

A new pseudoscorpion species of the genus *Chthonius* C.L. Koch (Pseudoscorpiones: Chthoniidae) from western Iran

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Abstract

Pseudoscorpion, also known as the false scorpion or book scorpion, is belonging to the arachnida class. They can be found in virtually all terrestrial habitats, but are most common in leaf litter, in soil, and under the bark of trees and logs. In spite of this widespread, the results of pseudoscorpion fauna are still poor in Iran. This study was based on specimens collected in different localities from the province of Lorestan, during 2016-2017. The pseudoscorpionids specimens were gathered directly by hand or with an entomological aspirator from leaf litter or under stone. For their taxonomic study, the specimens were cleared in lactic acid, subsequently mounted on glass microscope slide in Hoyer's medium (Gum Arabic 15g, Chloral Hydrate 75g, Distilled Water 25ml, Glycerin 5ml), and studied using Olympus CH-2 compound microscope. The measurements were taken using calibrated ocular micrometer (WF10X-18MM). Figures were drawn with a drawing tube attached to the microscope. The others inspected as temporary slides made by glycerin. a new pseudoscorpion species, *Chthonius youtabae* n. sp. is described and figured based on females collected from Lorestan province-western Iran.

Key words: Arachnida, taxonomy, distribution, Lorestan Province, Middle East.

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Introduction

The pseudoscorpions genus *Chthonius* C.L. Koch, 1843 is mostly distributed in Europe with sporadic occurrences in the Middle East, central Asia, and North America with currently more than 120 valid species (Harvey 2013; Zaragoza 2017). Chthoniid pseudoscorpions are poorly represented in the Middle East and central Asia. Only, nine species belonging to the genus *Chthonius* have been reported from the Middle East and central Asia up to now (summarized in Harvey 2013): *Chthonius shelkovnikovi* Redikorzev, 1930; *Chthonius azerbaijanus* Schawaller and Dashdamirov, 1988; *Chthonius ponticus* Beier, 1965; *Chthonius satapliaensis* Schawaller and Dashdamirov, 1988; *Chthonius jonicus* Beier, 1931; *Chthonius shulovi* Beier, 1963; *Chthonius tadjikistanicus* Dashdamirov and Schawaller, 1992; *Chthonius ischnocheles* Hermann, 1804 and *Chthonius orthodactyloides* Beier, 1967. This paper reports discovery of a new species belonging to the genus *Chthonius* recently collected from Lorestan Province-western Iran.

Material and methods

This study was based on specimens collected in Lorestan Province which has a moderate humid climate (with 46% to 49% humidity). The material used in this study was found under stones in relatively humid areas (with 46% to 49% humidity) and collected directly by hand. The holotype was permanently mounted on glass microscope slide in Hoyer's medium and the paratypes were studied as temporary glycerin mounts in slides. The specimens were examined with an Olympus CH-2 compound microscope and illustrated with a drawing tube attachment. The measurements were taken by using calibrated ocular micrometer (WF10X-18MM) and are expressed in mm. The specimens are lodged in collection of the Acarology Laboratory, Islamic Azad University of Arak (IAUA), Iran. Morphological terminology and mensuration follow Chamberlin (1931), Harvey (1992), Harvey et al. (2012), Judson (2007) and Zaragoza (2017).

Family Chthoniidae Daday, 1888

Genus *Chthonius* C.L. Koch, 1843

Chthonius youtabae n. sp.

Figures 1A-G

Material examined. IRAN: Lorestan Province: holotype ♀, Cheshmeh Serenjeh [33°27'15"N, 49°04'17"E, altitude 1537 m], Doroud, under stone, May 04 2017, leg. M. Zamani (IAUA). Paratypes 2 ♀ collected with the holotype.

Etymology. This species is dedicated to Youtab, Ariobarzanes of Persis's sister, who fought alongside her brother against Greek Macedonian King.

Diagnosis. *Chthonius youtabae* n. sp. can be differentiated from the other species of the genus by the following combination of characters: carapace sub-quadrate (posterior margin indistinctly constricted), carapacial chaetotaxy (with total of 20 setae, of which 2 long and 2 short setae situated on posterior margin), middle part on anterior margin of carapace obviously dentate and its adjacent area covered with minute denticles, tergal chaetotaxy (presence of 4 setae on tergites I-IV), cheliceral structure (presence of two median large teeth in the fixed and an isolated sub-apical plus a large median tooth in the movable cheliceral finger), movable chelal finger with 26-30 teeth becoming fade sub-basally and fixed chelal finger with 46-50 teeth ending basally, chelal shape and size (movable finger slightly curved distally and somewhat longer than fixed finger), and the presence of three microsetae on apical projection of coxa I.

