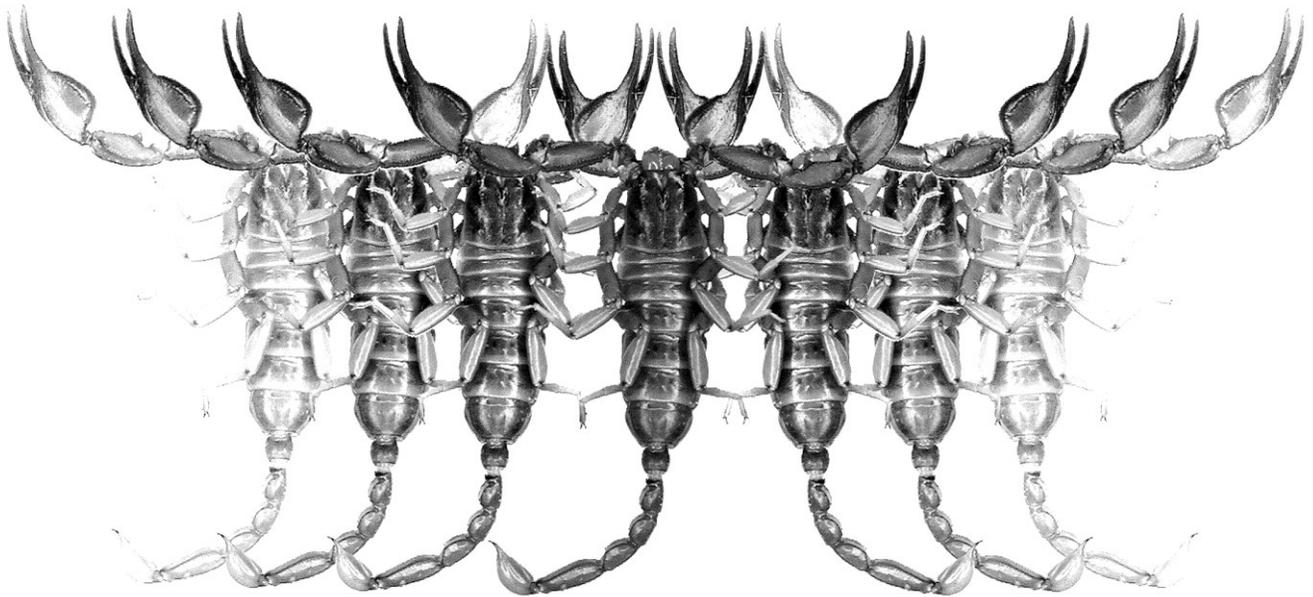


# *Euscorpius*

Occasional Publications in Scorpiology



**Two New Scorpions of the Genus *Chanek* Francke,  
Teruel et Santibáñez-López, 2014 (Scorpiones: Buthidae)  
from Southern Mexico**

**František Kovařík, Rolando Teruel & Graeme Lowe**

**February 2016 — No. 218**

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## Occasional Publications in Scorpiology

**EDITOR:** Victor Fet, Marshall University, 'fet@marshall.edu'  
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## Two new scorpions of the genus *Chanেকে* Francke, Teruel et Santibáñez-López, 2014 (Scorpiones: Buthidae) from southern Mexico

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### Summary

Herein we describe two new species of the recently discovered buthid scorpion genus *Chanেকে* Francke, Teruel et Santibáñez-López, 2014. Both are from Oaxaca State in southern Mexico: *Chanেকে hofereki* sp. n. based upon adults of both sexes from a single coastal locality, and *Chanেকে baldazoi* sp. n. based upon adult females and juveniles from a mountain site in the Sierra Madre. Additional information is given on their taxonomy, distribution, ecology, and reproductive biology, fully complemented with color photos of live and preserved specimens, and their habitat.

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### Introduction

The genus *Chanেকে* was very recently described by Francke et al. (2014), to accommodate two rare species of very small scorpions belonging to the family Buthidae C. L. Koch, 1837. (informally, such scorpions are often addressed as “micro-scorpions” or “micro-buthids”, which does not bear a systematic value). One of them was *Tityopsis aliciae* Armas & Martín Frías, 1998 (which had been erroneously assigned to *Tityopsis*, otherwise endemic to western Cuba), while the second was described as new and designated as its type-species: *Chanেকে fogoso* Francke, Teruel & Santibáñez-López, 2014. Both species remain known only from single populations located on the Pacific coast, the former at a hilltop near Copala in southeastern Guerrero State and the latter in suburban Santo Domingo Tehuantepec in southeastern Oaxaca State.

As a noteworthy but expected result, the phylogenetic analyses by Francke et al. (2014) provided evidence that *Chanেকে* is not closely related to the only other buthid genus confirmed to occur in Mexico (*Centruroides* Marx, 1890), but instead is more closely allied to the other very small buthids from the Antilles and South America: *Alayotityus* Armas, 1973, *Mesotityus* González-Sponga, 1981, *Microtityus* Kjellesvig-Waering, 1966, *Tityopsis* Armas, 1974, *Zabius* Thorell, 1893 and the “clathratus” species-group of *Tityus* C. L. Koch, 1836. Among these genera, *Chanেকে* appears to

be most closely related to *Alayotityus*, a genus endemic to eastern Cuba.

Recently, two additional populations of *Chanেকে* were discovered during arachnological surveys conducted in Oaxaca. Their thorough study and direct comparison to all known specimens (types included) of both *C. aliciae* and *C. fogoso*, revealed that both represent as yet undescribed species belonging to this genus. Therefore, their formal description constitutes the main objective of the present paper.

### Methods & Material

Nomenclature and measurements follow Stahnke (1971), Kovařík (2009), and Kovařík & Ojanguren Affilastro (2013), except for trichobothriotaxy (Vachon, 1974), metasomal carinae (Francke, 1977), pedipalp chela carinae (Acosta et al., 2008, as interpreted by Armas et al., 2011), and sternum (Soleglad & Fet, 2003). We also applied a different terminology for lobe structures of the buthid hemispermatophore than those employed by other authors, which are inconsistent and confusing. We base our notation on proposed homology of the major carinated lobe of the capsule in New World and Old World buthids, which was hypothesized to be derived from the similarly carinated lobe of chaerilids (Stockwell, 1989), herein termed the “median lobe”. Following Vachon (1952), we use “median lobe” to denote the entire lobate structure, not just the carina that

Stockwell (1989) referenced. Our designation of the 'basal lobe' agrees with that of several other authors (e.g. Maury, 1970; Ojanguren Affilastro, 2005; Prendini et al., 2009; Stockwell, 1989; Teruel & Armas, 2012; Vachon, 1952). We use the terminology "dorsal", "internal", "ventral" and "external" to refer to axes of the animals body with hemispermatophores positioned in situ (i.e. dorsal surface is convex, and flagellum arises on external side). Unless otherwise noted, all morphologically diagnostic characters mentioned in the text refer to adults of both sexes.

Label data are transcribed literally here, but further information about localities (e.g., political-administrative divisions such as regions, provinces and districts) is added between brackets. Specimens studied herein are preserved in 80% ethanol and deposited in the following collections: FKCP (František Kovařík, private collection, Prague, Czech Republic) and RTOC (Rolando Teruel, private collection, Santiago, Cuba).

For comparative purposes, all known specimens of the two previously described species of the genus (including all types), were personally examined by one of us (RT) during a work visit to the Colección Nacional de Arácnidos (CNAN), Universidad Nacional Autónoma de México, in summer 2014. Full label data of these specimens are available in Francke et al. (2014: 225, 230).

## Systematics

### Family Buthidae C. L. Koch, 1837

#### Genus *Chanেকে* Francke, Teruel et Santibáñez-López, 2014

DIAGNOSIS (emended). Adult size small for the family (male 15–26 mm, female 21–30 mm). Entire body and appendages covered with modified macrosetae: thick, pale, with tip truncate to crown-shaped. Cheliceral fixed finger with one ventral denticle, movable finger with two. Pedipalp trichobothrial pattern A- $\alpha$ , with reductive neobothriotaxy (all known species lack trichobothria  $d_2$  from both femur and patella and  $Eb_3$  from manus, one species further lacks  $Esb$  from manus and  $esb$  from fixed finger), patellar  $d_3$  external to dorsal median carina; chelae robust, wider than patella and strongly carinate; fixed and movable fingers with 9–11 principal rows of denticles which are short, oblique, subequal and flanked by internal and external accessory denticles, basal lobe/notch combination present (stronger in male). Carapace trapezoidal but conspicuously narrowed anteriorly, essentially flat, and heavily granulose, with carinae indistinct from surrounding granulation (the only definable carinae are the superciliaries and posterior medians); lateral eyes, largely concealed below antero-

lateral margin. Legs without tibial spurs, both pedal spurs present; telotarsi ventrally with two longitudinal rows of setae. Male genital papillae well-developed, but lacking pointed tip. Pectines with 9–11 teeth in male, 6–11 in female; fulcra well-developed; basal middle lamella slightly enlarged. Tergites heavily granulose, monocarinate to vestigially tricarinate, with carinae and granulation projecting over posterior margin. Sternites III and V with a single posteromedian smooth patch (larger in male); spiracles round to short slit-like; basal plate enlarged but not spatulate in female. Metasoma very similar in both sexes: short, robust and very strongly carinate, but without lateral supramedian nor infra-median carinae on segment V. Telson vesicle globose; subaculear tubercle very large and compressed, irregularly blade-like.

DISTRIBUTION (Fig. 60). Known only from southern Mexico (Guerrero and Oaxaca States), along the Pacific watershed of the Sierra Madre Mountains.

