Francke, O. F. 1975. A new species of *Diplocentrus* from New Mexico and Arizona (Scorpionida, Diplocentridae). J. Arachnol. 2:107-118.

A NEW SPECIES OF *DIPLOCENTRUS* FROM NEW MEXICO AND ARIZONA (SCORPIONIDA, DIPLOCENTRIDAE)

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ABSTRACT

The scorpion *Diplocentrus peloncillensis* new species (Scorpionida, Diplocentridae) is described from specimens collected in the Peloncillo Mts. and Guadalupe Mts. of New Mexico and Arizona. Related to *D. spitzeri* Stahnke and *D. keyserlingi zacatecanus* Hoffmann, it can be separated from these two species by the tarsomere II spine formula and by several morphometric differences, most important of which are the relative lengths of the pedipalp humerus and metasoma segment V. Brief ecological observations on the new species are reported.

INTRODUCTION

Taxonomically, the species belonging to the genus *Diplocentrus* Peters (1861) have been largely neglected in the United States, with most published records before 1967 being erroneously referred to either Mexican or Antillean taxa. Since then, two species belonging to this genus have been described from the continental United States. *Diplocentrus bigbendiensis* Stahnke (1967) is a large species, with adults commonly reaching 65-75 mm in total length. It has a dark brown to black coloration and occurs in the Big Bend region of Texas. *Diplocentrus spitzeri* Stahnke (1970) is smaller, with the adults never exceeding 50 mm in total length. It is medium brown in coloration and has been found only in Santa Cruz Co., Arizona, and in adjacent areas in Sonora, Mexico. The new species described in this paper is closely related to *D. spitzeri*, but comes from the Peloncillo Mts., Hidalgo Co., New Mexico, and Guadalupe Mts., Cochise Co., Arizona. The physiological study by Crawford and Wooten (1973) on specimens from the Peloncillo Mts., reported as being *D. spitzeri*, is here referred to this new species.

Diplocentrus peloncillensis, new species

Diagnosis–Medium sized, adult length not exceeding 50 mm. Light brown with well defined, light fuscous pattern; median ocular tubercle not contrasting sharply with surrounding areas by its coloration. Carapace shorter than movable finger of pedipalp chela. Metasoma V shorter than pedipalp humerus in adult males, approximately equal in length in females and immatures; humerus with dorsal surface flat. Tergum VII with indistinct keels, sternum VII four keeled. Cheliceral fixed finger approximately half as long as chela. Tarsomere II spine formula:

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

Pectinal teeth count 13-14 in males, 11-12 in females.

Holotype–Male (measurements in Table 2).

Prosoma. Carapace light brown with well defined, light fuscous pattern, slightly darker on median ocular tubercle but not contrasting sharply with surrounding areas. Lateral eyes with uniform black pigment, sharply contrasting with surrounding areas. Anterior median notch obtusely angular, not extending beyond posterior margin of second pair of lateral eyes. Antero-lateral margins sparsely hirsute, with three pairs of lateral eyes. Anterior median furrow shallow, vestigial towards and over median ocular tubercle. Posterior median furrow distinct, shallow on anterior two-thirds, abruptly deeper distally for one-fifth total carapace length to posterior margin. Posterior marginal furrow moderately deep, not connected to posterior lateral furrows. Posterior lateral furrows obtusely angular; posterior two-fifths vestigial, parallel to posterior median furrow; anterior three-fifths divergent, moderately deep, ending abruptly at lateral sixth of posterior carapace width. Anterior submargin moderately granulose; carapace surface densely, minutely granulose. Maxillary lobes light yellow; internal surface with dense, white microchaetae; ventral surface with sparse, erect, brown macrochaetae. Coxae light yellow, with sparse macrochaetae marginally. Sternum light yellow; subpentagonal, posterior third with deep longitudinal furrow; anterior half moderately hirsute, posterior half sparsely hirsute.

