Systematic studies on the genus *Megacormus* (Scorpiones, Chactidae, Megacorminae), with descriptions of a new species from Oaxaca, Mexico and of the male of *Megacormus segmentatus* Pocock

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Abstract

A new species of the genus *Megacormus* Karsch from the Mexican state of Oaxaca is described. The new species is most similar to *M. segmentatus* Pocock, with which it is compared; the two species are most readily separated by male characters. The male of *M. segmentatus* is also described, based on material from two new localities in Veracruz. Hemispermatophores of three of the four species in the genus are illustrated, providing evidence of their usefulness in species level taxonomy. Finally, new records for *M. gertschi* Diaz, including the first accurate localities in Puebla, are given.

Introduction

The genus *Megacormus* Karsch, revised by Soleglad (1976) more than 15 years ago, is represented by three species from eastern and central Mexico. Only one of these, *M. gertschi* Diaz Najera, is relatively well known; the other species, *M. granosus* Karsch and *M. segmentatus* Pocock, are known only from a handful of female specimens from a few localities in Veracruz and Oaxaca, Mexico.

Some new *Megacormus* material was made available from the collections of the Museum of Comparative Zoology (MCZ), the Muséum National d'Histoire Naturelle (MNHN), the Texas Memorial Museum (TMM), and the Instituto de Biología "Los Tuxtlas" (IBLT). Among this material are some important new specimens (including males) and records of *M. segmentatus* and *M. gertschi*, as well as a male and four females representing a new species from Oaxaca. As a result, a description of the male of *M. segmentatus* and a description of the new species are provided here; hemispermatophores for three of the four species in the genus *Megacormus* are illustrated (two of the species are illustrated for the first time); and the new records for *M. gertschi* are listed.

Megacormus grubbsi, new species (Figs. 1-4, 8)

Megacormus segmentatus, Soleglad 1976: 277 (part ?; Oaxacan specimens only).

Type Data. Holotype male from Cerro Ocote, 5 mi S. Tenango in April 1987 (A. Grubbs, A. Cressler, and P. Smith); deposited in the American Museum of Natural History.

Etymology. The specific epithet is a patronym honoring Andrew Grubbs for his important scorpion collections and contributions to Mexican speleology.

Distribution. Known only from northern Oaxaca, Mexico.

Diagnosis. Adult males about 30 mm in length, adult females about 35-40 mm. Pectinal tooth count 6 in males, 4-6 in females; anterior and middle lamellae well developed. Metasoma: ratio of III length/width 0.98-1.14; of V length/width, 2.39-2.82. Telson globose, 1.06-1.18 times wider than

maximum width of metasomal segment V. Pedipalp patella with 20 external trichobothria (3 *et*, 4 *est*, 4 *em*, 2 *esb*, 7 *eb*) and 7 ventral trichobothria (designations after Soleglad 1976). Pedipalp femur length/width, 2.69-3.21. Male with strong scalloping on pedipalp chela fixed finger, matched by distinct lobe on movable finger; ratio of movable finger length/carapace length 1.04-1.05. Ventral aspect of femur and patella of leg essentially smooth.

Description of Holotype Male. Coloration: Carapace, tergites, metasoma, and pedipalps orange brown to dark orange brown; venter light orange brown. Most cuticular surfaces with moderate to strong dark underlying markings; telson with distinct ventromedian dusky stripe, but otherwise with diffuse dusky pigment. Pectines yellowish, with dusky markings on pectinal shaft.

Prosoma: Carapace: Coarse granulation present throughout, but more dense on medial areas. Lateral ocular carinae irregular, composed of medium-sized granules; posterior median carinae well developed, with irregularly-spaced coarse granules.

