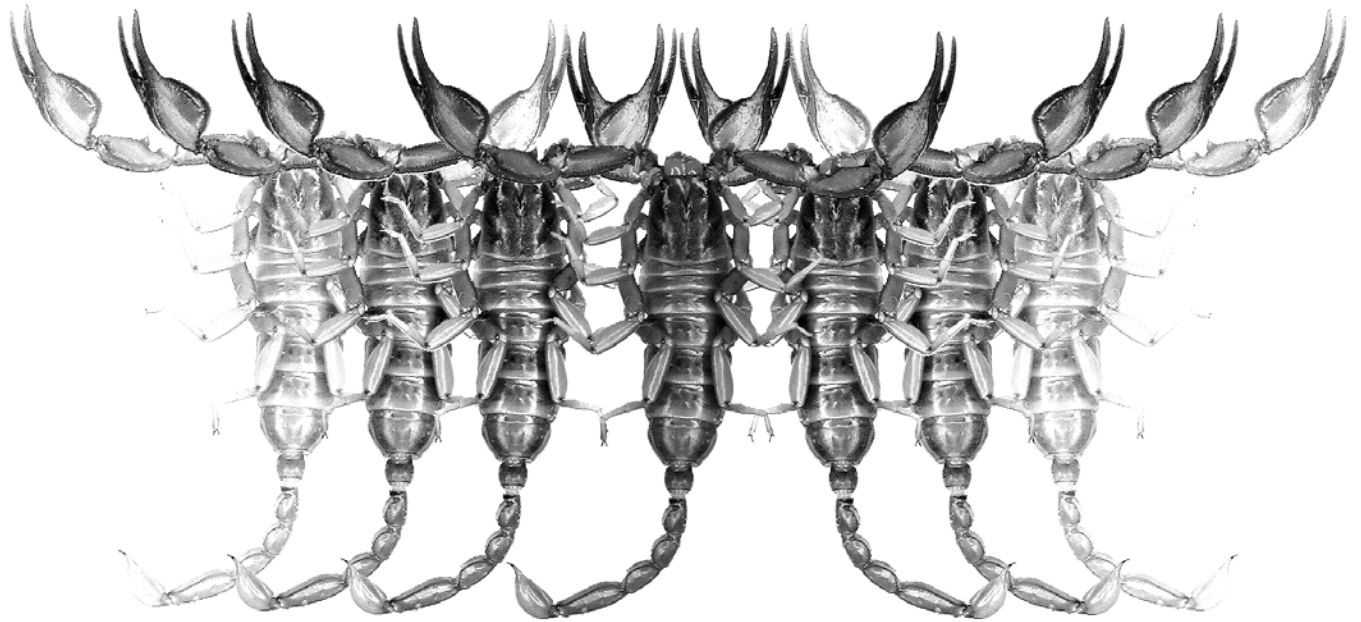


Euscorpilus

Occasional Publications in Scorpiology



**Redescription of the Mexican Scorpion *Centruroides hoffmanni*
Armas, 1996 (Scorpiones: Buthidae)**

Eliézer Martín-Frías, Luis F. de Armas and Jorge F. Paniagua-Solís

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- **ZISP**, Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia
- **WAM**, Western Australian Museum, Perth, Australia
- **NTNU**, Norwegian University of Science and Technology, Trondheim, Norway

Redescription of the Mexican scorpion *Centruroides hoffmanni* Armas, 1996 (Scorpiones: Buthidae)

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Summary

The Mexican scorpion *Centruroides hoffmanni* Armas, 1996 is redescribed, based on adults of both sexes. It is readily diagnosed by its medium size, dark brown two-banded tergites and brown marbling on carapace, appendages and metasoma, pectinal tooth counts, the shape of the female basal plate of the pectines, development of metasomal carinae, and shape of the telson and subaculear tubercle. The geographical distribution of this species ranges from southeastern Oaxaca to southwestern Chiapas, Mexico. It was originally compared with *Centruroides thorelli* (Kraepelin, 1891), but actually it seems to be closely related to *C. infamatus* (C. L. Koch, 1845) and *C. baergi* Hoffmann, 1932.