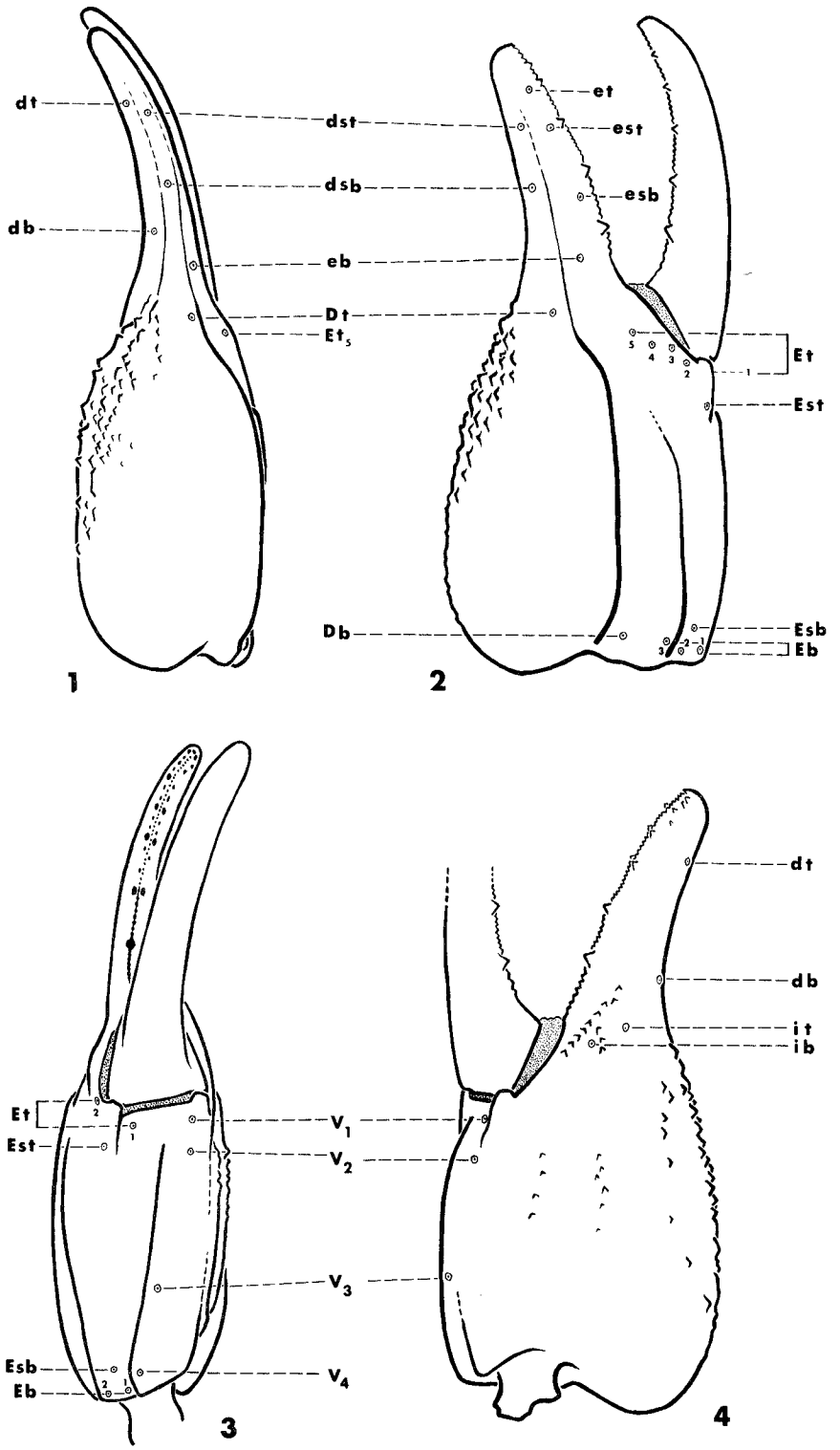
Mesosoma. Terga light brown with well defined, light fuscous pattern; posterior and lateral margins sparsely hirsute. Terga I-VI surfaces with dense, minute granules. Tergum VII with median and lateral keels indistinct, lateral lobes moderately granulose; posterior submargin vestigially granulose dorsally, weakly granulose laterally; surface granules dense, minute. Genital operculi light yellow, ovoid, divided, with sparse macrochaetae. Genital papillae large, extending beyond posterior margins of operculi. Pectines white; basal plate approximately twice as broad as long, anterior margin slightly notched medially. Marginal and middle lamellae with sparse to moderate, erect macrochaetae; middle lamellae 4-5. Fulcra subtriangular, with 1-2 depressed white microchaetae distally. Pectinal teeth count 12-14, each tooth approximately 3.5 times longer than broad. Sterna light yellow, lateral and posterior margins feebly hirsute. Sterna III-VI smooth; stigmata slightly depressed, three times longer than broad. Sternum III with disc moderately hirsute, with posteriorly depressed and suberect macrochaetae irregularly set on inverted "V" pattern, outlining resting position of pectines. Sterna IV-VI with inverted "V" macrochaetal pattern vestigial. Sternum VII four keeled, each keel with 4-5 erect macrochaetae; median keels with anterior half obsolete, posterior half indistinct to weak; lateral keels with anterior third vestigial to weak, posterior two-thirds moderately strong.