#### *Chanেকে hofereki* Kovařík, Teruel et Lowe, sp. n.

(Figures 1–40, 43; Table 1)

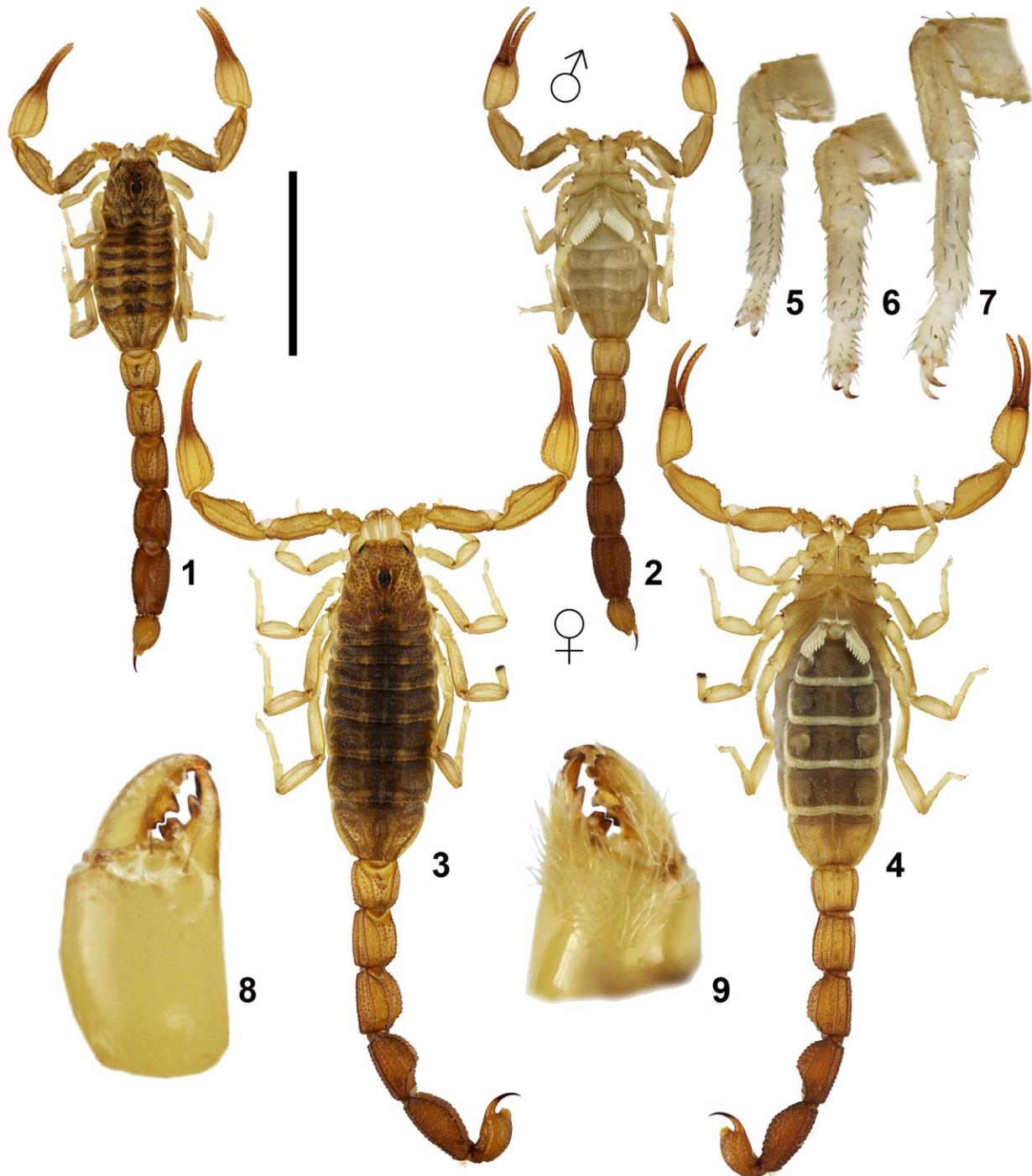
<http://www.zoobank.org/urn:lsid:zoobank.org:act:64E9AA17-AE1D-4C6A-A4D1-BD189C5E9C7A>

TYPE LOCALITY AND HOLOTYPE DEPOSITORY. Mexico, Oaxaca State, Santa María Huatulco Municipality, Bahías de Huatulco, Crucecita, 15°45'73"N 96°08'05"W, 70 m a.s.l. (Figs. 40, 60), FKCP.

TYPE MATERIAL. Mexico, Oaxaca State, Santa María Huatulco Municipality, Bahías de Huatulco, Crucecita, 15°45'73"N 96°08'05"W, 70 m a.s.l., 25-26.X.2015, UV detection at night, soil of dry tropical forest, leg. D. Hoferek, 1♂ holotype, 1♀ and 1 juvenile ♂ paratypes (FKCP), 1♂ paratype (RTOC).

ETYMOLOGY. The selected epithet is a patronym honoring our good friend David Hoferek, the collector of both new species described in the present paper.

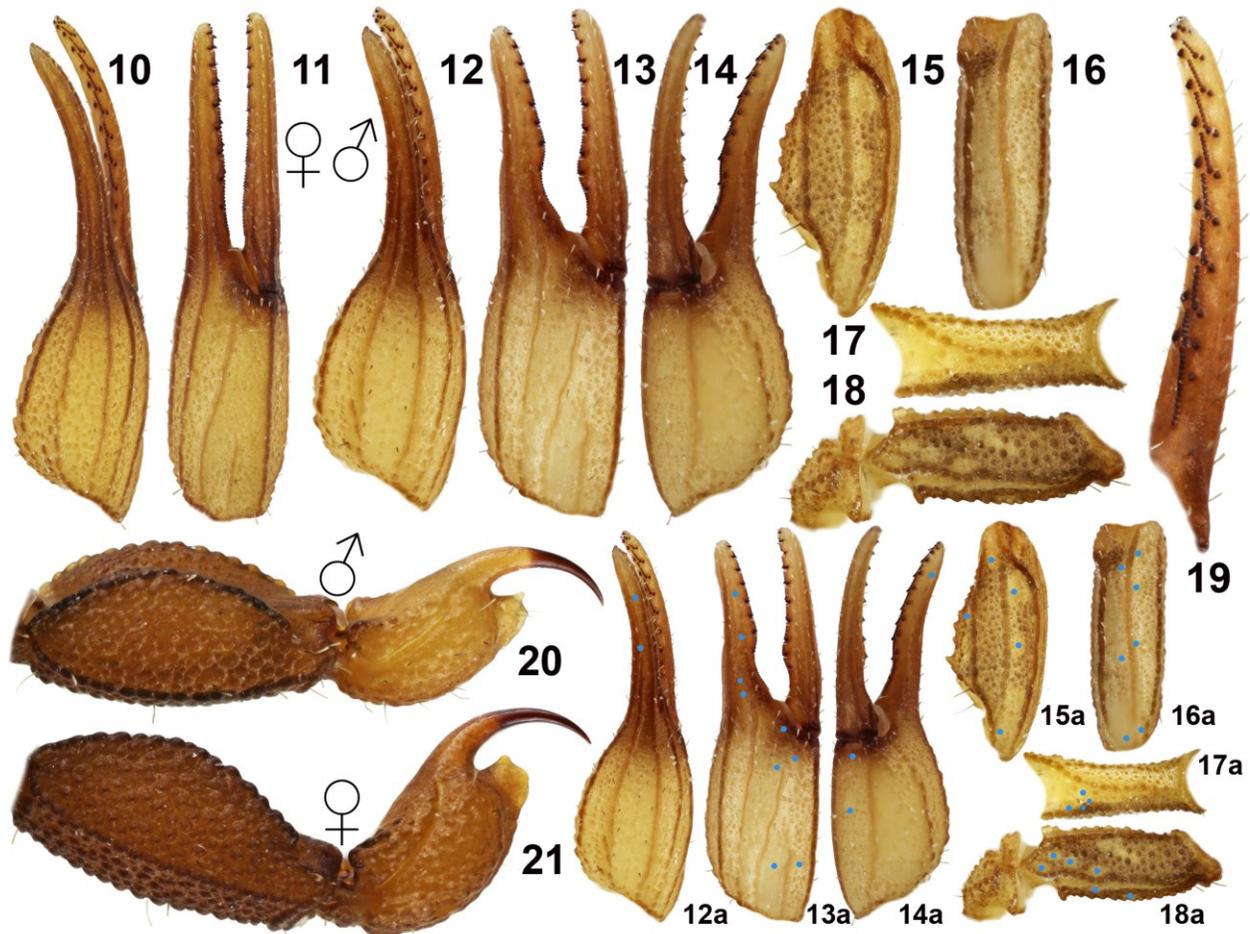
DIAGNOSIS. Adult size standard for the genus (male 15–16 mm, female 21 mm). Coloration basically yellowish brown, moderately spotted with medium to dark brown all over the body and appendages except ventrally on prosoma and mesosoma (pattern more contrasting in male: base color paler but spots darker). Pedipalps with reductive neobothriotaxy (three missing trichobothria:  $d_2$  from both femur and patella,  $Eb_3$  from manus); chelae with manus oval and wider than patella (ratio 1.23–1.25 in male, 1.08 in female); fixed finger with 10 principal rows of denticles, movable finger with 9, basal lobe/notch combination moderate in male, very weak in female. Pectines with 9–10 teeth in male, 6–7 in female;



**Figures 1–9:** *Chaneke hofereki* sp. n. **Figures 1–2, 5–7.** Holotype male, dorsal (1) and ventral (2) views, distal segments of legs II–IV (5–7), retroventral view. **Figures 3–4, 8–9.** Paratype female, dorsal (3) and ventral (4) views, and chelicera dorsal (8) and ventral (9). Scale bar (1–4): 10 mm.

basal middle lamella roundly subtriangular, weakly enlarged. Sternite V with the smooth patch moderately small, much longer than wide, teardrop-shaped, slightly bulky, and translucent (larger and with a deep median suture in male); spiracles round (III) or elongate oval to

short slit-like (IV–VI). Metasoma short, robust and moderately wider distally (segment I essentially as long as wide in male, wider than long in female), with 10/10/8/8/5 complete to essentially complete, very strong, coarsely crenulate carinae; dorsal lateral carinae



