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Two new subterranean species of the genus *Chthonius* from Latium (Pseudoscorpiones, Chthoniidae)

Abstract: Two new subterranean species of the genus *Chthonius* C.L. Koch, 1843 from Latium caves are described: *Chthonius auruncus* n. sp. (♀, Voragine del Vallaroce 1000 La/LT, Formia, Latina province, Aurunci Mountains) and *Chthonius hernicus* n. sp. (♀, Grotta della Regina Margherita 22 La/FR, Collepardo, Frosinone Province, Ernici Mountains). *Chthonius auruncus* n. sp. is compared to the widespread epigeal *Chthonius tenuis* L. Koch, 1873 and the subterranean *Chthonius ligusticus* Beier, 1930, *Chthonius lanzai* Caporiacco, 1947 and *Chthonius elongatus* Lazzeroni, 1970 from caves in eastern Liguria and Tuscany. *Chthonius hernicus* n. sp. is compared to the widespread epigeal *Chthonius densedentatus* Beier, 1938 and the subterranean *Chthonius caoduroi* Callaini, 1987 from a cave in Basilicata. *Chthonius vannii* Callaini, 1986 (n. stat.) is upgraded from subspecies of *Chthonius lanzai* Caporiacco, 1947.

Riassunto: Due nuove specie sotterranee del genere *Chthonius* del Lazio (Pseudoscorpiones, Chthoniidae).

Sono descritte due nuove specie sotterranee del genere *Chthonius* C.L. Koch, 1843 di grotte del Lazio: *Chthonius auruncus* n. sp. (♀, Voragine del Vallaroce 1000 La/LT, Formia, Latina, Monti Aurunci) e *Chthonius hernicus* n. sp. (♀, Grotta della Regina Margherita 22 La/FR, Collepardo, Frosinone, Monti Ernici). *Chthonius auruncus* n. sp. è comparato con *Chthonius tenuis* L. Koch, 1873, specie epigea diffusa nella stessa area geografica, e con le specie sotterranee *Chthonius ligusticus* Beier, 1930, *Chthonius lanzai* Caporiacco, 1947 e *Chthonius elongatus* Lazzeroni, 1970, di grotte della Liguria orientale e della Toscana. *Chthonius hernicus* n. sp. è comparato con *Chthonius densedentatus* Beier, 1938, specie epigea largamente diffusa nell'Italia appenninica, e con *Chthonius caoduroi* Callaini, 1987 della Grotta di Sant'Angelo 40 B/PZ (Trecchina, Basilicata). *Chthonius vannii* Callaini, 1986 (n. stat.) è elevato al rango di specie da sottospecie di *Chthonius lanzai* Caporiacco, 1947.

Key words: new species, *Chthonius*, Latium, Italy.

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INTRODUCTION

The pseudoscorpion genus *Chthonius* C.L. Koch, 1843 comprises 120 extant nominal species distributed mainly in the Euro-Mediterranean-Turanic region, eastwards to Azerbaijan and Tajikistan, with only four exceptions in this regard: *Chthonius ischnocheles* (Hermann, 1804), introduced from its primary European range to St Helena and the USA, *Chthonius pacificus* Muchmore, 1968, *Chthonius paganus* (Hoff, 1961) and *Chthonius paludis* (Chamberlin, 1929), all known from USA (World Pseudoscorpiones Catalog, 2026). Furthermore, three fossil species of this genus are known from Baltic and Rovno amber (World Pseudoscorpiones Catalog, 2026).

A total of 40 species of *Chthonius* are known from mainland Italy and its islands, of which 19 are epigeic and 21 subterranean (Gardini, 2000, 2021; World Pseudoscorpiones Catalog, 2026). Only 7 species are known to occur in Latium, none of which

is troglotic. The 2 new subterranean species of this genus, described in this paper, come from caves in the Aurunci Mountains and the Ernici Mountains, respectively, in southern Latium.

