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Diplocentrus colwelli, a new species of scorpion from northern Mexico (Diplocentridae)

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INTRODUCTION

Presently, only a single species of the genus *Diplocentrus* is known from northeastern México, *D. whitei* (Gervais) (Hoffman 1931). This species is dark brown to black and is quite large, with adults 65-75 mm long. Recent collecting in the mountains near Monterrey and El Potosí, Nuevo León, México has revealed the presence of a much smaller, more lightly-colored species. The description of this new species is the subject of the present paper.

Nomenclature and mensuration essentially follows that of Stahnke (1970), with the following exceptions: carinal terminology and cheliceral measurements are after Francke (1975, 1977) and trichobothrial terminology is after Vachon (1974). All measurements were taken with an American Optical Model 569 dissecting microscope equipped with an ocular micrometer calibrated at 10x.

Diplocentrus colwelli, new species (Figs. 1-11)

TYPE DATA.-MÉXICO: Nuevo León, Cañon de Huasteca, 3 mi S Santa Catarina, 22 May 1984 (W. D. Sissom, C. S. Colwell), holotype male (American Museum of Natural History), 9 paratype males, 1 paratype female (W. D. Sissom collection); Cerro Potosí (east slope), near El Potosí, 5 July 1966, (C. J. McCoy, A. V. Bianculli), 1 paratype female (California Academy of Sciences).

ETYMOLOGY. - This species is dedicated to my close friend, Christopher S. Colwell, who assisted in collecting the type series.

DISTRIBUTION. - Known only from two localities in Nuevo León, México.

DIAGNOSIS. - Adults 34-44 mm in length. Base color orange brown to reddish brown, with distinct dusky markings on carapace and tergites. Tergite VII not noticeably bilobed. Pectinal tooth counts: males, 10-13; females, 9-10. Metasoma V with ventrolateral carinae strong, composed of enlarged, subconical granules. Cheliceral fixed finger length/chela length ratio 0.53-0.66; movable finger length/chela length 0.84-1.00. Pedipalps: femur distinctly shorter than metasomal segment V; chela fixed finger distinctly shorter than carapace; movable finger length less than or equal to carapace length; outer chela palm moderately to strongly reticulate in males; dorsal face only reticulate in females. Chela length/width ratio 1.78-1.87 in males, 1.86-1.96 in females. Tarsomere II spine formula:

$$\frac{5}{6} \frac{5}{5} : \frac{5}{6} \frac{5}{6} : \frac{6}{7} \frac{6}{7} : \frac{6}{7} \frac{6}{7}$$

DESCRIPTION. - Based on males; measurements of the holotype

are given in Table 1.

PROSOMA: Carapace (Fig. 1) base color orange brown with distinct dusky pattern. Anterior median notch distinct, rounded, typically extending to posterior margin of first pair of lateral eyes. Anterior portion of carapace densely, coarsely granular; remainder of carapace densely, minutely granular. Median longitudinal furrow weak anteriorly; strong, deep, narrow posteriorly. Posterior lateral furrows moderately deep, curved. Coxosternal region light yellow brown, lustrous. Coxae and sternum sparsely setose.

MESOSOMA: Tergites orange brown to reddish brown, with distinct dusky pattern on anterior portions. Tergites I-VII monocarinate, with median carina weak, smooth. Tergites I-VI with dense minute granulation interspersed with sparse, coarse granulation. Tergite VII with moderately dense, coarse granulation, especially on posterior lateral portions; not noticeably bilobed. Pectines pale yellow, with 10-13 teeth (mode = 12). Sternites uniformly yellow brown; III-VI smooth, lustrous, moderately setose. Sternite VII tetracarinate: lateral carinae moderate, granulose; submedian pair moderate, smooth to weakly granular; posterior and lateral portions of sternite rather densely setose.

HEMISPERMATOPHORE (Figs. 2-3): tip of lamella distinctly tapered, coiled inside paraxial organ; lateral face of dorsal lobe with four weak crenulations.

METASOMA: Segments I-IV dark orange brown; V slightly darker than preceding segments. Segment I wider than long, II about as wide as long; III longer than wide; V 2.3 times longer than wide. Segments I-IV: Dorsolateral carinae on I-III moderate, granulose; on IV weak, smooth to feebly granular. Lateral suprmedian carinae on I-III strong, granulose; on IV moderate, subgranulose. Lateral inframedian carinae on I-II strong, granulose; on III moderate, granulose; on IV vestigial. Ventrolateral carinae on I-II strong, deeply crenulate; on III strong, crenulate; on IV moderate, irregularly granular. Ventral submedian carinae on I-III strong, irregularly granulose; on IV vestigial. Intercarinal spaces with sparse, coarse granulation; ventral and lateral spaces densely setose; setae of dorsal face flanking dorsolateral carinae. Segment V (Figs. 4-5): distinctly narrower than segments I-IV, with lateral sides parallel. Dorsolateral carinae weak, essentially smooth. Lateromedian carinae obsolete. Ventrolateral, ventromedian, and ventral transverse carinae strong, with distinctly enlarged, subconical granules (Figs. 4-5). Dorsal intercarinal space smooth, with sparse setation anteriorly; lateral and ventral intercarinal spaces smooth, densely setose.