Introduction

The original description of the buthid scorpion *Centruroides hoffmanni* Armas, 1996 was based on a supposedly adult female from southwestern Chiapas, Mexico. Armas (1999) and Armas et al. (2003) pointed out that this specimen is really an immature female, but they did not provide data of additional examined specimens. Beutelspacher Baigts (2000) confused this species with at least two different taxa: *C. tuxtla* Armas, 1999 [previously misidentified as *C. thorelli* (Kraepelin, 1891) by Hoffmann (1932)], and *C. nigrovariatus* (Pocock, 1898). He also recorded *C. hoffmanni* from Oaxaca, Oaxaca, but we suspect it is a misidentification as well. Armas et al. (2003, 2004) recorded *C. hoffmanni* from Oaxaca State but they did not mention a precise locality of the examined specimens.

Material and Methods

Examined material is deposited at the Instituto de Ecología y Sistemática (IES), Havana, Cuba; personal collection of Eliézer Martín-Frías (EMF), Colección Nacional de Arácnidos (CNAN), Instituto de Biología, Universidad Nacional Autónoma de México, Mexico, D. F., and Escuela Nacional de Ciencias Biológicas (ENCB), I.P.N., Mexico, D. F. Terminology for general morphology follows Stahnke (1970), except for metasomal carinae (Francke, 1977), pedipalpal chela carinae (Soleglad & Sissom, 2001), and trichobothria patterns (Vachon, 1974). All measurements are given in millimeters.

Systematics

Centruroides hoffmanni Armas, 1996

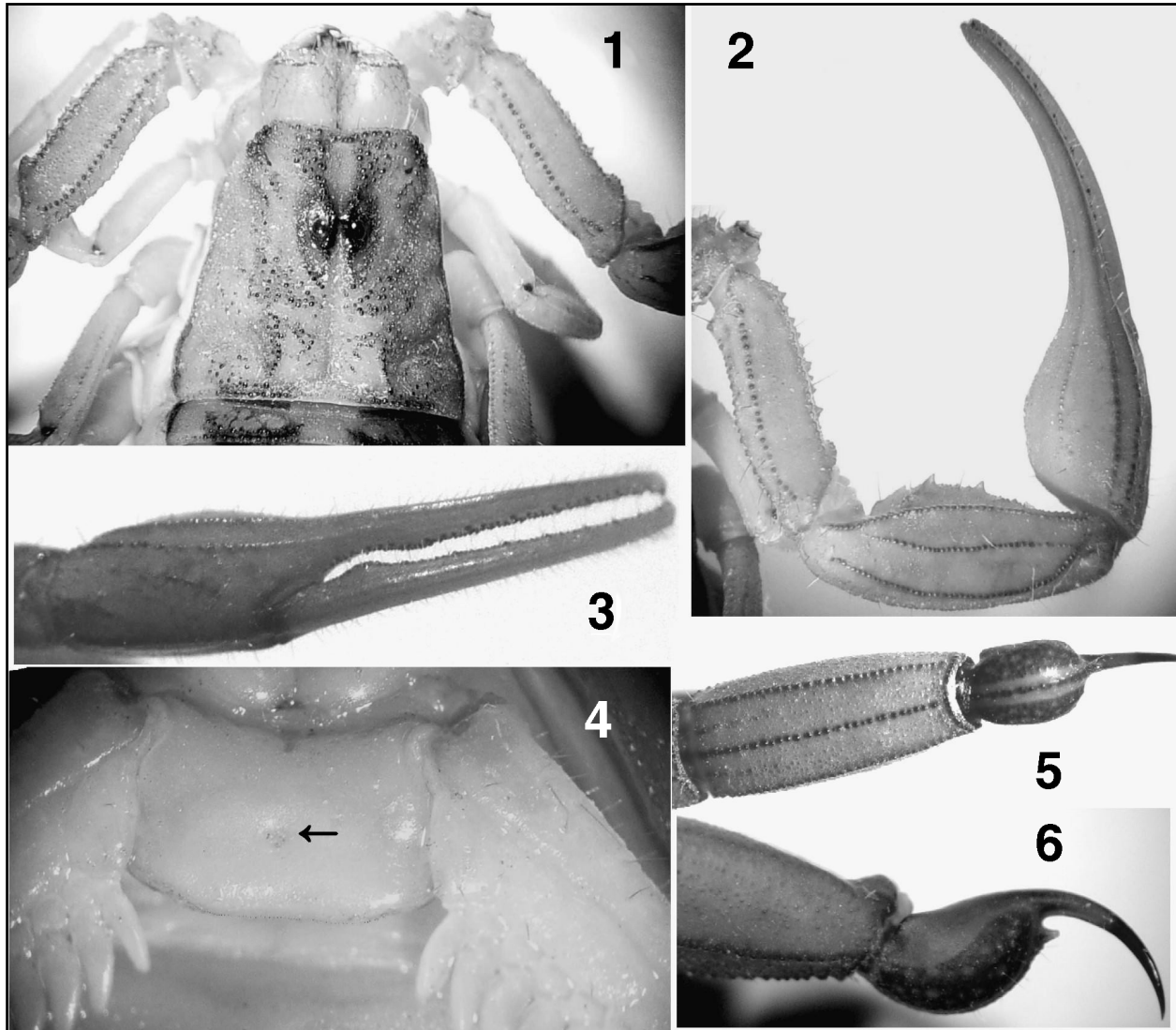
(Figs. 1–11, Tables 1–3)