MATERIALS AND METHODS

The specimens were cleared in a very dilute KOH solution for a few hours, then in 70% lactic acid for a few days, and finally temporarily mounted on cavity slides with the same medium, after dissection of the palp and chelicera. After examination, each specimen was rinsed in distilled water and returned to a vial of 70% ethanol, together with the dissected parts in glass capillary tubes. All specimens were examined with an Olympus BHB compound microscope and drawn with the aid of a Nachet drawing tube. Terminology and reference points for measurements largely follow Chamberlin (1931);

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measurements are given in mm, with proportions expressed as length/breadth for carapace, chelicera and pedipalpal femur, and as length/depth for pedipalpal chela. Following Gardini (2013) and Zaragoza (2017), measurements of the pedipalpal trochanter and patella and leg IV have been excluded because they provide no additional information. The use of the terms rallum, antiaxial and paraxial follows Judson (2007). Acronyms: Muséum d'Histoire naturelle, Geneva (MHNG).

TAXONOMY

Chthonius auruncus n. sp.

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EF83BEDD-85AD-49B9-BC00-33D1E740979A

(Figs. 1-5)

TYPE LOCALITY. Italy, Latium, Latina Province, Formia, Voragine del Vallaroce 1000 La/LT (41°18'52"N, 13°38'54"E).

DISTRIBUTION. Italy (Latium).

DIAGNOSIS (♀). An anophthalmic hypogean *Chthonius* that differs from other Italian species of the *orthodactylus-tenuis* group (sensu Gardini, 2021) in the following combination of characters: anterior margin of carapace with one preocular microseta on each side; posterior margin with two macrosetae and one lateral microseta on each side; tergite I with 4 setae; chelicerae with 2-3 lateral microsetae, movable cheliceral finger with an isolated subapical tooth; chela length 1.49 mm; movable chelal finger length 0.97 mm; chela 6.62 times as long as deep; both chelal fingers with reclined, spaced teeth; fixed chelal finger with 51 teeth, movable chelal finger with 26 visible teeth plus approximately 14 in the proximal half, identifiable by the presence of the dental canal; ratio of pedipalpal femur/carapace 1.84.