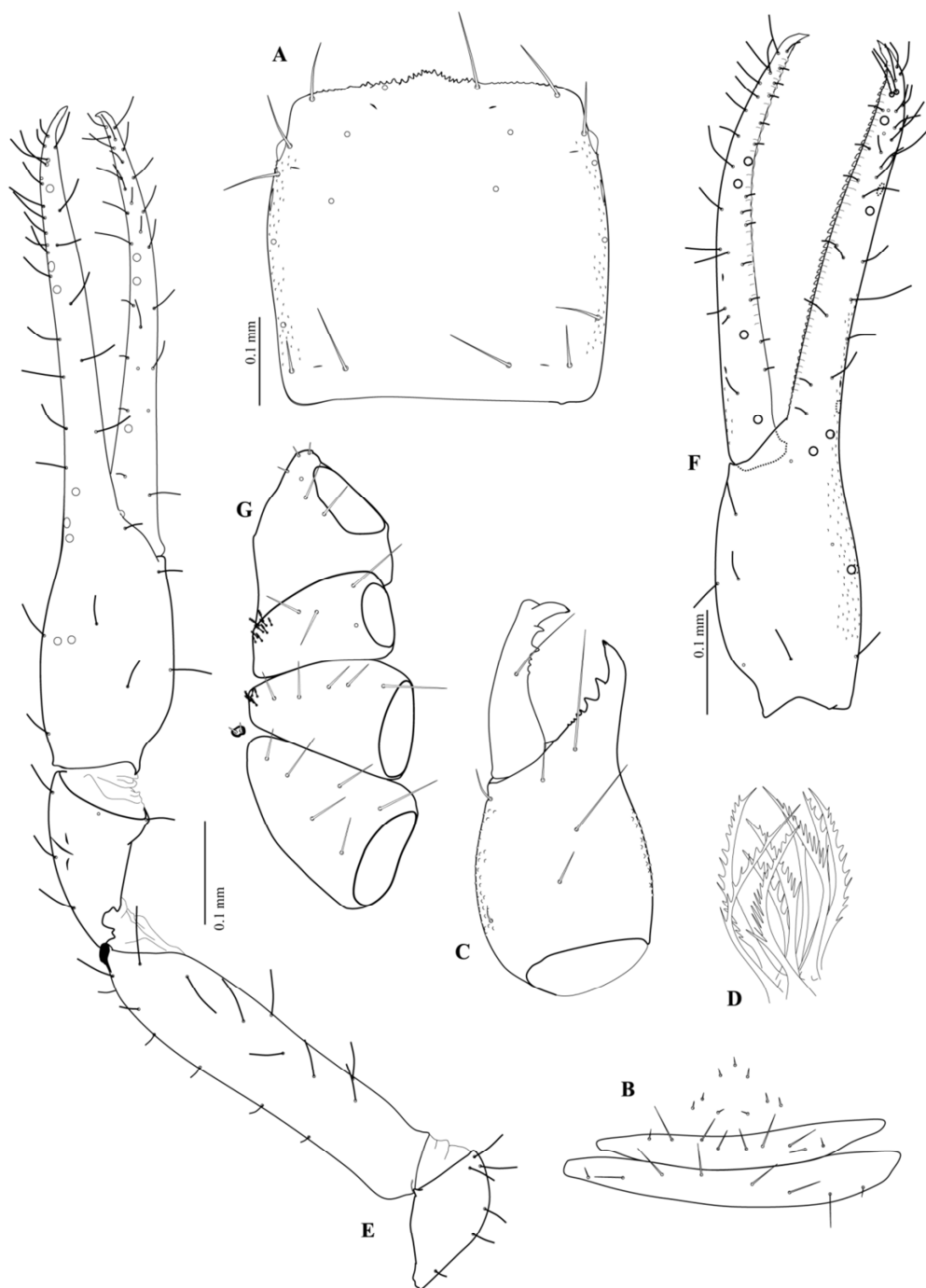


Fig 1. *Chthonius (Chthonius) youtabae* n. sp., holotype♀: A. carapace, dorsal view; B. sternites II-IV (showing chaetotaxy); C. chelicera (serrula omitted), ventral view; D. rallum; E. left pedipalp, dorsal view; F. right chela, lateral view; G. left coxae, ventral view.