Mesosoma: Tergites II-VI with subtle median keel and scattered, coarse granulation; tergite VII with short weak, median keel and two pairs of moderate granulose lateral keels; tergal surfaces moderately, coarsely granular. Genital opercula fully separated along medial margin; genital papillae large, conspicuous (Fig. 1). Pectines: disposition of lamellae on pectinal shaft as in Fig. 1; pectinal tooth count 6-6; sensorial areas large, occupying four-fifths of ventral tooth surface. Sternites III-VI roughened and minutely punctate, with a few coarse granules near lateral margins (particularly on VI); stigmata small, suboval. Sternite V with distinct subtriangular yellowish posteromedian elevation. Sternite VII sparsely, coarsely granular with a weak smooth to granular median carina and one pair of short moderate, lateral carinae consisting of three to five large rounded granules on an elevated ridge.

Metasoma: Segments I-IV: dorsolateral, lateral supramedian, and ventrolateral carinae strong, crenulate. Lateral inframedian carinae on I moderate, crenulate; on II vestigial, represented by a short distal row of granules; on III and IV more or less obsolete. Ventromedian carina on I moderate, crenulate; on II-IV strong, crenulate. Distalmost denticles of dorsolateral and lateral supramedian carinae not distinctly enlarged. All surfaces, except dorsal surface of IV, moderate coarsely granular. Segment V: Dorsolateral carinae well developed, serratocrenulate; lateral carinae moderate, present on anterior one-half, crenulate; ventrolateral and ventromedian carinae strong, serratocrenulate; ventral and lateral intercarinal spaces sparsely, coarsely granular.

Telson. Lateral and ventral surfaces of vesicle with relatively dense, medium-sized granules. Vesicle globose, distinctly wider than (1.11X) metasomal segment V. Junction of vesicle and aculeus well defined.

Pedipalps: Femur: Dorsointernal, dorsoexternal, and ventrointernal carinae strong, serratocrenulate; ventroexternal carina weak proximally, crenulate distally. Inner face with an irregular row of seven to eight granules; ventral face with strong crenulate carina; dorsal face with scattered, coarse granulation; external face shagreened. Trichobothrial pattern Type C, orthobothriotaxic (Vachon 1974).

Patella (Figs. 2-3): Pentacarinate, all carinae strong, crenulate to serratocrenulate. Inner face with large spinoid basal tubercle followed distally by several smaller spinoid granules. Dorsal face moderately coarsely granular; external and ventral faces shagreened. Trichobothrial pattern Type C, neobothriotaxic (Vachon 1974; nomenclature of patellar trichobothria modified by Soleglad 1976): 7 ventral trichobothria along ventroexternal carina (Fig. 2); 20 external trichobothria (3 *et*, 4 *est*, 4 *em*, 2 *esb*, 7 *eb*; Fig. 3).

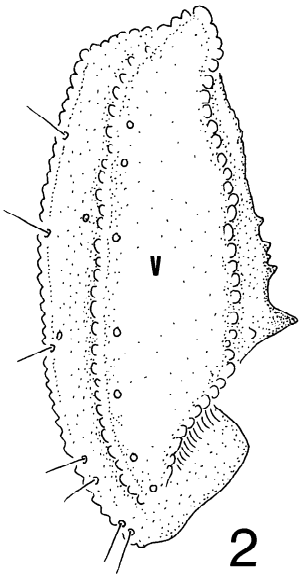
Chela (Fig. 4): Dorsal and external carinae strong, crenulate to serrate; dorsointernal carina moderate, serrate; ventrointernal carina strong, crenulate; ventromedian carina moderate, granular. Dorsal intercarinal spaces sparsely, coarsely granular; external spaces densely, coarsely granular. Cutting margins of chela fingers with distinct scalloping (Fig. 4). Trichobothrial pattern Type C, orthobothriotaxic (Vachon 1974).

Legs. Ventral aspects of femora and patellae smooth.

Hemispermatophore as in Fig. 8: distal lamina relatively slender and distinctly tapered, with ental edge gently rounded; dorsal trough rim (margin) with series of large spines; accessory lobes with fine serrations.