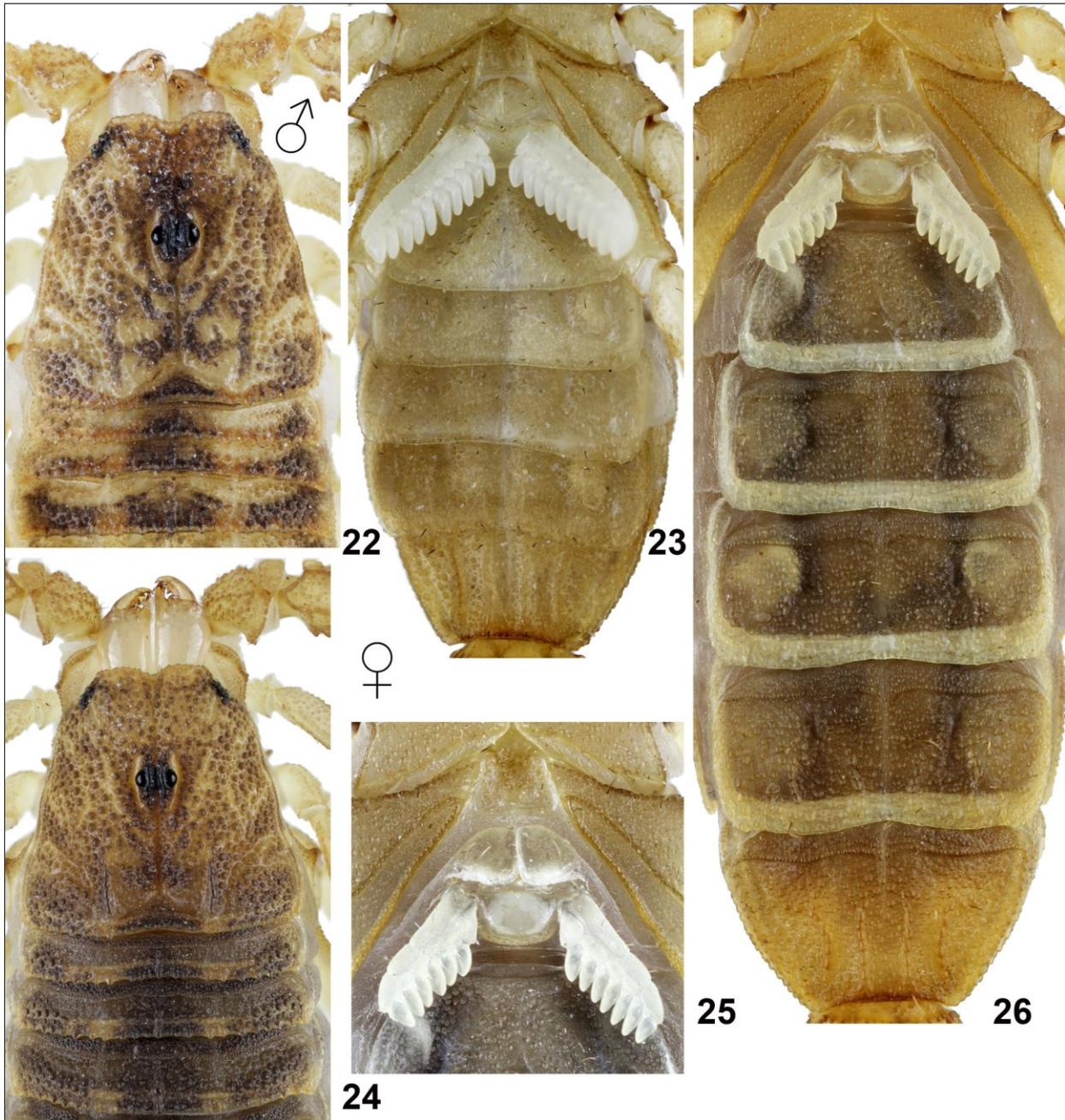
**Figures 10–21:** *Chaneke hofereki* sp. n. **Figures 10–11, 21.** Paratype female, pedipalp chela, dorsal (10) and external (11) views, and telson and fifth metasomal segment lateral (21). **Figures 12–20.** Holotype male, pedipalp chela, dorsal (12), external (13), and ventral (14) views. Pedipalp patella, dorsal (15) and external (16) views. Pedipalp femur internal (17) and femur and trochanter dorsal (18) views. Pedipalp movable finger (19) and telson and fifth metasomal segment lateral (20). The trichobothrial pattern is indicated in Figures 12a–18a.

on segments II–IV with terminal denticle not enlarged; all intercarinal spaces very densely and coarsely granulate. Telson vesicle globose, weakly but coarsely granulate; subaculear tubercle with a conspicuous conical tip.

**DESCRIPTION** (adult male holotype). **Coloration** (Figs. 1–2, 38–39) base light yellowish brown, densely and symmetrically spotted with medium to dark brown all over the body and appendages, except on chelicerae, pedipalp manus, ventral region of prosoma and mesosoma, and telson. Chelicerae only with fingers subtly infuscate. Pedipalp with all carinae darker due to heavier sclerotization; trochanter, femur and patella diffusely spotted with medium brown; chela almost entirely immaculate, except for diffuse infuscation from apical portion of manus through basal half of fingers. Carapace symmetrically and densely spotted with dark to medium brown all over; eyes and ocular tubercles black. Tergites

each with three large and irregular dark to medium brown spots, arranged into three irregular longitudinal stripes. Pectines immaculate whitish, with basal portion and basal plate progressively darker due to heavier sclerotization. Sternites largely immaculate, only with posterior margin of VII infuscate; sternites III and V with the smooth patch translucent. Metasoma with base color becoming progressively darker and more reddish distally; all surfaces diffusely spotted with dark to medium brown, with pattern becoming denser distally in every segment. Telson vesicle light brown, immaculate, subaculear tubercle gradually paler distally; aculeus with distal two-thirds dark brown to blackish.

**Chelicerae** (Fig. 22). With dentition typical for the genus; teeth relatively long and sharp. Tegument glossy, dorsodistal portion of manus with coarse, glossy granules irregularly arranged transversally, defining a depressed area. Setation very dense ventrally, but essen-

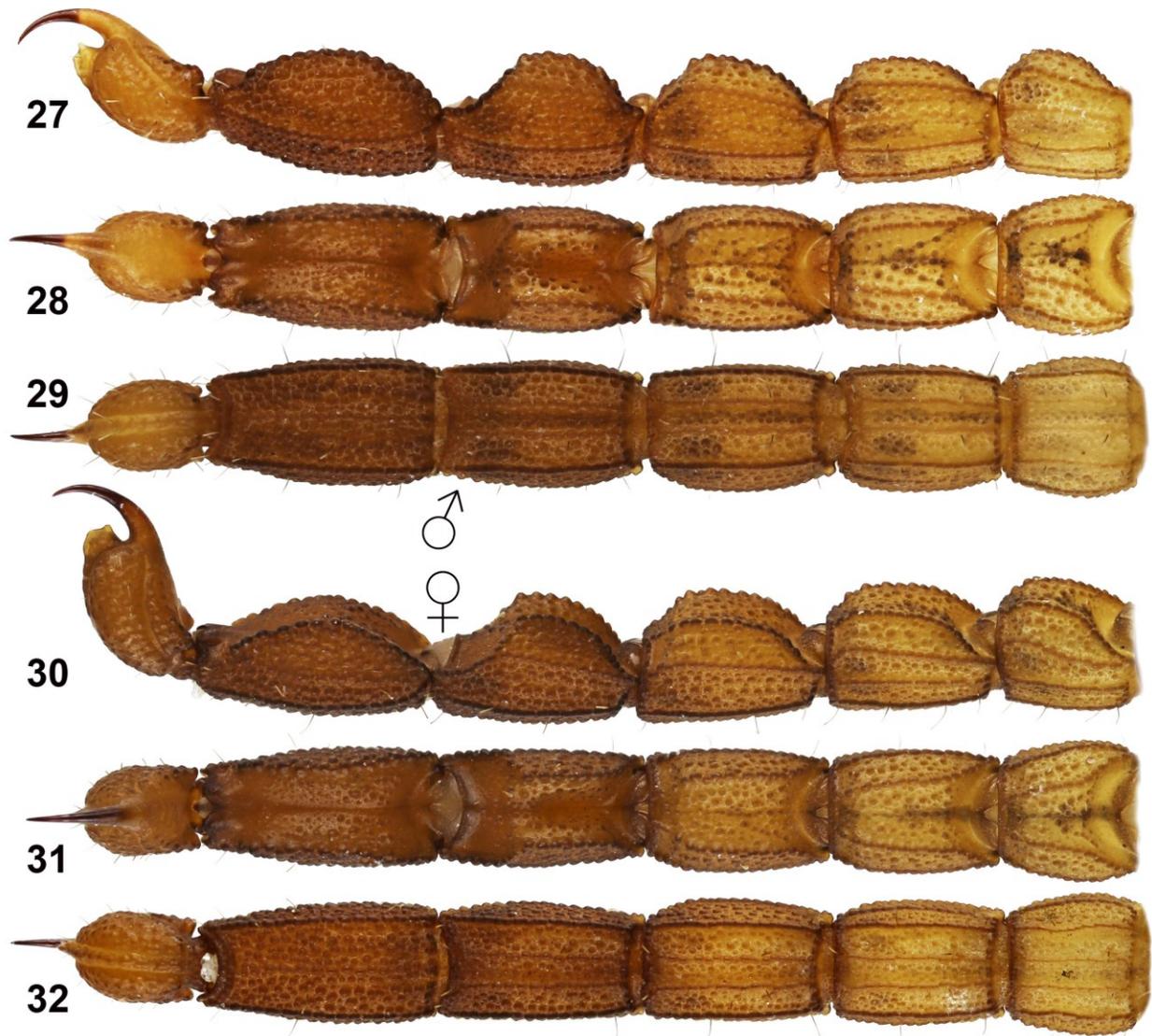


**Figures 22–26:** *Chaneke hofereki* sp. n. **Figures 22–23.** Holotype male, chelicerae, carapace and tergites I–III (22), and sternopectinal region and sternites III–VII (23). **Figures 24–26.** Paratype female, chelicerae, carapace and tergites I–III (24), sternopectinal region (25), and sternopectinal region and sternites III–VII (26).

tially lacking dorsally, except for four rigid, whitish macrosetae around depressed area of manus.

