

## The species of the pseudoscorpion genus *Pseudoblothrus* (Pseudoscorpiones: Syarinidae) in Italy (on Italian pseudoscorpions XLVIII)

Giulio Gardini

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**Abstract.** The species of the genus *Pseudoblothrus* Beier, 1931 from Italy are revised. Two species are present in this area: *P. peyerimhoffi* (Simon, 1905) (Piedmont) and *P. regalini* Inzaghi, 1983 (Lombardy). The following synonymy is proposed: *Pseudoblothrus ellingseni* (Beier, 1929) is a junior subjective synonym of *P. peyerimhoffi* (Simon, 1905) (**syn. nov.**). A key to all species of the genus *Pseudoblothrus* is provided.

**Keywords:** Alps, biospeleology, new synonymy, taxonomy

Three genera of the family Syarinidae are known from Italy: *Microcreagrina* Beier, 1961 with the epigeal *M. hispanica* (Ellingsen, 1910) from Sicily and Sardinia, *Hadoblothrus* Beier, 1952 with the subterranean *H. gigas* (di Caporiacco, 1951) from Apulia and *Pseudoblothrus* Beier, 1931 with three subterranean species from northern Italy (Gardini 2000).

The genus *Pseudoblothrus*, established for *Ideoblothrus roszkovskii* Redikorzev, 1918 from Crimea, is represented in Europe by ten subterranean species (Harvey 2013), described from the Azores Archipelago (*P. oromii* Mahnert, 1990 and *P. vulcanus* Mahnert, 1990), the French and Italian western Alps [*P. peyerimhoffi* (Simon, 1905) and *P. ellingseni* (Beier, 1929)], the Italian central Alps (*P. regalini* Inzaghi, 1983), Swiss and French Jura Mountains (*P. strinatii* Vachon, 1954), Switzerland (*P. thiebaudi* Vachon, 1969 and *P. infernus* Mahnert, 2011) and Crimea [*P. roszkovskii* (Redikorzev, 1918) and *P. ljevuschkini* Krumpál, 1984]. Relationships between the species listed above and between *Pseudoblothrus* and related genera of Syarinidae, chiefly *Chitrella* Beier, 1932 from North America, are still uncertain, as discussed in detail by Zaragoza (2010).

The necessity of reviewing the *P. peyerimhoffi* – *P. ellingseni* complex has been pointed out by Mahnert (1980), Inzaghi (1983) and Gardini (2000). The results obtained during intensive speleological investigations in the western Alps, chiefly carried out during the last ten years by Enrico Lana (Chivasso, Torino), have made available a sufficient number of

these rare pseudoscorpions for this purpose. Moreover, examination of further specimens of *P. regalini* from Lombardy allows a supplementary description of this species.

### Material and methods

This study is based on the examination of 38 adult specimens and 1 tritonymph of *Pseudoblothrus*, all lodged in the collection of the author. Specimens were cleared in 60% lactic acid and temporarily mounted – after dissection of right palp, chelicera, legs I and IV – in cavity slides with the same medium. Each specimen was returned, after study, to a vial of 70% ethanol together with the dissected portions placed in glass capillary tubes. All specimens were studied using an Olympus BHB compound microscope and illustrated with the aid of a Nacet drawing tube. Measurements and proportions are given as length/breadth for carapace, chelicerae and pedipalps and as length/depth for legs; measurements are expressed in mm. For reference points, used to take measurements, see Chamberlin (1931).

Only references to publications useful for a correct understanding of the taxon are cited. Synonymies are supplied in the case of changes relative to the catalogue of Harvey (2013), as a consequence of revised identifications. The localities of examined specimens are listed in the order of SW to NE. Names of caves are followed by their current cadastral number.

### Taxonomy

#### *Pseudoblothrus peyerimhoffi* (Simon, 1905)

(Figs 1-27, 50)

*Obisium torrei* (not Simon, 1881): Ellingsen 1905: 9 (misidentification).

*Blothrus peyerimhoffi* Simon, 1905: 282; Vachon 1938: 66, 67, figs 37i, 38a.

*Obisium (Blothrus) ellingseni* Beier, 1929: 363 (**syn. nov.**).

*Neobisium (Blothrus) peyerimhoffi*: Beier 1932: 83, 113.

*Neobisium (Blothrus) ellingseni*: Beier 1932: 83, 113.

*Pseudoblothrus peyerimhoffi*: Vachon 1945: 230, figs 1-7; Vachon 1947: 318; Vachon 1952: 536; Vachon 1954: 217; Beier 1963: 229; Vachon 1969: 392; Mahnert 1980: 33, figs 15-16; Inzaghi 1983: 46; Isaia *et al.* 2011: 210, figs 5.22-5.24.

*Pseudoblothrus ellingseni*: Beier 1963: 228; Vachon 1969: 392; Mahnert 1980: 30, figs 13-14; Muchmore 1982: 218; Inzaghi 1983: 46; Bologna & Vigna Taglianti 1985: 65, 228; Isaia *et al.* 2011: 203, 209, figs 5.19-5.21.

*Pseudoblothrus* sp. prope *peyerimhoffi*: Vigna Taglianti 1969: 267.

*Pseudoblothrus ellingseni* (ssp.?): Mahnert 1980: 32.

**Type localities.** FRANCE, Alpes-de-Haute-Provence, Méailles, Grotte de Mélan (44°03'18"N 6°37'33"E) and Trou du Perthus (= Pertuis) (44°02'02"N 6°37'33"E). ITALY, Piedmont, Frabosa Soprana, Grotta di Bossea n. 108 Pi/CN (44°14'31"N 7°50'27"E).

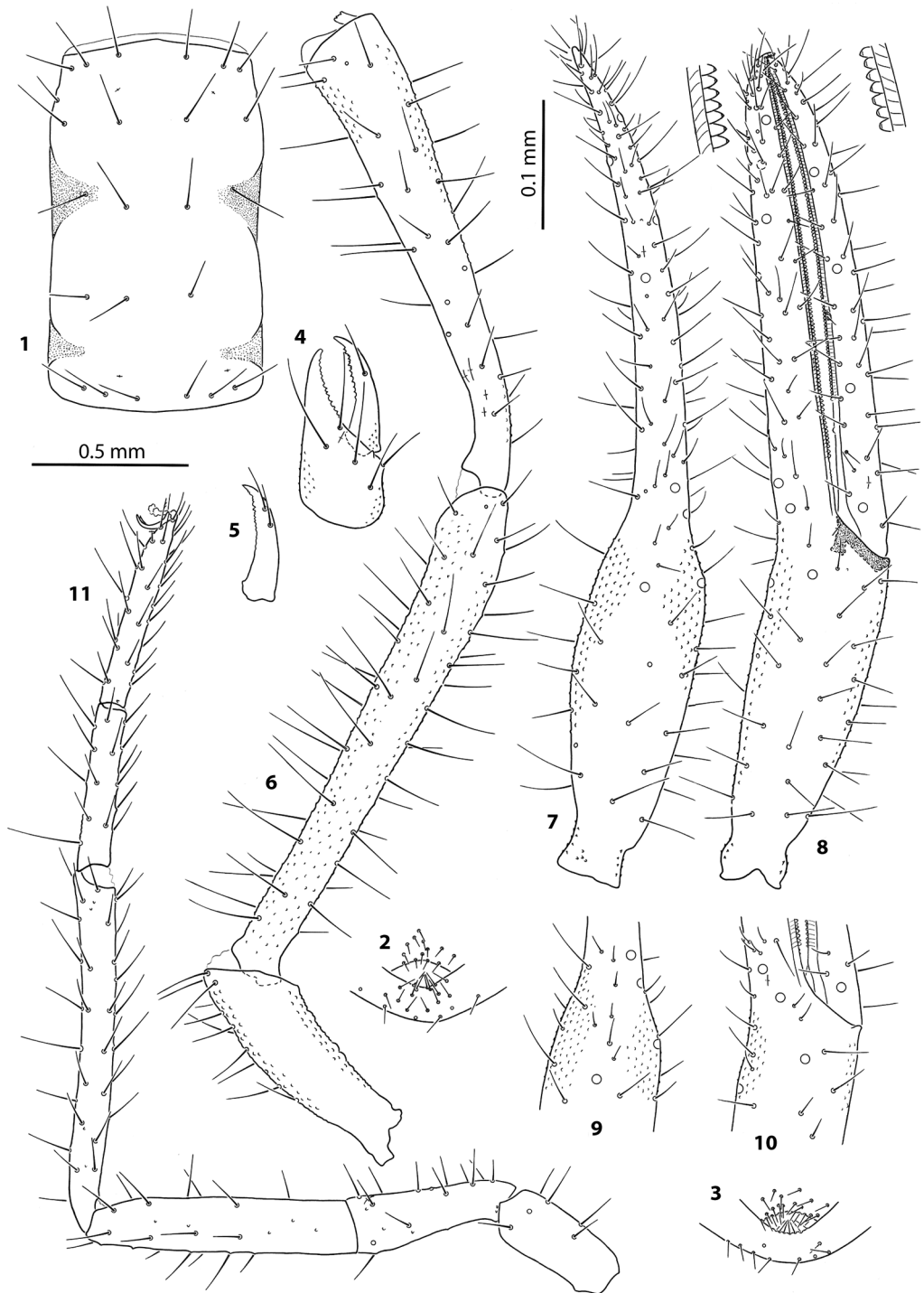
**Distribution.** SE France (departments of Alpes-Maritimes, Alpes-de-Haute-Provence, Drôme and Isère), NW Italy (Piedmont) (Fig. 50).

