

## Description of a new epigean species of the genus *Ephippiochthonius* (Pseudoscorpiones: Chthoniidae) from Russia

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**Abstract** — A new pseudoscorpion species, *Ephippiochthonius caucasicus* n. sp. is described and figured based on adults found in a yew and boxtree grove of the Caucasian State Nature Biosphere Reserve, Russia.

**Key words** — Arachnida, taxonomy, new fauna, distribution, Caucasian State Nature Biosphere Reserve, Russia.

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### Introduction

The family Chthoniidae Daday 1889 is poorly represented in the Caucasus, the Middle East and central Asia, and the genus *Ephippiochthonius* (Beier 1930) currently contains only seven named species from this area (Table 1) (Harvey 2013; Nassirkhani & Vafai 2015). In this contribution, a new pseudoscorpion species belonging to the genus *Ephippiochthonius* was discovered in soil of common yew trees, *Taxus baccata*, and evergreen trees, *Buxus* spp., locating in a yew-boxtree grove of the Caucasian State Nature Biosphere Reserve. The new species is described and its diagnostic characters are illustrated.

The yew-boxtree grove is located in an isolated area of the main territory of the Caucasian State Natural Biosphere Reserve, two kilometers from the Black Sea coast, on the east bank of the Khosta River on the south-eastern slope of the Big Ahun Mountain. The grove ranges in altitude from 40 to 520 meters above sea level. A large area of the Kolkhida forest is preserved here, where millennial yew-trees can be found.

### Materials and Methods

The specimens were collected using Barber's soil traps. The traps were plastic 0.5 liter disposable containers, where a fixing liquid - a 4% formaldehyde solution - was added. Soil traps were placed in four plots, each with an area of 100 square meters, which were characterized by different types of phytocoenosis. The male holotype and one of the female paratypes were permanently mounted on glass microscope slide in Hoyer's medium and the other specimens were studied as temporary slides in glycerin. The specimens were

examined with an Olympus CH-2 compound microscope. Morphological terminology and mensuration follow Chamberlin (1931), Gardini (2013), Harvey (1992), Harvey et al. (2012), Judson (2007), and Zaragoza (2017). The specimens are deposited in collection of the Acarology Laboratory, Islamic Azad University of Arak (IAUA), Iran.

The following abbreviations were employed: *eb* = external basal; *esb* = external sub-basal; *ib* = internal basal; *isb* = internal sub-basal; *ist* = internal sub-terminal; *est* = external sub-terminal; *it* = internal terminal; *et* = external terminal; *t* = terminal; *b* = basal; *sb* = sub-basal; *st* = sub-terminal; *L* = length; *W* = width; *D* = Depth; *mm* = millimeter; *m* = preocular microseta; *ms* = microseta; *T*, *TS* = tactile seta; *fa* = retrolateral lyrifissure of fixed chelal finger; *fb* = basal lyrifissure of fixed chelal finger; *fd* = dorsal lyrifissure of fixed chelal finger; *hd* = distal lyrifissure of chelal hand; *hp* = proximal lyrifissure of chelal hand; *ma* = retrolateral lyrifissure of movable chelal finger; *mv* = prolateral lyrifissure of movable chelal finger.

*Ephippiochthonius caucasicus* n. sp.

Figs. 1–11

**Material examined.** RUSSIA: Krasnodar Krai, Sochi, Khosta district: holotype ♂, Caucasian State Nature Biosphere Reserve [43°32'22.87"N, 39°52'22.94"E, altitude 278 m.], soil of yew and boxtree grove, Barber's soil trap, 2006, leg. Yu. Chumachenko (IAUA). Paratypes 2 ♂, 4 ♀, collected with holotype (IAUA).