**Pedipalps** (Figs. 12–19). Standard-sized for the genus. Neobothriotaxic A- $\alpha$  reductive: femur and patella both missing trichobothrium  $d_2$ , chela missing  $Eb_3$ . Femur short, essentially straight and sparsely covered with thick, dark macrosetae with truncate tips; all four carinae

very strongly crenulate to subserrate; intercarinal tegument coarsely granulose; internal (*i*) trichobothria surrounding a large, crest-like, tridentate spur. Patella short, essentially straight and sparsely covered with thick, dark macrosetae with truncate tips; all seven carinae very strongly granulose to crenulate; intercarinal tegument coarsely granulose; intercarinal tegument entirely cov-



**Figures 27–32:** *Chaneke hofereki* sp. n. **Figures 27–29.** Holotype male, metasoma and telson, lateral (27), dorsal (28), and ventral (29) views. **Figures 30–32.** Paratype female, metasoma and telson, lateral (30), dorsal (31), and ventral (32) views.

ered with granules smaller and denser than on femur, internal surface irregularly tuberculate. Chela robust and densely covered with short, dark macrosetae with truncate tips; manus oval (1.42 times longer than wide), wider than patella (ratio 1.23), and with the basal half only slightly widest, all nine carinae very strongly subcostate to subcrenulate, intercarinal tegument entirely covered with granulation smaller but as dense as on femur; fingers short and thick (movable finger 1.31 times longer than underhand), shallowly curved and densely covered with short, dark macrosetae with truncate tips, fixed finger with 10/10 principal rows of denticles, movable finger with 9/9 plus an apical subrow of three denticles and a large internal accessory denticle (large terminal denticle not included), basal lobe/notch combination moderate.

**Carapace** (Fig. 22). Trapezoidal but with lateral margins strongly converging anteriorly, slightly wider than long; anterior margin bilobed, serrate and with two pairs of small macrosetae. Carination essentially indistinct from surrounding coarse granulation: the only definable carinae are the superciliaries and posterior medians, both formed by medium-sized, partially fused granules. Furrows: anterior median, median ocular, central median, posterior median and posterior marginal fused, narrow and moderately deep, posterior laterals long, narrow and moderately shallow, other furrows indistinct. Tegument very densely covered by various-sized but mostly coarse, rough granules. Median eyes relatively small and separated by more than one ocular diameter; two pairs of smaller lateral eyes, largely concealed below anterolateral margin.



**Figures 33–37:** *Chanেকে hofereki* sp. n., paratype male, left hemispermatochore with capsule region oriented for external (33), dorsal (34, 37), internal (35) and ventral (36) views. Hemispermatochore was dissected around 17.XI.2015, Figure 37 was taken 7.XII.2015, Figures 33–36 were taken 11.I.2016, showing gradual fading of the violet color over eight weeks of storage in alcohol. Scale bar: 500 µm.

**Sternum** (Fig. 23). Standard for the genus: type 1, relatively large, slightly longer than wide, and pentagonal in shape, with two pairs of short, dark macrosetae. Tegument finely and densely granulose.

**Genital operculum** (Fig. 23). Medium-sized, halves tightly apposed and roundly subtriangular in shape, with three pairs of short, dark macrosetae; tegument finely and densely granulose. Genital papillae typical of the genus: medium-sized, not protruding and lacking sharp-pointed tips. Pre-pectinal plate heavily sclerotized and widely crescent-shaped.

**Pectines** (Fig. 23). Size and shape standard for the group: short, (not reaching leg IV trochanter), wide, subrectangular and moderately setose. Tooth count 10/10, teeth moderately swollen and not separated basally. Basal middle lamella roundly subtriangular, weakly enlarged. Basal plate highly sclerotized, about as long as wide; anterior margin widely V-shaped, posterior margin essentially straight; tegument finely and densely granulose.

**Hemispermatochore** (Figs. 33–37). Flagelliform. Flagellum relatively short, proximal half (*pars recta*) with membranous lamina along ental margin, distal half (*pars reflecta*) cylindrical. Base of flagellum buttressed by broad internal lamina. Capsule region with

three distinct lobes. Median lobe broad with gently curved apical margin, and almost linear dorsal carina terminating in blunt vertex. Internal lamina of flagellum fused basally to median lobe. Internal lobe acuminate, well separated from median lobe by deep incision. Basal lobe strongly developed as prominent, hamate process arising at 45° angle on dorsal capsule near base of median lobe. Trunk relatively broad and short, approximately three times length of capsule region. Freshly extracted hemispermatochore with a violet tint, most intense in flagellum, fainter in trunk (Fig. 37); violet color fading after several weeks of storage in alcohol (Figs. 33–36).

**Legs** (Figs. 5–7). Short, slender and densely covered with short, dark macrosetae with truncate tips. All carinae coarsely crenulate to serrate, intercarinal tegument densely and irregularly granulose. Prolateral and retrolateral pedal spurs short and sharp. Ventral surface of telotarsi round, with two longitudinal rows of thin, dark setae converging basally. Claws short and strongly curved.

**Mesosoma** (Figs. 1–2, 22–23). Tergites coarsely and densely granulose, with many granules projecting over posterior margin; I–VI with the median longitudinal carina very long and strong, granulose to crenulate,

| Dimensions (mm)            |           | ♂ holotype            | ♂ paratype            | ♀ paratype            |
|----------------------------|-----------|-----------------------|-----------------------|-----------------------|
| Carapace                   | L / W     | 2.075 / 2.125         | 2.150 / 2.150         | 2.650 / 2.800         |
| Mesosoma                   | L         | 3.500                 | 3.650                 | 6.600                 |
| Tergite VII                | L / W     | 1.025 / 2.000         | 1.100 / 1.850         | 1.875 / 2.775         |
| Metasoma + Telson          | L         | 9.363                 | 10.126                | 11.875                |
| Segment I                  | L / W / H | 1.150 / 1.175 / 1.063 | 1.213 / 1.175 / 1.075 | 1.450 / 1.463 / 1.325 |
| Segment II                 | L / W / H | 1.375 / 1.050 / 1.063 | 1.500 / 1.075 / 1.075 | 1.775 / 1.300 / 1.225 |
| Segment III                | L / W / H | 1.525 / 1.075 / 1.100 | 1.675 / 1.125 / 1.075 | 1.950 / 1.300 / 1.375 |
| Segment IV                 | L / W / H | 1.650 / 1.075 / 1.100 | 1.825 / 1.100 / 1.075 | 2.100 / 1.250 / 1.375 |
| Segment V                  | L / W / H | 1.863 / 1.075 / 1.025 | 2.100 / 1.100 / 1.025 | 2.400 / 1.250 / 1.250 |
| Telson                     | L / W / H | 1.800 / 0.775 / 0.750 | 1.813 / 0.775 / 0.800 | 2.200 / 0.950 / 0.950 |
| Vesicle (without tubercle) | L         | 1.050                 | 1.075                 | 1.475                 |
| Aculeus                    | L         | 0.750                 | 0.825                 | 0.900                 |
| Pedipalp                   | L         | 6.725                 | 7.338                 | 8.525                 |
| Femur                      | L / W     | 1.650 / 0.550         | 1.750 / 0.650         | 2.075 / 0.800         |
| Patela                     | L / W     | 1.950 / 0.775         | 2.113 / 0.800         | 2.500 / 0.975         |
| Chela                      | L         | 3.125                 | 3.475                 | 3.950                 |
| Manus                      | L / W / H | 1.350 / 0.950 / 0.925 | 1.575 / 1.000 / 0.950 | 1.725 / 1.050 / 1.000 |
| Movable finger             | L         | 1.775                 | 1.900                 | 2.225                 |
| <b>Total</b>               | <b>L</b>  | <b>14.938</b>         | <b>15.926</b>         | <b>21.125</b>         |

**Table 1:** Measurements of three adult types of *Chaneka hofereki* sp. n. Abbreviations: length (L), width (W, in carapace it corresponds to posterior width), depth (H).

formed by partially fused coarse granules projected well beyond posterior margin, flanked on each side by some aligned and prominent coarse granules that suggest a vestigial pair of submedian carinae which is short and also projected well beyond posterior margin; VII with the standard five longitudinal carinae (median, submedians and laterals), which are long and strongly crenulate to serrate. Sternites coarsely and densely granulose (much finer and denser in both depressed lateral areas of III), densely covered with short, dark macrosetae with truncate tips; sternites IV–VI sulcate with a median longitudinal suture that extends over basal half of VII; spiracles slightly oblique, round on sternite III, elongate oval to short slit-like on sternites IV–VI; posterior margin of III widely convex, of IV–VII widely concave; III–V with carinae either absent or obscured by surrounding granulation, VI–VII with two pairs of carinae (submedians and laterals) which are coarsely granulose and become progressively longer, stronger and better defined posteriorly; smooth patch of sternite III medium-sized, teardrop-shaped, much longer than wide, slightly bulky, and translucent, smooth patch of V moderately small, teardrop-shaped, much longer than wide, slightly bulky, translucent, and divided along midline by the median longitudinal suture.

**Metasoma** (Fig. 27–29). Moderately short, robust and moderately wider distally; segment I slightly wider than long, II–V progressively longer than wide. Segments I–II with ten complete carinae, III–IV with eight, V with five: dorsal laterals very strong and coarsely crenulate on I–IV (without enlarged terminal denticles), absent on V; lateral supramediains very strong and coarsely crenulate on I–V; lateral inframediains very strong and coarsely crenulate on I–II, absent on III–V (but suggested on III by a row of isolate coarse granules that do not form a true carina); ventral laterals very strong and coarsely crenulate on I–V; ventral submedians very strong and coarsely crenulate on I–IV, coarsely granulose but present only on basal half of V; ventral median absent on I–IV, very strong and coarsely crenulate on V, linear and not divided or furcate distally. Intercarinal tegument very densely and coarsely granulose on all surfaces but sparser dorsally; dorsal furrow complete, wide and moderately deep on all segments (progressively narrower and deeper posteriorly); setation essentially absent except for two long, dark macrosetae over every carina on I–IV, up to 3–4 on V.