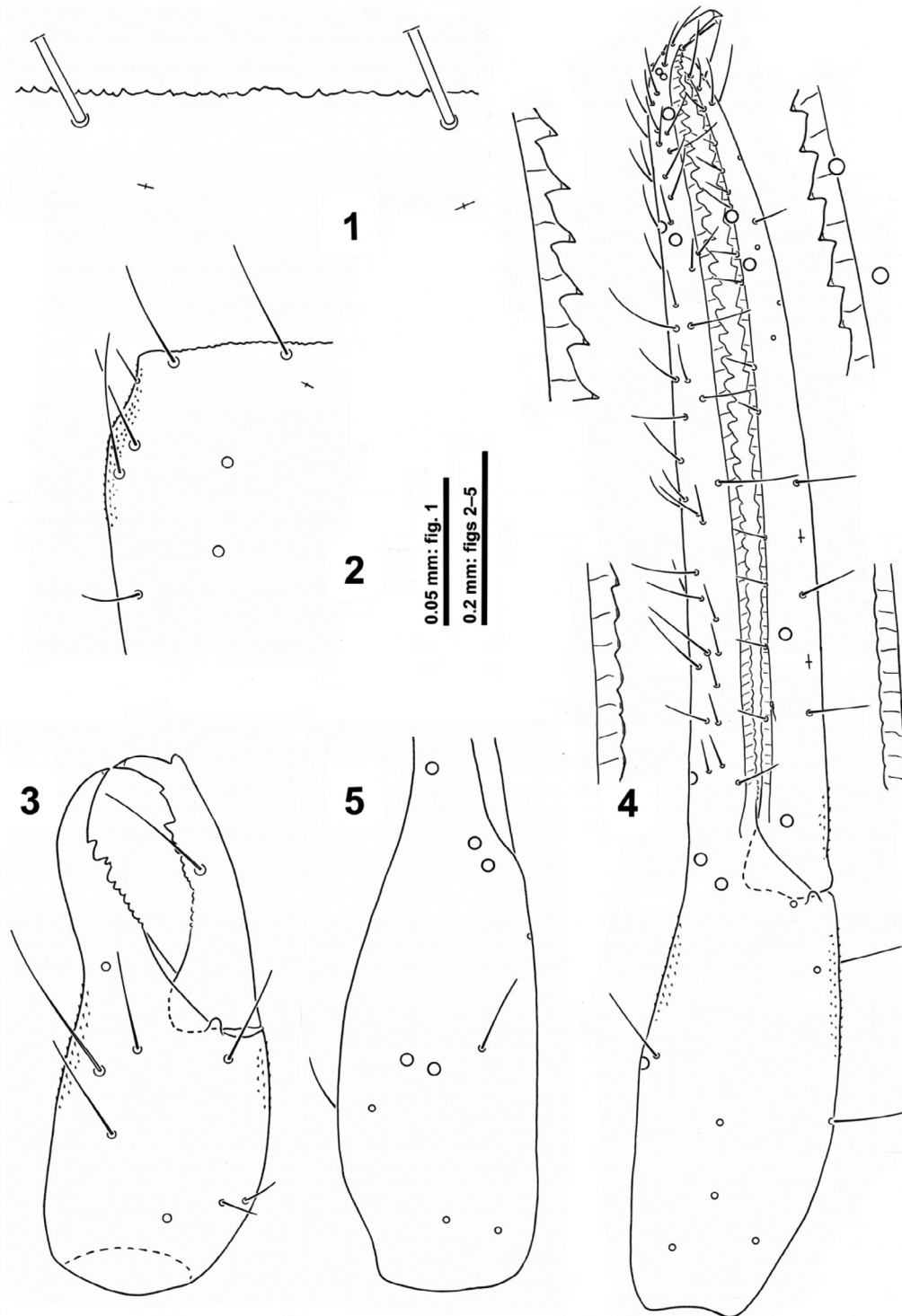
TYPE MATERIAL. ITALY—*Latium*: 1 ♀ (holotype, with damaged opisthosoma), Latina Province, Formia, Pagliarello, Voragine del Vallaroce 1000 La/LT (41°18'52"N, 13°38'54"E), 1255 m a.s.l., 25.II.1990, S. Gambari leg. (MHNG).

DERIVATIO NOMINIS. The Aurunci were an ancient Italic people who settled in southern Latium; they gave their name to the Aurunci Mountains, where the type locality of *Chthonius auruncus* n. sp. is situated: the cave Voragine di Vallaroce.

DESCRIPTION OF ADULT (♀; ♂ unknown).

Highly specialized troglomorphic facies; integument slightly pigmented, carapace, tergites, chelicerae and pedipalps pale brown; weak hispid granulation on lateral surfaces of carapace, on cheliceral palm and on base of chelal fingers. Carapace 0.93 times longer than broad; anterior margin without epistome (Fig. 1); ocular area as in Fig. 2, no eyes or eye-spots; chaetotaxy m4m:6:4:2:m2m (18 macrosetae), length of anteromedian macrosetae 0.155 mm. Chaetotaxy of tergites I-IV: 4:4:4:4. Chaetotaxy of sternites not visible. Chelicerae (Fig. 3) 2.47 times as long as broad, palm with 6 setae and 2-3 lateral microsetae; with 2 large distal teeth followed proximally by 7 teeth of decreasing size; movable finger with an isolated subapical tooth (*di*) located proximal to the spinneret, followed by a large tooth and 11 teeth proximally reduced in size; *gs* ratio 0.57; spinneret prominent, apically rounded; rallum with 11 blades; serrulae not seen. Coxal setae: pedipalp 5 (including 2 on manducatory process), I 3 + 3 marginal microsetae, II 4, III 5, IV 6; coxal spines not visible; intercoxal tubercle bisetose. Pedipalp: femur 6.86 times as long as broad; chela (Fig. 4) 6.62 times as long as deep; hand of chela 2.13 times as long as deep, with subparallel sides in dorsal view (Fig. 5); fixed chelal finger with 51 reclined teeth increasingly reduced towards the finger base: 4 small distal ones, followed by 27 with pointed tips and 20 rounded ones, which gradually decrease in size until they disappear (Fig. 4), fixed chelal finger at level of *est-it* with 4 teeth occupying 0.1 mm (distance between successive apices 0.028-0.030 mm); all teeth with dental canal; distal paraxial seta apically broken; movable chelal finger with about 40 teeth: 16 teeth reclined and apically pointed in the distal half of the finger, followed by 10 teeth apically broadly rounded and increasingly reduced proximally, and about 14 teeth, between *sb* and *b*, recognizable only by the presence of dental canal (Fig. 4); coupled sensilla *pc* closer to *sb* than to *b*; trichobothria as in Fig. 4; ratio of movable finger/hand of chela 2.02; ratio of pedipalpal femur/movable finger 1.06; ratio of pedipalpal femur/carapace 1.84.