**Etymology.** This species is named for the region where it was found (Caucasicus refers to: Caucasia, geographic region

**Table 1.** Distribution of *Ephippiochthonius* species in the Middle East, central Asia, and adjacent areas.

Species	Distribution
<i>E. tetrachelatus</i> (Preysslner 1790)	Algeria – Argentina – <b>Armenia</b> – Australia – Austria – <b>Azerbaijan</b> – Belgium – Bulgaria – Canada – Croatia – Cuba – Cyprus – Czech Republic – Denmark – Egypt – Estonia – Finland – France – <b>Georgia</b> – Germany – Greece – Hungary – <b>Iran</b> – Ireland – <b>Israel</b> – Italy – <b>Lebanon</b> – Luxembourg – Macedonia – Moldova – Netherlands – Norway – Poland – Portugal – Romania – Serbia – Seychelles – Slovakia – Slovenia – Spain – Sweden – Switzerland – <b>Syria</b> – <b>Turkey</b> – <b>Turkmenistan</b> – Ukraine – United Kingdom – United States
<i>E. fuscimanus</i> (Simon 1900)	Austria – Czech Republic – <b>Georgia</b> – Germany – Italy – <b>Turkey</b>
<i>E. anatolicus</i> (Beier 1969)	<b>Iran</b> – <b>Turkey</b>
<i>E. iranicus</i> (Beier 1971)	<b>Iran</b>
<i>E. romanicus</i> (Beier 1935)	Greece – <b>Iran</b> – Romania – <b>Turkey</b>
<i>E. negarinae</i> (Nassirkhani & Vafai 2015)	<b>Iran</b>
<i>E. sacer</i> (Beier 1963)	<b>Israel</b>

of Eurasia, a region located at the border of Eastern Europe and Western Asia, including Russia, Georgia, Azerbaijan, and Armenia).

### Diagnosis

*Ephippiochthonius caucasicus* n. sp. differs from all other species of the *E. tetrachelatus* group *sensu* Gardini (2013) by the following combination of characters: the presence of 4 well-developed eyes; the presence of 4–6 preocular microsetae (2–3 microsetae on each side), and only 2 macrosetae on the posterior margin of carapace; the presence of an isolated sub-apical tooth in movable cheliceral finger; the presence of 2 microsetae on cheliceral hand; the morphometric characters e.g. chelal size is 0.70–0.74/0.14 mm for males and 0.81–0.88/0.20 mm for females; movable chelal finger with 8–9 and fixed chelal finger with 15–18 (5–6 teeth at level of trichobothria *est-it*, 2–3 teeth occupying 0.1 mm in distance) teeth.

### Description

#### Adults

*Body length*: 1.32–1.35 mm (♀ 1.65–1.90 mm).

*Carapace*: brown and weakly sclerotized, pale and desclerotized at posterior margin; mostly smooth, lateral margins with hispid granulation, clearly marked beside anterior eyes; L/W 0.95–1.00 (♀ 0.85–0.95); basally constricted obviously [in 1♀, with weak basal constriction]; with 2 pair of well-developed eyes; anterior eyes with convex lenses situated close to anterior margin; posterior eyes with flat lenses distinctly smaller than anterior eyes and located in distant less than one ocular diameter from the anterior pairs (Fig. 1); anterior margin with minute denticulations, sharp and compact denticles mainly located between median macrosetae (Figs. 1–2, 9); without a well-defined epistome; anterior margin with 4 setae, median setae longer than lateromedian setae; preoc-