Metasoma. Proximally light brown, distally darkening gradually to medium brown. Dorsal surfaces bare; lateral and ventral surfaces sparsely to moderately hirsute, with slight density increase distally. Inferior median keels parallel: feebly crenate, moderately strong on I-II; weak, smooth on III; obsolete on IV. Inferior lateral keels subparallel: crenate, strong on I-II; moderately strong, smooth on III; vestigial on IV. Lateral keels: moderately strong, coarsely crenate, complete on I; vestigial on II; obsolete on III-IV. Dorsal lateral keels: moderately strong, coarsely crenate on I; weak, smooth to feebly crenate on II-III; vestigial on IV. Dorsal median keels weak: short, granular on I; feebly crenate to smooth on II-IV. Metasoma V shorter than pedipalp humerus. Inferior median and inferior lateral keels irregular; proximal one-fourth vestigial, central half weakly to moderately granulose, distal fourth with large conical granules. Lateral and dorsal keels obsolete. Distal crescent with convex margin with large conical granules; disc

with six medium to small, irregularly placed granules. Anal arc circular, weakly lobed; anterior transverse anal crest strong, with nine oblong granules; posterior transverse anal crest weak, vestigially granulose. Telson slightly wider than metasoma V: vesicle dorsally smooth, sparsely hirsute; lateral and ventral surfaces smooth, moderately hirsute, proximal submargin with clusters of 3:3:3 medium sized granules. Subaculear tubercle strong, rounded, densely covered with erect white microchaetae. Aculeus dark brown, short, sharply curved.

Chelicera. Chela light yellow, movable and fixed fingers light brown, teeth dark brown to black. Inferior surfaces of chela and fingers densely covered with long, anteriorly depressed and suberect, distally curved white hairs. Chela length measured dorsally along midline to fixed finger internal base; width measured dorsally at widest point; chela width/length ratio 0.66. Fixed finger sharply curved distally, internal margin with two teeth; basal tooth with two subequal cusps, distal tooth pointing to finger tip. Length measured from proximal base of bicuspid tooth to finger tip; fixed finger length/chela length ratio 0.50. Movable finger sharply curved distally; forked, inferior tine four times longer than superior tine. Internal dorsal margin with three teeth; middle tooth largest, distal tooth on superior tine base. Length measured from dorsal external articulation to extreme tip of inferior tine; movable finger length/chela length ratio 0.88.

Pedipalps. Humerus light brown. Internal dorsal and internal ventral keels strong, irregularly granulose; external dorsal keel with proximal half moderately strong, granulose, distal half vestigial; external ventral keel obsolete. Dorsal face flat, surface feebly granulose on internal margin, with one proximal trichobothrium on external margin. Internal face slightly concave dorsoventrally, with dense irregular granules; margins sparsely hirsute, with one proximal trichobothrium on dorsal margin. External face smooth, with one dorsal trichobothrium approximately one-third of humerus length from base. Brachium light brown. Dorsal keel strong, smooth; internal ventral keel weak to moderate, irregularly granulose; external ventral keel smooth, proximal two-thirds weak, distally vestigial. Internal face densely and minutely granulose, with three trichobothria on dorsal margin. Ventral face flat, smooth; external margin with three trichobothria on proximal half. External face with two vestigial keels, feebly reticulate; 13 trichobothria as follows: five basal, two suprabasal, two median, one subterminal, three terminal. Chela medium brown, trichobothrial pattern as in Figs. 1-4 (nomenclature after Vachon, 1973). Dorsal margin of manus irregularly granulose; proximal half with small granules, distally with coarse overlapping granules extending to base of fixed finger. Digital keel smooth, strong to fixed finger base, abruptly weaker at base and along fixed finger. Ventral keel smooth, strong, oblique to midpoint of movable finger articulation. Dorsal secondary keel vestigial to obsolete. External secondary keel moderately strong, smooth, parallel to digital keel, ending gradually approximately three-fourths length of latter. Dorsal face (dorsal margin to digital keel) feebly convex proximally, with distal third flat to slightly concave; bare, weakly reticulate with dense, minute pores on ridges. External face (digital keel to ventral keel) longitudinally divided by external secondary keel, upper and lower surfaces obtusely angular; upper surface bare, weakly reticulate with moderate, minute pores on ridges; lower surface vestigially reticulate, moderately hirsute. Internal face with median longitudinal concavity where chela flexes against brachium, dorsal and ventral margins of concave area weakly granulose distally. Internal dorsal surface convex, with coarse irregular granules distally. Internal ventral surface convex, one vestigial longitudinal keel oriented towards internal base of movable finger; vestigially reticulate, moderately hirsute. Fixed finger gently curved,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dorsal and digital keels vestigial to obsolete; densely hirsute, setae arising from shallow pits creating regularly punctate appearance. Movable finger longer than carapace, densely hirsute.