Centruroides hoffmanni Armas, 1996: 28, 29–32, Figs. 5–9, Table 3; Armas, 1999: 47, 51. Kovařík, 1998: 107; Fet & Lowe, 2000: 109; González Santillán, 2000: 573 (cited only); Beutelspacher Baigts, 2000: 123, 126, 139, 144, 155, Map 106 (in part: records from Arriaga, Chiapas); Armas et al., 2003: 94; Armas et al., 2004: 170, Table 1.

Type data. Immature female holotype, La Gloria, municipio de Arriaga, Chiapas, Mexico, 11 December 1974, J. Lino G., Rodolfo Ruiz, J. Luis M. G., collection number 71 (identified as *Centruroides thorelli* by José Lino García, unknown date). Deposited in the CNAN.

New records. Oaxaca State: One male (ENCB) Tehuantepec, 2 February 1972, Alum[nos]. de Biología, ENCB. Five females, and two males (ENCB-221) Salina Cruz, 3 February 1980, E. Martin & A. Laguerenne. Three females (IES), Colonia Emiliano Zapata, Tehuantepec, 9 December 1998, E. Martin & R. Meza. One female (EMF-461), Colonia Emiliano Zapata, Tehuantepec, 14 January 2003, Alex Cofu. One male (IES), Ixtepec, 5 January 1998, Obemar Benítez. Three females (EMF-462), Pie del Cerro Guiengola, Tehuantepec, 23 January 2003, Alex Cofu. One male (EMF, no number), Bahía Chahue, Huatulco, 20 December 1991, Alejandro Tovar S., on the beach.

Distribution. Southeastern Oaxaca and southwestern Chiapas, Mexico (Fig. 11).