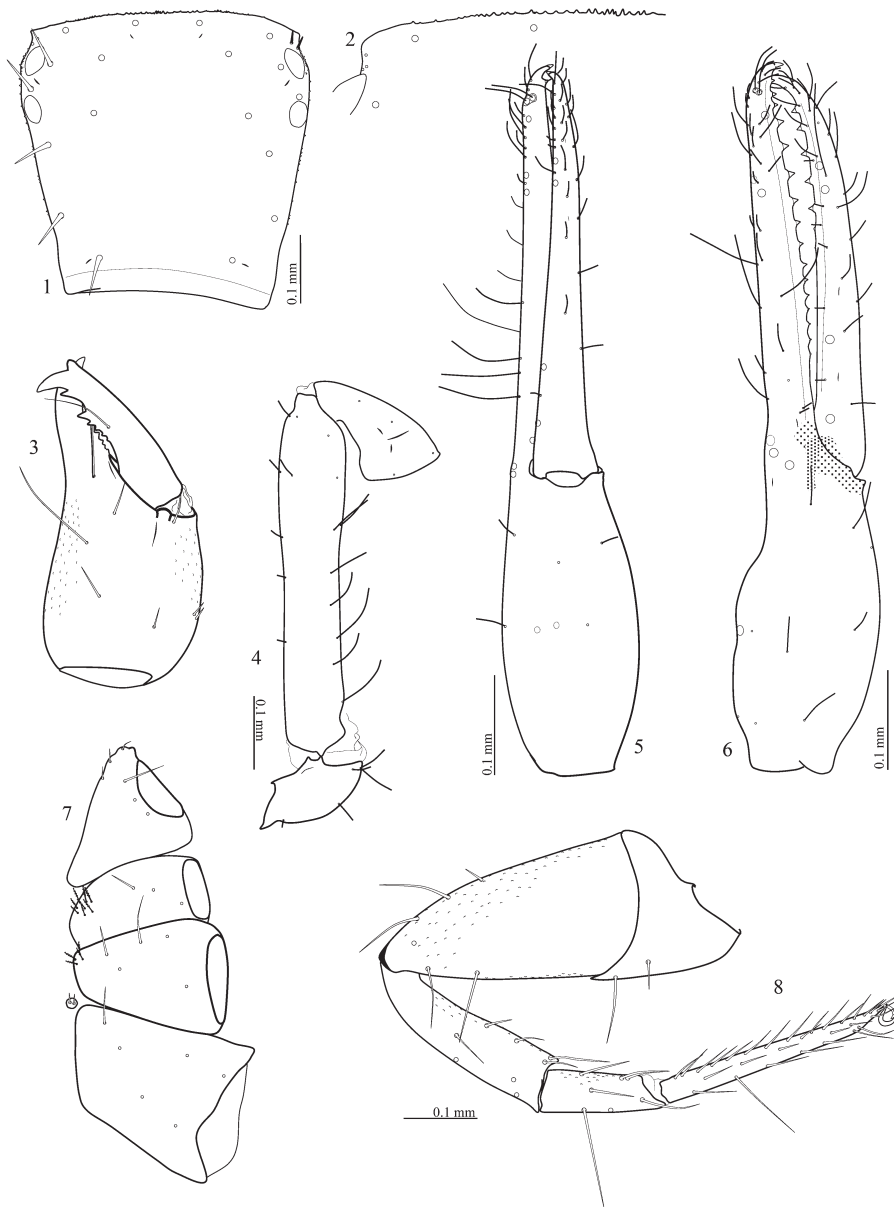
ular setae smallest, 2–3 microsetae situated on each side; one seta situated between eyes (Fig. 1); posterior margin without microsetae; carapace with setae arranged: mm4mm–mmm4mmm: 6: 4: 2: 2; transverse furrows absent; with 6 lyrifissures, first pair situated close to the antromedian setae, second pair located between eyes, closer to anterior eyes than posteriors and third pair situated on posterior margin.

*Tergites*: yellowish-brown, V–XI darker in color than the other tergites; not granulate; lightly sclerotized; without median suture line; IX with 2 tactile setae situated sub-medially; X without tactile setae; XI with two long tactile setae situated mediolaterally or medially; tergal setae arranged: 4: 4: 4: 4–6: 6: 6: 6: 1T2T1: 4: 1TT1–T2T: 0 (♀ 4: 4: 4: 6: 6: 6: 1T2T1: 4: 1T2T1: 0); setae long, acute and stout.

*Sternites*: pale yellowish-brown, lighter in color than tergites; not granulate; poorly sclerotized; without median suture line; X with 4 tactile setae situated laterally and sub-medially; males with genital atrium relatively short, with 4 pairs of glandular setae; females with wide cribriform plate; male genitalia without median hiatus dividing each row of internal guard-setae; sternite III of males with V-shaped opening aperture, 4–6 pairs surrounded genital aperture and 8–10 setae situated irregularly; most setae acute, simple and same as tergal setae; sternal setae arranged: 8–10: (3)8–10(3): (2)8(2): 8: 6: 6: 6: 6: T1T1T1T–T1TT1T: 0: 2 (♀ 9–10: (2–3)8–10(2–3): (1)7–8(1): 6: 6: 6: 6: 6: T1TT1T: 0: 2); anterior spiracle more swollen than posterior one; anterior tracheal trunk slightly larger than posterior one.