Walking legs. Light yellow. Trochanter, femur, tibia sparsely hirsute; tarsomeres I and II moderately hirsute. Femoral dorsal margin vestigially granulose, ventral margin weakly granulose. Tarsomere II spine formula:

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

Allotype–Female (measurements in Table 2), differs from holotype as follows.

Prosoma. Carapace anterior submarginal granules weak. Surface smooth; anterolateral region behind lateral eyes with minute, vestigial granules.

Mesosoma. Terga I-VI with surfaces smooth. Tergum VII with keels indistinct, lateral lobes weakly granulose; lateral surfaces moderately, minutely granulose. Genital operculi ovoid, fused; genital papillae absent. Pectines: right pectine broken off proximally, teeth absent; left pectine with second marginal lamellae fused to middle lamellae, vestigial sutures outline two middle lamellae. Pectinal teeth count ?-12, each tooth approximately 2.5 times longer than broad. Sterna: sternum III with discal macrochaetae sparse, on irregular inverted "V" pattern; sternum VII lateral keels weak to vestigial, not reaching anterior margin.

Metasoma. Inferior median and inferior lateral keels on I-III granulose. Metasoma V length equal to pedipalp humerus length; anterior transverse anal crest with ten oblong granules. Telson conspicuously wider than metasoma V.

Chelicera. Chela length/width ratio is 0.69, fixed finger length/chela length ratio is 0.51, movable finger length/chela length ratio is 0.93.

Pedipalps. Brachium internal face with dense, extremely minute granules; external face smooth, keels and reticulation obsolete. Chela with dorsal margin weakly and irregularly granulose distally; reticulation on all surfaces obsolete, minute pores retaining reticular configuration. Digital keel obsolete on chela and fixed finger, vestigial at fixed finger base. Dorsal secondary and external secondary keels obsolete.

Walking legs. Femora I-II with dorsal and ventral margins vestigially granulose, femora III-IV with margins smooth. Tarsomere II spine formula:

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

Improper preservation has resulted in general darkening of cuticle to deep red-brown in all structures.

Type data–Holotype male: Geronimo Pass (1780 m), Peloncillo Mts., Hidalgo Co., New Mexico, 8 June 1973 (O. F. Francke). Collected by ultra-violet detection and preserved according to the method recommended by Williams (1968). Deposited in the collection of the American Museum of Natural History, New York. Allotype female: same locality as holotype, August 1969 (Nick Bucknall). Deposited in the collection of the American Museum of Natural History.

In addition to the primary types, the following specimens were studied: five paratopotype males; two adults deposited in the collection of the California Academy of

Figs. 1-4.–*Diplocentrus peloncillensis* holotype male from Geronimo Pass (1,780 m), Peloncillo Mts., Hidalgo Co., New Mexico. Trichobothria on the right pedipalp chela: 1, dorsal; 2, external; 3, ventral; 4, internal.

Sciences, San Francisco, two adults and one immature in the author's collection. One immature female from Guadalupe Canyon, Guadalupe Mts., 28 mi E Douglas, Cochise Co., Arizona, 11 June 1968 (Vincent Roth); in the collection of the Southwestern Research Station of the American Museum of Natural History at Portal, Arizona.

