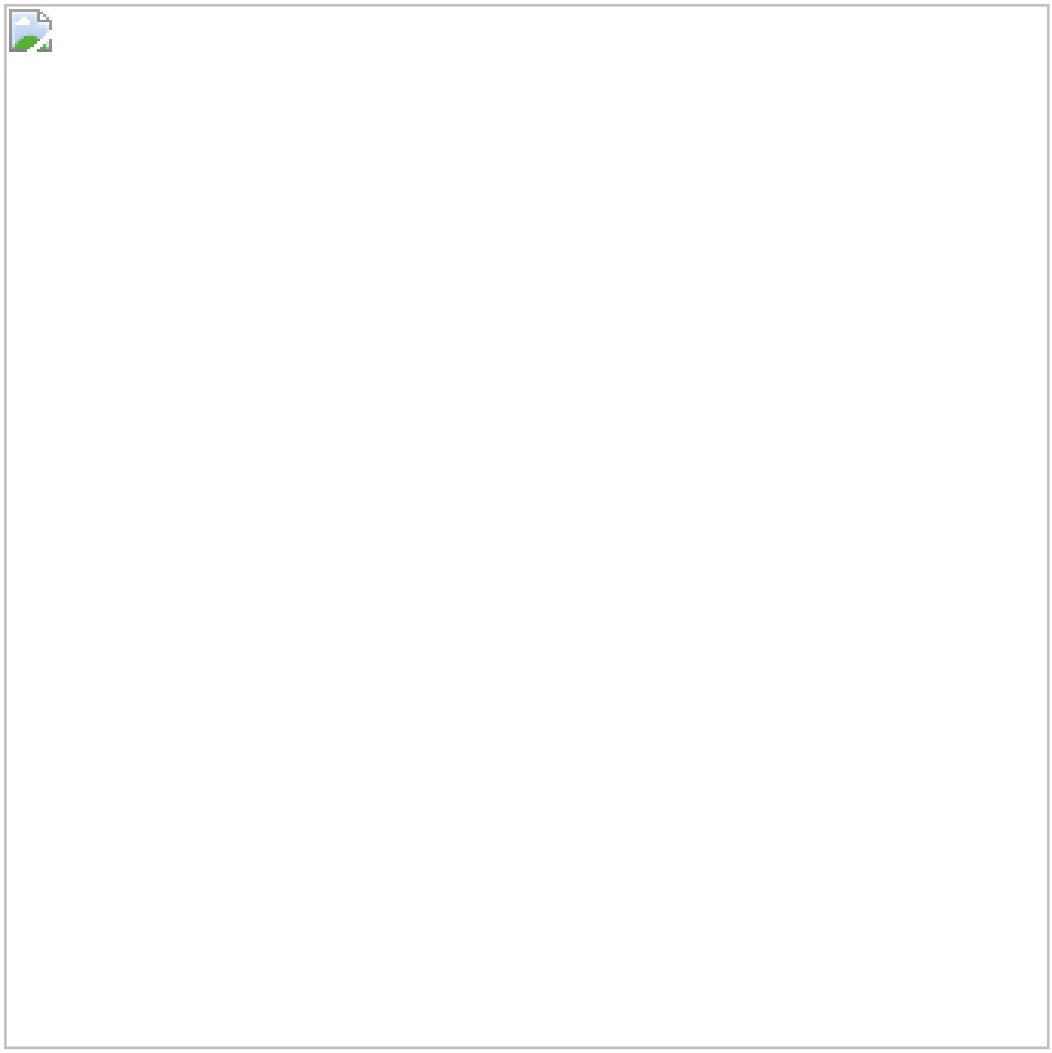

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Neobisium (*Neobisium*) *onnisi* n. sp., a new subterranean pseudoscorpion from Sardinia (Arachnida: Pseudoscorpiones: Neobisiidae)

Giulio Gardini

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Abstract. *Neobisium* (*Neobisium*) *onnisi* **n. sp.** is described from a cave on Mount Arcuerì near Seui (Sardinia, Province of Nuoro) and compared with the subterranean *Neobisium* (*Neobisium*) *sardoum* Beier, 1956 from caves of Supramonte of Oliena, Orgosolo and Urzulei (Eastern Sardinia). *Neobisium* (*N.*) *onnisi* **n. sp.** shares with *N.* (*N.*) *sardoum* the heterodont dentition of the pedipalpal fixed finger and it differs from the latter in having a lower degree of troglomorphism.