*Pleural membrane*: plicate and granulated with small granules.

*Chelicera*: brown, distinctly darker in color than body; hand with 6 [+2(ms)] setae; lateral face of hand with marked hispid granulation; one seta located medially on movable finger; setae simple and acute; rallum with 9–10 denticulate blades (♀♂); spinneret bulge-shaped and situated sub-distal-

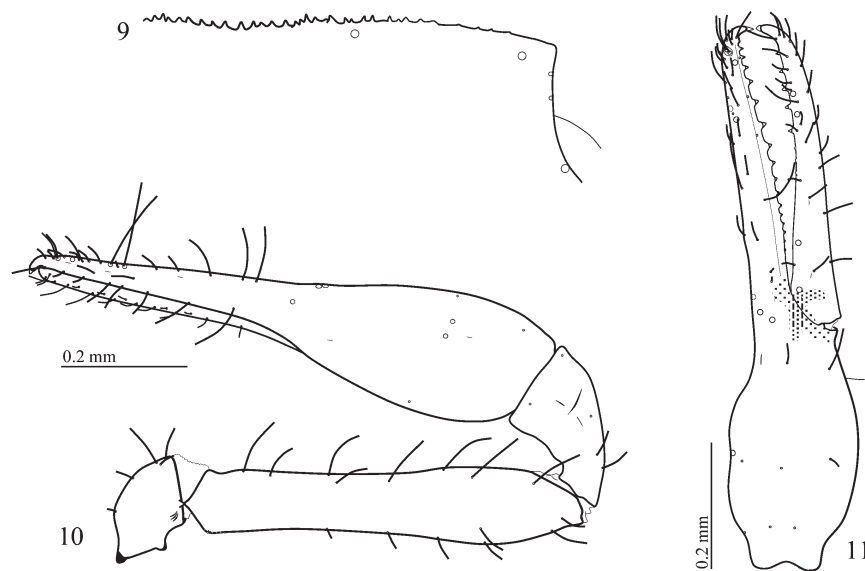


**Figs. 1–8.** *Ehippochthonius caucasicus* n. sp., holotype ♂: 1. carapace, dorsal view; 2. left half of anterior margin of carapace (showing dental structure), dorsal view; 3. right chelicera (serrula exterior and lamina exterior omitted), dorsal view; 4. basal segments of left pedipalp (coxa omitted), dorsal view; 5. left chela, ventral view; 6. right chela, ventral view; 7. left coxae, ventral view; 8. leg IV, retrolateral view.

ly (Fig. 3); serrula exterior with 12–15 blades (♀♂); serrula interior with 9–10 blades (♀♂); fixed finger with 8–10 distinct teeth, basal teeth smaller than apical teeth (♀♂); movable finger with 6–8 teeth (♀♂), sub-apical tooth largest and situated separately from others, basal teeth very small, teeth become larger gradually from base to apical margin of finger (Fig. 3).

*Pedipalps*: uniformly light brown; distinctly lighter in color than carapace; entirely smooth; coxa with 5 setae, 2 setae situated on manducatory process; trochanter L/W 1.78–1.80

(♀1.54–1.67); femur elongate, without distinct pedicel, with irregular shaped ornamentations, prolateral margin with longer setae than retrolateral margin (Fig. 4), femoral setae arranged: 3: 6: 2: 5: 1 (1♀: 3: 5: 2: 5: 1), L/W 5.55–5.90 (♀5.16–5.33); patella with very short and stout pedicel, L/W 1.75–1.91 (♀1.31–1.86); patella with three median lyrifissures; chela without pedicel; chela L/W 5.14–5.28 (♀4.05–4.40); dorsum of hand distinctly curved distally and clearly depressed at level of *ib-isb*, L/W 2.14 (♀1.90–2.00), distal of *ib-isb* with a deep obvious hump; ventral intercondylar



**Figs. 9–11.** *Ehippichthonius caucasicus* n. sp., paratype ♀: 9. right half of anterior margin of carapace (showing dental structure), dorsal view; 10. right pedipalp, dorsal view; 11. right chela, retrolateral view.