Etymology—This species is named after the Peloncillo Mts. of New Mexico and Arizona.

COMPARATIVE DESCRIPTION AND ANALYSIS OF VARIABILITY

Diplocentrus peloncillensis is closely related to *D. spitzeri*; the separation of these two taxa often requires the use of more than one character, most of which are subject to intraspecific variation and require special consideration. Color differences exist between adults: in *D. spitzeri* the carapace and terga have a diffuse, indefinite fuscous pattern, and the median ocular tubercle is uniformly dark brown or black, contrasting sharply with the surrounding areas; in *D. peloncillensis* the carapace and terga have a well defined, light fuscous pattern, and the median ocular tubercle does not contrast sharply with the surrounding areas. Immatures of both species are pale yellow, without fuscosity on the carapace and terga.

A slight tendency towards a lower pectinal teeth count occurs in *D. peloncillensis* males as compared to *D. spitzeri* males (Table 1). Whether this tendency is present in females also cannot be determined at this time due to the small sample size. This character is known to be fixed at birth, and the data given for *D. spitzeri* include ten first instar counts (8 ♂♂, 2 ♀♀).

Tarsomere II spine counts variability and differences given in Table 3. From this table it can be determined that the "typical" spine formulas are: *D. peloncillensis*

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

and *D. spitzeri*

$$\frac{6\,6}{6\,6} : \frac{6\,6}{6\,7} : \frac{7\,7}{7\,7} : \frac{7\,7}{7\,7}.$$

The posterior margin of tarsomere II on the second pair of legs has 6-7 spines with equal frequency. These spines do not appear until the second instar, but from this point in life they are fixed, and the variability observed is not due to either age or sex. It must also be mentioned that in Stahnke's (1970) original description of *D. spitzeri* two different tarsomere II formulas are given; on p. 26 it is

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

whereas on p. 28 it becomes

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

with discrepancy on the posterior margin of the first pair of legs. Based on 42 specimens studied from several localities, I conclude that the former is definitely incorrect; the latter approximates the one found in this study, but since no variability is considered its usefulness decreases.

Morphometric differences are quite significant between *D. peloncillensis* and *D.*

Table 1. Pectinal teeth counts.

		D. peloncillensis		*D. spitzeri*	
		No. Observed	Percent	No. Observed	Percent
Males	16			1	1.72
	15			23	39.66
	14	4	33.33	30	51.72
	13	8	66.67	4	6.90
		12	100.00	58	100.00
Females	13			8	19.05
	12	1	33.33	17	40.48
	11	2	66.67	14	33.33
	10			3	7.14
		3	100.00	42	100.00

Table 2. Measurements (in millimeters) of *Diplocentrus peloncillensis* Francke, new species, holotype and allotype.

	Holotype ♂	Allotype ♀
Total length	46.10	48.50
Carapace: length	6.00	6.20
width, anterior/posterior	3.20/6.00	3.60/6.80
width at median eyes	5.05	5.60
Mesosoma length	15.60	18.00
Metasoma length	24.50	24.30
I length/width	3.10/3.20	3.00/3.30
II length/width	3.50/2.90	3.30/2.90
III length/width	3.80/2.75	3.60/2.80
IV length/width	4.10/2.55	4.00/2.60
V length/width	5.20/2.10	5.20/2.20
Telson length	4.80	5.20
Vesicle length/width	4.00/2.30	4.20/2.70
depth	1.80	2.10
Aculeus length	0.80	1.00
Pedipalp length	22.10	21.80
Humerus: length/width	5.50/2.05	5.20/2.10
Brachium: length/width	5.30/2.10	5.30/2.30
Chela: length/width	11.30/4.95	11.50/5.20
depth	3.05	3.40
Movable finger length	6.70	6.90
Fixed finger length	4.85	4.90
Chelicera: chela length/width	2.10/1.40	2.25/1.55
Movable finger length	1.85	2.10
Fixed finger length	1.05	1.15

spitzeri, as shown in Table 4. These ratios were not chosen haphazardly; all the structures listed in Table 2 were measured in *D. spitzeri* (n=39), *D. peloncillensis* (n=8), *D. bigbendiensis* (n=43), and an undescribed species of *Diplocentrus* (n=63). Correlation coefficients were determined for all possible combinations of paired measurements; initially for the entire sample of each species, subsequently for each sex and age class considered in Table 4 so that these variables would be eliminated from the correlation coefficients analysis. Significant correlation at the 95 percent level of confidence (Steel and Torrie, 1960) was found in 180 instances, and ratios were figured in each case. Analysis of these 180 ratios showed that 102 of them did not reflect any differences at the specific level and were discarded, 31 are useful in separating *D. peloncillensis*

Table 3. Variability and differences observed in tarsomere II spine counts.