TELSON (Fig. 5): reddish to orange brown. Dorsal surface slightly convex laterally, with moderate depression at proximal midline; sparsely setose. Ventral surface densely setose. Subaculear tubercle strong, rounded, covered with fine white microchaetes. Proximal margin of ventral surface with continuous row of 6-7 large, rounded granules.

CHELICERAE (Fig. 6): light yellow brown, lustrous, with subtle dusky mottling on dorsal surface of manus; teeth dark reddish brown. Distal end of manus dorsally with transverse row of 3-4 setae; movable finger dorsally with 3-4 setae. Ventral aspect of chelicerae with dense, fine, white macrochaetes. Chela length/width 1.27-1.42; fixed finger length/chela length 0.53-0.66; movable finger length/chela length 0.84-1.00. Movable finger with subdistal tooth not closely apposed to distal tooth.

PEDIPALPS: Femur (Fig. 7) orange brown, lustrous. Dorsointernal and ventrointernal carinae strong, irregularly granular. Dorsoexternal carina strong, irregularly granular proximally, smooth distally. Ventroexternal carina obsolete. Dorsal, internal, and ventral surfaces moderately granular; external surface smooth. Dorsal surface slightly convex. Orthobothriotaxia C.

Tibia (Fig. 8) reddish brown, lustrous. Dorsal carina strong, smooth. Ventrointernal carina weak, granular; ventroexternal carina weak, smooth. Basal tubercle of inner surface moderate; remainder of inner surface with moderately dense, fine granules. External surface convex, irregularly granular. Ventral face slightly convex, essentially smooth. Orthobothriotaxia C.

Chela (Figs. 9-11) orange brown to reddish brown, lustrous. Dorsal marginal carina strong, granular; dorsal secondary carina vestigial basally, weak to moderate distally, granular; digital carina strong, smooth. External secondary carina weak, smooth. Ventroexternal carina obsolete basally; present, strong on distal one-fourth of manus, irregularly granular. Ventromedian carina very strong, irregularly granular. Dorsal and external faces of manus moderately to strongly reticulate (Fig. 9), ridges smooth. Inner and ventral faces with irregular granulation and punctations. Dorsal surface of manus sparsely setose; internal and external surfaces moderately to densely setose; fixed and movable fingers densely setose. Inner margins of chela fingers with subtle scalloping. Orthobothriotaxia C. Chela length/width 1.78-1.87; fixed finger length/carapace length 0.62-0.68; movable finger length/metasomal segment V length 0.98-1.09.

LEGS: Proximal segments yellow brown; tarsi light yellow. Lateral surfaces of femora with fine granulation. Tarsomere II spine formula typically:

$$\frac{5}{6} \frac{5}{5} : \frac{5}{6} \frac{5}{6} : \frac{6}{7} \frac{6}{7} : \frac{6}{7} \frac{6}{7}$$

FEMALE. - The female paratype differs from the males in the following characters: carapace surface essentially smooth with sparse granulation near anterior margin; metasoma and telson less hirsute; pectinal tooth count 9-10; pedipalp femur, tibia, and chela less granular; dorsal and external faces of pedipalp chela manus with weak keels and feeble reticulations. The female differs morphometrically from the males as follows: pedipalp chela fixed finger length/carapace length 0.56-0.64; carapace length/metasomal segment V length 1.09-1.24; cheliceral chela length/width 1.43-1.48. Measurements of the paratype female from Cañon de Huasteca are given in Table 1.

VARIATION. - Significant variation occurs in pectinal tooth counts and tarsomere II spine counts. For males, 2 pectinal combs have 10 teeth, 3 have 11 teeth, 9 have 12 teeth and 6 have 13 teeth. For females, 3 combs have 9 teeth and 1 has 10.

Variation in tarsomere II spine counts is given in Table 2. Morphometric variation is summarized in Table 3.

The female from Cerro Potosí differs from the female from Cañon de Huasteca by being somewhat larger (total length about 44mm) and by having the dorsal margin of the pedipalp chela smoother (not granulose.)

