex acute (Fig. 9, 10, 14). Color pattern with white and darkish transverse band near the anterior (Fig. 18). Anterior corner of paranota of anterior segments with marginal tooth. Males with pronounced conical tubercles in sternum, between the third pair of legs.

HOLOTYPE: Adult male, length 39 mm, width 10.8 mm.. Collum white with two

dark brown spots connected along the median line. Metazona white dorsally, but with a dark brown transverse band near the anterior margin; prozona and sides of metazonapleurites dark brown to black. Legs yellowish white, antennae lemon yellow. Hypoproct somewhat thickened. Tooth at the anterior corner of paranota of segments 2-4, or segments 5-9 only slightly indicated.

VARIABILITY: Males (n=39), length 37.56 (32-44), width 5.02 (4.45-5.55); females (n=20), length 41.9 (36-46), width 5.89 (5.35-6.3); collum generally with two brown spots, pale or dark, connected at median line, or sometimes not connected; rarely the collum is entirely white. Dorsal surface with metazonites almost completely white, except for a thin dark brown band along the anterior margin. Prozonites almost completely white or pale brown, except for a thin, dark



Figs. 11-14. Apex of telopodite of four species of *Cubodesmus*. 11, *C. ramsdeni*. 12, *C. prominens*. 13, *C. mariana*. 14, *C. yazminae*.

brown band along the posterior margin (the pro-metazonite union). Pleurites colored like prozonites. Epiproct and hipoproct white. Sternites light brown to white. Legs yellowish white or sometimes light brown or rarely reddish brown. Antennae lemon yellow. Dorsum flattened in males and slightly curved or convex in females. Tooth is present in anterior corner of paranota (2)-3-4-(5-12), at segment 2, sometimes only insinuated or absent; in 5-12 sometimes well defined, only indicated, or sometimes toothless. Posterior margin of paranota straight; without nodules or sometimes with a small nodule towards the rear region of the body; females sometimes with two small nodules. Peritremata present and well marked in both sexes. Female paranota not conspicuously reduced. Leg articles without granules or tubercules. Hypoproct not thickened, normal; occasionally somewhat thickened. Male with coxae of second pair of legs with small ventral tubercules; pronounced conical tubercules in sternum between the third pair of legs; and prominent rounded tubercules between the fourth pair.

TERATOLOGIES: Male 1582, right antenna with only 6 articles, atrophied. Male 1594, left paranotum of segment 5 without peritreme or pore. Female 1604, many atrophied legs throughout the body. Female 1572, left posterior leg of segment 10 atrophied.

DISTRIBUTION: Known only from type locality (Fig. 19). This is a remarkable locality for this genus, the species of which are otherwise restricted to the mountains of Oriente Province.

NOTE: The female specimen collected by Loomis (1933) under stones near the sugar factory "Jaronú" (now renamed as "Brasil") in Camagüey, and assigned by him as *C. proximus*, should belong, with no doubt, to this new species.

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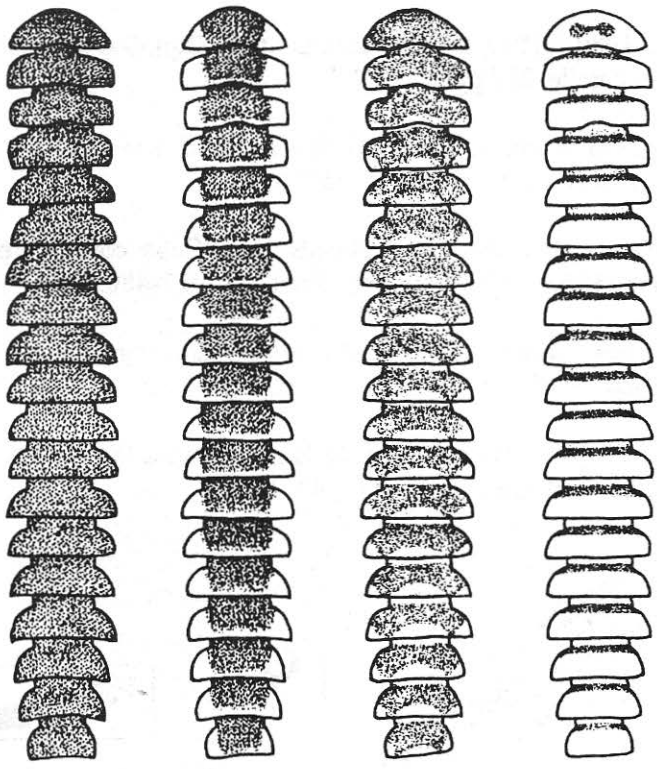

Figs. 15-18. Diagramatic color patterns of four species of *Cubodesmus*. 15, *C. prominens*. 16, *C. ramsdeni*. 17, *C. mariana*. 18, *C. yazminae*.

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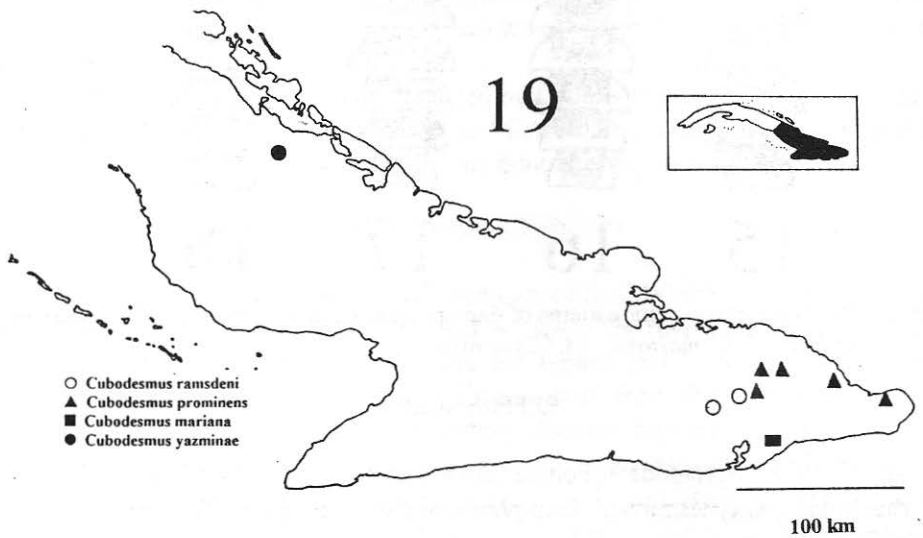

Fig. 19. Distribution of species of *Cubodesmus* in eastern Cuba.

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