MEASUREMENTS. Body length not measured due to the contracted opisthosoma. Carapace 0.56×0.60 (anteriorly). Chelicerae 0.605×0.245; movable finger length 0.32. Pedipalp: femur 1.03×0.15; chela 1.49×0.225; hand length 0.48; movable finger length 0.97.



Figs. 1-5. *Chthonius auruncus* n. sp., female holotype. 1) Anterior margin of carapace; 2) left ocular area of carapace; 3) right chelicera, dorsal view; 4) right pedipalpal chela, antiaxial view, with magnified details of teeth at level of trichobothria *sb* and *st-t/est-it*; 5) hand of right chela, dorsal view.

REMARKS. Among the Apennine species of the *Chthonius orthodactylus-tenuis* group that possess an isolated subapical tooth (*di*) on the movable cheliceral finger, *Chthonius auruncus* n. sp. is most similar to the epigeal *Chthonius tenuis* L. Koch, 1873 and the subterranean *Chthonius ligusticus* Beier, 1930 and *Chthonius lanzai* Caporiacco, 1947. *Chthonius vannii* Callaini, 1986 (n. stat.)—described from a female and a tritonymph from the cave Buca della Ghiandaia 736 T/FI, Calenzano near Florence—is upgraded here from *Chthonius lanzai vannii* Callaini, 1986 and given species rank because, compared with *Chthonius lanzai*, it lacks the isolated tooth *di* on the movable cheliceral finger, lacks microchaetae at the base of the carapace, and is larger in size (chela 2.08 mm in *Chthonius vannii*, 1.70–1.75 mm in females of *Chthonius lanzai*).

Chthonius tenuis, which is widespread in northern Italy but also occurs in central and southern Italy (Gardini, 2000, 2009), exhibits the same cephalothoracic chaetotaxy and shares the same chelal tooth pattern as *Chthonius auruncus* n. sp. However, the latter differs from the former in several marked adaptive characters: no eyes in *Chthonius auruncus* n. sp. vs. four well-developed eyes in *Chthonius tenuis*; larger size and more slender appendages in *Chthonius auruncus* n. sp.: [length of pedipalpal chela (♀) 1.49 mm, chela (♀) 6.62 times as long as deep, fixed and movable chelal fingers with 51 and 40 teeth, respectively, in *Chthonius auruncus* n. sp.; length of pedipalpal chela (♀) 0.87–1.16 mm, chela (♀) 4.6–5.2 times as long as deep, fixed and movable chelal fingers with a maximum of 38 and 34 teeth, respectively, in *Chthonius tenuis*] (DeVore-Scribante, 1999; Gardini, 2009).