Leg	Margin	No.	*D. peloncillensis* n. sp. Frequency	Percent	*D. spitzeri* Stahnke Frequency	Percent
I	anterior	5	11	73.33	29	36.71
		6	4	26.67	50	63.29
			15	100.00	79	100.00
	posterior	5			1	1.27
		6	11	73.33	60	75.95
		7	4	26.67	18	22.78
			15	100.00	79	100.00
II	anterior	5	2	12.50	4	4.94
		6	14	87.50	71	87.65
		7			6	7.41
			16	100.00	81	100.00
	posterior	6	9	56.25	39	48.15
		7	7	43.75	42	51.85
			16	100.00	81	100.00
III	anterior	6	11	68.75	20	25.64
		7	5	31.25	58	74.36
			16	100.00	78	100.00
	posterior	6	3	18.75	1	1.28
		7	12	75.00	73	93.59
		8	1	6.25	4	5.13
			16	100.00	78	100.00
IV	anterior	6	11	68.75	11	13.58
		7	5	31.25	70	86.42
			16	100.00	81	100.00
	posterior	6	1	6.25	3	3.70
		7	14	87.50	70	86.42
		8	1	6.25	8	9.88
			16	100.00	81	100.00

and *D. spitzeri* from the other two species included in this study, and 47 indicated the presence of morphometric differences between the two species under discussion. Further analysis of the structures involved in the significant ratios revealed that 28 reflected differences between the pedipalps and other structures, seven involved two separate measurements of the pedipalps, seven showed differences between telson measurements and structures other than the pedipalps, and the remaining five dealt with carapacial and metasomal structures. Redundancy and repetition were eliminated by pooling measurements in some ratios, e.g., total pedipalp length (B and C), and metasoma I-V length (C); and by creating composite ratios (C, F, and J).

The differences appearing in Table 4 are subjectively summarized in Table 5. In both *D. peloncillensis* and *D. spitzeri* the only ratio showing marked allometric growth differences in both sexes is B (carapace length/pedipalp length), and since neither ratio A (carapace length/metasoma V length) nor B indicate sexual dimorphism in immatures, it can be concluded that the observed differences are the result of a relative elongation of the pedipalps in adults, especially males. The moderate allometricity indicated by ratio D (carapace length/pedipalp chela width) is also due to a relative increase in pedipalp chela width with age.

In ratios A, C (metasoma I-V length/pedipalp length), F (vesicle width + vesicle depth/telson length), and J (humerus length + brachium length/pedipalp chela length)

Table 4. Morphometric ratios for *Diplocentrus peloncillensis* and *D. spitzeri* Stahnke, listed as follows: high, low, mean.