Description

Carapace: uniformly light brown; smooth, lateral margins with very fine hispid granules (fig. 1A); slightly wider than length, 0.90-0.92x longer than breadth; slightly constricted posteriorly; with 2 pair of eyes, anterior eyes corneate and situated close to anterior margin, posterior eyes with weak lens, distinctly reduced and located in distant more than one ocular diameter from the anterior eyes (fig. 1A); median zone of anterior margin plus its adjacent area with closely set distinct denticles (fig. 1A); anterior margin with 4 setae, median setae longer than lateromedian setae; carapace with setae arranged: 4: 6: 4: 2: 4; microsetae absent; transverse furrows absent; with 6 lyrifissures, first pair situated between the anteromedian setae and the median ocular setae, second pair located between eyes, closer to anterior eyes than posteriors, and third pair situated on posterior margin.

Tergites: yellowish brown, apparently lighter in color than carapace; not granulate; lightly sclerotized; without median suture line; setae long, acute and stout; loss of long tactile setae; tergal setae arranged: 4: 4: 4: 4: 6: 6: 6: 6: 4: 6: 0.

Sternites: yellowish brown, slightly lighter in color than tergites; not granulate; poorly sclerotized; without median line; most setae acute, simple and same as tergal setae; without long tactile setae; females with widely cribriform plate; opercula shown in (fig. 1B); sternal setae arranged: 9-10: (3)9(3): (1)8(1): 6: 6: 6: 6: 6: 6: 0: 2; anterior spiracle more swollen than posterior one; anterior tracheal trunk larger than posterior one.

Pleural membrane: plicate and granulated with small granules.

Chelicera: brown, distinctly darker in color than carapace; hispid granulation on lateral face of hand present; hand with 5 [+1(ms)] setae, microseta situated basally (fig. 1C); galeal setae situated medially on movable finger; setae simple and acute; rallum with 9-10 denticulate blades (fig. 1D); spinneret bulge-shaped and situated sub-distally; serrula exterior with 13-14 blades; serrula interior with 9-10 blades; lamina exterior absent; fixed finger with 7-8 distinct teeth, with two median large teeth, basal teeth small; movable finger with 5-6 teeth including an isolated large sub-apical tooth, a large median tooth, and very small basal teeth (fig. 1C).

Pedipalps: uniformly light brown, same as carapace in coloration; trochanter, femur and patella entirely smooth (fig. 1E), lateral face of hand and base of fingers with very fine hispid granules (fig. 1F); coxa with 5 setae, 2 setae situated on manducatory process; trochanter L/W 1.78; femur elongate, without pedicel, prolateral margin with longer setae than retrolateral margin (Fig. XX), femoral setae arranged: 2: 6: 2: 5 (fig. 1E), L/W 4.30-4.41; patella with very short and stout pedicel, with 3 lyrifissures situated medially, L/W 1.64-1.70; chela without pedicel; chela L/W 4.50-4.61; hand L/W 1.46-1.50; movable finger distinctly longer than hand (2.05-2.10x); chelal hand setae arranged (fig. 1F): 3 (basal): 3 (medial): 2 (apical); dorsum of hand slightly curved distally and not depressed at level of *ib-isb*; fixed finger and dorsum of hand with 8+2(*xs*) and movable finger with 4 trichobothria (figs. 1E-F); fixed finger with trichobothrium *et* closer to *xs* than to *it*, *est* situated slightly proximal to *it*, *ist* situated in base of finger, *ib* and *isb* situated on dorsum of hand; movable finger with trichobothrium *st* distinctly closer to *t* than to *sb*, *t* and *st* situated slightly distal to middle of the finger, and *b* and *sb* located in basal third of the finger; movable finger slightly curved distally in lateral view and somewhat longer than fixed finger; fixed finger with 46-50 teeth with dental canal plus 3 most proximal teeth without dental canal; distal teeth of fixed finger rhomboid-shaped and acute ending in the middle of distance between trichobothria *est* and *ist*, basal teeth rounded and small; fixed finger at level of *it/est* with 4 teeth occupying 0.1 mm (distance between successive apices 0.025 mm); movable finger with 26-30 small, rounded and continuous teeth becoming fade at the level of *sb*, all with dental canal.