bow-like protuberance present; movable finger distinctly longer than hand, movable finger 1.37–1.40 (♀ 1.17–1.29) times longer than hand; chelal hand setae arranged on retrolateral surface: 3 (distal): 3 (medial): 3 (proximal); fixed finger and dorsum of hand with 8+2(*xs*) and movable finger with 4 trichobothria (Figs. 5–6, 10–11); fixed finger with trichobothrium *et* closer to *xs* than to *est*, *it* situated very close to *est*, *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 in distal third and *b* and *sb* located in basal third of finger; movable finger apically curved; basal half of movable chelal finger with 2 basal lyrifissures (*ma*<sub>1</sub>, *ma*<sub>2</sub>) in retrolateral view, and 2 distal lyrifissures in dorsal view (*mv*<sub>1</sub>, *mv*<sub>2</sub>); fixed finger with 2 lyrifissures (*fa*, *fb*) located basally in retrolateral view, and 3 distal lyrifissures (*fd*<sub>1</sub>, *fd*<sub>2</sub>, *fd*<sub>3</sub>) in dorsal view; chelal hand with 2 lyrifissures (*hd*, *hp*) in retrolateral view; fixed finger with 16–19 and movable finger with 8–9 separated teeth (♀♂); 15–17 teeth of fixed finger triangular-shaped and acute, 1–3 basal teeth blunt, rounded and small; fixed finger at level of *est-it* with 2–3 teeth occupying 0.1 mm (distance between successive apices 0.028–0.030 mm ♀♂); males with a modified accessory tooth and a hollow near tip of fixed finger (Fig. 5); basal internal apodeme of movable finger strongly sclerotized, rectangular with apical squat, hammer-like, without point branch (Figs. 6, 11); 5–6 teeth of movable finger triangular-shaped and acute, 1–2 basal teeth rounded and blunt.

**Legs:** yellowish-brown, slightly darker in color than tergites; coxal setae arranged (Fig. 7): coxa I 3+2–3(*ms*), coxa II 3–4, coxa III with 4–5 and coxa IV with 5–6; coxa I with

apical projection, microsetae situated on this projection; most coxal setae acute and long; coxal spines situated on coxae II and III, each coxa II with 7–10 and each coxa III with 4 coxal spines (♀♂); coxal spines of coxa II irregularly arranged in a rounded patch; bisetose intercoxal setae present and situated between coxae III and IV; claws simple and narrow; arolia simple, thin and shorter than claws (Fig. 8). Leg I: tibia L/D 3.60–5.67 (♀ 3.80–4.00) and tarsus L/D 5.25–8.00 (♀ 7.75–8.25). Leg IV: patella, tibia, and metatarsus with small hispid granulation (Fig. 8); tibia L/D 4.00–4.28 (♀ 3.89–4.37); metatarsus with one tactile seta situated proximal to middle (♀♂ TS=0.37–0.41), L/D 2.83–3.00 (♀ 2.71–3.33); tarsus with one tactile seta situated sub-basally (♀♂ TS=0.28–0.33), L/D 11.00–11.70 (♀ 9.50–10.11).

**Dimensions** (in mm): ♂ *Carapace*: 0.40–0.42/0.40–0.42. *Pedipalp*: trochanter 0.16–0.18/0.09–0.10; femur 0.50–0.59/0.09–0.10; patella 0.21/0.11–0.12; chela 0.70–0.74/0.14; hand L.0.30; movable finger L. 0.41–0.42. *Leg I*: femur 0.30–0.31/0.06–0.07; patella 0.14–0.15/0.06; tibia 0.17–0.18/0.03–0.05; tarsus 0.21–0.32/0.04. *Leg IV*: femur + patella 0.49–0.50/0.20–0.21; tibia 0.30–0.32/0.07–0.08; metatarsus 0.17–0.18/0.06; tarsus 0.33–0.35/0.03. ♀ *Carapace*: 0.46–0.51/0.48–0.60. *Pedipalp*: trochanter 0.20/0.12–0.13; femur 0.62–0.64/0.12; patella 0.25–0.26/0.14–0.19; chela 0.81–0.88/0.20; hand L. 0.38–0.40; movable finger L. 0.47–0.49. *Leg I*: femur 0.31–0.34/0.08; patella 0.15–0.17/0.07–0.06; tibia 0.19–0.20/0.05; tarsus 0.31–0.33/0.04. *Leg IV*: femur + patella 0.56–0.59/0.21–0.22; tibia 0.35/0.08–0.09; metatarsus 0.19–0.20/0.06–0.07; tarsus 0.38/0.04.