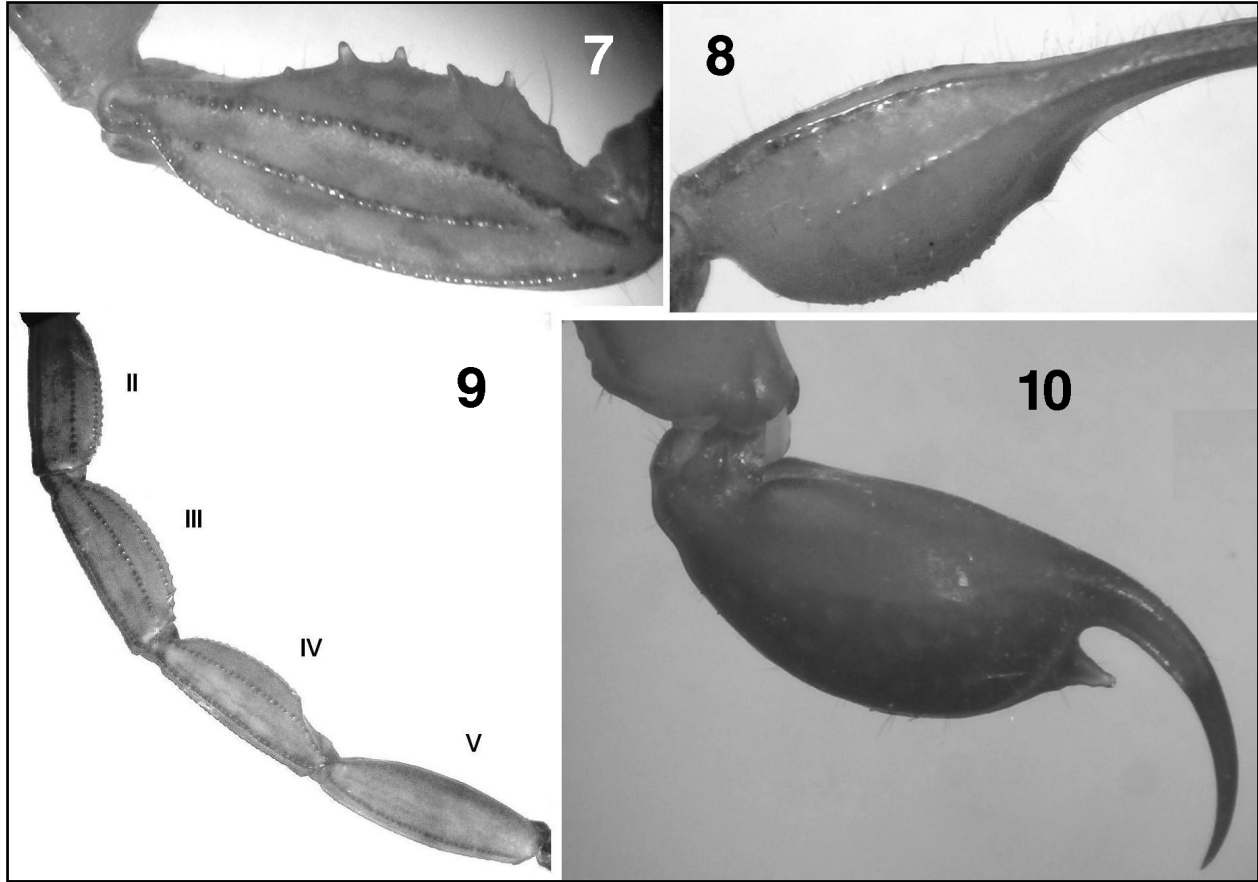


Figures 1–6: *Centruroides hoffmanni*. Female. 1, Prosoma, dorsal aspect; 2, right pedipalp, dorsal aspect; 3, right pedipalp chela, external aspect; 4, basal plate of the pectines, showing the central pit (arrow); 5–6, telson and metasomal segment V: 5, ventral aspect; 6, lateral aspect.

Diagnosis. A medium sized *Centruroides* species (36–58 mm), light yellow with distinct dusky marbling on carapace; tergites I–VI with two dusky submedian bands. Pectinal tooth counts 20–22 in female, 21–24 in male. Basal plate of pectines subsquare in shape in the female, with a central pit. Metasomal intercarinal spaces finely and sparsely granular, dorsolateral carinae I–IV, lateral suprmedian carinae I–IV, lateral inframedian carinae I, and ventrolateral carinae I–IV strong, feebly serrate on most part. Telson vesicle globose, with subaculear tubercle spinelike, well developed.

Female. Coloration. Base color yellow to light yellow brown. Carapace with distinct dusky marbling concentrated mostly in median area. Tergites with two submedian broad dusky bands. Metasomal segments light

yellow, faintly marbled dorsally and laterally, slightly darker on ventral aspect, carinae all spotted with dark brown. Telson dark brown, contrasting with metasomal segments; ventrally with two submedian pale stripes. Cheliceral manus with brown reticulations. Pedipalps, including manus, faintly marbled with pale brown. Venter and sternites III–VI pale yellow; sternite VII with faint dusky marbling. Legs light yellow, prolaterally marbled with light brown. *Prosoma*. Carapace moderately coarsely granular; anterior median furrow moderately deep; posterior median furrow shallow anteriorly, deep posteriorly; posterior lateral furrows wide, moderately deep; superciliary and posterior median carinae weak, minutely granular. *Mesosoma*. Median carina on tergites I–VI moderate, granular to subcrenate. Preter-



Figures 7–10: *Centruroides hoffmanni*. Male. 7–8, pedipalp, dorsal aspect: 7, patella; 8, chela; 9–10, metasoma, lateral aspect: 9, segments II–V; 10, telson.