Measurements (in mm, l = length, w = width; d = depth). **Holotype male:** Total l, 30.75; carapace l, 4.30; mesosoma length, 7.85; metasoma l, 13.20;

Figures 1-7. Morphology of *Megacormus grubbsi*, new species, and *M. segmentatus* Pocock. *Megacormus grubbsi*: 1, sternopectinal area of holotype male; 2, ventral aspect of right pedipalp patella; 3, external aspect of right pedipalp patella; 4, external aspect of right pedipalp chela (note scalloped inner margins of chela fingers). *Megacormus segmentatus*: 5, ventral aspect of right pedipalp patella; 6, external aspect of right pedipalp patella; 7, external aspect of right pedipalp chela (note straight inner margins of chela fingers). Trichobothrial designations are as follows: eb = external basal, em = external medial, esb = external subbasal, est = external subterminal, et = external terminal, v = ventral (note the seven trichobothria in a row along the ventroexternal carina).



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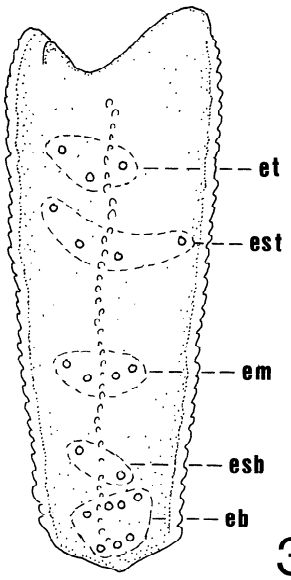

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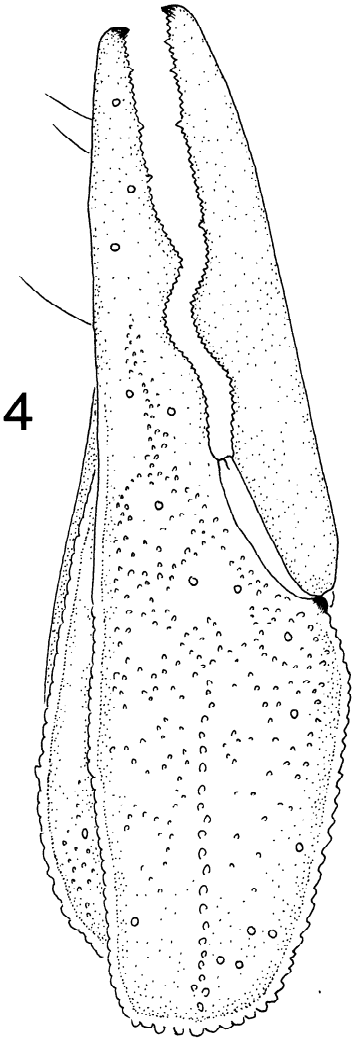

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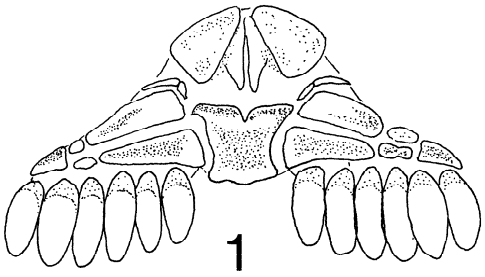

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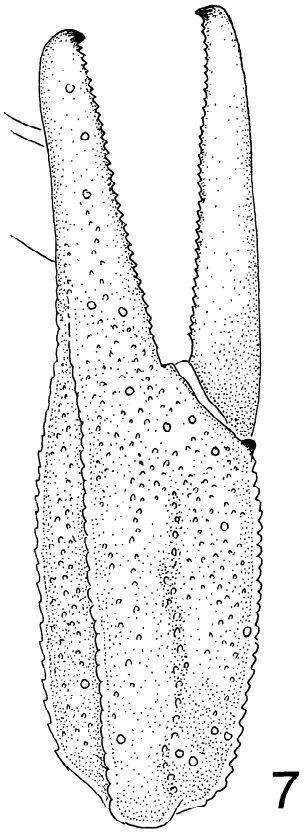

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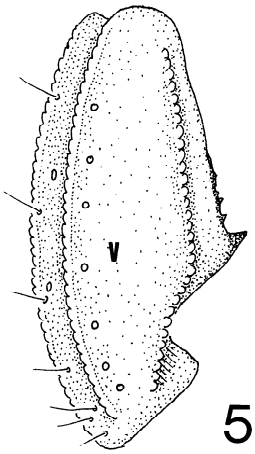