**Telson** (Fig. 20). Vesicle globose (1.35 times longer than wide, 1.03 times wider than deep), with some scattered long, dark setae of different sizes and thick, dark macrosetae with truncate tips; tegument weakly but coarsely granulose on all surfaces except dorsally; ventral median carina weak but coarsely granulose, evenly raised into the subaculear tubercle which is very large, laterally compressed (irregular blade-like), with a conspicuous conical tip, and without dorsal granules.

Aculeus shorter than vesicle, thick but sharp, and strongly curved.

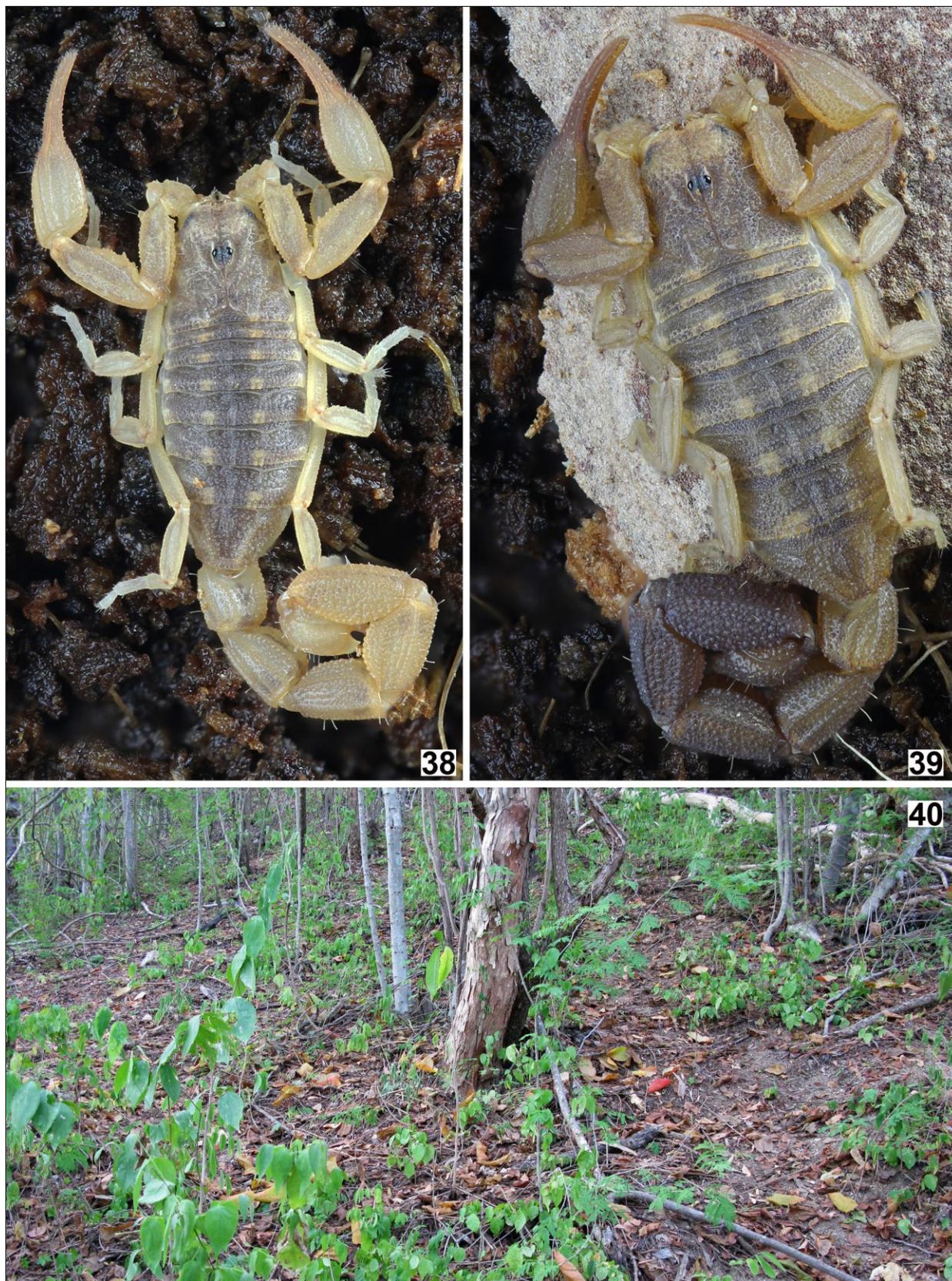
**FEMALE** (paratype: Figs. 3–4, 8–9, 10–11, 21, 24–26, 30–32, 39; Table 1). Strong sexual dimorphism evident in: **1)** size larger; **2)** overall coloration darker and less conspicuously patterned all over; **3)** pedipalp manus more slender; **4)** fingers longer, thinner and with lobe/notch combination much weaker; **5)** genital operculum larger, with papillae absent; **6)** pectines smaller and with fewer teeth, which are also shorter and narrower; **7)** pectinal basal plate conspicuously larger, bulky and with posterior margin markedly convex; **8)** mesosoma wider, with sides slightly more convex; **9)** smooth patch of sternite V much smaller and not divided by median suture; **9)** metasoma slightly narrower and essentially parallel-sided.

**VARIATION.** The paratype male is slightly larger than the holotype (Tab. 1), but both specimens seem to belong to the same size-class. The female paratype is conspicuously larger and most likely represent the next upper class, but ontogenetic studies are required to confirm this hypothesis.

Pectinal tooth count of paratypes varied as follows: adult male 9/9, juvenile male 9/10, female 6/7.

**AFFINITIES** (both sexes, unless otherwise stated). The other two previously described species of *Chaneka* can be easily distinguished from *C. hofereki* **sp. n.** as follows:

- *C. aliciae*: **1)** adult size remarkably larger (26 mm in male, 28–30 mm in female); **2)** coloration basically darker (reddish brown), with the dark pattern much less contrasting; **3)** chela conspicuously more robust (length/width ratio 3.10 in male, 3.18–3.26 in female vs. 3.29–3.47 and 3.76, respectively, in *C. hofereki* **sp. n.**); **4)** pedipalp fixed finger with 9 principal rows of denticles; **5)** tergites I–VI similarly coarsely granulose, but without any aligned granules suggesting a tricarinate condition; **6)** male sternite V with smooth patch slightly larger and wider; **7)** sternite VI with submedian and lateral carinae better defined; **8)** female metasomal segment I longer than wide; **9)** dorsal lateral carinae on metasomal segments II–III with terminal denticle slightly enlarged; **10)** telson subaculear tubercle with tip shorter and truncate. Moreover, the available sample of both species is too small to be categorical, but pectinal tooth counts in female *C. aliciae* appear to be slightly higher (8–9).
- *C. fogoso*: **1)** pedipalp chela lacking two more trichobothria (*Esb* from manus and *esb* from fixed finger); **2)** pedipalp fingers with basal lobe/notch combination noticeably weaker; **3)** chela conspicuously more robust (length/width ratio 2.73–2.88 in



Figures 38–40: *Chaneke hofereki* sp. n., male (38) and female (39) paratypes, and the type locality (40).

male, 3.46–3.69 in female vs. 3.29–3.47 and 3.76, respectively, in *C. hofereki* sp. n.); **4**) pedipalp fixed and movable fingers with 10 and 11 principal rows of denticles, respectively; **5**) tergites I–VI similarly coarsely granulate, but without any aligned granules suggesting a tricarinate condition; **6**) male sternite V with smooth patch larger but shorter, wider than long and cordiform; **7**) sternite VI with submedian and lateral carinae better defined; **8**) telson subaculear tubercle smaller and more regular in contour. Moreover, even though the available sample of *C. hofereki* sp. n. is too small to be categorical, pectinal tooth counts in female *C. fogoso* are slightly but consistently higher (8–9).

A detailed comparison against the fourth species of the genus, which is also described as new in the present paper, can be found in its “Affinities” section (see below).

**DISTRIBUTION** (Fig. 60). Known only from the type locality, in the Pacific coast of Oaxaca State.

**ECOLOGY**. All specimens were collected during a nocturnal search with standard UV flashlights, on the leaf-litter soil of a tropical dry forest. It lives syntopically with the buthids *Centruroides hoffmanni* Armas, 1996 and *Centruroides nigrimanus* (Pocock, 1898), and the vaejovid *Mesomexovis occidentalis* (Hoffmann, 1931).

***Chanেকে baldazoi*** Kovařík, Teruel et Lowe,  
sp. n.

(Figures 41–60; Table 2)

<http://www.zoobank.org/urn:lsid:zoobank.org:act:1319A712-CB30-4D48-973E-141A70F90BB8>

**TYPE LOCALITY AND HOLOTYPE DEPOSITORY**. Mexico, Oaxaca State, Nejapa de Madero Municipality, El Camarón, 16.554167°N 96.026944°W, 690 m a.s.l. (Figs. 59–60), FKCP.

**TYPE MATERIAL**. Mexico, Oaxaca State, Nejapa de Madero Municipality, El Camarón, 16.554167°N 96.026944°W, 690 m a.s.l., 22.IX.2012, under rocks in dry tropical forest, leg. D. Hoferek, 1♀ holotype, 3♀ and 1 juvenile ♀ paratypes (FKCP), 1♀ paratype (RTOC), 10 juvenile paratypes born from a female paratype, still alive after third ecdysis, kept by D. Hoferek.