gites minutely granular. Posterior third of each tergite moderately, coarsely granular; submedian carinae represented on tergites IV–VI by four or five granules. Tergite VII with moderate crenulate median carina and two pairs of strong, finely serrate lateral carinae. Basal plate of the pectines subsquare in shape, 1.2 times wider than long; with a well developed central pit; posterior margin straight; pectinal tooth counts 20–22. Sternites III–VI smooth; VII, finely granular, with submedian and lateral carinae moderate, finely serrate. *Metasoma*. Segments I–IV: dorsolateral carinae, lateral supramedian carinae, lateral inframedian carinae on I, and ventrolateral carinae strong, feebly serrate on most part but distally crenulate; ventral submedian carinae on I weak, feebly serrate; on II moderate, finely serrate; on III–IV strong, serrate. Segment V: dorsolateral carinae weak, feebly granular; ventrolateral and ventral median carinae moderate, crenate; lateromedian carinae obsolete. All metasomal intercarinal spaces finely and sparsely granular. Telson: vesicle globose in shape; ventral aspect with median longitudinal row of vestigial granules, leading to subaculear tubercle; subaculear tubercle spinelike, near to basal part of aculeus; its point directed to middle of aculeus;

ventral aspect of the vesicle very finely granular. *Pedipalps*: Orthobothriotaxic pattern A. Femur: all carinae strong, the dorsal one crenulate, external carinae serrate; internal aspect with some large, moderate granules; dorsal aspect finely granular. Patella: dorsal internal carina strong, crenulate; dorsal median carina moderate, crenate; dorsal external carina strong, subgranular; external carina and ventral external carinae moderate, subgranular; ventral internal carina moderate, crenulate. Internal aspect with five to six large, conical granules. Chela: dorsal internal carina obsolete; dorsal marginal carina moderate, finely granulate; dorsal secondary carina strong, with fine, weak granules; digital carina weak, irregularly subgranulose; external secondary carina vestigial, smooth; ventral external carina strong, smooth; ventral internal and internal median carinae obsolete. Fixed finger with eight oblique rows of granules flanked by supernumerary granules; trichobothrium *db* positioned just distal to trichobothrium *et*. Movable finger with short apical row of four granules followed by eight oblique rows of granules, the last are flanked by supernumerary granules; basal lobe moderate.

Character	Females (n = 8)			Males (n = 5)		
	Range	X	SD	Range	X	SD
Carapace, L	5.10–5.98	5.60	0.32	3.69–4.68	4.22	0.37
Posterior W	5.20–6.34	5.84	0.36	3.69–4.68	4.13	0.41
Pedipalp, L	17.47–22.04	20.03	1.58	15.39–18.56	16.34	1.85
Femur, L	4.37–5.56	4.99	0.40	3.54–4.73	4.18	0.45
W	1.35–1.72	1.53	0.12	0.94–1.35	1.14	0.15
Patella, L	4.94–6.08	5.57	0.39	3.90–5.15	4.57	0.49
W	1.98–2.44	2.24	0.15	1.46–1.82	1.53	0.23
Chela, L	8.16–10.40	9.47	0.80	6.40–8.68	7.58	0.91
Manus, L	2.96–3.59	3.41	0.24	2.39–3.12	2.85	0.30
W	1.98–2.44	2.26	0.16	1.40–2.13	1.78	0.26
H	1.92–2.44	2.19	0.19	1.46–2.08	1.78	0.22
Movable finger, L	5.20–6.71	6.08	0.54	3.95–5.56	4.81	0.66
Mesosoma, L	13.50–17.77	15.56	1.66	8.59–12.40	11.07	1.43
Metasoma, L	27.55–34.47	31.38	2.35	23.39–32.70	28.29	3.74
I, L	4.21–4.37	3.99	0.34	2.91–4.21	3.61	0.55
W	2.86–3.43	3.25	0.21	2.03–2.60	2.35	0.23
II, L	4.21–5.25	4.82	0.37	3.48–5.04	4.35	0.63
W	2.76–3.59	3.13	0.26	2.03–2.60	2.35	0.23
III, L	4.63–5.77	5.22	0.40	3.95–5.72	4.89	0.71
H	2.76–3.48	3.01	0.34	1.98–2.60	2.28	0.23
IV, L	5.04–6.29	5.68	0.43	4.26–6.19	5.32	0.78
W	2.65–3.28	2.91	0.33	1.92–2.55	2.22	0.24
V, L	5.61–7.02	6.39	0.52	5.15–6.86	6.00	0.68
W	2.50–3.28	2.85	0.24	1.92–2.50	2.18	0.22
H	2.29–2.86	2.57	0.30	1.61–2.08	1.95	0.19
Telson, L	4.68–5.77	5.28	0.35	3.64–4.68	4.13	0.42
Vesicle, L	2.75–3.54	3.22	0.24	2.55–3.12	2.79	0.23
W	1.87–2.39	2.09	0.17	1.40–2.03	1.73	0.23
H	1.72–2.24	1.99	0.17	1.30–1.77	1.55	0.18
Total L	46.53–58.22	52.55	4.22	36.03–49.78	43.59	5.48

Table 1: Measurements (in mm) of *Centruroides hoffmanni* from Oaxaca State. H, height; L, length; SD, standard deviation; W, width; X, mean.