Key words: New species, subterranean species, taxonomy

Zusammenfassung. *Neobisium* (*Neobisium*) *onnisi* n. sp., ein neuer subterraner Pseudoskorpion aus Sardinien (Arachnida: Pseudoscorpiones: Neobisiidae). *Neobisium (Neobisium) onnisi* **n. sp.** wird aus einer Höhle des Monte Arcuerì bei Seui (Sardinien, Provinz Nuoro) beschrieben und mit dem subterranen *Neobisium* (*Neobisium*) *sardoum* Beier, 1956 aus Höhlen des Supramonte bei Oliena, Orgosolo und Urzulei (Östliches Sardinien) verglichen. *Neobisium (Neobisium) onnisi* **n. sp.**, hat wie *N. (N.) sardoum* eine heterodonte Bezahnung des unbeweglichen Grundglieds und unterscheidet sich von der Art durch eine schwächer ausgeprägte Anpassung an das Leben in Höhlen.

The subterranean species of the genus *Neobisium* Chamberlin, 1930, belonging to the nominotypical subgenus, from mainland Italy and the Sardinian-Corsican complex—previously attributed to the subgenus *Ommatoblothrus* Beier, 1956—were recently reviewed by Gardini (2023). Three troglomorphic species of this subgenus were known until now from Sardinia, all confined to the central-eastern karst areas of the island: *Neobisium* (*Neobisium*) *sardoum* Beier, 1956 from Supramonte of Oliena, Orgosolo and Urzulei, *Neobisium* (*Neobisium*) *henroti* Beier, 1956 and *Neobisium* (*Neobisium*) *lulense* Gardini, 1982, both from Mount Albo. Thanks to the courtesy of Carlo Onnis, I had the opportunity to examine some specimens of a subterranean *Neobisium*, collected in a small cave on the slope of Mount Arcuerì near Seui (Sardinia), which I believe belongs to a new species and is the subject of this work.

Material and methods

Specimens were cleared by immersion in 70% lactic acid and then temporarily mounted, after dissection of the palp, chelicera and leg IV, in cavity slides with the same medium. They were rinsed, after study, in distilled water and returned to vials in 70% ethanol, together with the dissected portions in glass capillary tubes. Specimens were studied using an Olympus BHB compound microscope; drawings were made with the aid of a Nachet drawing tube. Terminology and reference points for measurements largely follow Chamberlin (1931), measurements are given in mm and proportions are given as length/breadth for the carapace, chelicera and pedipalp and as length/depth for the legs; measurements of the chela are taken in ventral view. The relative position of trichobothria along the chelal axis and the ratio between the diameter of the distal opening of the patella (X) and the length of the inner margin of the patella (Y) are calculated following Gabbutt & Vachon (1965). The use of the terms rallum, antiaxial and paraxial follows Judson (2007).

Abbreviations. id. (from the Latin *idem*) = the same; T = tritonymph.

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Acronym. MHNG (Muséum d'histoire naturelle, Genève, Switzerland). If not otherwise indicated, the specimens are in the author's collection.

Taxonomy

***Neobisium* (*Neobisium*) *onnisi* n. sp.** (Figs 1-8)

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Type locality. ITALY, Sardinia, municipality of Seui, Monte Arcuerì, small cave without cadastral number at the base of a limestone wall (39.8261°N, 9.3764°E, 1060 m a.s.l.).

Distribution. Italy, Sardinia.