**Diagnosis** (♂♀). A subterranean *Pseudoblothrus* from the western Alps of France and Italy that differs from other species of the genus in the following combination of characters: no eyes or eye-spots; anterior and posterior rows of carapace with 6 setae each; male without ventral glands on sternite VI, sternites without fields of glandular pores; sternites III and IV respectively with 4 and 3 suprastigmal setae; pedipalp granulate; pedipalpal femur length 1.34–2.24 mm (6.9–8.9 times as long as broad), patella 1.20–2.12 mm (5.0–6.8×), chela with pedicel 2.13–3.18 mm (6.0–7.5×); fixed and movable chelal fingers with 100–150 and 91–153 teeth respectively.

**Material examined.** FRANCE – *Alpes-Maritimes*: 1 ♂, Séranon, Embut de Rouaine 134-A, 1164 m a.s.l., 11.VIII.1991, E. Piva leg. ITALY – *Piedmont, Cuneo Prov.*: 1 ♂, Valdieri, Valle Infernotto, Sweet Inny or Maissa 10 n. 1218 Pi/CN (U.T.M. coordinates: 32T 373153 4902351), 1047 m a.s.l., 8.VIII.1912, E. Lana leg.; 1 tritonymph, Vernante, Vallone di Palanfrè: Grotta G-4 della Lausea n. 1130

Pi/CN (U.T.M. coordinates: 32T 379920 4893530), 1530 m a.s.l., 28.VII.2012, E. Lana leg.; 1 ♂ 1 ♀, Limone Piemonte, Colle di Tenda, Buco di Napoleone art. Pi/CN (U.T.M. coordinates: 32T 386064 4890982), 1475 m a.s.l., 23.VII.1988, R. Sciaky leg.; 1 ♂ 1 ♀, id., 30.IX.2001, E. Lana leg.; 4 ♂ 6 ♀, id., 4.VII.2014, M. Chesta & E. Lana leg.; 1 ♂, Briga Alta, Massiccio del Marguareis, Abisso F33, 14.VIII.1985, E. Piva leg.; 1 ♀, Frabosa Soprana, Grotta di Bossea n. 108 Pi/CN, 836 m a.s.l., 16.III.2003, E. Lana leg.; 3 ♂, Frabosa Soprana, Grotte della Mottera n. 242-675 Pi/CN, 27.VII.1986, S. Zoia leg.; 1 ♀, Garessio, Pozzo del Villaretto n. 273 Pi/CN (U.T.M. coordinates: 32T 417950 4889397), 1100 m a.s.l., 22.XI.2009, E. Lana leg.; 1 ♂, Lisio, Grotta di Rio dei Corvi n. 884 Pi/CN, 800 m a.s.l., 29.X.2006, E. Lana leg.; 1 ♂, Roccaforte Mondovì, Grotta dell'Argilla o D-1 del Mongioie n. 168 Pi/CN (U.T.M. coordinates: 32T 401424 4892621), 1995 m a.s.l., 10.VII.2011, E. Lana & A. Pastorelli leg.; 1 ♀, Villanova Mondovì, Grotta Superiore dei Dossi n. 106 Pi/CN, 626 m a.s.l., 23.II.2002, C. Arnò & E. Lana leg. *Piedmont, Torino Prov.*: 1 ♀, Ala di Stura, Borna o Cava del Servais C art. Pi/TO (U.T.M. coordinates: 32T 369010 5020260), 1405 m a.s.l., 13.VI.2012, E. Lana leg. *Piedmont, Biella Prov.*: 1 ♂, Quittengo, Alpe Machetto, artificial gallery, 1250 m a.s.l., 20.IV.1996, T. Pascutto leg. *Piedmont, Vercelli Prov.*: 2 ♂, Varallo, Monte Camossaro, Grotta Ovaighe n. 2516 Pi/VC, 980 m a.s.l., 24.III.2002, T. Pascutto & L. Collivassone leg. *Piedmont, Verbania Prov.*: 1 ♀, Verbania, Monte Spalavera, Prospetto di Miniera art. Pi/VB, 1150 m a.s.l., 1.XI.1994, E. Lana leg.

**Description of adults** (♂♀). Carapace, pedipalps and first tergite reddish brown, tergites II–XI yellowish brown; hispid granulation on cheliceral palm, on base of movable cheliceral finger and on pedicel of pedipalpal chela; rounded granulation on trochanter, femur, patella and hand of pedipalp; pleural membrane striate. Carapace (Figs 1, 12) 1.65–1.8 times as long as broad, without eyes or eye-spots, with two transverse furrows, the subbasal one narrower; anterior margin without epistome, rarely weakly prominent medially; 24–32 fine macrosetae, 6 (rarely 5 or 7) in anterior, 6 (rarely 7) in posterior row, standard chaetotaxy 6:6:4:6:6(28). Chaetotaxy of tergites I–XI 6:8–10:9–11:10–14:12–14:12–14:12–14:12–14:12–14:8–12(4 tactile setae):7–8(4 tactile setae); tergite I rarely with 5 or 7 setae, II 7 or 11, III 12 or 13, VI 11 or 15, IX 11, X 7, XI 6 or 9 setae. Chaetotaxy of



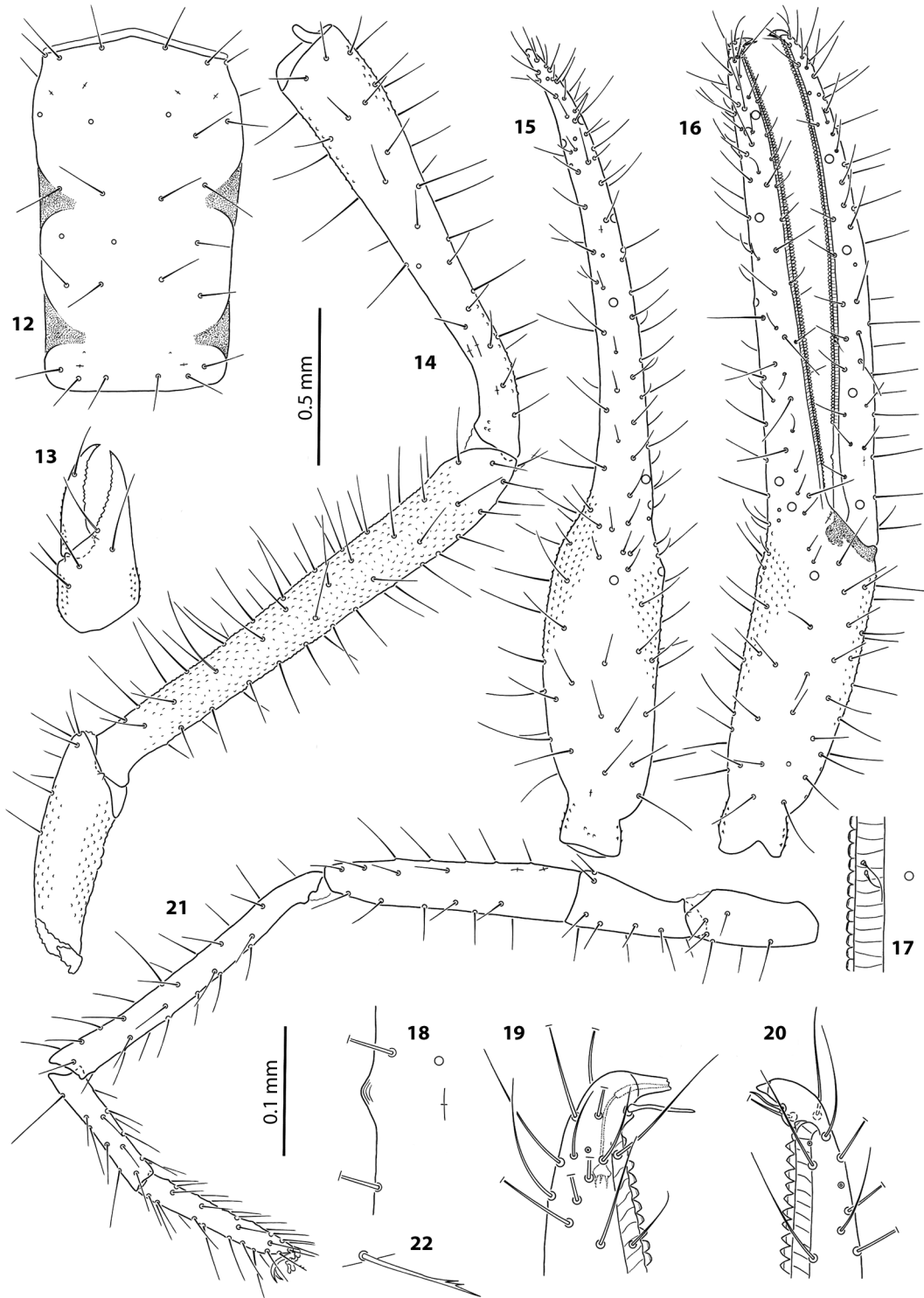
**Figs 1-11:** *Pseudoblothrus peyerimhoffi* (Simon, 1905), male. **1:** carapace (France: Séranon); **2:** genital opening (France: Séranon); **3:** id. (Italy: Quittengo); **4:** right chelicera (France: Séranon); **5:** movable finger of right chelicera with abnormal presence of two setae (Italy: Quittengo); **6:** trochanter, femur and patella, right pedipalp (France: Séranon); **7:** right chela, dorsal view (France: Séranon); **8:** id., lateral view with details of subapical teeth (France: Séranon); **9:** detail of right chela with trichobothria *ib-eb-esb-isb*, dorsal view (Italy: Quittengo); **10:** id., lateral view (Italy: Quittengo); **11:** left leg IV (France: Séranon). (Scale bar 0.5 mm; 0.1 mm: details of fig. 8)