		D. peloncillensis				*D. spitzeri*			
	NUMERATOR/ DENOMINATOR	ADULTS		IMMATURES		ADULTS		IMMATURES	
		♂	♀	♂	♀	♂	♀	♂	♀
		n=5	n=1	n=1	n=1	n=17	n=9	n=4	n=9
A	Carapace L/	1.154				1.137	1.378	1.370	1.405
	Metasoma V L	1.110				1.058	1.265	1.329	1.310
		1.124	1.192	1.298	1.333	1.096	1.296	1.344	1.348
B	Carapace L/	0.272				0.305	0.337	0.364	0.356
	Pedipalp L	0.258				0.288	0.319	0.338	0.340
		0.264	0.282	0.308	0.331	0.297	0.328	0.352	0.349
C	Metasoma I-V L/	0.916				1.033	0.952	0.967	0.966
	Pedipalp L	0.881				0.960	0.906	0.915	0.914
		0.894	0.868	0.901	0.887	0.996	0.930	0.946	0.937
D	Carapace L/	1.212				1.244	1.350	1.500	1.520
	Pedipalp chela W	1.183				1.125	1.220	1.347	1.333
		1.193	1.192	1.359	1.419	1.192	1.277	1.414	1.417
E	Metasoma I W/	1.625				1.600	1.550	1.528	1.444
	Metasoma V W	1.524				1.429	1.364	1.333	1.357
		1.554	1.500	1.562	1.438	1.483	1.462	1.422	1.411
F	Vesicle W + D/	0.854				0.956	1.070	1.088	1.054
	Telson L	0.814				0.857	1.010	1.000	0.960
		0.837	0.923	0.938	1.031	0.903	1.039	1.036	1.013
G	Metasoma V L/	0.817				0.912	0.824	0.879	0.879
	Movable finger L	0.743				0.810	0.759	0.839	0.771
		0.773	0.754	0.788	0.825	0.872	0.787	0.851	0.821
H	Pedipalp chela W/	0.755				0.836	0.836	0.828	0.811
	Movable finger L	0.700				0.769	0.783	0.788	0.750
		0.729	0.754	0.753	0.775	0.801	0.798	0.810	0.781
I	Humerus L/	1.068				0.926	0.978	0.926	0.926
	Metasoma V L	1.028				0.865	0.898	0.862	0.862
		1.050	1.000	1.000	0.970	0.895	0.927	0.899	0.898
J	Humerus L +	0.985				0.978	0.917	0.927	0.926
	Brachium L/	0.941				0.919	0.865	0.888	0.873
	Pedipalp chela L	0.954	0.913	0.918	0.928	0.952	0.890	0.908	0.895
K	Metasoma V W/	1.024				1.278	1.278	1.364	1.364
	Humerus W	0.974				1.059	1.111	1.200	1.125
		1.000	1.048	1.067	1.067	1.176	1.206	1.272	1.242
L	Pedipalp chela L/	2.385				2.111	2.150	2.154	2.320
	Pedipalp chela W	2.204				1.956	1.979	2.038	2.026
		2.313	2.212	2.297	2.226	2.056	2.057	2.105	2.142

Table 5. Synthesis of information provided by morphometric ratios A-L presented in Table 4 (• ranges do not overlap, ○ range overlap 10 percent or less).

	Ratios	A	B	C	D	E	F	G	H	I	J	K	L
Allometry	♂♂	•	•	○	•		•				○		
	♀♀		•		○								
Dimorphic		•	•	•			•				•		
Specific			•	•			•	•	•	•		•	•

where allometric growth differences are present only in males, it is found that immature males are morphometrically indistinguishable from females, both adult and immature, so the differences point to male secondary sexual characters: metasoma V, and telson being relatively longer and narrower; the pedipalps are longer, with the humerus and brachium contributing proportionately more than the chela to this increase in length. Also very interesting is the fact that those ratios indicating allometric growth rates are the same ones that reflect marked sexual dimorphism in the adults.

Analyzing the differences present at the specific level it can be seen that despite sexual dimorphism and allometric growth rates, ratios B, C, and F are useful in separating *D. peloncillensis* from *D. spitzeri*. However, ratios G(metasoma V length/movable finger length), H (pedipalp chela width/movable finger length), I (humerus length/metasoma V length), K (metasoma V width/humerus width), and L(pedipalp chela length/pedipalp chela width) are especially significant in that they do not change with age or sex in either species, yet reflect significant differences at the specific level. In *D. peloncillensis* metasoma V is slightly longer and narrower, the brachium and humerus are considerably longer and narrower, the pedipalp chela is longer but its width remains the same, and the movable finger of the pedipalp chela is proportionately longer while maintaining the same relationship to the chela length.

At this time it can only be guessed as to what biological function these morphometric differences reflect, since very little is known of the biology, ecology, and behavior of scorpions, Diplocentrids in particular.

Other less noticeable differences between *D. spitzeri* and *D. peloncillensis* have been found. With most trichobothria intraspecific variability is as great as if not greater than interspecific variability; but in *D. peloncillensis* Eb_1, Eb_2, and Esb form and equilateral triangle, and in *D. spitzeri* these form a scalene triangle. In *D. peloncillensis* the dorsal face of the humerus is completely flat, and in *D. spitzeri* it is convex on the proximal third to one-half.