Diagnosis (♂♀). A subterranean troglomorphic *Neobisium* from Sardinia that differs from other Mediterranean species of the genus in the following combination of characters: carapace with one (rarely two) subocular microseta on each side, posterior margin with six (rarely seven) setae; epistome triangular, apically with few denticles; eyes with convex lens and tapetum, anterior eyes distant from the edge of the carapace less than their diameter; carapace weakly granular ventrally to the eyes, dark integument between anterior and posterior eyes present; tergites I–IV: 6:6–7:6–8:7–9; cheliceral palm with seven setae, rallum with eight blades; fixed chelal finger irregularly heterodentate, with contiguous, pointed teeth; movable chelal finger with contiguous, flattened teeth, apart from the last distal ones which are pointed; fixed and movable chelal fingers with 110–116 and 92–96 teeth, respectively; pedipalpal femur 1.70–1.93 mm length (6.03–6.25×), patella 1.17–1.38 mm (3.64–3.81×), movable finger 1.88–2.21 mm; pedipalpal hand with oval profile and its greatest width in the proximal third; chelal fingers curved in dorsal view, movable chelal finger slightly curved in antiaxial view; ratio between movable chelal finger and chelal hand with pedicel 1.53–1.60; ratio between pedipalpal femur and movable chelal finger 0.87–0.90; ratio between pedipalpal femur and carapace 1.54–1.72; trichobothrium *ist* distal *st,* closer to the finger tip than to *isb*.

Type material. ITALY, Sardinia: Holotype ♂, Nuoro province, Barbagia di Seulo, Seui, Monte Arcuerì, piccola cavità n.c. alla base di parete calcarea [small cave without cadastral number at the base of a limestone wall] (39.8261°N, 9.3764°E), 1060 m a.s.l., 15. Apr. 2017, C. Onnis leg. (MHNG). Paratypes:

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1 ♂, 1 ♀, 1 T, same locality as the holotype, 20. Apr. 2018, C. Onnis leg. (♂♀ MHNG); 2 ♂♂, 4 ♀♀, 1 T, id., 22. Apr. 2018, C. Onnis leg.; 1 ♀, 1 T, id., 6. Jun. 2021, C. Onnis leg.

Non-type material examined. ITALY, Sardinia: 1 ♀, Nuoro province, Desulo, Pozzo di Genna 'e Ragas 2738 Sa/NU (39.9634°N, 9.2863°E), 1050 m a.s.l., 17. Sep. 2000, M. Mucedda leg.

Derivatio nominis. Named in honour of the biospeleologist Carlo Onnis (Maracalagonis, Cagliari) for his important contributions to the knowledge of the Sardinian subterranean fauna.

