

Two species of the genus *Neobisium* (Pseudoscorpiones: Neobisiidae) from western Iran

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Abstract. Records of two epigean species of *Neobisium*, *N. (N.) alticola* Beier, 1973 and *N. (N.) validum* (L. Koch, 1873) are presented for western Iran. *N. (N.) alticola*, including all nymphal stages, and males of *N. (N.) validum* are redescribed and illustrated.

Keywords: Arachnida, Middle East, pseudoscorpions, taxonomy

Zusammenfassung. Zwei *Neobisium*-Arten (Pseudoscorpiones: Neobisiidae) aus dem West-Iran. Nachweise zweier *Neobisium*-Arten, *N. (N.) alticola* Beier, 1973 und *N. (N.) validum* (L. Koch, 1873), aus dem West-Iran werden vorgestellt. *N. (N.) alticola*, einschließlich aller Nymphenstadien, und Männchen von *N. (N.) validum* werden wiederbeschrieben und abgebildet.

Ten species of the family Neobisiidae Chamberlin, 1930 have been reported from Iran (Harvey 2013). Of these, four are attributed to the subgenus *Neobisium* (*Neobisium*) Chamberlin, 1930: *N. (N.) validum* (L. Koch, 1873), from Mazandaran and Fars Provinces, *N. (N.) fuscimanum* (C.L. Koch, 1843), from Mazandaran Province, *N. (N.) erythrodactylum* (L. Koch, 1873), from Tehran and Mazandaran Provinces, and *N. (N.) alticola* Beier, 1973, from Eastern Azerbaijan Province (Beier 1951, 1971, Schawaller 1983a).

Two of these species, *N. (N.) alticola* and *N. (N.) validum* were recently collected from western Iran. The original description of *N. (N.) alticola* is rather incomplete and lacks figures apart from illustration of the pedipalp (Beier 1973). Similarity, Dashdamirov & Schawaller (1992a, 1992b) only illustrated the pedipalp of *N. (N.) alticola* in dorsal view. Therefore, this contribution presents a detailed redescription and numerous standard illustrations of this species in addition to short descriptions of its nymphal stages. Additionally, the males of *N. (N.) validum* are redescribed from a new provincial record.

Material and methods

The specimens examined for this study are lodged in the collection of the Acarology Laboratory, Islamic Azad University of Arak (IAUA), Iran. The morphological terminology and mensuration follow Chamberlin (1931), Harvey (1992), Harvey et al. (2012), Judson (2007) and Zaragoza (2008). The studied specimens were mounted on microscope slides in Hoyer's medium, studied with an Olympus BH-2 compound microscope and illustrated with an attached drawing tube. Measurements were taken at the highest possible magnification using an ocular graticule.

Abbreviations. L = length, W = width, D = depth

Trichobothriotaxy. eb = external basal, esb = external sub-basal, est = external sub-terminal, et = external terminal, ib = internal basal, isb = internal sub-basal, ist = internal sub-terminal, it = internal terminal

Chaetotaxy. Em = external microseta, Im = internal microseta, Mm = medial microseta, TS = tactile seta

Systematics

Family Neobisiidae Chamberlin, 1930

Subfamily Neobisiinae Chamberlin, 1930

Genus *Neobisium* Chamberlin, 1930

Subgenus *Neobisium* Chamberlin, 1930

Neobisium (Neobisium) alticola Beier, 1973 (Figs 1-21)

Neobisium (Neobisium) alticola Beier 1973: 226-227, fig. 1

Material examined. IRAN. 2♀♀, 1 tritonymph, under stone, Borujerd, 33°55'06"N, 48°50'27"E, altitude 1600 m, Lorestan Province, 2 July 2016, coll. M. Zamani (IAUA); 1♀, 1 tritonymph, 1 deutonymph, 1 protonymph, in litter, Dorood, 33°19'42"N, 48°52'41"E, altitude 1560 m, Lorestan Province, Iran, 16 July 2016, coll. M. Zamani (IAUA).

Redescription

Female

Carapace. Reddish brown, entirely smooth, 0.98–1.07 x longer than broad, with 2 pairs of corneate eyes, anterior eyes larger than posterior pairs, with 24–26 setae, anterior margin with 4–6 setae, preocular setae absent, 1 seta situated between eyes on each side, posterior margin with 7–8 setae (Fig. 1), setae long and acute, transverse furrows absent, epistome large, triangular and apically rounded (Fig. 1), each anterolateral corner with a protuberance, with 6 microlyriforms, one pair situated in ocular zone and two pairs located on posterior margin.

Tergites. Brown, lighter in colour than carapace, smooth, all setae simple and acute, uniseriate, X with 2 and XI with 4 long tactile setae, anal cone with two pairs of short setae, chaetotaxy: 7: 8: 10: 12: 12: 11: 12: 12: 2T1T2: T2T1T2T: 2.