Variability in the number of lateral eyes occurs at low frequencies, but indicates that this is not as stable a character as it has been thought to be, and its use in scorpion classification at the supraspecific level should be carefully reconsidered. One paratopotype of *D. peloncillensis* has four lateral eyes on the right side instead of the "normal" three, and two adult males of *D. spitzeri* have only two lateral eyes on the left side.

Diplocentrus peloncillensis is also related to *D. keyserlingi zacatecanus* Hoffmann (1931), but in the latter species the humerus is shorter than metasoma V in adult males, the pedipalp chela is shorter (chela length/chela width ratio is 1.859), and the tarsomere II spine formula is

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

ECOLOGICAL NOTES

Geronimo Pass in the Peloncillo Mts., Hidalgo Co., New Mexico, consists of a small saddle (approximately 300 m X 80 m) at an elevation of 1,780 m (5,840 ft) with an E-W orientation. The north-facing and south-facing slopes are moderately steep (approximately 18°-20°). The north-facing slope has a moderate amount of rocks (10 cm-50 cm greatest dimension) resting loosely on fine soil. The south-facing slope has large boulders and rock outcrops on similar type of soil, but few loose rocks.

Unlike other north- and south-facing slopes at this latitude (31°30'N), in Geronimo Pass the south-facing slope has higher vegetation density than the north-facing slope. The south-facing slope has a moderate to dense cover of low shrubs, predominantly scrub oak (*Quercus* sp.) and several species of grasses (Gramineae). The saddle and north-facing slope show signs of overgrazing and the vegetation includes scrub and tree oaks (*Quercus* sp.), pinyon pine (*Pinus edulis* Engelmann), one-seed juniper [*Juniperus monosperma* (Engelmann) Sargent], bear-grass (*Nolina microcarpa* Watson), cholla (*Cylindropuntia* sp.), prickly-pear (*Opuntia* sp.), soap tree yucca (*Yucca elata* Engelmann), and grasses (Gramineae).

Some of the larger rocks on the north side of the saddle, and at the base of the north-facing slope have burrows underneath. Excavating five of them produced one large centipede (*Scolopendra* sp.), and two *D. peloncillensis*: one immature male from a vertical burrow 13 cm deep, elliptical in cross section; one adult male from a vertical burrow 21 cm deep, also elliptical in cross section, that terminated in a small chamber (4 cm × 2.5 cm × 1.5 cm) at 45° from the vertical axis of the burrow. Two specimens of the dark phase of the scorpion *Centruroides sculpturatus* Ewing were also collected under rocks lacking burrows.

Black-lighting (U. V. detection) for scorpions produced negative results on the south-facing slope, but the saddle and north-facing slope yielded four additional males of *D. peloncillensis*, seven *C. sculpturatus*, one adult *Uroctonus apacheanus* Gertsch and Soleglad, and two adult *Vaejovis vorhiesi* Stahnke. Crawford and Wooten (1973) also found *D. peloncillensis* only on north-facing slopes, in burrows under rocks.

It is reasonable to assume that the occurrence of *D. peloncillensis* on north-facing slopes in the Peloncillo Mts. is determined by the availability of suitable microhabitats, and that rock cover is the limiting factor in south-facing slopes. A rock over the entrance of a vertical burrow shields these photonegative scorpions from direct sunlight, reduces temperatures inside the burrow, prevents flooding by rains, and might deter potential predators.

ACKNOWLEDGMENTS

The author expresses his sincere gratitude to Dr. Mont A. Cazier of Arizona State University (A.S.U.) for the constant encouragement and assistance provided in the course of this work; Dr. Frank F. Hasbrouck (A.S.U.) and Dr. Neil F. Hadley for valuable criticisms of the manuscript. Dr. Willis J. Gertsch, Curator Emeritus of the American Museum of Natural History, loaned me the female designated as allotype; Vincent D. Roth, Director of the Southwestern Research Station of the American Museum of Natural History at Portal, Arizona, collected and loaned me the immature female from Guadalupe Canyon; Dr. Stanley C. Williams and Dr. Robert X. Schick of the California Academy of Sciences arranged for the loan of the specimens deposited at that institution; and finally, Mr. David Bailey (A.S.U.) who wrote the computer programs used in this study.

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