Chthonius auruncus n. sp. is morphologically similar to *Chthonius ligusticus* and *Chthonius lanzai*, subterranean species from the eastern Ligurian Apennines and the Apuan Alps (Tuscany), respectively. All three species share the same chelal fingers dentition pattern, but *Chthonius auruncus* n. sp. exhibits a higher degree of troglomorphy, as shown by the absence of eyes (anterior eyes with flat lens, posterior ones absent or reduced to a white spot in *Chthonius ligusticus* and *Chthonius lanzai*), the higher number of teeth on the fixed chelal finger (51 teeth in *Chthonius auruncus* n. sp., 25–30 in females of *Chthonius ligusticus* and about

40 in females of *Chthonius lanzai*), and the more slender appendages [pedipalpal chela 6.62 times as long as deep in *Chthonius auruncus* n. sp., 4.36–5.20 (♀) times as long as deep in *Chthonius ligusticus* and 6.00–6.30 (♀) times as long as deep in *Chthonius lanzai*] (Callaini, 1986; Gardini, 1979, 1980; Gardini & Oggianu, 1992; Lazzeroni, 1970).

Chthonius auruncus n. sp. can also be compared with *Chthonius elongatus* Lazzeroni, 1970—a subterranean species endemic to Monte Pisano near Pisa—although the presence of the isolated tooth on the movable cheliceral finger has not yet been definitively established in the latter species (Gardini, 1979; Callaini, 1986). *Chthonius auruncus* n. sp. differs in lacking both eyes and eye spots (anterior eyes with flat lens, posterior ones reduced to a white spot in *Chthonius elongatus*), in having less slender palps and smaller size (chela 6.62 times as long as deep, 1.49 mm long in *Chthonius auruncus* n. sp., 7.17–7.50 times as long as deep, 2.37–2.49 mm long in females of *Chthonius elongatus*).

Chthonius hernicus n. sp.

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0FAACB3F-DA04-48EE-9B8C-AE892F9219EB

(Figs. 6–10)

TYPE LOCALITY. Italy, Latium, Frosinone Province, Collepardo, Grotta della Regina Margherita 22 La/FR (41°45′31″N, 13°22′01″E).

DISTRIBUTION. Italy (Latium).

DIAGNOSIS (♀). An anophthalmic hypogean *Chthonius* that differs from other Italian species of the *ischnocheles* group (sensu Gardini, 2021) in the following combination of characters: anterior margin of carapace with one preocular microseta on each side; posterior margin with two macrosetae and one lateral microseta on each side; tergite I with 4 setae; chelicerae with 3 lateral microsetae, movable cheliceral finger with an isolated subapical tooth; chela length 1.49 mm; movable chelal finger length 1.01 mm; chela 7.45 times as long as deep; both chelal fingers with reclined, contiguous teeth; fixed and movable chelal fingers with 82 and 68 teeth, respectively; ratio of pedipalpal femur/carapace 1.64.

TYPE MATERIAL. ITALY—*Latium*: 1 ♀ (holotype), Frosinone Province, Collepardo, Grotta della

Regina Margherita 22 La/FR (= Grotta di Colleparado or Grotta dei Bambocci) (41°45'31"N, 13°22'01"E), 490 m a.s.l., 13.II.1994, L. Latella leg. (MHNG).

DERIVATIO NOMINIS. From the adjective *hernicus*, -a -um, meaning "pertaining to the Hernici", an ancient Italic people who settled in southern Latium, bordering the territories of the Volsci and the Marsi. The cave Grotta della Regina Margherita, the type locality of *Chthonius hernicus* n. sp., is situated in the mountain range named after the Hernici people.