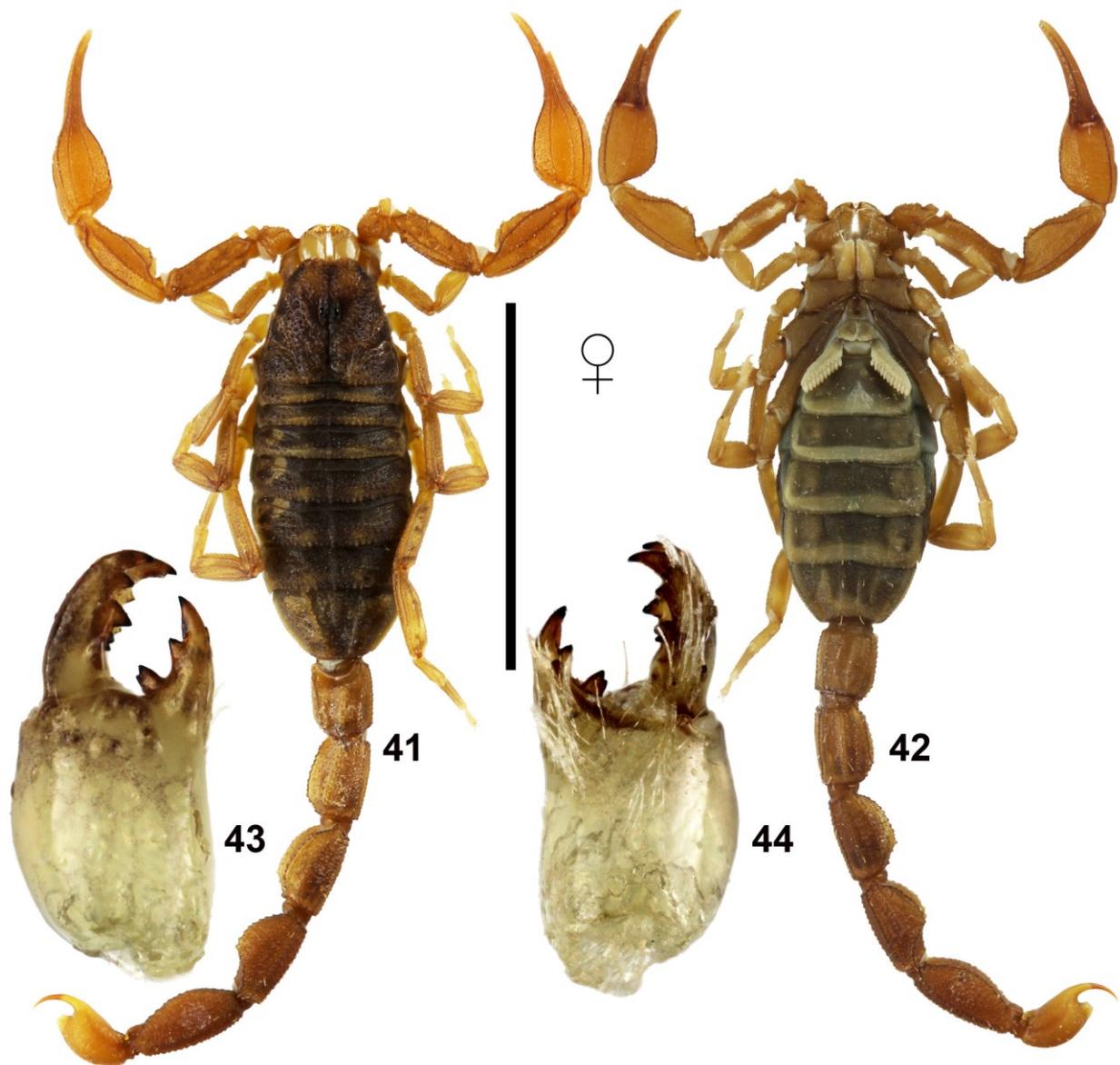
**ETYMOLOGY**. The selected epithet is a patronym honoring José Guadalupe Baldazo Monsivaiz (Zihuatanejo, Guerrero State, Mexico), who is one of the best experts in Mexican scorpiology and also a good friend.

**DIAGNOSIS** (females only, male unknown). Adult size large for the genus (female 26–28 mm). Coloration bas-

ically reddish brown, diffusely spotted with medium to dark brown all over the body and appendages except ventrally on prosoma and mesosoma (dark pattern poorly contrasting). Pedipalps with reductive neobothriotaxy (three missing trichobothria:  $d_2$  from both femur and patella,  $Eb_3$  from manus); chelae with manus oval and wider than patella (ratio 1.14–1.20); fixed finger with 10 principal rows of denticles, movable finger with 11, basal lobe/notch combination moderate. Pectines with 9–11 teeth; basal middle lamella paraboloid, moderately enlarged. Sternite V with the smooth patch moderately small, much longer than wide, hourglass-shaped, bulky, and translucent; spiracles round (III) or elongate oval to short slit-like (IV–VI). Metasoma short, robust and slightly narrower distally (segment I longer than wide), with 10/10/8/8/5 complete to essentially complete, very strong, coarsely crenulate to dentate carinae; dorsal lateral carinae on segments II–III with terminal denticle slightly enlarged; all intercarinal spaces very densely and coarsely granulate. Telson vesicle globose, weakly but coarsely granulate; subaculear tubercle with a short truncate tip.

**DESCRIPTION** (adult female holotype). **Coloration** (Figs. 41–42, 58) base light reddish brown, diffusely and symmetrically spotted with medium to dark brown all over the body and appendages, except on chelicerae, pedipalp manus, ventral region of prosoma and mesosoma, and telson. Chelicerae only with fingers very subtly infuscate. Pedipalp with all carinae darker due to heavier sclerotization; trochanter, femur and patella diffusely spotted with medium brown; chela almost entirely immaculate, except for very faint infuscation from apical portion of manus through basal half of fingers. Carapace symmetrically and densely spotted with dark to medium brown all over; eyes and ocular tubercles black. Tergites each with three large and irregular dark to medium brown spots, arranged into three irregular longitudinal stripes. Pectines immaculate whitish, with basal portion and basal plate progressively darker due to heavier sclerotization. Sternites largely immaculate, only with posterior margin of VII infuscate; sternites III and V with the smooth patch translucent. Metasoma with base color essentially uniform throughout; all surfaces diffusely spotted with dark to medium brown except dorsally, with pattern becoming denser distally in every segment. Telson vesicle light brown, immaculate, subaculear tubercle gradually paler distally; aculeus with distal two-thirds dark brown to blackish.

**Chelicerae** (Fig. 43–44). With dentition typical for the genus; teeth relatively long and sharp. Tegument glossy, dorsodistal portion of manus with coarse, glossy granules irregularly arranged transversally, defining a depressed area. Setation very dense ventrally, but essentially lacking dorsally, except for four rigid, whitish macrosetae around depressed area of manus.

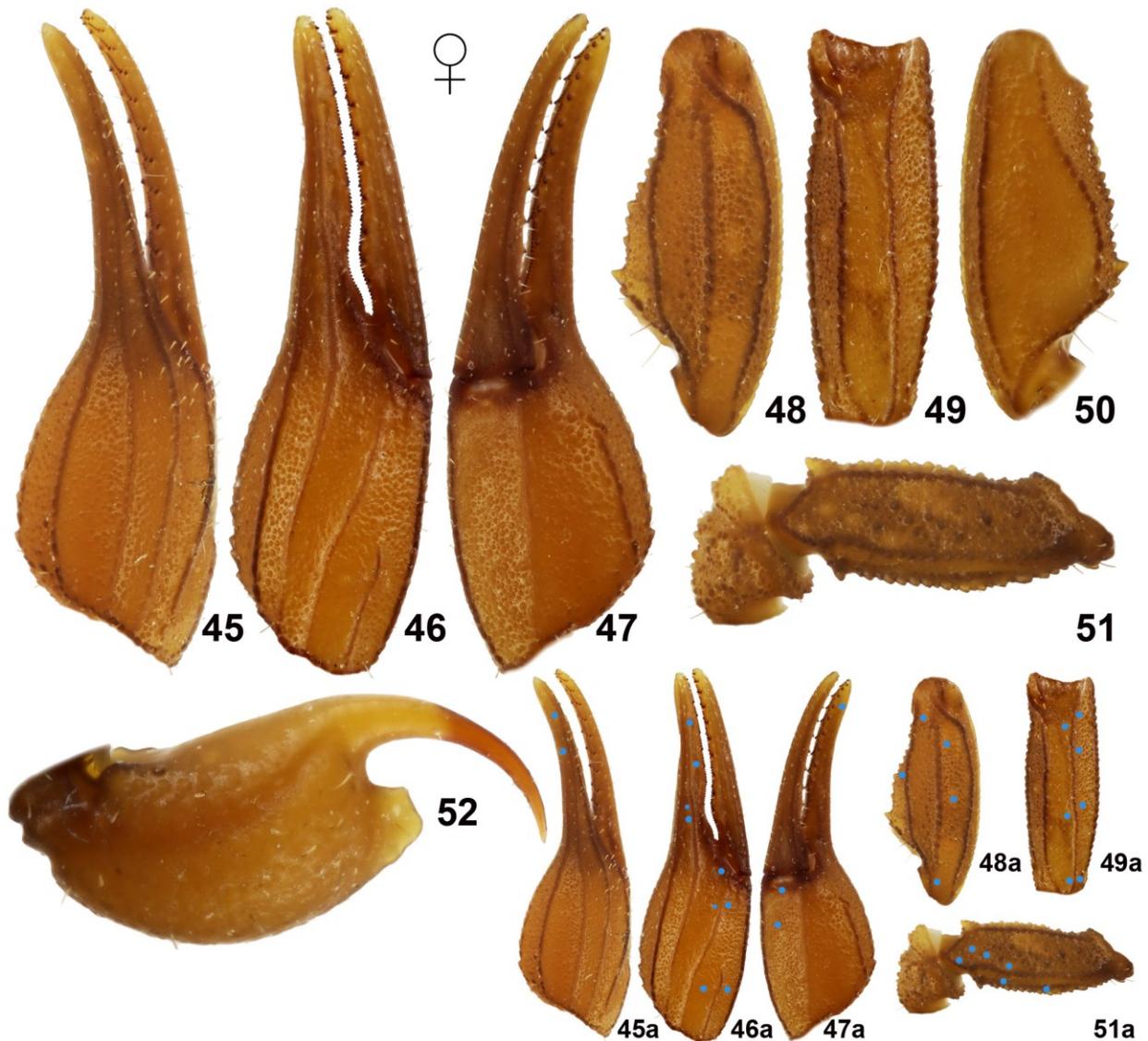


**Figures 41–44:** *Chaneke baldazoi* sp. n., paratype female, dorsal (41) and ventral (42) views, and chelicera dorsal (43) and ventral (44). Scale bar (41–42): 10 mm.