COMPARISONS. - *Diplocentrus colwelli* is closely related to *D. spitzeri* Stahnke, *D. zacatenus* Hoffman, and *D. peloncillensis* Francke. It differs from these in the following characters: (1) male pedipalp chelae of *D. colwelli* have moderate to strong reticulations on the entire outer surface of the palm (with weak to moderate reticulations restricted to the dorsal surface in the other species); (2) pedipalp chela movable finger length/carapace length of 0.94-1.00 (greater than 1.03 in the other species); (3) pedipalp chela fixed finger length/carapace length 0.62-0.68 (greater than 0.72 in the other species); (4) total body length of 34-44 mm (greater than 44 mm in the other species); and (5) metasomal segment V with ventrolateral carinae strong, composed of enlarged, subconical granules (with ventrolateral carinae moderate, with medium-sized subconical granules in the other species).

Pectinal tooth counts differ slightly between the four species. The counts for males are as follows: *D. colwelli*, 10-13 (mode = 12); *D. spitzeri*, 13-16 (mode = 14); *D. peloncillensis*, 13-14 (mode = 13); and *D. zacatenus*, 12-16 (mode = 14). Sample sizes for female pectinal tooth counts are too low in these species to permit adequate comparisons, although counts for *D. colwelli* are somewhat lower.

Diplocentrus colwelli has significantly lower tarsomere II spine counts than *D. zacatenus* and *D. spitzeri*, and slightly lower counts than *D. peloncillensis*. The typical tarsomere II spine formulas for the four species are as follows:

<i>D. colwelli</i>				<i>D. spitzeri</i>											
5	5	5	5	6	6	6	6	6	6	6	6	7	7	7	7
6	5	6	6	7	7	7	7	6	6	6	7	7	7	7	7
<i>D. zacatenus</i>				<i>D. peloncillensis</i>											
5	5	6	6	7	7	7	7	5	5	6	6	6	6	6	6
7	7	7	7	7	7	7	7	6	6	6	7	7	7	7	7

Finally, *D. colwelli* has relatively shorter, wider pedipalp chelae than the other three species, although there is slight overlap with *D. zacatenus*. Chela length/width ratios for the four species are as follows: *D. colwelli*, 1.78-1.88; *D. zacatenus*, 1.86-1.92; *D. spitzeri*, 1.96-2.11; and *D. peloncillensis*, 2.20-2.38.

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Table 1. Measurements in mm and meristic characters of the male holotype and female paratype of *Diplocentrus colwelli*, new species.