Description of adults (♂♀). Carapace, chelicera, pedipalps and palpal coxae fawn-brown; anterolateral carapace surface slightly granular, pedipalps smooth, pleural membrane granular. Carapace 1.35–1.50 (♂♀) times as long as broad, with four eyes with tapetum (Fig. 1), the anterior ones with convex lens (diameter 0.12–0.14 mm), the posterior ones weakly reduced; distance from anterior eyes to anterior margin of carapace 0.065–0.08 mm, distance from anterior to posterior eyes 0.03–0.035 mm; dark integument between anterior and posterior eyes present; anterior margin of carapace with prominent triangular epistome, apically rounded or acuminate, with few denticles (Fig. 1); 22–24 macrosetae, anterior and posterior rows with four and six (rarely seven) macrosetae, respectively, besides one (rarely two) preocular seta on each side. Chaetotaxy of tergites I–X (♂♀): 6:5–7:6–8:7–9:8–10:9–10:9–10:9–11:10–12:9–11. Chaetotaxy of sternites II–X (♂): 12–16:(3)34–35(3):(2–3)16–17(2–3):14–17:14:14–15:14:14:14–15; median genital sac pyriform, reaching the middle of sternite V; chaetotaxy of sternites II–X (♀): 15:(4)31–36(4):(3–4)15–16(3):14–20:14–16:15–16:17:16:15–16; anal cone with 2–3 dorsal and 3–4 ventral setae. Chelicera (Figs 2–3) 2.05–2.1 (♂♀) times as long as broad, palm with seven setae; fixed finger with 10–15 subequal teeth proximally and distally decreasing in size; movable finger with 10–12 subequal teeth and one or two prominent teeth just distal *gs*; *gs* ratio 0.64–0.70, spinneret largely prominent and rounded; rallum with eight blades, the distal one laterally pinnate and isolated on a prominence, the second one serrate, the successive ones smooth, the proximal shorter; serrulae interior and exterior with about 30–33 and 34–38 blades, respectively. Manducatory process with five setae. Coxal setae (♂♀): pedipalp 11–14, I 8–10, II 8–10, III 8–9, IV 13–16; anterolateral process of coxa I acuminate, anteromedial process rounded with denticles (Fig. 4). Pedipalp (Figs 5-7): trochanter 2.53–2.70 (♂♀) times as long as broad, with two weak tubercles (with lyrifissure) on antiaxial face; femur 6.18–6.25 (♂) or 6.03–6.20 (♀) times as long as broad, weakly enlarged distally; patella 3.65–3.81 (♂) or 3.64–3.73 (♀) times as long as broad, club gradually enlarged distally, ratio X/Y = 0.48–0.51 (♂♀); chela with pedicel 5.02–5.19 (♂) or 4.77–5.25 (♀) times as long as broad; chelal fingers curved in dorsal view, movable chelal finger slightly curved in antiaxial view (Figs 6-7); hand of chela with pedicel 2.00–2.14 (♂) or 2.01–2.03 (♀) times as long as broad, with oval profile and its greatest width in the proximal third (dorsal view); fixed chelal finger irregularly heterodentate (Fig. 7), with 110–116 (♂♀) pointed contiguous teeth, nodus ramosus subterminal; movable chelal finger with 92–96 (♂♀) low, flattened contiguous teeth (Fig. 7), apart from the last 11–14 distal ones which are cuspidate; all teeth with dental canals; trichobothria as in figs 6–7; relative position of trichobothria along chelal axis (♂♀): *it* 0.09–0.095/*et* 0.10–0.115/*est* 0.15–0.175/*ist* 0.26–0.275/*isb* 0.84–0.86/*ib* 0.86–0.88/*esb* 0.94–0.97/*eb* 0.96–0.98/*t* 0.16–0.17/*st* 0.30–0.31/*sb* 0.73–0.78/*b* 0.90–0.91; trichobothrium *est* more or less at level of *t*; trichobothrium *ist* distal *st,* closer to the finger tip than to *isb*; trichobothrium *isb* proximal *sb*; ratio between movable finger and hand of chela with pedicel 1.54–1.60 (♂) or 1.53–1.55 (♀); ratio between pedipalpal femur and movable finger 0.87–0.90 (♂♀); ratio between pedipalpal femur and carapace 1.54–1.67 (♂) or 1.55–1.72 (♀). Leg IV (Fig. 8): trochanter 2.68–2.92 (♂) or 2.83–2.87 (♀) times as long as deep, femur + patella 5.63–5.67 (♂) or 5.60 (♀) times as long as deep, tibia 9.85–10.04 (♂) or 9.80–10.5 (♀) times [TS = 0.42–0.43 (♂) or 0.46–0.57 (♀)], basitarsus 5.63–5.77 (♂) or 5.38–6.45 (♀) times [TS = 0.16 (♂) or 0.14–0.18 (♀)], telotarsus 8.66 (♂) or 8.3–8.5 (♀) times as long as deep [TS = 0.54 (♂) or 0.44–0.57 (♀)], ratio between basitarsus and telotarsus 0.79–0.81 (♂) or 0.835–0.84 (♀), subterminal seta furcate, claws with small dorsal tooth.