sternites (♂) II: 13–24 (4–10 of which along anterior margin of genital opening: Figs 2–3), III: 12–28 (4–14 of which discal or along posterior margin of genital opening: Figs 2–3), IV: 12–14 + 3–7 discal setae, V: 11–14 + 5–8 discal setae, VI: 12–16 + 4–10 discal setae, VII–XI: 12–17:12–16:12–16:12–16:7–9; genital chamber with 2 unmodified setae; sternite VI without glandular area; chaetotaxy of sternites II–XI (♀): 8–16:12–18:8–12:12–15:12–17:13–17:13–15:13–15:11–13:7–9; sternites IV–VI of ♀ without discal setae; sternites III and IV (♂♀) respectively with 4 (rarely 3) and 3 (rarely 2 or 4) microsetae in front on each stigma; anal cone with 2+2 setae. Chelicera (Figs 4, 12) 2.1–2.35 (♂) or 2.0–2.3 (♀) times as long as broad, palm with 5 setae, fixed and movable fingers respectively with 13–20 and 8–16 subequal teeth, *gl* ratio 0.64–0.78 (additional teratological seta in right movable finger of the male from Quittengo: Fig. 5), spinneret absent (silk ducts not seen), rallum with 6–7 finely dentate blades, the median ones side-by-side; serrulae interior and exterior respectively with 16–21 and 22–27 blades. Manducatory process triangular and acuminate, with 2 setae. Coxal setae: pedipalp 9–12 (mostly 10, rarely 8 or 13), I 6–8 (rarely 5), II 6–8 (rarely 5 or 9), III 3–4 (rarely 5), IV 7–10 (rarely 6); anterolateral process of coxa I prominent, apically acuminate or truncate. Pedipalp (Figs 6–10, 14–16): trochanter 3.3–3.9 (♂) 3.1–4.2 (♀) times as long as broad, granulate, with one or two button-like tubercles on antiaxial face; femur 6.9–8.9 (♂) or 7.15–8.15 (♀) times as long as broad, granulate, weakly and gradually enlarged distally; patella 5.0–6.8 (♂) or 5.0–5.9 (♀) times as long as broad, club-shaped, weakly granulate on antiaxial face of pedicel and on both lateral faces of club; chela with pedicel 6.25–7.5 (♂) or 6.0–7.1 (♀) times as long as broad; hand of chela with pedicel 2.4–3.3 (♂) or 2.4–3.1 (♀) times as long as broad, cylindrical, finely granulate from *esb* to the base (♂) or to the proximal third (♀), pedicel with hispid granulation; fixed chelal finger with 100–150 (♂♀) small, pointed contiguous teeth with dental canals (Figs 8, 16); base of fixed finger with 5–8 microtubercles; tip of fixed finger as in Fig. 19, venom duct short; movable chelal finger with 91–153 (♂♀) small contiguous teeth with dental canals reaching back beyond *sb* (Figs 8, 16–17), only the 15–30 distal teeth pointed (Fig. 20); coupled sensilla *pc* in variable position between *sb* and *st* and a large tubercle (sensillum?) between *b* and *sb* (Fig. 18); trichobothria as in Figs 7–10 and 15–16, *ib* mostly

slightly proximad *eb*, both on distal third of the hand; trichobothrium *t* simple, slightly shorter than *st* and weakly bent backward; ratio of movable finger/hand of chela with pedicel 1.35–1.7 (♂) or 1.4–1.7 (♀); ratio of pedipalpal femur/movable finger 0.95–1.15 (♂) or 1.25–1.45 (♀). Leg I (♂♀): femur 5.5–7.6 times as long as deep and 1.6–1.8 times longer than patella, the latter 3.3–4.7 times as long as deep, tibia 6.5–8.6 times, basitarsus 4.1–4.9, telotarsus 5.7–7.2 times as long as deep and 1.2–1.4 times longer than basitarsus, subterminal seta dentate, arolium shorter than claws, these ones smooth; leg IV (♂♀) (Figs 11, 21): femur+patella 6.1–7.6 times as long as deep, ratio of femur/patella 0.53–0.63; tibia 8.8–10.7 times, basitarsus 4.3–5.35 times, telotarsus cylindrical, not expanded, 6.0–8.5 as long as deep and 1.15–1.2 longer than basitarsus; junction between femur and patella perpendicular, subterminal seta dentate (Fig. 22), arolium shorter than claws, latter smooth.

Measurements (in mm). Body length 3.1–4.5 (♂) 3.1–4.5 (♀). Carapace 1.0–1.36 × 0.57–0.75 (♂) or 1.0–1.32 × 0.60–0.72 (♀). Chelicera 0.52–0.64 × 0.22–0.30 (♂) or 0.49–0.63 × 0.23–0.31 (♀); movable finger length 0.33–0.41 (♂) or 0.32–0.41 (♀). Pedipalp: trochanter 0.68–1.05 × 0.20–0.28 (♂) or 0.65–0.94 × 0.20–0.22 (♀); femur 1.34–2.24 × 0.19–0.25 (♂) or 1.36–1.90 × 0.19–0.27 (♀); patella 1.22–2.12 × 0.235–0.32 (♂) or 1.22–1.80 × 0.24–0.32 (♀); chela with pedicel 2.19–3.18 × 0.31–0.44 (♂) or 2.13–2.85 × 0.35–0.44 (♀); hand with pedicel length 0.86–1.28 (♂) or 0.86–1.20 (♀); movable finger length 1.36–2.05 (♂) or 1.35–1.68 (♀). Leg I: femur 0.68–1.12 × 0.12–0.165 (♂) or 0.665–0.92 × 0.12–0.15 (♀), patella 0.40–0.62 × 0.115–0.13 (♂) or 0.38–0.55 × 0.115–0.14 (♀), tibia 0.56–0.91 × 0.085–0.105 (♂) or 0.55–0.86 × 0.085–0.10 (♀), basitarsus 0.285–0.44 × 0.07–0.09 (♂) or 0.29–0.44 × 0.07–0.09 (♀), telotarsus 0.40–0.55 × 0.065–0.08 (♂) or 0.40–0.52 × 0.07–0.08 (♀); leg IV: femur+patella 1.10–1.68 × 0.15–0.22 (♂) or 1.10–1.43 × 0.17–0.20 (♀), tibia 0.89–1.40 × 0.10–0.135 (♂) or 0.88–1.27 × 0.10–0.14 (♀), basitarsus 0.40–0.59 × 0.085–0.11 (♂) or 0.41–0.54 × 0.085–0.11 (♀), telotarsus 0.46–0.68 × 0.075–0.085 (♂) or 0.47–0.63 × 0.075–0.09 (♀).

**Description of tritonymph.** Carapace, tergites and pedipalps pale reddish brown, granulation on pedipalps weak. Carapace 1.8 times longer than broad, without epistome, no eyes or eye-spots, with two transverse furrows, chaetotaxy 6:6:4:6:6(28).