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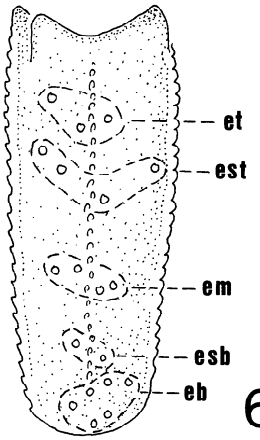

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telson l, 5.40. Metasomal segments: I l/w, 1.70/2.30; II l/w, 2.00/2.10; III l/w, 2.15/2.10; IV l/w, 2.65/2.00; V l/w, 4.70/1.90. Telson vesicle l/w/d, 3.10/2.10/1.70; aculeus l, 2.30. Pedipalp: femur l/w, 3.95/1.35; patella l/w, 4.20/1.60; chela l/w/d, 7.70/2.35/2.60; fixed finger l, 3.50; movable finger l, 4.50. **Paratopotype female:** Total l, 34.70; carapace l, 5.25; mesosoma l, 11.00; metasoma l, 12.65; telson l, 5.80. Metasomal segments: I l/w, 1.60/2.40; II l/w, 1.85/2.00; III l/w, 2.05/1.80; IV l/w, 2.50/1.75; V l/w, 4.65/1.65. Telson vesicle l/w/d, 3.40/1.95/1.65; aculeus l, 2.40. Pedipalp: femur l/w, 4.65/1/45; patella l/w, 4.75/1.95; chela l/w/d, 9.30/2.55/2.75; fixed finger l, 4.40; movable finger l, 5.53.

Variation. Only a single adult male, the holotype, was available for study. The juvenile specimen, possibly a third or fourth instar male, had a pectinal tooth count of 6-6. In females, pectinal tooth counts varied as follows: one specimen had 4-5 teeth, two had 5-5 teeth, and one had 6-6 teeth. Slight variation was also noted in patellar trichobothriae numbers: for the six specimens (counting trichobothria on both the left and right sides), 11 patellae bore four *em* trichobothria and one bore three; likewise, nine patellae had seven *v* trichobothria and three had only six.

Variation in several adult morphometric characters is as follows: chela length/width, 3.28 in the male and 3.22-3.65 in females; metasomal segment III length/width, 1.02 in the male and 0.98-1.14 in the females; metasomal segment V length/width, 2.47 in the male and 2.39-2.82 in females; telson width/metasomal segment V width, 1.11 in the male and 1.06-1.18 in the females.

Comparisons. *Megacormus grubbsi* is most similar to *M. segmentatus*, as evidenced by its trichobothrial patterns, pectinal morphology, and hemispermatophore structure. From this species it may be easily distinguished by the very prominent scalloping of the cutting margins the male pedipalp chela fingers (in *M. segmentatus*, the cutting margins of the male chela fingers are straight). The male hemispermatophores have somewhat differently-shaped distal lamina and capsular regions (cf. Figs. 8-9). The cuticular surfaces in both sexes, particularly of the sternites and metasomal segments, are less granulose than in *M. segmentatus*, as noted by Soleglad (1976) for females. *Megacormus grubbsi* is also a larger species, with adult body size approximately 30-40 mm, rather than 20-27 mm. Finally, the telson is globose in *M. grubbsi*, as wide as or noticeably wider than metasoma V (in *M. segmentatus*, the telson is narrower than metasoma V.

Comments. Soleglad's (1976) three female specimens from 20 miles west of Huautla that were referred to *M. segmentatus* are almost certainly referable instead to *M. grubbsi*. The collection of males from this locality will confirm their exact placement. Soleglad (1976) noted the differences in sternite granulation between these female specimens and those from Veracruz and suggested they might represent different species.

Specimens Examined. MEXICO: Oaxaca: Cerro Ocote, 5 mi S Tenango (under bark of trees), April 1987 (A. Grubbs, A. Cressler, P. Smith), 1 holotype male, 2 paratype females, 1 paratype juvenile (AMNH); Trail 25-32 km E Huautla de Jimenez on way to Cerro Rabon, 23 March 1981 (A. Grubbs), 2 paratype females (TMM).