Ratio	Range	X	SD
Metasomal segment II, L/W ♀♀	1.46–1.59	1.54	0.04
♂♂	1.71–2.00	1.86	0.11
Metasomal segment V, L/W ♀♀	2.14–2.35	2.24	0.08
♂♂	2.68–2.84	2.79	0.09
Metasomal segment V, L/H ♀♀	2.27–2.55	2.40	0.09
♂♂	2.89–3.30	3.09	0.18
Telson vesicle, L/H ♀♀	1.55–1.71	1.62	0.05
♂♂	1.75–1.96	1.81	0.12
Metasomal segment V, L/carapace, L ♀♀	1.10–1.19	1.14	0.03
♂♂	1.38–1.47	1.42	0.04
Pedipalp patella L/A ♀♀	2.40–2.55	2.48	0.05
♂♂	2.67–2.90	2.78	0.09
Metasoma, L/Carapace, L ♀♀	5.40–5.75	5.60	0.12
♂♂	6.34–7.09	6.68	0.34

Table 2: Morphometric comparisons between females (n = 8) and males (n = 5) of *Centruroides hoffmanni* from Oaxaca State. H, height; L, length; SD, standard deviation; W, width; X, mean.

Sex	n	Pectinal teeth number					X	SD
		20	21	22	23	24		
Female	26	8	12	6			20.92	0.74
Male	10		2	3	3	2	22.50	1.08

Table 3: Variation of the pectinal tooth counts in *Centruroides hoffmanni*. n, examined number of pectines; SD, standard deviation; X, mean. Holotype data are included.

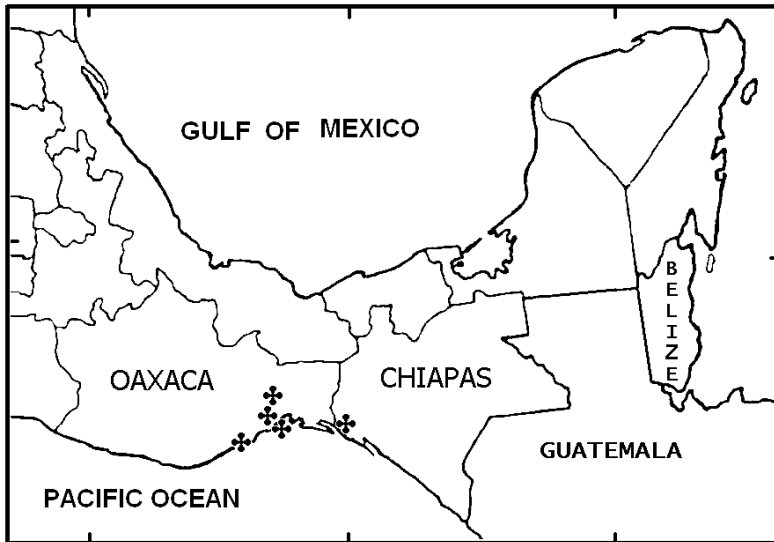


Figure 11: Geographical distribution of *C. hoffmanni*.

Male. Similar to female in general color patterns. Morphologically differs from the female as follows: the metasomal segments are proportionally slender and larger, but the rest of the body shorter; the telson vesicle is slightly ovoid; pectinal tooth counts are slightly higher (Table 3); and the basal plate of the pectines is shorter, rectangular. Other differences as shown in Table 2.

Male specimen from Bahia Chahue has telson vesicle pale in appearance, not contrasting with metasomal segments, a phenomenon that may be due to preservation.

Morphometrics. See Table 1.