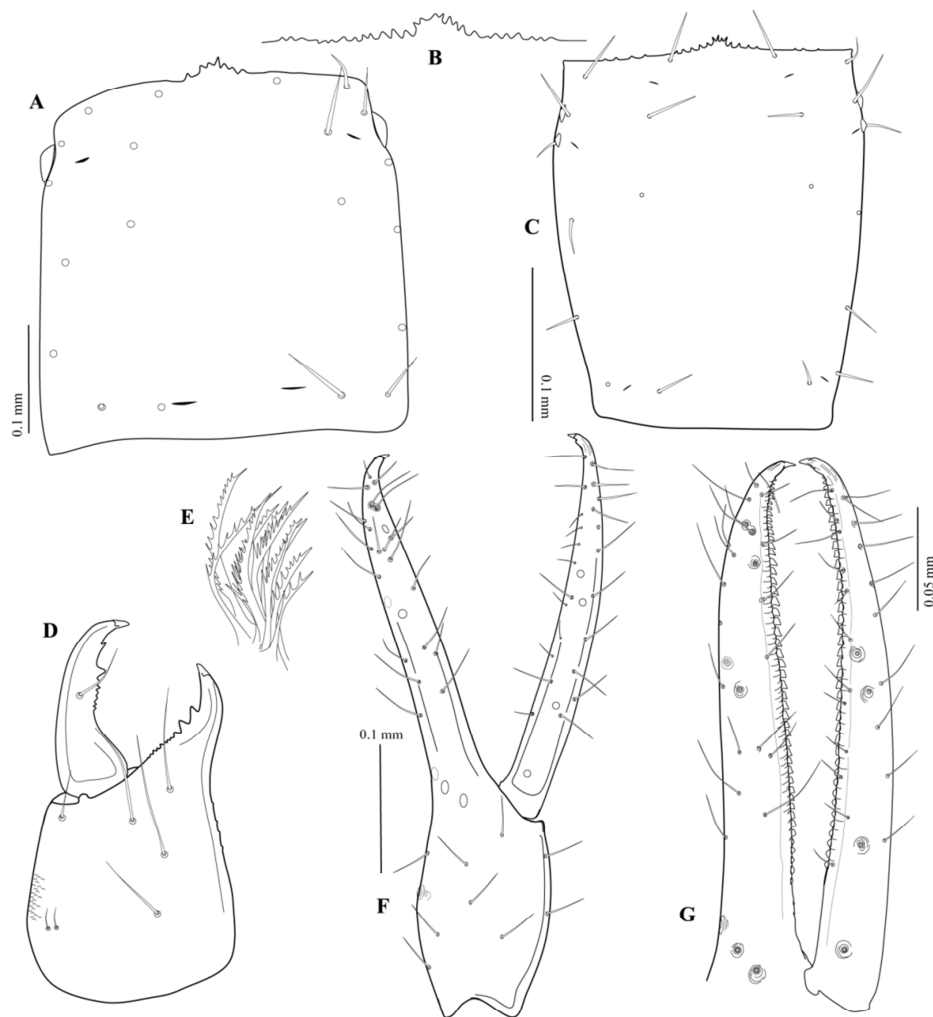


Fig 2. *Chthonius (C.) shelkovnikovi* Redikorzev, 1930, ♀♂: A. carapace, dorsal view (♂ from Sarab-e Dowreh); B. anterior margin of carapace, dorsal view (♀ from Sarab-e Dowreh); C. carapace, dorsal view (♀ from Cham Davoud); D. chelicera (serrula omitted) (♂), ventral view; E. rallum (♂); F. right chela (♂), lateral view; G. right chelal fingers (♀), lateral view.

Legs: pale brown, apparently lighter in color than carapace; coxal setae arranged (Fig. 1G): I 3+3(ms), coxa II 4, coxa III with 4-5 and coxa IV with 6; coxa I with apical projection, microsetae situated on this projection; most coxal setae acute and relatively long; coxal spines situated on coxa II and III, each coxa II with 8-9 and each coxa III with 4-5 coxal spines; bisetose intercoxal setae present and situated between coxae III and IV; claws simple and narrow; arolia simple, thin and shorter than claws. *leg I*: femur L/D 5.00-5.20; patella L/D 2.20-2.50; tibia L/D 3.50; tarsus L/D 6.25-7.67. *leg IV*: femur L/D 1.14-1.19; patella L/D 1.92-2.36; tibia L/D 3.00-3.71; femur + patella L/D 2.40-2.44; metatarsus L/D 3.00-4.00; tarsus L/D 6.00-8.00; metatarsus with one tactile seta situated proximal to middle (TS = 0.37); tarsus with one tactile setae situated almost basally (TS = 0.29).