Measurements. Body length 3.6–3.8 (♂) or 4.0–4.2 (♀). Carapace 1.03–1.10 × 0.73–0.74 anteriorly (♂) or 1.08–1.24 × 0.80–0.83 anteriorly (♀). Chelicera 0.70–0.71 × 0.34 (♂) or 0.79–0.81 × 0.38–0.395 (♀); movable finger length 0.46 (♂) or 0.51–0.53 (♀). Pedipalp: trochanter 0.735–0.745 × 0.285–0.29 (♂) or 0.81–0.84 × 0.30–0.325 (♀); femur 1.70–1.72 × 0.275 (♂) or 1.86–1.93 × 0.30–0.32 (♀); patella 1.17–1.22 × 0.32 (♂) or 1.31–1.38 × 0.36–0.37 (♀); chela with pedicel 2.96–2.99 × 0.57–0.595 (depth 0.54–0.575) (♂) or 3.20–3.68 × 0.67–0.70 (depth 0.635–0.68) (♀); hand with pedicel length 1.19–1.22 (♂) or 1.35–1.42 (♀); movable finger length 1.88–1.91 (♂) or 2.07–2.21 (♀). Leg IV: trochanter 0.55–0.60 × 0.205 (♂) or 0.66–0.68 × 0.23–0.24 (♀); femur + patella 1.55–1.56 × 0.275 (♂) or 1.61–1.68 × 0.30–0.34 (♀); tibia 1.35–1.38 × 0.13–0.14 (♂) or 1.47–1.52 × 0.14–0.155 (♀); basitarsus 0.62–0.635 × 0.11 (♂) or 0.70–0.71 × 0.11–0.13 (♀); telotarsus 0.78 × 0.09 (♂) or 0.83–0.85 × 0.10 (♀).

Description of tritonymphs. Carapace, chelicerae, pedipalps and palpal coxae fawn-brown pale; anterolateral carapace surface slightly granular, pedipalps smooth, pleural membrane granular. Carapace 1.46–1.49 times as long as broad, with four eyes, the anterior ones with convex lens (diameter 0.07–0.08 mm), the posterior ones reduced, with weak lens; distance from anterior eyes to anterior margin of carapace 0.05 mm, distance from anterior to posterior eyes 0.02 mm; anterior margin of carapace with a triangular epistome conforming to that of adults; 22–24 macrosetae, anterior and posterior rows with four and six macrosetae, respectively, besides one preocular seta on each side. Chaetotaxy of tergites I–X 6:6:6:8:8–9:8–9:8–11:8:9:9. Chaetotaxy of sternites II–X: 2:(2)9–10(2):(2)9–10(2):13:13–14:13–14:13:13:11–12. Chelicera 1.98–2.04 times as long as broad, palm with six setae, fixed finger with 14–16 subequal teeth, movable finger with 9–13 teeth, 2–3 of which prominent distad of *gs*; *gs* ratio 0.64, spinneret hemispheric; rallum with seven blades, the distal one laterally pinnate and isolated on a prominence, the second one serrate, the successive ones apparently smooth, the proximal shorter. Manducatory process with four setae. Coxal setae: pedipalp 10, I 6, II 6–8, III 5–6, IV 7–8; anterolateral process of coxa I pointed. Pedipalp: trochanter 2.1–2.3 times as long as broad, with nearly indistinct tubercles; femur 5.38–5.62 times as long as broad, weakly enlarged distally;