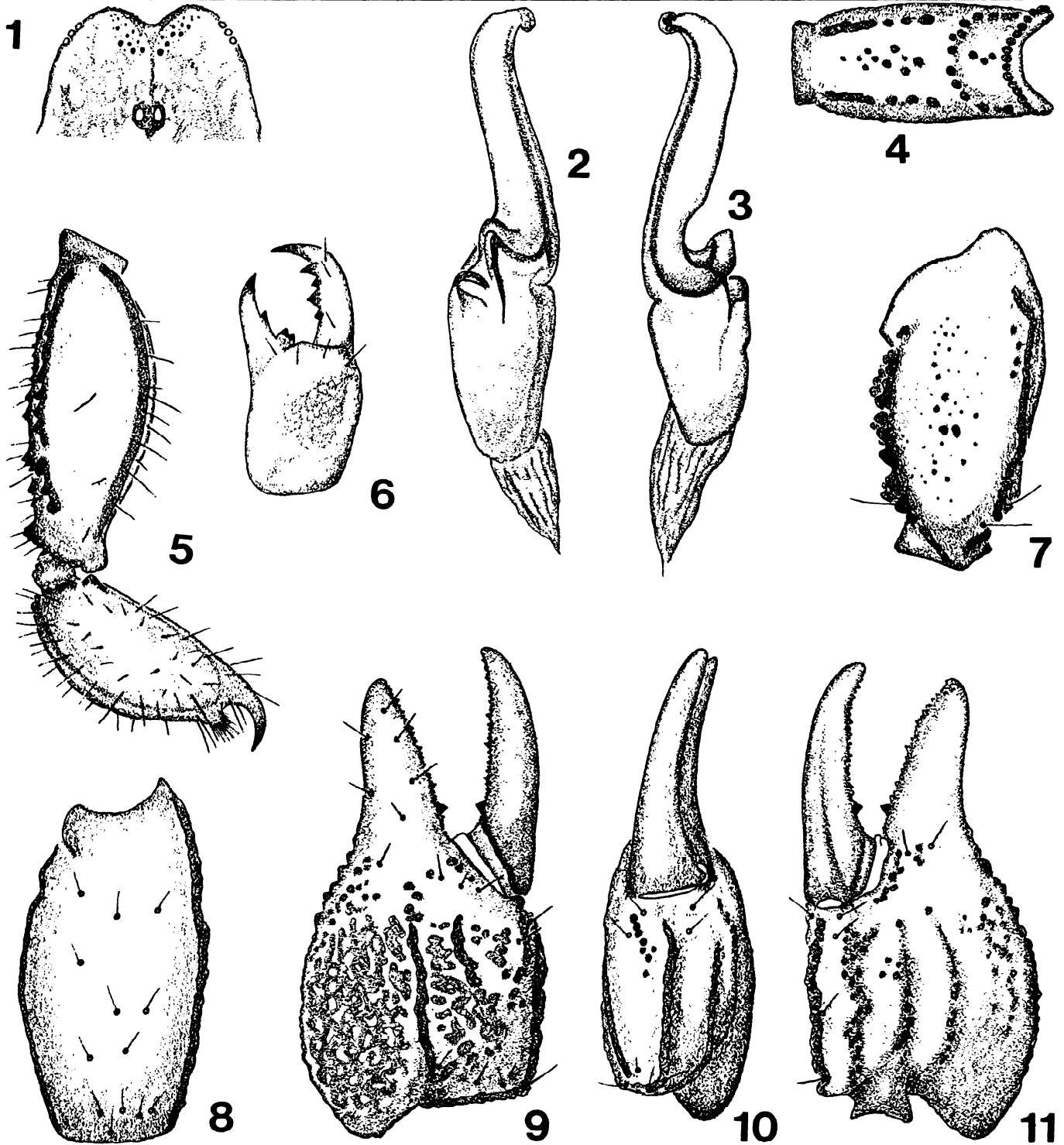
Character	Holotype male	Paratype female
Total length	36.2	34.9
Carapace length	4.6	4.6
Mesosoma length	12.0	12.9
Metasoma length	16.3	13.9
I length/width	2.5/2.8	2.2/2.7
II length/width	2.8/2.6	2.4/2.5
III length/width	3.0/2.5	2.6/2.5
IV length/width	3.6/2.3	3.0/2.3
V length/width	4.4/1.9	3.7/2.1
Telson length	3.9	3.5
Vesicle length/width/depth	3.0/1.7/1.5	2.7/2.1/1.7
Aculeus length	0.9	0.8
Pedipalp length	15.0	13.6
Femur length/width/depth	3.6/1.7/1.6	3.2/1.6/1.7
Tibia length/width/depth	3.9/1.8/2.2	3.5/1.6/2.1
Chela length/width/depth	7.5/4.0/2.2	6.9/3.7/2.5
Fixed finger length	3.0	2.6
Movable finger length	4.4	4.0
Chelicera: chela length/width	1.5/1.1	1.7/1.2
Fixed finger length	0.8	1.0
Movable finger length	1.5	1.6
Pectinal tooth count	12-11	9-10

Table 2. Variation in tarsomere II spine counts in *Diplocentrus colwelli*, new species (n = 12). On each specimen, the spines of the left and right legs of each pair were counted.

Leg	Margin	No. Spines				
		4	5	6	7	8
I	Prolateral	2	22			
	Retrolateral		13	11		
II	Prolateral	1	18	5		
	Retrolateral			23	1	
III	Prolateral			16	8	
	Retrolateral			1	23	
IV	Prolateral			18	6	
	Retrolateral				20	4

Table 3. Means (\bar{x}), standard deviations (sd), and ranges in morphometric characters in *Diplocentrus colwelli*, new species. Values in morphometric characters of the two females are given in as the range.

Character	males			females
	\bar{x}	sd	range	range
Pedipalps:				
Chela length/width	1.83	0.04	1.78-1.88	1.86-1.96
Fixed finger length/carapace length	0.65	0.02	0.62-0.68	0.56-0.64
Movable finger length/metasoma V length	1.02	0.03	0.98-1.09	1.02-1.08
Carapace length/metasoma V length	1.06	0.04	1.02-1.14	1.09-1.24
Chelicerae:				
Chela length/width	1.36	0.05	1.27-1.42	1.43-1.48
Fixed finger length/chela length	0.60	0.04	0.53-0.66	0.58-0.60
Movable finger length/chela length	0.95	0.05	0.84-1.00	0.91-1.00



Figs. 1-5. Morphology of *Diplocentrus colwelli*, new species: 1, anterior portion of carapace; 2, right hemispermaphore, mesal view; 3, right hemispermaphore, lateral view; 4, ventral aspect of metasomal segment V; 5, lateral aspect of metasomal segment V and telson.

Fig. 6. Dorsal aspect of right chelicera of *Diplocentrus colwelli*, new species, showing dentition and setation.

Figs. 7-11. Right pedipalp of *D. colwelli*, showing trichobothrial pattern, granulation, and carinal development (setae omitted): 7, dorsal aspect of femur; 8, external aspect of tibia; 9, external aspect of chela; 10, ventral aspect of chela; 11, internal aspect of chela.