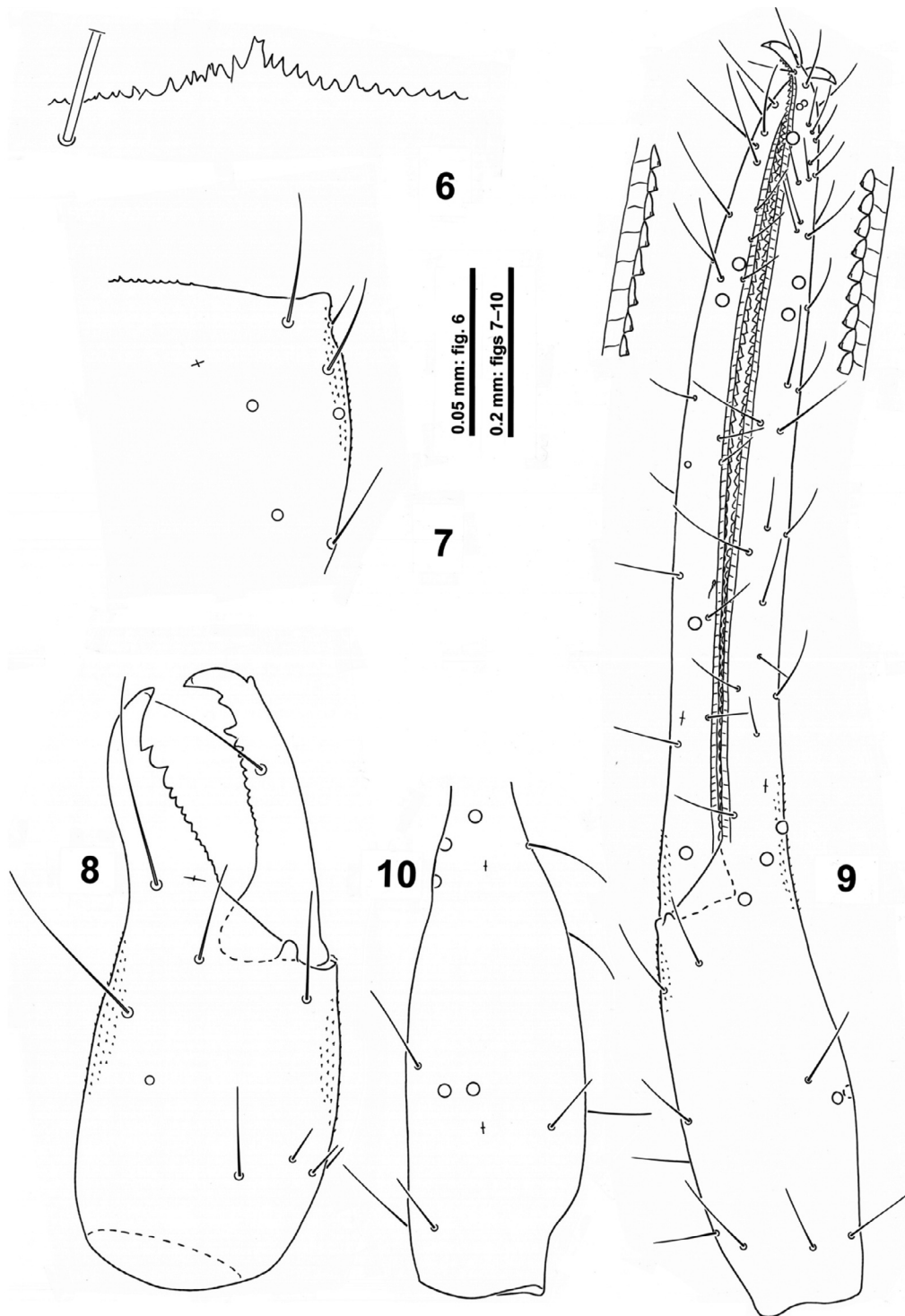
DESCRIPTION OF ADULT (♀; ♂ unknown). Highly specialized troglomorphic facies; integument slightly pigmented, carapace, tergites, chelicerae and pedipalps pale brown; weak hispid granulation on lateral surfaces of carapace, on cheliceral palm and on base of chelal fingers. Carapace 0.94 times longer than broad, trapezoidal, constricted posteriorly; anterior margin with an evident epistome (Fig. 6); ocular area as in Fig. 7, no eyes or eye-spots; chaetotaxy m3m:6:4:2:m2m (17 macrosetae), length of anteromedian macroseta 0.18 mm. Chaetotaxy of tergites I-X: 4:4:4:4:6:6:6:6:6:4. Chaetotaxy of sternites II-IX: 9:(3)8(3):(2)7(2):8:6:6:6:6. Chelicerae (Fig. 8) 2.41 times as long as broad, palm with 6 setae and 3 lateral microsetae; fixed finger with 2 large distal teeth followed proximally by 8 teeth of decreasing size; movable finger with an isolated subapical tooth (*di*) located at level of the spinneret, followed by a large tooth and 7 teeth proximally reduced in size; *gs* ratio 0.62; spinneret prominent, apically rounded; rallum with 11 blades; serrula exterior with 18 blades. Coxal setae: pedipalp 5 (including 2 on manducatory process), I 3 + 3 marginal microsetae, II 4, III 5, IV 6; coxa II with 7 coxal spines, coxa III with 4 coxal spines; intercoxal tubercle bisetose. Pedipalp: femur 7.03 times as long as broad; chela (Fig. 9) 7.45 times as long as deep; hand of chela 2.40 times as long as deep, with subparallel sides in dorsal view (Fig. 10); fixed chelal finger with 82 long reclined teeth increasingly reduced towards the finger base (Fig. 9), at level of *est-it* with 8 teeth occupying 0.1 mm (distance between successive apices 0.012 mm); all teeth with dental canal; distal paraxial seta slightly sigmoid; movable chelal finger with about 68 teeth, reclined and apically pointed in the distal half of the finger, apically broadly rounded and increasingly reduced towards