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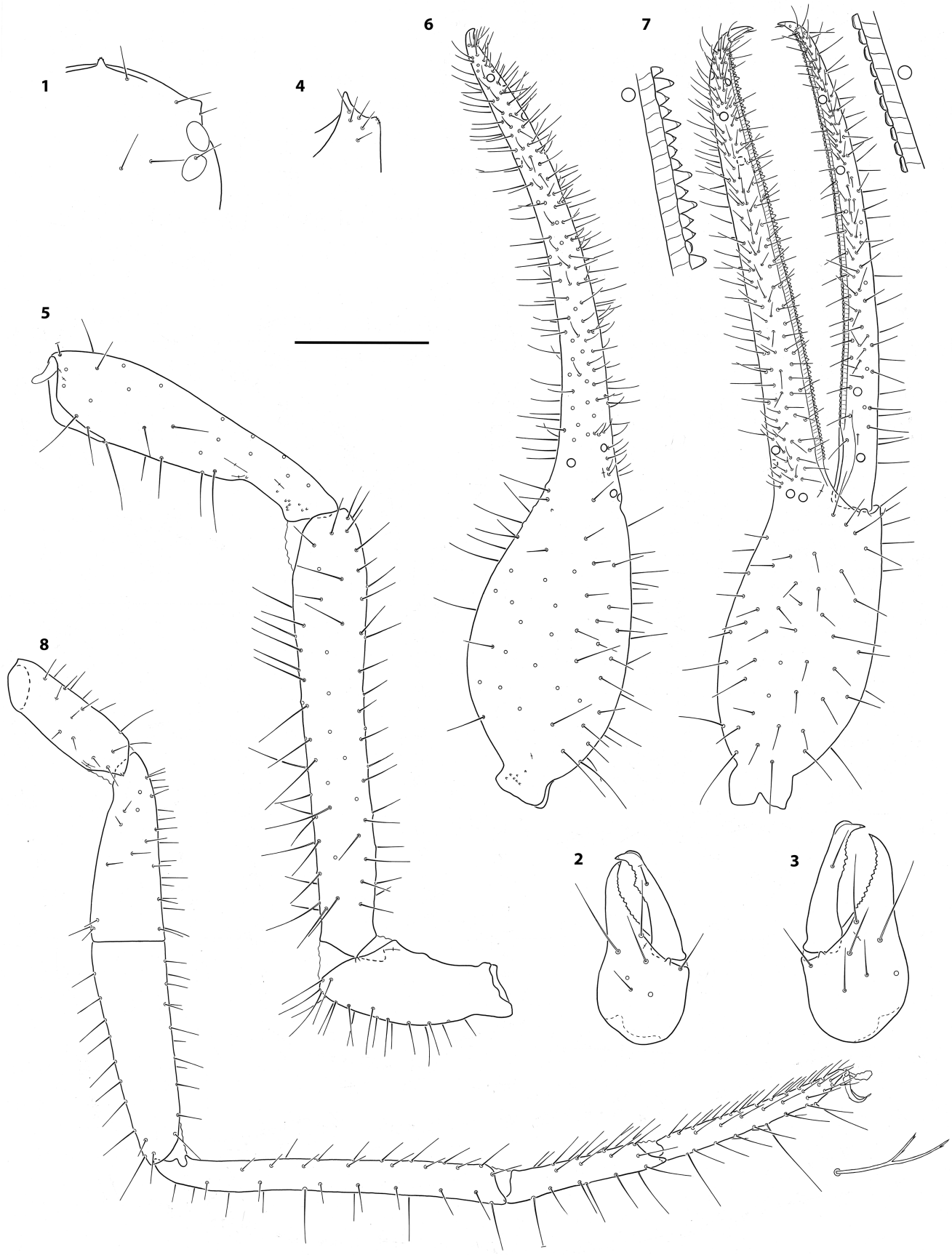

Figs 1-8: *Neobisium* (*Neobisium*) *onnisi* **n. sp.**, male (1-2, 4-8) and female (3) paratypes, 22. Apr. 2018. **1.** epistome of carapace and ocular area; **2.** right chelicera, dorsal view; **3.** left chelicera, dorsal view; **4.** anterior processes of right coxa I; **5.** trochanter, femur and patella of right pedipalp, dorsal view; **6.** right pedipalpal chela, dorsal view; **7.** same, antiaxial view, with magnified detail of teeth; **8.** right leg IV, antiaxial view, with magnified detail of subterminal seta of telotarsus (scale bar: 0.5 mm)

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patella 3.21–3.38 times as long as broad, weakly and gradually enlarged distally, ratio X/Y = 0.69–0.70; chela with pedicel 4.89–5.03 times as long as broad; hand of chela with pedicel 2.07–2.19 times as long as broad; fixed chelal finger irregularly heterodentate, with 72–78 pointed contiguous teeth, nodus ramosus subterminal; movable chelal finger with 63–69 low, flattened contiguous teeth, apart from the last 11–12 distal ones which are cuspidate; all teeth with dental canals; sensillum not seen; relative position of trichobothria along chelal axis: *it* 0.13–0.14/*et* 0.165–0.175/*est* 0.225–0.255/*ist* 0.35–0.36/*ib* 0.865–0.87/*esb* 0.925–0.94/*eb* 0.95–0.97/*t* 0.26–0.27/*st* 0.48/*b* 0.88–0.89; ratio between movable finger and hand of chela with pedicel 1.43–1.50; ratio between pedipalpal femur and movable finger 0.88–0.94; ratio between pedipalpal femur and carapace 1.36–1.45. Leg IV: trochanter 2.48–2.66 times as long as deep, femur + patella 5.05–5.08 times as long as deep, tibia 7.0–7.6 times (TS = 0.39–0.40), basitarsus 4.62 times (TS = 0.11–0.15), telotarsus 6.4–6.5 times as long as deep (TS = 0.42–0.45), ratio between basitarsus and telotarsus 0.71–0.77, subterminal seta furcate, claws with dorsal tooth.