**Pedipalps** (Figs. 45–51). Standard-sized for the genus. Neobothriotaxic A- $\alpha$  reductive: femur and patella both missing trichobothrium  $d_2$ , chela missing  $Eb_3$ . Femur short, essentially straight and sparsely covered with thick, pale macrosetae with truncate tips; all four carinae very strongly crenulate to subserrate; intercarinal tegument coarsely granulose; internal ( $i$ ) trichobothria surrounding a large, crest-like, serrate spur. Patella short, essentially straight and sparsely covered with thick, pale macrosetae with truncate tips; all seven carinae very strongly granulose to crenulate; intercarinal tegument coarsely granulose; intercarinal tegument entirely covered with granules smaller and denser than on femur, internal surface irregularly tuberculate. Chela robust and densely covered with short, pale macrosetae with trun-

cate tips; manus oval (1.35 times longer than wide), wider than patella (ratio 1.20), and with the basal half widest, all nine carinae very strongly subcostate to subcrenulate, intercarinal tegument entirely covered with granulation smaller but as dense as on femur; fingers long and thick (movable finger 1.52 times longer than underhand), shallowly curved and densely covered with short, pale macrosetae with truncate tips, fixed finger with 10/10 principal rows of denticles (the two basal-most rows not clearly divided or fused), movable finger with 11/11 plus an apical subrow of three denticles and a large internal accessory denticle (large terminal denticle not included), basal lobe/notch combination moderate.

**Carapace** (Fig. 53). Trapezoidal but with lateral margins strongly converging anteriorly, slightly wider



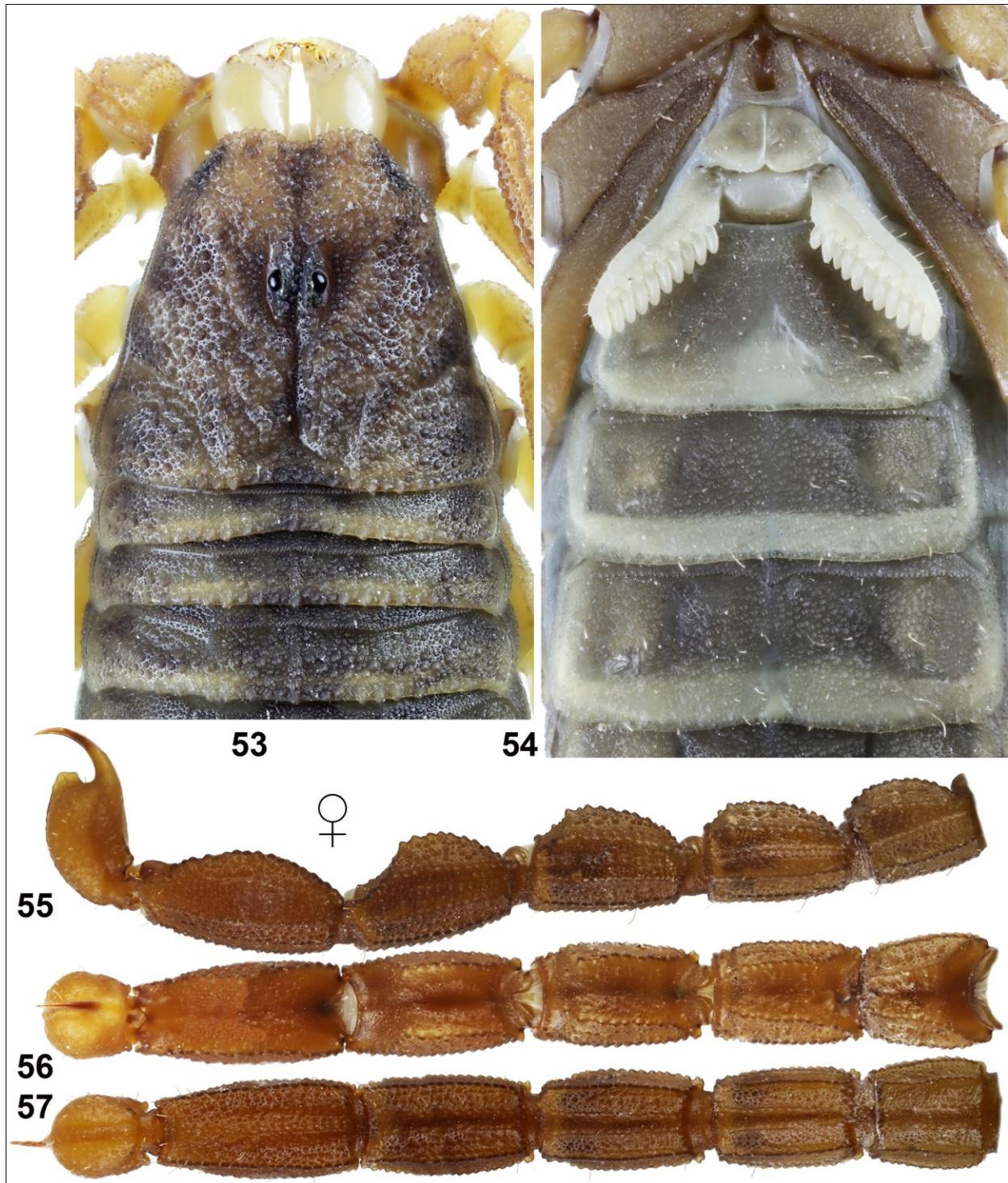
**Figures 45–52:** *Chaneke baldazoi* sp. n., paratype female, pedipalp chela, dorsal (45), external (46), and ventral (47) views. Pedipalp patella, dorsal (48), external (49), and ventral (50) views. Pedipalp femur and trochanter dorsal (51). Telson lateral (52). The trichobothrial pattern is indicated in Figures 45a–49a, 51a.

than long; anterior margin widely bilobed, serrate and with 2–3 pairs of small macrosetae. Carination essentially indistinct from surrounding coarse granulation: the only definable carinae are the superciliaries and posterior medians, both formed by medium-sized, isolated granules. Furrows: anterior median, median ocular, central median, posterior median and posterior marginal fused, narrow and moderately deep, posterior laterals long, very narrow and moderately shallow, other furrows indistinct. Tegument very densely covered by variously-sized but mostly coarse, rough granules, even on the median ocular furrow between superciliary carinae. Median eyes relatively small and separated by more than one ocular diameter; two pairs of smaller lateral eyes, largely concealed below anterolateral margin.

**Sternum** (Fig. 54). Standard for the genus: type 1, relatively large, slightly longer than wide, and pentagonal in shape, with two pairs of short, pale macrosetae. Tegument finely and densely granulose.

**Genital operculum** (Fig. 54). Medium-sized, halves tightly apposed and roundly subtriangular in shape, with three pairs of short, pale macrosetae; tegument finely and densely granulose. Genital papillae absent.

**Pectines** (Fig. 54). Size and shape standard for the group: short, (far from reaching leg IV trochanter), wide, subrectangular and moderately setose. Tooth count 10/11, teeth moderately swollen and not separated basally. Basal middle lamella paraboloid, moderately enlarged. Basal plate highly sclerotized, wider than long;



**Figures 53–57:** *Chaneke baldazoi* sp. n., paratype female, chelicerae, carapace and tergites I–III (53), and sternopectoral region and sternites III–V (54). Metasoma and telson, lateral (55), dorsal (56), and ventral (57) views.

anterior margin essentially straight, posterior margin very shallowly convex to straight; tegument smooth to feebly granulose.

**Legs.** Short, slender and densely covered with short, dark macrosetae with truncate tips. All carinae coarsely

crenulate to serrate, intercarinal tegument densely and irregularly granulose. Prolateral and retrolateral pedal spurs short and sharp. Ventral surface of telotarsi round and with two longitudinal rows of thin, dark setae converging basally. Claws short and strongly curved.

| Dimensions (mm)            |           | ♀ holotype            | ♀ paratype            |
|----------------------------|-----------|-----------------------|-----------------------|
| Carapace                   | L / W     | 3.500 / 3.875         | 2.800 / 3.250         |
| Mesosoma                   | L         | 7.800                 | 7.850                 |
| Tergite VII                | L / W     | 2.050 / 3.775         | 1.900 / 3.175         |
| Metasoma + Telson          | L         | 14.35                 | 12.80                 |
| Segment I                  | L / W / H | 2.050 / 1.850 / 1.625 | 1.550 / 1.525 / 1.400 |
| Segment II                 | L / W / H | 2.450 / 1.665 / 1.575 | 1.875 / 1.375 / 1.275 |
| Segment III                | L / W / H | 2.725 / 1.665 / 1.575 | 2.100 / 1.350 / 1.300 |
| Segment IV                 | L / W / H | 2.900 / 1.650 / 1.625 | 2.275 / 1.375 / 1.350 |
| Segment V                  | L / W / H | 3.275 / 1.650 / 1.550 | 2.675 / 1.350 / 1.275 |
| Telson                     | L / W / H | 3.000 / 1.375 / 1.325 | 2.325 / 1.150 / 1.075 |
| Vesicle (without tubercle) | L         | 2.030                 | 1.550                 |
| Aculeus                    | L         | 1.175                 | 0.975                 |
| Pedipalp                   | L         | 12.000                | 9.875                 |
| Femur                      | L / W     | 2.950 / 0.975         | 2.450 / 0.850         |
| Patela                     | L / W     | 3.450 / 1.375         | 2.875 / 1.100         |
| Chela                      | L         | 5.600                 | 4.550                 |
| Manus                      | L / W / H | 2.225 / 1.650 / 1.525 | 1.875 / 1.250 / 1.165 |
| Movable finger             | L         | 3.375                 | 2.675                 |
| <b>Total</b>               | <b>L</b>  | <b>25.65</b>          | <b>23.45</b>          |

**Table 2:** Measurements of two adult types of *Chaneke baldazoi* sp. n. Abbreviations: length (L), width (W, in carapace it corresponds to posterior width), depth (H).