**Figs 12-22:** *Pseudoblothrus peyerimhoffi* (Simon, 1905), female from Italy: Bossea. **12:** carapace; **13:** left chelicera; **14:** trochanter, femur and patella, right pedipalp; **15:** right chela, dorsal view; **16:** id., lateral view; **17:** movable chelal finger, detail of teeth and coupled sensilla; **18:** id., detail of tubercle between *b* and *sb*; **19:** apex of fixed chelal finger, lateral view; **20:** apex of movable chelal finger, lateral view; **21:** right leg IV; **22:** subdistal seta of leg IV. (Scale bar 0.5 mm: figs 12-16, 21; 0.1 mm: figs 17-20, 22)

Chaetotaxy of tergites I–V: 6:8:11:12:13. Chaetotaxy of sternites not determined (opisthosoma crumpled). Chelicera 2.0 times as long as broad, palm with 5 setae, fixed and movable fingers respectively with 12 and 10 subequal teeth, *gl* ratio 0.68, spinneret absent, rallum with 5 blades; serrulae interior and exterior respectively with 15(?) and 17 blades. Manducatory process triangular, with 2 setae. Coxal setae: pedipalp 6–7, I 4–5, II 5, III 3, IV 5–6. Pedipalp (Figs 23–27): trochanter 2.7 times as long as broad, with one button-like tubercle on anti-axial face, femur 5.1 times, patella 3.75 times, chela with pedicel 5.2 times, hand of chela with pedicel 2.15 times as long as broad; fixed chelal finger with 62 contiguous teeth with dental canals and 8 basal microtubercles, venom duct short; movable chelal finger with 66 contiguous teeth with dental canals reaching back halfway between *b* and *sb*; coupled sensilla *pc* at level of *st* and large tubercle (sensillum?) between *b* and *st* (Fig. 27); tip of chelal fingers as in Fig. 26; trichobothria as in Figs 24–25; ratio of movable finger/hand of chela with pedicel 1.5; ratio of pedipalpal femur/movable finger 1.0; ratio of pedipalpal femur/carapace 1.05. Leg I: femur 4.0 times as long as deep and 1.7 times longer than patella, the latter 2.6 times as long as deep, tibia 4.45 times, basitarsus 2.8, telotarsus 3.9 times as long as deep and 1.4 times longer than basitarsus, subterminal seta, arolium and claws as in adults; leg IV: femur+patella 5.0 times as long as deep, ratio of femur/patella 0.58; tibia 5.9 times, basitarsus 3.1 times, telotarsus not expanded, 3.85 as long as deep and 1.2 longer than basitarsus, junction between femur and patella, subterminal seta, arolium and claws as in adults.

Measurements (in mm). Body length 2.6 (?). Carapace 0.74 × 0.41. Chelicera 0.36 × 0.18; movable finger length 0.21. Pedipalp: trochanter 0.41 × 0.15; femur 0.77 × 0.15; patella 0.64 × 0.17; chela with pedicel 1.25 × 0.24; hand with pedicel length 0.52; movable finger length 0.79. Leg I: femur 0.38 × 0.095, patella 0.22 × 0.085, tibia 0.29 × 0.065, basitarsus 0.17 × 0.06, telotarsus 0.235 × 0.06; leg IV: femur+patella 0.60 × 0.12, tibia 0.475 × 0.08, basitarsus 0.22 × 0.07, telotarsus 0.27 × 0.07.

**Remarks.** A single specimen of a cavernicolous pseudoscorpion, collected by Alfredo Borelli in the cave of Bossea in Piedmont, was described by Ellingsen (1905) and misidentified as *Obisium (Blothrus) Torrei* Simon, 1881 (now *Neobisium (B.) torrei*), a

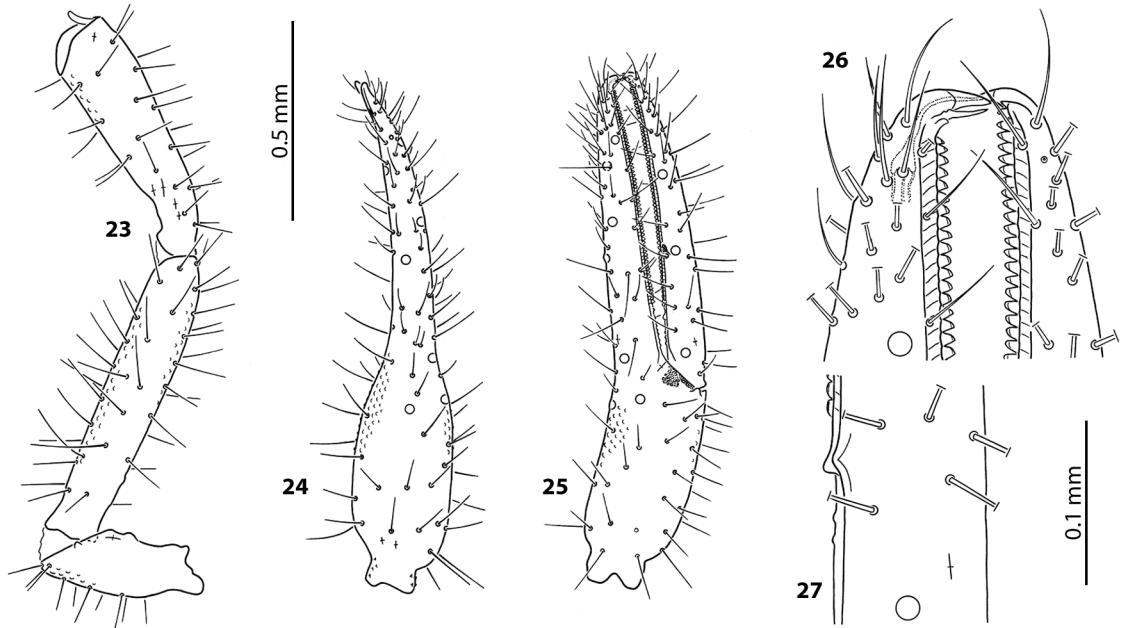
species known at that time only from Oliero cave (= Covo dei Siori n. 600 V/VI near Valstagna, Veneto). Ellingsen's description is reasonably accurate, chiefly concerning details of the carapace, highlighting the presence of two transverse furrows, the shape of the pedipalps and of the movable cheliceral finger; the following measurements (in mm) were also given: carapace 1.31 × 0.72, pedipalpal trochanter 0.80 × 0.24, femur 1.76 × 0.24, patella 1.60 × 0.32, hand 1.07 × 0.40, fingers 1.92.

Probably unaware of Ellingsen's paper, Simon (1905) described *Blothrus peyerimhoffi* a few months later from specimens of both sexes collected by Paul de Peyerimhoff in the caves of Mélan and Pertuis (Alpes-de-Haute-Provence) and by Agostino Doderò in the cave of Bossea. Simon's description is vague, apart from a few details on the shape of the carapace and the pedipalp.

Beier (1929) proposed the name *Obisium (Blothrus) Ellingseni* Beier, 1929 for the material from Bossea cave described by Ellingsen (1905), without examining any material. In so doing, he overlooked the paper of Simon (1905) and consequently did not notice that Bossea cave was also one of the localities of *Blothrus peyerimhoffi*. Beier (1932) included both species in the genus *Neobisium* (= *Obisium* Leach, 1815), subgenus *Blothrus* Schiödte, 1847, using the original data of Ellingsen (1905) and Simon (1905).

Vachon (1945) redescribed *N. peyerimhoffi* from syntypes from Mélan (or Pertuis), transferred the species from *Neobisium* (Neobisiidae) to *Pseudoblothrus* (Syarinidae), and gave a key to the species of the latter genus, including only *P. roszkovskii* and *P. peyerimhoffi*, making no mention of *O. ellingseni* (then still placed in *Neobisium*). Vachon (1945) was the first to revise *P. peyerimhoffi* and the species was subsequently cited (Vachon 1947, 1952) from the cave of Clue near Séranon (Alpes-Maritimes).

Beier (1963), without examining any material, proposed a key to European species of *Pseudoblothrus* using the data of Ellingsen (1905) and Vachon (1945) respectively for *P. ellingseni* and *P. peyerimhoffi*. The most important character used to separate the two species was the ratio of movable finger/hand of chela: 1.79 in *P. ellingseni*, 1.45 in *P. peyerimhoffi*. Later, Vachon (1969) included *P. peyerimhoffi*, together with *P. ellingseni*, in the key to species of *Pseudoblothrus* and Leclerc (1983, 1984) recorded *P. peyerimhoffi* from caves in the French departments of Isère and Drôme.