Measurements. Body length 2.6–2.9. Carapace 0.73–0.79 × 0.49–0.54 anteriorly. Chelicera 0.49–0.505 × 0.24–0.255, movable finger length 0.30–0.31. Pedipalp: trochanter 0.42–0.46 × 0.20; femur 1.06–1.075 × 0.19–0.20; patella 0.71–0.74 × 0.21–0.23; chela with pedicel 1.81–1.91 × 0.36–0.39 (depth 0.35–0.395); hand with pedicel length 0.79–0.81; movable finger length 1.13–1.22. Leg IV: trochanter 0.385 × 0.145–0.155; femur + patella 0.94–0.96 × 0.185–0.19; tibia 0.77–0.80 × 0.105–0.11; basitarsus 0.37 × 0.08; telotarsus 0.48–0.52 × 0.075–0.08.

Remarks. Among the troglomorphic *Neobisium* species of the Sardinian-Corsican complex, *N. onnisi* **n. sp.** is comparable only to *N. sardoum* – from Supramonte of Oliena, Orgosolo and Urzulei – as both possess the fixed chelal finger which is evidently heterodentate (Gardini 2023). *Neobisium onnisi* **n. sp.** differs from *N. sardoum* mainly in the lower degree of troglomorphism, evidenced by the smaller size, less slender appendages and the shape of the chelal hand. The two species can be distinguished by the following main characters (♂♀): dark integument between anterior and posterior eyes present in *N. onnisi* **n. sp.** (absent in *N. sardoum*); cheliceral palm with seven setae (with six setae in *N. sardoum*); pedipalpal femur length 1.70–1.93 mm, 6.03–6.25 times as long as broad (1.94–2.27 mm, 6.36–7.32 × in *N. sardoum*); pedipalpal patella length 1.17–1.38 mm, 3.64–3.81 × (1.40–1.71 mm, 4.05–4.83 × in *N. sardoum*); ratio X/Y = 0.48–0.51 (0.34–0.39 in *N. sardoum*); pedipalpal chela 4.77–5.25 × (5.78–6.45 × in *N. sardoum*); pedipalpal hand 2.0–2.14 × (2.48–3.06 × in *N. sardoum*); ratio between pedipalpal femur and carapace 1.54–1.72 × (1.73–2.20 × in *N. sardoum*). The two species occur in independent karst complexes.

The female from the cave Pozzo di Genna ‘e Ragas 2738 Sa/NU, in the municipality of Desulo, is here provisionally attributed to *Neobisium onnisi* **n. sp.** because the weak morphological differences found with respect to females of the latter species cannot be assessed on the basis of a single specimen. The female from Desulo, compared to those of Mount Arcuerì, is slightly smaller and with slightly less slender appendages: pedipalpal femur length 1.68 mm versus 1.86–1.93 mm in females from Mount Arcuerì; pedipalpal patella length 1.17 mm (3.35×) vs. 1.31–1.38 mm (3.64–3.73×); ratio X/Y = 0.61 vs. 0.48–0.51; pedipalpal chela length 2.99 mm vs. 3.20–3.68 mm; pedipalpal hand length 1.26 mm vs. 1.35–1.42 mm; movable chelal finger length 1.92 mm vs. 2.07–2.21 mm; fixed chelal finger with 104 teeth vs. 110–116 teeth. The two populations occur in cavities 17 km apart, in independent karst complexes.

The small cave on Mount Arcuerì from which the type specimens of *Neobisium onnisi* **n. sp.** originates is also the type locality of *Typhloreicheia elegans* (Dodero, 1916), *Ichnusodytes nivis* (Magrini & Onnis, 2018) (both Coleoptera: Carabidae) and *Sardulus gelidus* Magrini & Onnis, 2019 (Coleoptera: Histeridae) (Magrini & Onnis 2018, 2019, Magrini et al. 2019).

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