Megacormus segmentatus Pocock (Figs. 5-7, 9)

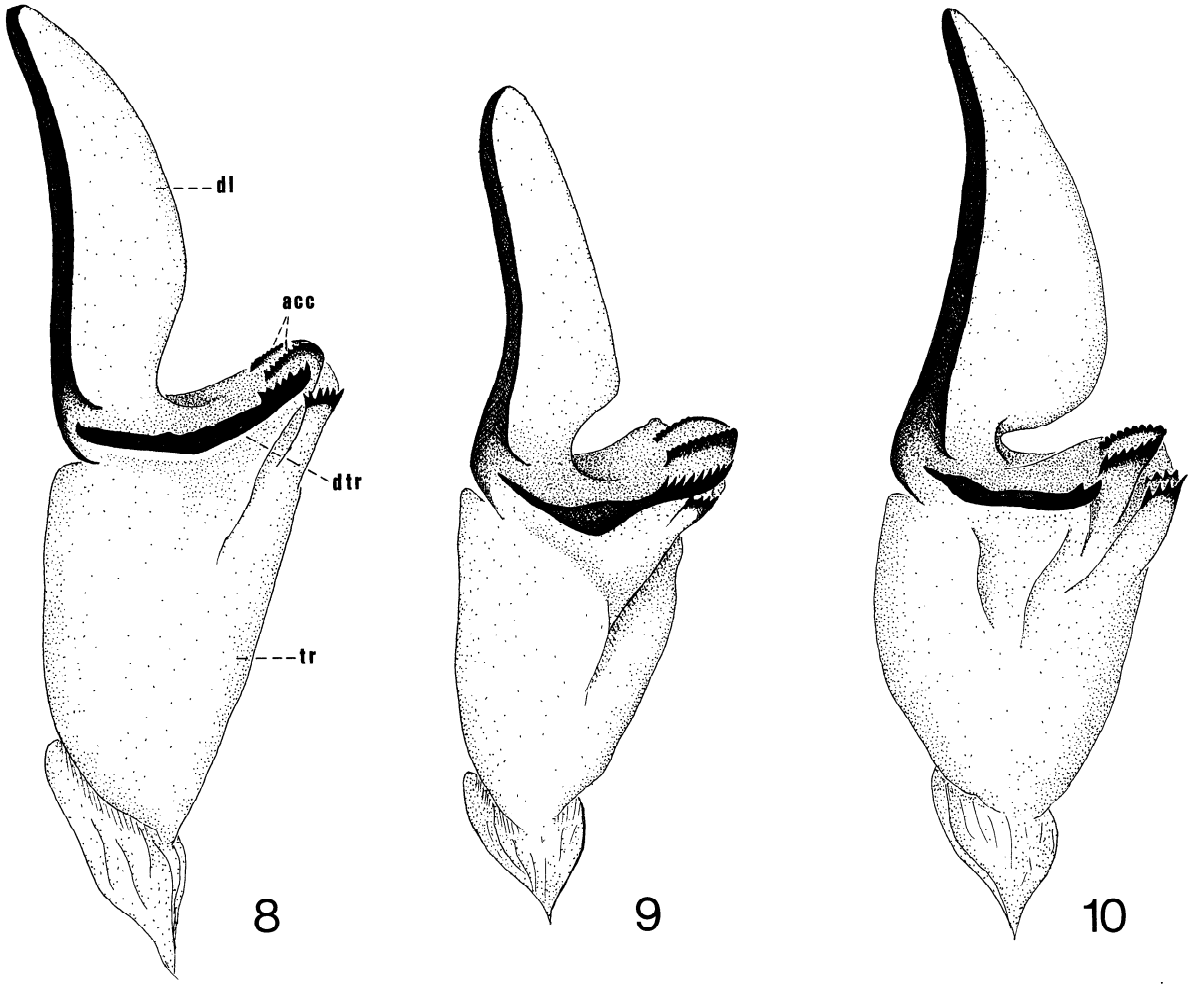
Synonymy: The complete synonymy for this species is given in Soleglad (1976).