**Figs 23-27:** *Pseudoblothrus peyerimhoffi* (Simon, 1905), tritonymph from Italy: Vernante. **23:** trochanter, femur and patella, right pedipalp; **24:** right chela, dorsal view; **25:** id., lateral view; **26:** apex of chelal fingers, lateral view; **27:** movable chelal finger, detail of tubercle between *b* and *st*. (Scale bar 0.5 mm: figs 23-25; 0.1 mm: figs 26-27)

The contribution of Mahnert (1980) provided plenty of scope for a correct interpretation of relationships between *P. ellingseni* and *P. peyerimhoffi*. His redescription of *P. ellingseni* based on topotypes from Bossea, evaluation of morphological variability of neighbouring populations and redescription of *P. peyerimhoffi* from the cave of Clue allowed the presumption that differences between the species listed above were not substantial, as emphasized in his own (p. 35) conclusions. Differences in the form of the chelal palm and in granulation on the femur, as proposed by Mahnert (1980) in the key to species, cannot be considered sufficient to separate *P. ellingseni* and *P. peyerimhoffi* since they show high variability between sexes and among different populations.

The material examined here, together with those studied by Mahnert (1980), also reveals remarkable intrapopulational dimensional variability, as shown in ♂♀ from Bossea cave: pedipalpal femur 1.43–1.69 × 0.18–0.21 mm (7.6–8.3 times as long as broad), patella 1.24–1.52 × 0.22–0.265 mm (5.5–6.0 times as long as broad), chela with pedicel 2.27–2.58 × 0.32–0.37 mm (6.5–7.1 times as long as broad), movable finger length 1.46–1.70 mm, ratio of movable finger/hand of chela with pedicel 1.58–1.70. Interpopulational variability shows a much greater dimensional

ranges. The higher dimensions were found in males from Ovaighe cave, Varallo: pedipalpal femur 2.22–2.24 × 0.25 mm (8.88–8.90 times as long as broad), patella 2.10–2.12 × 0.31–0.32 mm (6.56–6.80 times as long as broad), chela with pedicel 3.12–3.18 × 0.42–0.44 mm (7.2–7.4 times as long as broad), movable finger length 1.95–2.05 mm, ratio of movable finger/hand of chela with pedicel 1.54–1.60. The dimensions and proportions given by Vachon (1945) and Mahnert (1980) for both *P. peyerimhoffi* and *P. ellingseni* fall within the ranges presented here.

Furthermore, the improbable occurrence at the same locality (Bossea cave) of both *P. ellingseni* and *P. peyerimhoffi*, allows the following synonymy to be proposed: *Pseudoblothrus ellingseni* (Beier, 1929) is a junior subjective synonym of *P. peyerimhoffi* (Simon, 1905) (**n. syn.**).

***Pseudoblothrus regalini* Inzaghi, 1983** (Figs 28-50)  
*Pseudoblothrus regalini* Inzaghi, 1983: 38, figs 1–12.

**Type locality.** N ITALY, Lombardy, Bergamo Prov., Grone, Cave on NW slope of Grone Mt. (45°43'N 9°56'E).

**Distribution.** Italy (Lombardy) (Fig. 50).

**Diagnosis** (♂♀). A subterranean *Pseudoblothrus* from northern Italy that differs from the other spe-

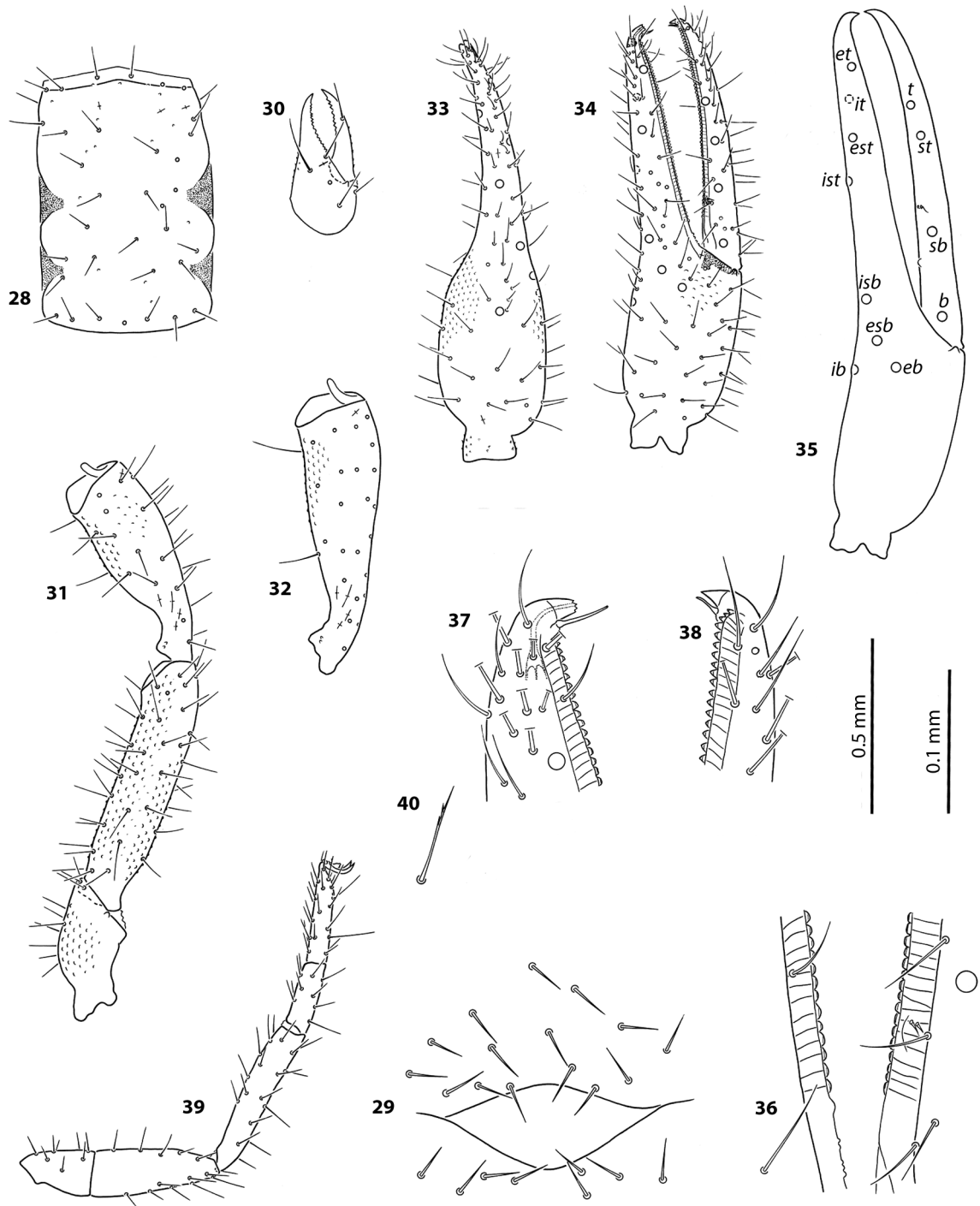
cies of the genus in the following combination of characters: no eyes or eye-spots; anterior and posterior rows of carapace with 6 setae each; male without ventral glands on sternite VI, sternites without fields of glandular pores; sternites III and IV each with 4 suprastigmal setae; pedipalp weakly granulate; pedipalpal femur length 0.73–1.05 mm (4.5–5.6 times as long as broad), patella 0.62–0.82 mm (2.8–3.6 $\times$ ), chela 1.22–1.60 mm (3.5–4.9 $\times$ ); fixed and movable chelal fingers respectively with 62–84 and 66–77 teeth.

**Material examined.** ITALY – *Lombardy, Lecco Prov.*: 1 ♀, Lecco, Piani Resinelli, disused lead mines, 1000 m a.s.l., 18.XI.1999, R. Monguzzi leg. *Lombardy, Brescia Prov.*: 1 ♂, Adro, Grotta Lachetto di Monte Alto n. 120 Lo/BS, 20.XI.1987, R. Monguzzi leg. *Lombardy, Bergamo Prov.*: 1 ♂ 1 ♀, Dossena, Mine on western slope of Vaccareggio Mt., 1250 m a.s.l., 17.VI.2014, M. Grottolo leg.; 1 ♂, id., 1.XI.2014; 2 ♀, Grone, Pozzo del Bosco Faét n. 1127 Lo/BG, 900 m a.s.l., 3.XI.1991, L. Latella & S. Zoia leg.; 1 ♂, Ardesio, Grotta della Poderizza n. 3505 Lo/BG, 845 m a.s.l., 19.XI.1992, R. Monguzzi leg.