**Mesosoma** (Figs. 41–42, 53). Tergites coarsely and densely granulose, with many granules projecting over posterior margin; I–VI with the median longitudinal carina very long and strong, granulose to crenulate, formed by partially fused coarse granules projected well beyond posterior margin, with surrounding granulation not aligned into any particular arrangement; VII with the standard five longitudinal carinae (median, submedians and laterals), which are long and strongly crenulate to serrate. Sternites coarsely and densely granulose (much finer and denser in both depressed lateral areas of III), densely covered with short, pale macrosetae with truncate tips; sternites IV–VI sulcate by a median longitudinal suture; spiracles slightly oblique, round on sternite III, elongate oval to short slit-like on sternites IV–VI; posterior margin of III straight, of IV–VI widely bilobed, of VII widely concave; III–V with carinae either absent or obscured by surrounding granulation, VI–VII with two pairs of carinae (submedians and laterals) which are coarsely granulose and become progressively longer, stronger and better defined posteriorly; smooth patch of sternite III very large, teardrop-shaped, longer than wide, bulky, and slightly whitish, smooth patch of V moderately small, much longer than wide, hourglass-shaped, bulky, translucent, and not divided along midline by the median longitudinal suture.

**Metasoma** (Figs. 55–57). Moderately short, robust and slightly narrower distally; segments I–V progressively longer than wide. Segments I–II with ten complete carinae, III–IV with eight, V with five: dorsal laterals very strong and coarsely crenulate to dentate on I–IV (with terminal denticle slightly enlarged on II–III), absent on V; lateral supramedians very strong and coarsely crenulate on I–V; lateral inframedians very strong and coarsely crenulate on I–II, absent on III–V (but suggested on III by a row of isolate coarse granules that almost form a true carina); ventral laterals very strong and coarsely crenulate on I–V; ventral submedians very strong and coarsely crenulate on I–IV, coarsely granulose but present only on basal half of V; ventral median absent on I–IV, very strong and coarsely crenulate on V, linear and not divided or furcate distally. Intercarinal tegument very densely and coarsely granulose on all surfaces but sparser dorsally; dorsal furrow complete, wide and moderately deep on all segments (progressively narrower and deeper posteriorly); setation essentially absent except for two long, pale macrosetae over every carina on I–IV, up to 3–4 on V.

**Telson** (Figs. 52). Vesicle globose (1.48 times longer than wide, 1.04 times wider than deep), with some scattered long, dark setae of different sizes and thick, dark macrosetae with truncate tips; tegument weakly but coarsely granulose on all surfaces except dorsally; ventral median carina weak but coarsely granulose, evenly raised into the subaculear tubercle which is

very large, laterally compressed (irregular blade-like), with a short truncate tip, and without dorsal granules. Aculeus shorter than vesicle, thick but sharp, and strongly curved.

**VARIATION.** One paratype female is slightly smaller than the holotype (Tab. 2), but all adults seem to belong to the same size-class.

Pectinal tooth count of paratypes varied as follows: adults 11/10, 10/10, 9/10, juvenile 10/9.

**AFFINITIES** (females only). The three other described species of *Chaneka* can be easily distinguished from *C. baldazoi* **sp. n.** as follows:

- *C. aliciae*: **1**) chela more robust (length/width ratio 3.18–3.26 vs. 3.39–3.64 in *C. baldazoi* **sp. n.**); **2**) pedipalp manus with internal surface more strongly denticulate; **3**) pedipalp fixed and movable fingers with 9 principal rows of denticles; **4**) carapace without coarse granules (fine only) between superciliary carinae; **5**) sternite V with the smooth patch teardrop-shaped. Moreover, the available sample of both species is too small to be categorical, but pectinal tooth counts in *C. aliciae* appear to be slightly lower (8–9).
- *C. fogoso*: **1**) size remarkably smaller (up to 21 mm); **2**) coloration basically paler (yellowish brown), with dark pattern much more contrasting; **3**) pedipalp chela lacking two more trichobothria: *Esb* from manus and *esb* from fixed finger; **4**) pedipalp fingers shorter, with basal lobe/notch combination noticeably weaker; **5**) chela much more robust (length/width ratio 2.73–2.88 vs. 3.39–3.64 in *C. baldazoi* **sp. n.**); **6**) sternite V with the smooth patch teardrop-shaped; **7**) metasomal segment I wider than long; **8**) dorsal lateral carinae on metasomal segments II–III with terminal denticles not enlarged; **9**) telson subaculear tubercle larger, with tip longer and sharp. Moreover, even though the available sample of *C. baldazoi* **sp. n.** is too small to be categorical, pectinal tooth counts in *C. fogoso* seem slightly lower (8–9).
- *C. hofereki* **sp. n.**: **1**) size remarkably smaller (up to 21 mm); **2**) coloration basically paler (yellowish brown), with dark pattern much more contrasting; **3**) pedipalp movable finger with 9 principal rows of denticles; **4**) pedipalp fingers slightly shorter, with basal lobe/notch combination much weaker; **5**) chela slightly more slender (length/width ratio 3.76 vs. 3.39–3.64 in *C. baldazoi* **sp. n.**); **6**) tergites I–VI similarly coarsely granulose, but with aligned submedian granules suggesting a tricarinate condition; **7**) sternite V with the smooth patch teardrop-shaped; **8**) sternite VI with submedian and lateral carinae less defined; **9**) metasomal segment I wider than long; **10**) dorsal lateral carinae on metasomal



Figures 58–59: *Chaneke baldazoi* sp. n., holotype female (58) and the type locality (59).



**Figure 60:** Map of southern Mexico, showing the known geographical distribution of the four species of *Chaneka*: *C. aliciae* (1), *C. baldazoi* sp. n. (2), *C. fogoso* (3), and *C. hofereki* sp. n. (4).

segments II–III with terminal denticles not enlarged; **11**) telson subaculear tubercle larger and more irregular in contour, with tip longer and sharp. Moreover, the available sample of both species is too small to be categorical, but pectinal tooth counts in *C. hofereki* sp. n. seem conspicuously lower (6–7).

**DISTRIBUTION** (Fig. 60). Known only from the type locality, in the eastern tip of the Sierra Madre Mountains in Oaxaca State.

**ECOLOGY.** All specimens were collected during daytime, under rocks in tropical dry forest. It lives syntopically with the buthid *Centruroides* sp.

### General Remarks

The new taxa described herein double the known diversity of the genus to four species. Three of them are

known from a few localities along the Pacific coast of Guerrero (*C. fogoso*) though Oaxaca west of the Theuantepec Isthmus (*C. aliciae* and *C. hofereki* sp. n.), while the fourth occurs in the Sierra Madre Mountains (*C. baldazoi* sp. n.). This area is extremely complex in most landscape parameters that are good for scorpion diversification (e.g., geographic fragmentation/isolation, altitude, soil and vegetation types), which coupled to its very poorly sampled condition and the highly restricted distribution ranges typical of these micro-scorpions, all lead us to predict that *Chaneka* may likely be at least as diverse here as its closest relative *Alayotityus* in eastern Cuba: eight described species, all endemic from similar landscapes (Teruel & Kovařík, 2012).

In the original description of the genus (Francke et al., 2014), all cladistic and morphological analyses consistently showed *Chaneka* to be phylogenetically closer to *Alayotityus* than to any other described genera of Buthidae (in fact, both were repeatedly referred to as

sister taxa). One of the main diagnostic differences between these two genera was in the carination of the tergites, i.e., monocarinate in the former vs. tricarinate in the latter. Our discovery of *C. hofereki* sp. n., which exhibits a vestigially tricarinate condition, reinforces the previously hypothesized relationship, even though both genera remain very well defined as separate taxa.

The hemispermatothore of *Chaneke* is structurally similar to those of various members of the New World genera *Tityus*, *Centruroides*, *Rhopalurus* and *Zabius* that have been recorded in the literature (e.g. Maury, 1970; Francke & Stockwell, 1987; Stockwell, 1989; Lenarducci et al., 2005; Ojanguren-Affilastro, 2005; Prendini et al., 2009; Teruel & Armas, 2012; Kovařík et al., 2015). The flagellum is short, uncoiled, with *pars recta* and *pars reflecta* sections. The base of the flagellum is broadened and connected to an extended, subrectangular “median lobe” with an internally angled dorsal carina terminating in an apical-internal vertex. A well-developed basal lobe (“hook”) projects from the dorsal or dorso-internal surface of the capsule region, near the base of the median lobe carina. One or more additional smaller lobes may be developed on the internal aspect of the capsule. These shared hemispermatothore characters associate *Chaneke* with the “*Tityus* group” that was previously defined by cladistic analysis of trichobothriotaxy (Fet et al., 2005), a result also supported by the general character analysis of Francke et al. (2014). In that analysis, *Chaneke* is grouped in clade that also includes *Alayotityus*, *Microtityus*, *Zabius* and *Tityopsis*. Among the latter genera, the hemispermatothore has been illustrated only for *Zabius* (Ojanguren-Affilastro, 2005: figs. 116–117, 122–123). We note that the hemispermatothores of *Zabius* and *Chaneke* appear quite similar in overall shape of the flagellum and capsule. Both bear a single, acuminate internal lobe that is well separated from the median lobe by a deep incision, and a prominent, hook-like basal lobe. This provides further support for the hypothesized phylogenetic position of *Chaneke*.

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Personally, Rolando Teruel is deeply grateful to Oscar F. Francke (Colección Nacional de Arácnidos, Universidad Nacional Autónoma de México), for his kind help and hospitality during his summer 2014 visit to this impressive collection, especially for making possible to examine the types and all additional specimens of both *C. aliciae* and *C. fogoso*. During this process, he was also assisted by Carlos E. Santibáñez, Gerardo A. Contreras and Laura Holguín, to whom thanks are also extended. Special thanks to David Hoferek who collected all specimens of described species and who is author of figures 40 and 59. Further,

we thank two anonymous reviewers for their comments to the manuscript.

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