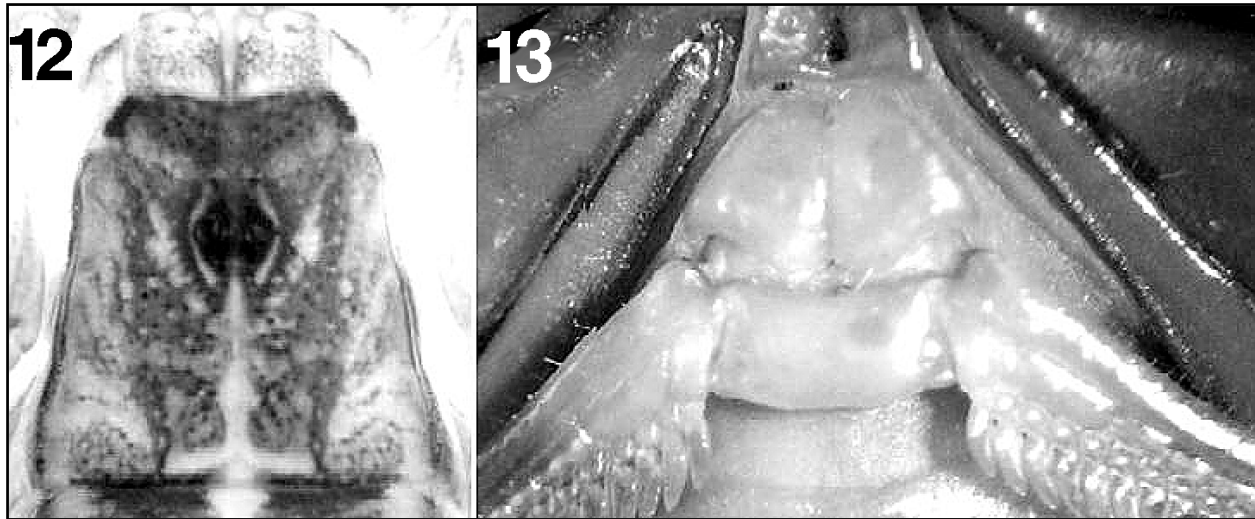
Natural history. This species have been collected under bark in fence post on yards and near houses. It has also been found in semideciduous forest in coastal and subcoastal areas. One dissected pregnant female (55 mm length; carapace, 5.67 mm) that was collected on January 23, had 30 well developed embryos.

Comparisons. In general appearance, *Centruroides hoffmanni* resembles *C. infamatus* (C. L. Koch, 1845) and *C. baergi* Hoffmann, 1932. It may be separated from the former by having the carapace without a broad and almost compact dark brown median band (Fig. 12), as well as by having a very heavily spotted telson. On the other hand, in *C. infamatus* the female has the basal plate of the pectines rectangular in shape (not subquadrate), without a central pit (Fig. 13). The female of *C.*

baergi has a small or obsolete subaculear tubercle, a well defined central pit in the basal plate of the pectines, and metasomal segment V 2.60–2.70 times as long as high (2.14–2.35 in *C. hoffmanni*).

Another geographically close species, *C. nigrovariatus*, has an inflated metasomal fifth segment, mainly in the male (length/width ratio 1.9–2.1 in both sexes), as well as smaller pectinal tooth counts (female, 17–20; male, 19–22).

Comments. Díaz Nájera (1964, 1975) recorded *C. infamatus infamatus* from Bajos de Chila, and Puerto Escondido, Oaxaca, but we suspect that his specimens could belong to either *C. hoffmanni* or *C. meisei* Hoffmann, 1938 because those localities are near the known area of distribution of these species. Unfortunately, the specimens examined by Díaz Nájera could not be located. We also could not obtain the Oaxacan specimens identified as *C. infamatus* by Beutelspacher Baigts (2000: 125, 126), who recorded it from Santiago Laxicha, Río Los Perros; Bajos de Chila; Pochutla; Puerto Escondido; Tehuantepec; and Tianguistengo. Beutelspacher Baigts (2000: 129, 132, Map 111) also recorded *C. nigrovariatus* from Salina Cruz and Tehuantepec, as well as *C. baergi* (as *C. nigrovariatus* f. *baergi*) from Tehuantepec. Those specimens were not available for us, but we seriously suspect that they might belong to *C. hoffmanni* because the only localities that



Figures 12–13: *Centruroides infamatus*. Female. **12**, carapace, showing pattern coloration; **13**, basal plate of the pectines.

are verified for both *C. baergi* and *C. nigrovariatus* are farthest westward (Armas & Martín-Frías, 1999). At least from Tehuantepec and Salina Cruz we have examined specimens of *C. hoffmanni*.

Acknowledgements

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