Dimensions (in mm): *Body length*: 1.30-1.37 mm. *Carapace*: 0.37-0.40/0.40-0.44. *Pedipalp*: trochanter 0.16/0.09; femur 0.38-0.43/0.08-0.10; patella 0.17-0.18/0.10-0.11; chela 0.60-0.63/0.13-0.14; hand L.0.19-0.21; movable finger L. 0.40-0.43. *Leg I*: femur 0.25-0.26/0.05; patella 0.10-0.11/0.04-0.05; tibia 0.12-0.14/0.04; tarsus 0.23-0.25/0.03-0.04. *Leg IV*: femur 0.17-0.19/0.15-0.16; patella 0.25-0.26/0.11-0.13; femur + patella 0.39-0.36; tibia 0.26/0.07; metatarsus 0.15-0.16/0.04-0.05; tarsus 0.24/0.03-0.04.

Remarks

C. youtabae n. sp. is morphometrically most similar to *C. shelkovnikovi* reported from Armenia, Azerbaijan, Georgia, Greece, Iran, Turkey, and Turkmenistan. The pedipalpal hand size of *C. shelkovnikovi* is 0.18/0.13 mm for the type (♀), 0.17-0.18/0.10-0.11 mm for the specimens from Turkey (♂), and 0.14-0.17/0.09-0.10 mm for the newly collected specimens (♀♂) from Lorestan Province-western Iran (personal data). In *C. youtabae* n.sp., it is 0.19-0.21/0.09-0.10 mm. Also, in *C. shelkovnikovi*, the chelal ratio is 4.00x for the type (♀), 5.10x for the specimens from Turkey (♂), and 4.27-5.00x for the newly collected specimens (♀♂) from western Iran (personal data). In *C. youtabae* n.sp., the chela is 4.50-4.61x (♀) longer than broad. Noticeably, the chela of *C. youtabae* n.sp. is clearly longer than that of *C. shelkovnikovi*, e.g. in *C. shelkovnikovi*, the chelal length is 0.42 mm for the specimens from northern Iran (♀) and 0.39-0.46 mm in the newly collected specimens from western Iran. The chelal length of *C. youtabae* n.sp. is 0.60-0.63 mm Iran (personal data). Moreover, *C. youtabae* n.sp. differs from *C. shelkovnikovi* by the presence of greater number of teeth in the movable chelal finger. In *C. shelkovnikovi*, there are 40-50 distinct teeth in the movable chelal finger which end distal to trichobothrium *b* (see fig. 2G, Beier 1963c: fig. 1; Dashdamirov and Schawaller 1992: fig. 4; Schawaller and Dashdamirov 1988: figs. 2-5), whereas that, the movable chelal finger of *C. youtabae* n.sp. bears 26-30 flattened teeth and the dental row up to proximad of trichobothrium *sb*. The other differences are the absence of fine hispid granulation on the carapace Chelicera and chelal hand in *C. shelkovnikovi* and shape and size of the movable chelal finger, e.g. it is some what longer than the fixed chelal finger and slightly curved distally in *C. youtabae* n.sp., while it is as long as the fixed chelal finger and straight in *C. shelkovnikovi* (see fig. 2F; Beier 1963c: fig. 1; Dashdamirov and Schawaller 1992: fig. 4; Redikorzev 1930: fig.4; Schawaller and Dashdamirov 1988: figs. 2-5). These morphological and morphometric variations are sufficient to recognise a new species which is very close to *C. shelkovnikovi*.

The species *C. youtabae* n.sp. is slightly larger than *C. shulovi* from Israel. For example, the chela is 4.20 times longer than broad in the male type of *C. shulovi* described by Beier (1963a) while it is 4.50-4.61 times longer than broad in the females from Iran. The number of setae located on the apical projection of coxa I (in *C. shulovi*) there are two setae on the apical projection of coxa I, whereas those are three in *C. youtabae* n.sp.), and the tergal chaetotaxy (4:4:6:6:6 in *C. shulovi*, 4:4:4:4:6 in *C. youtabae* n.sp.), are the major differences between the Israeli species and the females from Iran (Beier 1963a).