finger base, between *sb* and *b* recognizable only by the presence of dental canal (Fig. 9); coupled sensilla *pc* just distal *sb*, not on a tubercle; trichobothria as in Fig. 9; ratio of movable finger/hand of chela 2.10; ratio of pedipalpal femur/movable finger 1.01; ratio of pedipalpal femur/carapace 1.64.

MEASUREMENTS. Body length ca. 1.8. Carapace 0.62×0.66 (anteriorly). Chelicerae 0.70×0.29; movable finger length 0.37. Pedipalp: femur 1.02×0.145; chela 1.49×0.20; hand length 0.48; movable finger length 1.01.

REMARKS. Among the species of the *Chthonius ischnocheles* group, *Chthonius hernicus* n. sp. is most similar to the epigean *Chthonius densedentatus* Beier, 1938, which occurs in the same geographical area. Both species share the same chelal tooth pattern, the presence of 2 microsetae on the posterior margin of carapace and 3 lateral microsetae on the cheliceral palm. *Chthonius hernicus* n. sp. differs from *Chthonius densedentatus* for evident adaptive characters: no eyes in *Chthonius hernicus* n. sp. vs. four eyes in *Chthonius densedentatus*; larger in size and more slender appendages in *Chthonius hernicus* n. sp. [length of pedipalpal chela (♀) 1.49 mm, chela (♀) 7.45 times as long as deep, fixed and movable chelal fingers with 82 and 68 teeth, respectively, in *Chthonius hernicus* n. sp.; length of pedipalpal chela (♀) 0.73-1.18 mm, chela (♀) 4.45-5.5 times as long as deep, fixed and movable chelal fingers with 32-53 and 23-47 teeth, respectively, in *Chthonius densedentatus*].

Chthonius hernicus n. sp. is morphologically similar to *Chthonius caoduroi* Callaini, 1987, a subterranean species from the Lucanian Apennines (Basilicata), just south of Cilento. The two species share the same cephalothoracic chaetotaxy, the same number of lateral microsetae on the cheliceral palm, and, above all, the same chelal fingers dentition pattern. *Chthonius hernicus* n. sp. exhibits a higher degree of troglomorphy, as shown by the absence of eyes (anterior eyes with flat lens, posterior ones absent in *Chthonius caoduroi*), and by its more slender appendages: pedipalpal chela 7.45 (♀) times as long as deep in *Chthonius hernicus* n. sp., 6.2-6.4 (♀) times as long as deep in *Chthonius caoduroi*, hand of chela 2.4 (♀) times as long as deep in *Chthonius hernicus* n. sp., 2.0-2.05 (♀) times as long as deep in *Chthonius caoduroi*.



Figs. 6-10. *Chthonius hernicus* n. sp., female holotype. 6) Anterior margin of carapace; 7) right ocular area of carapace; 8) right chelicera, dorsal view; 9) left pedipalpal chela, antiaxial view, with magnified details of teeth at level of trichobothria *st-t/est-it*; 10) hand of left chela, dorsal view.

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