**Description of adults** (♂♀). Carapace and pedipalps reddish brown, tergites yellowish brown; weak hispid granulation on cheliceral palm, on base of cheliceral movable finger and on pedicel of pedipalpal hand; rounded granulation on trochanter, femur, patella and hand of pedipalps; pleural membrane striate. Carapace (Figs 28, 41) 1.2–1.55 times as long as broad, without eyes or eye-spots, with two weak transverse furrows, the subbasal one narrower; anterior margin without epistome, rarely with a weak prominence; 32–36 fine macrosetae, 6 in anterior, 6 (rarely 7 or 8) in posterior row, standard chaetotaxy presumably 6:8:6:8:6(34). Chaetotaxy of tergites I–XI: 6:9–11:11–14:12–15:12–15:12–15:12–15:13–16:12–16:9–12(4 tactile setae):7(4 tactile setae). Chaetotaxy of sternites II (♂): 12–15 (4 of which along anterior margin of genital opening: Fig 29), III: 18–20 (8–9 of which discal or along posterior margin of genital opening: Fig 29), IV: 10 + 4–8 discal setae, V: 12–14 + 7 discal setae, VI: 13–17 + 3–4 discal setae, VII–XI: 15–18:15–16:16–17:14–15:7; genital chamber with 2 unmodified setae, 2 median genital sacks; sternite VI without modified glandular area; chaetotaxy of sternites II–XI (♀): 9–12:13–16:11–14:12–16:14–17:16–17:16–18:14–16:12–15:7; sternites IV–VI of ♀ without discal setae; sternites III and IV (♂♀) with 4 microsetae in front of each stig-

ma; anal cone with 2+2 setae. Chelicera (Figs 30, 42) 2.0–2.2 (♂♀) times as long as broad, palm with 5 setae, fixed and movable fingers respectively with 9–18 and 6–10 subequal teeth, *gl* ratio 0.63–0.71, spinneret absent (silk ducts not seen), rallum with 6 blades (the 2–4 distal blades finely dentate, the median ones side-by-side); serrulae interior and exterior respectively with 17–21 and 20–24 blades. Manducatory process triangular and acuminate, with 2 setae. Coxal setae: pedipalp 8–12, I 5–7, II 5–8, III 3–4, IV 6–10. Pedipalp (Figs 31–35, 43–46): trochanter 2.1–2.6 (♂) 2.3–2.5 (♀) times as long as broad, granulate, with one button-like tubercle on antiaxial face; femur 4.5–5.6 (♂) or 4.9–5.1 (♀) times as long as broad, granulate; patella 2.8–3.6 (♂) or 2.9–3.0 (♀) times as long as broad, club-shaped, weakly granulate on paraxial face of club; chela with pedicel 3.9–4.9 (♂) or 3.5–3.9 (♀) times as long as broad; hand of chela with pedicel 1.7–2.1 (♂) or 1.6–1.8 (♀) times as long as broad, ovoid, finely granulate in distal third, pedicel with hispid granulation; fixed chelal finger with 62–84 (♂♀) small, pointed contiguous teeth with dental canals (Figs 34, 45); base of fixed finger with 4–8 microtubercles; tip of fixed finger as in Figs 37 and 48, venom duct short; movable chelal finger with 66–77 (♂♀) small contiguous teeth with dental canals reaching back halfway between *b* and *sb* (Figs 34, 45); tip of movable finger as in Fig. 38; coupled sensilla *pc* in variable position, distal, proximal or at level with *sb* (Figs 36, 47); a large tubercle (sensillum?) between *b* and *sb* (Figs 36, 47); trichobothria as in Figs 33–35 and 44–46, *ib* slightly proximad *eb*, both in distal third of the hand; *est* mostly halfway between *ist* and *it*, rarely slightly proximad *it* (Fig. 46); trichobothrium *t* simple, slightly shorter than *st* and weakly bent backward; ratio of movable finger/hand of chela with pedicel 1.3–1.5 (♂) or 1.3–1.4 (♀); ratio of pedipalpal femur/movable finger 0.95–1.1 (♂♀); ratio of pedipalpal femur/carapace 1.0–1.2 (♂) or 1.1–1.2 (♀). Leg I (♂♀): femur 3.7–4.9 times as long as deep and 1.5–1.75 times longer than patella, the latter 2.5–3.1 times as long as deep, tibia 4.6–5.7 times, basitarsus 2.7–3.8, telotarsus 4.75–5.5 times as long as deep and 1.25–1.5 times longer than basitarsus, subterminal seta dentate, arolium shorter than claws, latter smooth; leg IV (♂♀) (Figs 39, 49): femur+patella 4.3–6.0 times as long as deep, ratio of femur/patella 0.55–0.67; tibia 5.6–8.1 times, basitarsus 3.1–4.4 times as long as deep, telotarsus cylindrical, not expanded, 4.3–5.8 as long as deep and 1.2–1.4 times





**Figs 28-40:** *Pseudoblothrus regalini* Inzaghi, 1983, male from Adro, Italy, unless otherwise stated. **28:** carapace; **29:** genital opening; **30:** right chelicera; **31:** trochanter, femur and patella, right pedipalp; **32:** patella, right pedipalp (from Ardesio, Italy); **33:** right chela, dorsal view; **34:** id., lateral view; **35:** outline of right chela with trichobothrial pattern (from Ardesio, Italy); **36:** right chela, detail of proximal dentition; **37:** apex of fixed chelal finger, lateral view; **38:** apex of movable chelal finger, lateral view; **39:** right leg IV; **40:** subdistal seta of leg IV. (Scale bar 0.5 mm: figs 28, 30-35, 39; 0.1 mm: figs 29, 36-38, 40)

longer than basitarsus; junction between femur and patella perpendicular, subterminal seta dentate (Fig. 40), arolium shorter than claws, latter smooth.

Measurements (in mm). Body length 2.8–3.1 (♂) 2.8–3.5 (♀). Carapace 0.72–0.79 × 0.48–0.62 (♂) or 0.78–0.88 × 0.53–0.63 (♀). Chelicera 0.40–0.46 × 0.185–0.22 (♂) or 0.41–0.51 × 0.20–0.24 (♀); movable finger length 0.265–0.305 (♂) or 0.28–0.34 (♀). Pedipalp: trochanter 0.38–0.48 × 0.18–0.205 (♂) or 0.44–0.54 × 0.18–0.24 (♀); femur 0.73–0.95 × 0.16–0.19 (♂) or 0.89–1.05 × 0.18–0.205 (♀); patella 0.62–0.77 × 0.20–0.25 (♂) or 0.66–0.82 × 0.23–0.285 (♀); chela with pedicel 1.22–1.53 × 0.30–0.39 (♂) or 1.26–1.60 × 0.36–0.43 (♀); hand with pedicel length 0.55–0.69 (♂) or 0.58–0.76 (♀); movable finger length 0.75–0.98 (♂) or 0.80–1.00 (♀). Leg I: femur 0.35–0.49 × 0.095–0.115 (♂) or 0.465–0.51 × 0.105–0.12 (♀), patella 0.23–0.28 × 0.085–0.105 (♂) or 0.275–0.31 × 0.11 (♀), tibia 0.32–0.43 × 0.07–0.085 (♂) or 0.405–0.47 × 0.08–0.9 (♀), basitarsus 0.16–0.23 × 0.05–0.07 (♂) or 0.23–0.255 × 0.07 (♀), telotarsus 0.235–0.295 × 0.045–0.06 (♂) or 0.31–0.33 × 0.06 (♀); leg IV: femur+patella 0.56–0.755 × 0.13–0.15 (♂) or 0.74–0.84 × 0.15–0.17 (♀), tibia 0.45–0.65 × 0.08–0.11 (♂) or 0.63–0.71 × 0.10–0.115 (♀), basitarsus 0.20–0.29 × 0.065–0.08 (♂) or 0.275–0.30 × 0.08–0.09 (♀), telotarsus 0.285–0.36 × 0.055–0.08 (♂) or 0.37–0.39 × 0.07–0.075 (♀).