**Remarks.** The newly collected specimens from Russia are attributed to the *Ehippichthonius tetrachelatus* group

sensu Gardini (2013) and segregated from *E. fuscimanus* group sensu Gardini (2013) and *E. gibbus* group sensu Zaragoza (2017) based on the shape and structure of teeth of the chelal fingers, loss of the mariginal lamina in the movable chelal finger, and the presence of two lyrifissures ( $ma_1$ ,  $ma_2$ ) in the basal half of the movable chelal finger in retrolateral view (Gardini 2013; Zaragoza 2017).

Because of the presence of an isolated sub-apical tooth in the movable cheliceral finger, *E. caucasicus* n. sp. belongs to a small group of species defined by Gardini (2013), and subsequently Zaragoza (2017) containing *E. rimicola* (Mahnert 1993), *E. aguilerorum* (Carabajal Márquez, García Carrillo & Rodríguez Fernández, 2000), *E. gonzalei* Zaragoza 2017, and *E. hiberus* (Beier 1930) from Spain, *E. lucanus* (Calaini, 1984) and *E. messapicus* (Gardini 2013) from Italy, and as well as *E. iranicus* (Beier 1971) and *E. negarinae* (Nassirkhani & Vafai 2015) from Iran. Unfortunately, the presence/absence of an isolated sub-apical tooth in the movable cheliceral finger was not described for the other species of the group reported from the Middle East, central Asia and the adjacent areas, e.g. *E. romanicus* (Beier 1935), *E. sacer* (Berer 1963), and *E. anatolicus* (Beier 1969). So these species cannot be classified here and must be reexamined to clarify their situation in the relationship to this group.

*Ephippiochthonius caucasicus* differs from *E. aguilerorum* (see Zaragoza 2017: fig. 68), *E. hiberus* (see Zaragoza 2017: fig. 151), *E. messapicus* (see Gardini 2013: fig. 154), *E. iranicus* (see Beier 1971: fig. 1), *E. negarinae* (see Nassirkhani and Vafai 2015: fig. 5), *E. sacer* (see Beier 1963: fig. 1), and *E. anatolicus* (see Beier 1969: fig. 1) by the presence of a strong dorsal hump located distal to trichobothria *ib-isb* on the chelal hand in lateral view.

It differs from *E. lucanus* by the position of the chelal teeth in both fingers which are extended more basally, and also, with the presence of 4 (rarely 6) setae (2 median macrosetae and 2–4 lateral/lateromedian short setae) on posterior margin of the carapace (in Gardini 2013).

Noticeably, *E. romanicus* is smaller than *E. caucasicus*, e.g. the chelal hand size is 0.24/0.12 mm, and the movable chelal finger length is 0.35 mm for the male type of *E. romanicus* described by Beier (1935), while those are respectively 0.30–0.40/0.14–0.20 mm and 0.41–0.49 mm for the adults from Russia. Moreover, the dentation of the chelal fingers is different. For example, the movable chelal finger of *E. romanicus* bears 15 teeth reaching near to the trichobothrium *sb* (see Beier 1935: Fig. 2), whereas there are 8–9 teeth ending as far as trichobothrium *sb* in the movable chelal finger of *E. caucasicus*.

The new species from Russia can be separated from *E.*

*rimicola* by the presence of only two macrosetae on posterior margin of the carapace (there are 1–2 short lateral setae on each side of the carapace in *E. rimicola*) (Zaragoza 2017), and recognized from *E. gonzalei* based on the presence of 2–3 preocular setae on each side of the carapace (there are one preocular setae on each side of the carapace in *E. gonzalei*), and the presence of two pairs of distinct eyes (there are no eyes/eyespot in *E. gonzalei*) (Zaragoza 2017).

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