Chthonius jonicus from Greece, Israel, Italy, Lebanon, Malta, Portugal, Romania, Spain, and Turkey and *Chthonius orthodactyloides* Beier, 1967 from Turkey are the other close species to *C.youtabae* n.sp., which can be easily separated by the presence of only one median large tooth in the fixed cheliceral finger (Beier 1932, 1963b, 1967), while there are two large median teeth in the fixed cheliceral finger of *C.youtabae* n.sp.,

Chthonius tadzhikistanicus from Tajikistan is clearly distinct from *C. youtabae* n.sp., by the presence of 73 teeth in the fixed and 56 teeth in the movable chelal finger and the shape of the pedal tibia IV (see Dashdamirov and Schawaller 1992: fig. 16).

Chthonius ponticus from Georgia and Turkey, *Chthonius azerbaijhanus* from Azerbaijan, and *Chthonius satapliaensis* from Georgia, can be easily recognized from *C.youtabae* n.sp., by their dental position in the chelal fingers, e.g. teeth of the fixed chelal finger are apparently large and clearly spaced (see Beier 1965: fig. 1; Schawaller and Dashdamirov 1988: figs. 7-8, 13-14; Redikorzev 1930: fig. 4).

Chthonius ischnocheles (Hermann, 1804) from Andorra, Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, France, Germany, Greece, Hungary, Ireland, Italy, Malta, Netherlands, Norway, Poland, Portugal, Romania, Saint Helena, Serbia, Slovakia, Spain, Sweden, Switzerland, Turkey, United States of America, and United Kingdom can be differed from *C.youtabae* n.sp. by the shape of the carapace (it is obviously constricted in posterior margin), the epistome of anterior margin of the carapace (see Gabbutt and Vachon 1963: fig. 5), and the pedipalpal size, e.g. length of femur is 0.72-1.00 mm for *C. ischnocheles* (♂♀) (e.g. in Beier 1963b; Gabbutt and Vachon 1963).

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گزارش گونه جدیدی از جنس *Chthonius* C.L. Koch غرب ایران

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چکیده

شبه‌عقرب‌ها، عقرب‌های دروغین یا عقرب‌های کتاب، راسته‌ای از عنکبوت‌ماندها هستند. این جانوران در اغلب مناطق یافت می‌شوند اما عمدتاً زیستگاه اصلی آن‌ها زیر برگ‌ها، خاک، زیرسنگ‌ها، چوب‌های پوسیده و زیر پوستک درختان می‌باشد. با وجود پراکنش وسیع، تاکنون مطالعه‌های فراوانی در ارتباط با فون شبه‌عقرب‌ها در ایران صورت نگرفته است. در این مطالعه نمونه‌های مختلف شبه‌عقرب از مناطق مختلف استان لرستان طی سال‌های ۹۶-۹۵ جمع‌آوری شدند. نمونه‌ها به‌طور مستقیم با دست و یا به کمک اسپیراتور، از زیر سنگ‌ها و یا بقایای گیاهی جمع‌آوری شدند. به منظور مطالعه‌های تاکسونومی از میکروسکوپ Olympus CH-2 استفاده شد. برای این منظور نمونه‌ها در اسید لاکتیک، شفاف‌سازی شده و سپس در محلول هویر (صمغ عربی ۱۵ گرم، کلرال هیدرات ۷۵ گرم، آب مقطر ۲۵ میلی‌لیتر، گلیسرین ۵ میلی‌لیتر) و روی اسلاید میکروسکوپ تثبیت شدند. اندازه‌گیری‌ها با استفاده از میکرومتر چشمی کالیبره شده (MM۱۸-WF10X) انجام شد. شکل‌ها با استفاده از یک لوله ترسیم متصل به میکروسکوپ کشیده شد. بررسی سایر نمونه‌ها از طریق تهیه اسلاید موقت و به کمک گلیسرین صورت گرفت. در میان نمونه‌های جمع‌آوری شده، گونه *Chthonius youtabae* n. sp. به عنوان یک گونه جدید در دنیا و بر اساس نمونه ماده از استان لرستان شناسایی و توصیف شد.

واژه‌های کلیدی: عنکبوت‌ماندها، تاکسونومی، پراکنش، استان لرستان، خاورمیانه

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