**Description of tritonymph.** No specimens examined: see Inzaghi (1983): 44, figs 10–12).

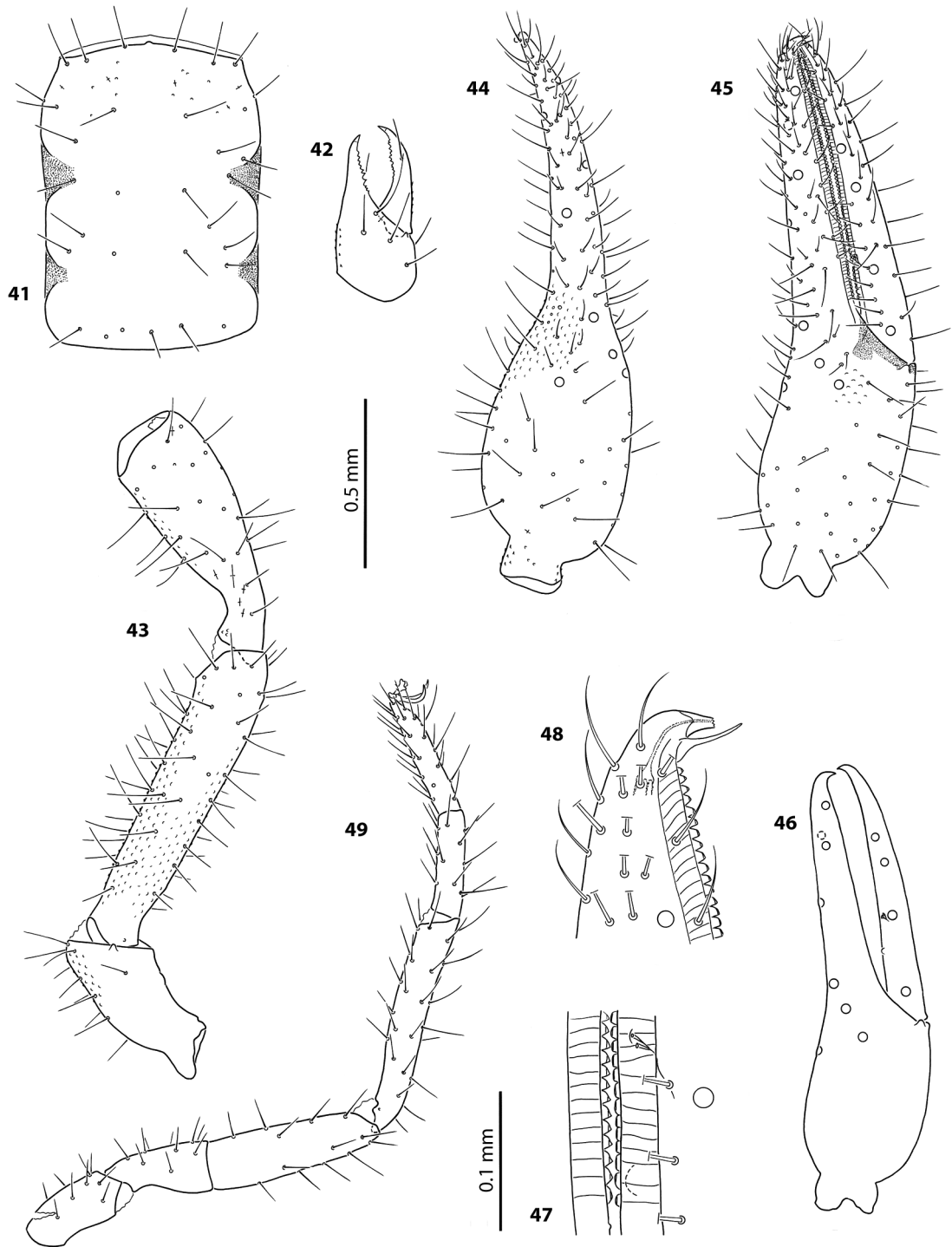
**Remarks.** The above redescription of *P. regalini* partially incorporates the original description of Inzaghi (1983), with the exception of a discrepancy concerning the pedipalpal granulation [trochanter and patella described as smooth in Inzaghi (1983), granulate here]. The highest length/breadth ratios of the pedipalps reported here (femur 5.6, patella 3.6, chela 4.9 as long as broad: see Figs 32, 35) were obtained from measurements of a male from Ardesio (Grotta della Poderizza), and are considered to form part the normal range of variation for this species. The presence of a putative new species of *Pseudoblothrus* from Mt Resegone near Lecco, Lombardy (Inzaghi in Gardini 2000) is still doubtful and might concern material similar to the above mentioned male of *P. regalini* from Ardesio or to the female of Piani Resinelli, which show a different position of trichobothrium *est* (Fig. 46). Mt Resegone is ca. 36 km west of Ardesio and ca. 10 km southeast of Piani Resinelli. Further material is therefore necessary to

confirm the taxonomic status of these populations in the Bergamasque pre-Alps.

#### Key to adults of the *Pseudoblothrus* species

[The male of *P. vulcanus* Mahnert 1990, which was originally described from females, has a discal gland opening area with two patches of glandular setae on sternite VI (V. Mahnert in litt., 16.II.2015)]

- 1 Sternite VI of male without discal area of gland openings ..... 2
- Sternite VI of male with discal area of gland openings ..... 4
- 2 Carapace usually with 6 setae in the anterior row; sternite III with 4+4 suprastigmal setae; cheliceral palm with 5 setae; pedipalpal femur 4.5–5.6 or 6.9–8.9, patella 2.8–3.6 or 5.0–6.8 times as long as broad; length of pedipalpal fingers 0.75–1.00 or 1.35–2.05 mm; species from western and central Alps. .... 3
- Carapace with 4 setae in the anterior row; sternite III with 3+3(4) suprastigmal setae; cheliceral palm with (5)6 setae; pedipalpal femur 6.1, patella 3.5 times as long as broad; length of pedipalpal fingers 1.125 mm; species from central Switzerland ..... *P. thiebaudi* Vachon, 1969
- 3 Sternite IV with 3+3 suprastigmal setae; species of large size, with pedipalps more slender: femur 1.34–2.24/0.19–0.27 mm (6.9–8.9×), patella 1.22–2.12/0.235–0.32 mm (5.0–6.8×), chela 2.13–3.18/0.31–0.44 (6.0–7.5×); fixed and movable chelal fingers respectively with 100–150 and 91–153 teeth; species from SE France and NW Italy (Piedmont) . . . *P. peyerimhoffi* (Simon, 1905)
- Sternite IV with 4+4 suprastigmal setae; species of middle size, with pedipalps less slender: femur 0.73–1.05/0.16–0.205 mm (4.5–5.6×), patella 0.62–0.82/0.20–0.285 mm (2.8–3.6×), chela 1.22–1.60/0.30–0.43 mm (3.5–4.9×); fixed and movable chelal fingers respectively with 62–84 and 66–77 teeth; species from N Italy (Lombardy) ..... *P. regalini* Inzaghi, 1983
- 4 No eyes; species of large size, with pedipalps more slender: femur 1.10–2.08/0.17–0.27 mm (6.0–8.5×), patella 0.89–1.88/0.21–0.35 mm (3.8–6.2×), hand 0.71–1.42/0.29–0.54 mm (2.2–2.9×), finger 1.15–1.97 mm; species from continental Europe. .... 6
- Four reduced eyes (with tapeta); species of medium size, with pedipalps less slender: femur 0.82–0.94/0.16–0.17 mm (4.9–5.7×), patella



**Figs 41-49:** *Pseudoblothrus regalini* Inzaghi, 1983, female from Grone, Italy, unless otherwise stated. **41:** carapace; **42:** right chelicera; **43:** trochanter, femur and patella, right pedipalp; **44:** right chela, dorsal view; **45:** id., lateral view; **46:** outline of right chela with trichobothrial pattern (from Lecco, Piani Resinelli, Italy); **47:** right chela, detail of proximal dentition; **48:** apex of fixed chelal finger, lateral view; **49:** right leg IV. (Scale bar 0.5 mm: figs 41-46, 49; 0.1 mm: figs 47-48)

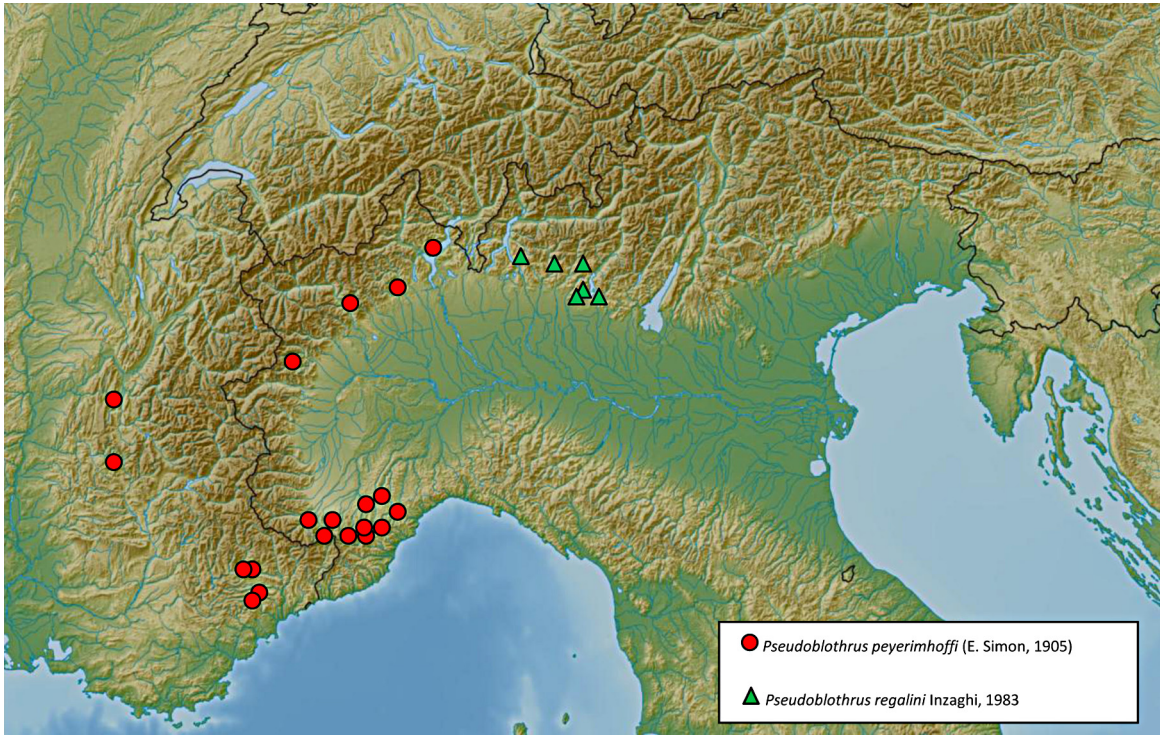


Fig. 50: Distribution map of *Pseudoblothrus peyerimhoffi* (Simon, 1905) (circles) and *P. regalini* Inzaghi, 1983 (triangles)