Type data. Female holotype from Atoyac, Veracruz, Mexico, 1900 (A. Dugés); deposited in the British Museum of Natural History, examined.

Description of Male. Coloration: virtually all cuticular surfaces with strong dark underlying markings; carapace, tergites, venter, and legs yellow brown; metasoma and pedipalps more orange brown. Pectines yellowish, with dusky markings on pectinal shaft.

Prosoma: Carapace: entire surface covered with relatively dense small to medium-sized granules. Carapacial carinae weak to moderate.

Mesosoma: Tergites I-VI with subtle median keel and scattered, coarse granulation; tergite VII with short weak, median keel and two pairs of moderate granulose lateral keels; tergal surfaces moderately, coarsely granular. Genital opercula completely separated along midline; genital papillae large, conspicuous. Pectines: disposition of lamellae on pectinal shaft as described for female (Soleglad 1976); pectinal tooth count 6-6; sensorial areas large. Sternites III-VI moderately granular; sternite V with small whitish subtriangular posteromedian elevation; sternite VII more coarsely



Figures 8-10. Hemispermatophore morphology (dorsal aspect) of *Megacormus* spp. 8, *M. grubbsi*, new species, holotype male; 9, *M. segmentatus* Pocock, male from Fortin de las Flores, Veracruz; 10, *M. gertschi* Diaz, male from Sierra de Zacapaxtla, Puebla. acc = accessory lobes, dl = distal lamina, dtr = rim of dorsal trough, tr = trunk.

granular with a weak crenulate median carina and one pair of moderate, crenulate lateral carinae.

Metasoma: Segments I-IV: dorsolateral, lateral supramedian, and ventrolateral carinae strong, crenulate. Lateral inframedian carinae on I moderate, crenulate; on II vestigial, represented by a short distal row of granules; on III and IV more or less obsolete. Ventromedian carina on I moderate, crenulate; on II-IV strong, crenulate. Distalmost denticles of dorsolateral and lateral supramedian carinae not distinctly enlarged. All surfaces moderate coarsely granular. Segment V: Dorsolateral carinae well developed, crenulate; lateral carinae moderate, present on anterior two-thirds, crenulate; ventrolateral and ventromedian carinae strong, crenulate; all intercarinal spaces moderately, coarsely granular.

Telson. Lateral and ventral surfaces of vesicle densely, coarsely granular. Vesicle not noticeably globose, narrower than metasomal segment V. Junction of vesicle and aculeus well defined.

Pedipalps: Femur: Dorsointernal, dorsoexternal, and ventrointernal carinae strong, serratocrenulate; ventroexternal carina weak proximally, with large sharp granules distally. Inner face with an irregular row of seven to eight granules; ventral face with distinct crenulate carina; dorsal face moderately, coarsely granular; external face shagreened. Trichobothrial pattern Type C, orthobothriotaxic (Vachon 1974).

Patella (Figs. 5-6): Pentacarinate, all carinae strong, crenulate to serratocrenulate. Inner face with large spinoid basal tubercle followed distally by several smaller spinoid granules. Dorsal face moderately coarsely granu-

lar; external face sparsely granular; ventral face shagreened. Trichobothrial pattern Type C, neobothriotaxic (Vachon 1974, Soleglad 1976); seven ventral trichobothria along ventroexternal carina (Fig. 5) and 20 external trichobothria (3 *et*, 4 *est*, 4 *em*, 2 *esb*, 7 *eb*; Fig. 6).

Chela (Fig. 7): All carinae except ventromedian carina strong, crenulate to serrate; ventromedian carina weak, granular. Intercarinal spaces moderately to densely coarsely granular. Cutting margins of chela fingers distinctly straight, without scalloping (Fig. 7). Ratio of movable finger length/metasoma V length 0.92; of movable finger length/carapace length 0.83.

Hemispermatophore as in Fig. 9: distal lamina slender, its ental edge essentially straight; dorsal trough rim (margin) with series of large spines; accessory lobes with fine serrations.