- 0.68–0.77/0.21–0.23 mm (3.1–3.5×), hand 0.58–0.74/0.34–0.37 mm (1.7–2.0×), finger 0.85–0.98 mm; species from the Azores. . . . . 5
- 5 Pedipalps smaller and less slender: femur 0.82–0.85 mm (4.9–5.0×), chela 1.37–1.41 mm (4.0–4.1×); ratio telo/basitarsus of leg I 1.50–1.64, of leg IV 1.36–1.42; species from the Azores: Sao Jorge Isl. . . . . *P. oromii* Mahnert, 1990
- Pedipalps larger and more slender: femur 0.92–0.94 mm (5.4–5.7×), chela 1.54–1.59 mm (4.3–4.5×); ratio telo/basitarsus of leg I 1.26–1.37, of leg IV 1.16–1.31; species from the Azores: Terceira Isl. . . . . *P. vulcanus* Mahnert, 1990
- 6 Carapace with 6 setae in the posterior row; pedipalpal femur and hand smooth; smaller: length of pedipalpal femur 1.10–1.12 mm, length of finger 1.15–1.23 mm; species from France and Switzerland . . . . . 7
- Carapace with 4 setae in the posterior row; pedipalpal femur and hand granulate; larger: length of pedipalpal femur 1.77–2.08 mm, length of finger 1.63–1.97 mm; species from Crimea . . . . . 8
- 7 Sternite VI with 3 patches of glandular setae; carapace with 6 setae in the anterior row; sterni-

- tes III and IV with 3+3 suprastigmal setae each; pedipalpal chela 5.5–5.9 times as long as broad; species from Swiss and French Jura Mountains. . . . . *P. strinatii* Vachon, 1954
- Sternite VI with 2 patches of glandular setae; Carapace with 4 setae in the anterior row; sternites III and IV with 4+4 suprastigmal setae each; pedipalpal chela 6.4 times as long as broad; species from central Switzerland . . . . . *P. infernus* Mahnert, 2011
- 8 Species of larger size, with pedipalps more slender: length of femur 2.08 mm (8.0–8.5×), length of patella 1.81–1.88 mm (6.2–6.3×), length of hand 1.41–1.42 (3.2×) . . . . . *P. roszkovskii* Redikorzev, 1918
- Species of smaller size, with pedipalps less slender: length of femur 1.77–1.95 mm (7.0–7.5×), length of patella 1.52–1.74 mm (4.7–5.4×), length of hand 1.07–1.25 mm (2.3–2.9×) . . . . . *P. ljoovuschkini* Krumpál, 1984

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## References

- Beier M 1929 Die Pseudoskorpione des Wiener Naturhistorischen Museums. II. Panctenodactyli. – Annalen des Naturhistorischen Museums in Wien 43: 341-367
- Beier M 1931 Zur Kenntnis der troglobionten Neobisien (Pseudoscorp.). – Eos 7: 9-23
- Beier M 1932 Pseudoscorpionidea I. Subord. Chthoniinea et Neobisiinea. In: Hesse R (ed.) Das Tierreich, 57. W. De Gruyter, Berlin & Leipzig. xx+258 pp.
- Beier M 1963 Ordnung Pseudoscorpionidea (Afterskorpione). In: d'Aguilar J, Beier M, Franz H & Raw F (Eds), Bestimmungsbücher zur Bodenfauna Europas. Vol. I. Akademie-Verlag, Berlin vi+313 pp.
- Bologna MA & Vigna Taglianti A 1985 Fauna cavernicola delle Alpi Liguri. – Annali del Museo civico di Storia naturale "G. Doria" 84bis(1984): 1-389
- Chamberlin JC 1931 The arachnid order Chelonethida. – Stanford University Publications, University Series, (Biol. Sci.) 7: 1-284
- Ellingsen E 1905 Pseudoscorpions from Italy and southern France conserved in the R. Museo Zoologico in Torino. – Bollettino dei Musei di Zoologia e di Anatomia comparata della R. Università di Torino 20(503): 1-13
- Gardini G 2000 Catalogo degli Pseudoscorpioni d'Italia (Arachnida). – Fragmenta Entomologica 32(suppl.): 1-181
- Harvey MS 2013 Pseudoscorpions of the World, version 3.0. Western Australian Museum, Perth. – Internet: <http://www.wa.gov.au/catalogues-beta/pseudoscorpions> (accessed 20 January 2015)
- Inzaghi S 1983 *Pseudoblothrus regalini* n. sp., da grotte della Provincia di Bergamo (Italia sett.) (Pseudoscorpiones Syarinidae). – Atti della Società italiana di Scienze naturali e del Museo civico di Storia naturale di Milano 124: 38-48
- Isaia M, Paschetta M, Lana E, Pantini P, Schönhofer AL, Christian E & Badino G 2011 Aracnidi sotterranei delle Alpi Occidentali italiane / Subterranean Arachnids of the Western Italian Alps (Arachnida: Araneae, Opiliones, Palpigradi, Pseudoscorpiones). Museo Regionale di Scienze Naturali, Torino. Monografie XLVII. 325 pp.
- Leclerc P 1983 À propos d'une collecte de Pseudoscorpion. – Ursus Spelaeus 8: 25
- Leclerc P 1984 Notes chernetologiques. – Ursus Spelaeus 9: 53-56
- Mahnert V 1980 Pseudoskorpione (Arachnida) aus Höhlen Italiens, mit Bemerkungen zur Gattung *Pseudoblothrus*. – Le Grotte d'Italia (4)8: 21-38
- Muchmore WB 1982 The genera *Ideobisium* and *Ideoblothrus*, with remarks on the family Syarinidae (Pseudoscorpionida). – Journal of Arachnology 10: 193-221
- Simon E 1905 Description d'un *Blothrus* nouveau [Arachn.], des grottes des Basses-Alpes. – Bulletin de la Société entomologique de France 74: 282-283
- Vachon M 1938 Recherches anatomiques et biologiques sur la reproduction et le développement des Pseudoscorpions. – Annales des Sciences naturelles, Zoologie (11)1: 1-207
- Vachon M 1945 Remarques sur un Pseudoscorpion des caverns de France: *Pseudoblothrus Peyerimhoffi* (E. S.) = *Blothrus Peyerimhoffi* E. S. 1905. – Bulletin du Muséum national d'Histoire naturelle (2)17(3): 230-233
- Vachon M 1947 À propos de quelques Pseudoscorpions (Arachnides) des caverns de France, avec description d'une espèce nouvelle: *Neobisium (Blothrus) tuzeti*. – Bulletin du Muséum national d'Histoire naturelle (2)19: 318-321
- Vachon M 1952 Remarques préliminaires sur l'anatomie et la biologie de deux Pseudoscorpions très rares de la faune française: *Pseudoblothrus peyerimhoffi* (E. S.) et *Apocheiridium ferum* (E. S.). – Bulletin du Muséum national d'Histoire naturelle (2)24: 536-539
- Vachon M 1954 Remarques morphologiques et anatomiques sur les Pseudoscorpions (Arachnides) appartenant au genre *Pseudoblothrus* (Beier) (Fam. Syarinidae J.C.C.) (à propos de la description de *P. strinatii* n. sp., des caverns de Suisse). – Bulletin du Muséum national d'Histoire naturelle (2)26: 212-219
- Vachon M 1969 Remarques sur la famille des Syarinidae J.C. Chamberlin (Arachnides, Pseudoscorpions) à propos de la description d'une nouvelle espèce: *Pseudoblothrus thiebaudi*, habitant les caverns de Suisse. – Revue Suisse de Zoologie 76: 387-396
- Vigna Taglianti A 1969 Un nuovo *Doderotrechus* cavernicolo delle Alpi Occidentali (Coleoptera, Carabidae). – Fragmenta entomologica 6: 253-269
- Zaragoza JA 2010 *Arcanobisium*, a remarkable new genus, representing a new subfamily with a relictual distribution from eastern Spain (Arachnida: Pseudoscorpiones: Syarinidae). – Zootaxa 2491: 41-60