Measurements (in mm): Male, Fortín de las Flores: Total length, 21.95; carapace l, 3.15; mesosoma l, 5.80; metasoma l, 9.10; telson l, 3.90. Metasomal segments: I l/w, 1.10/1.80; II l/w, 1.30/1.60; III l/w, 1.50/1.55; IV l/w, 1.90/1.50; V l/w, 3.30/1.55. Telson vesicle l/w/d, 2.45/1.40/1.15; aculeus l, 1.45. Pedipalp: femur l/w, 2.50/1.00; patella l/w, 2.80/1.10; chela l/w/d, 5.15/1.65/1/70; fixed finger l, 2.40; movable finger l, 3.00.

Comments. The two male specimens and the new female specimen all possess 4 trichobothria in the *em* series of the patella. The two males had seven ventral trichobothria on each pedipalp patella, whereas the female had six on one side and seven on the other. Pectinal tooth counts were as follows: the two males, 6-6 and 5-5 and the female, 5-4.

Specimens Examined. MEXICO: Veracruz: Atoyac, 1900 (A. Dugés), 1 female holotype (BMNH); Fortín de las Flores, Canyon Rio Metlac (Berlese leaf litter, tropical evergreen forest), 5 August 1969 (S. and J. Peck), 1 male, 1 female (MCZ); Estación Biología "Los Tuxtlas", 150 m, October 1986 (G. Pérez-Higareda), 1 male (IBLT).

Megacormus gertschi Diaz

In the course of study, six new records for *M. gertschi* were confirmed, including the first specific localities from the Mexican state of Puebla. The hemispermatophore of this species is illustrated in Fig. 10. It differs from those of *M. segmentatus* and *M. grubbsi* in the shape of the distal lamina, the armature of the rim of the dorsal trough (with only two large spines, rather than a series of seven to 10), the armature of the accessory lobes (more distinctly toothed than in the other species), and in the shape of the trunk (broader).

New records. MEXICO: Hidalgo, Jacualtipan (= Zacualtipan), 1885 (Cope), 1 female (ANSP); Zacualtipan, 20 July 1963 (L. Mazzotti), 2 males, 3 females, 1 juv. (MNHN, RS-4001). Puebla, Sierra de Zacapoaxtla, 1904 (Diguet), 3 males, 13 females, 1 juv. (MNHN, RS-3349); Sotano de Ocotempa, 3 Feb 1987 (S. Raines), 1 juv. (TMM). Queretaro, Jaguey del Norte, 4 km W El Madrono (1960 m), 2 June 1988 (P. Sprouse), 1 male, 3 females (TMM). San Luis Potosí, at km 53 Potosi & Rio Verde R.R., 31 July 1934 (Lot 557), collector? (ANSP).

Key to the species of *Megacormus* Karsch Modified from Soleglad (1976)

1. Pedipalp patella with 19-20 external trichobothria (usually 20), three of which are in the *et* series; patella with 5-7 (usually 7) ventral trichobothria 2
   Pedipalp patella with 21-22 external trichobothria (usually 22), four of which are in the *et* series; patella with 7-10 (usually 8) ventral trichobothria ..... *gertschi*

2. Shaft of pecten consisting of a single sclerite, without anterior or middle lamellae ..... *granosus*
   Shaft of pecten with distinct anterior and middle lamellae 3

3. Male pedipalp chela fingers with cutting margins distinctly scalloped; telson wider than (occasionally as wide as) metasomal segment V; sternites sparsely, coarsely granular; Oaxaca ..... *grubbsi*
   Male pedipalp chela fingers with cutting margins straight; metasomal segment V wider than telson; sternites densely, coarsely granular; Veracruz ..... *segmentatus*

Acknowledgments

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Veracruz; James R. Reddell of the Texas Memorial Museum (TMM), the University of Texas at Austin, and Donald Azuma of the Academy of Natural Sciences, Philadephia (ANSP) for providing the remaining specimens used in this study. Andy Grubbs provided habitat data for *M. grubbsi*.

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