Sternites. II–III yellowish brown, others brown, slightly lighter in colour than tergites, entirely smooth, IV–V divided, genital area with 7–8 microsetae on anterior operculum, 13–15 setae on posterior operculum (Fig. 2), with one large median and two small, elongate lateral cribriform plates, anterior spiracles with 4, posterior spiracles with 3 short suprastigmal setae, all setae acute and simple, uniseriate, X–XI with two long tactile setae, chaetotaxy: 7–8: (4)13–15(4): (3)10(3): 15: 15–16: 14: 16–17: 16–17: 5T1T6: 1T3T1: 2.

Pleural membrane. Coarsely granulate

Chelicera. Brown, hand with 7 acuminate setae (Fig. 3), galea knob-like, hyaline (Fig. 4), galeal seta situated sub-medially, at same level as last tooth on movable finger, fixed finger with 14–15 teeth, distal teeth small and rounded, median teeth acute, irregular in size, distal teeth small, acute and close-set,

movable finger with 7 teeth, serrula interior with 19–21 and serrula exterior with 25–27 blades, rallum with 8 blades, 2 distal blades long and denticulate, other 6 blades simple, smooth and acuminate, 2–3 proximalmost blades smallest (Fig. 4).

Pedipalps. Reddish brown, slightly darker in colour than carapace, entirely smooth (Figs 8–9), coxa with 11–13 setae, manducatory process with 5 long, acuminate setae, plus 6–8 additional setae, retrolateral face of trochanter with 3 stout and short setae, trochanter L/W 2.00–2.18, femur with short pedicel, 1 micro-protuberance in basal third of retrolateral margin, basal half of prolateral margin irregular, setae on prolateral side longer than setae on retrolateral side, with 2–3 long setae without enlarged alveoli situated sub-medially (Fig. 9), L/W 3.71–3.81, patella with short, stout pedicel [L=0.20 mm], patella distinctly shorter and wider than femur, with 3 lyrifissures situated basally, L/W 2.69–2.91, chela (with pedicel) L/W 3.59–3.72, chela (without pedicel) L/W 3.38–3.48, chelal setae simple and acute, movable finger 1.17–1.20 times longer than hand (with pedicel), chelal hand with slightly curved sides, fixed finger with 8 and movable finger with 4 trichobothria (Figs 8–9), fixed finger with trichobothria et, it and est aggregated in distal third, it located at same level as et, ist medial, isb on retrolateral face, ib at same level as isb, eb and esb located sub-basally, movable finger with trichobothrium st situated closer to t than to sb, sb in the middle between st and b, distance b–sb longer than t–st, dense, short sensory setae retrolaterally along fixed finger, basal half of fixed finger with 7 dorsal sensory setae (Em=2, Mm=4, Im=1), basal half of movable finger with 5–6 retrolateral sensory setae, prolateral face of chelal hand with 4–5 long setae situated at base of fixed finger (Fig. 10), fixed finger with 54–58 contiguous, retroconical teeth, basal teeth smaller, reaching to level of trichobothrium ib, movable finger with 46–50 small, contiguous teeth, not reaching to level of trichobothrium b, nodus ramosus only present in fixed chelal finger and situated distinctly distal to et (Fig. 11).

Legs. Brown, smooth, coxa I with long, sclerotized, triangular, apically rounded anterolateral process (Fig. 5), coxal chaetotaxy: 8–9:8–10:7:10–11, sub-terminal setae bifid, longer branch denticulate (Fig. 6), claws simple, arolia simple and shorter than claws. Leg I: femur L/D 4.00–4.80, patella L/D 2.27–2.42, femur 1.54–1.60x longer than patella, tibia L/D 3.22–3.89, metatarsus L/D 2.57–2.85, tarsus L/D 4.00–4.28. Leg IV (Fig. 7): femur L/D 1.50–1.70, patella L/D 1.87–2.00, femur + patella L/D 3.22–3.48, tibia with a moderately long tactile seta situated medially (TS=0.47–0.50), L/D 4.92–5.07, metatarsus with one tactile seta situated basally (TS=0.11–0.14), L/D 3.00–3.33, tarsus with a tactile seta situated proximal to middle (TS=0.36–0.43), L/D 5.00–5.43.

Dimensions (in mm). Carapace: 0.75–0.76/0.70–0.76. Pedipalp: trochanter 0.40–0.48/0.20–0.22, femur 0.75–0.80/0.20–0.21, patella 0.62–0.67/0.23–0.24, chela (with pedicel) 1.36–1.45/0.37–0.39, chela (without pedicel) 1.29–1.32, hand (with pedicel) L.0.68–0.72, movable finger L. 0.80–0.86. Leg I: femur 0.40–0.48/0.10, patella 0.25–0.31/0.11–0.13, tibia 0.29–0.35/0.09, metatarsus 0.17–0.20/0.06–0.07, tarsus 0.27–0.30/0.07. Leg IV: femur 0.34–0.37/0.20–0.24, patella 0.40–0.45/0.20–0.24, femur + patella 0.74–0.81, tibia 0.60–0.66/0.12–0.13, metatarsus 0.24–0.30/0.08–0.09, tarsus 0.38–0.41/0.07–0.08.

Short descriptions of nymphs

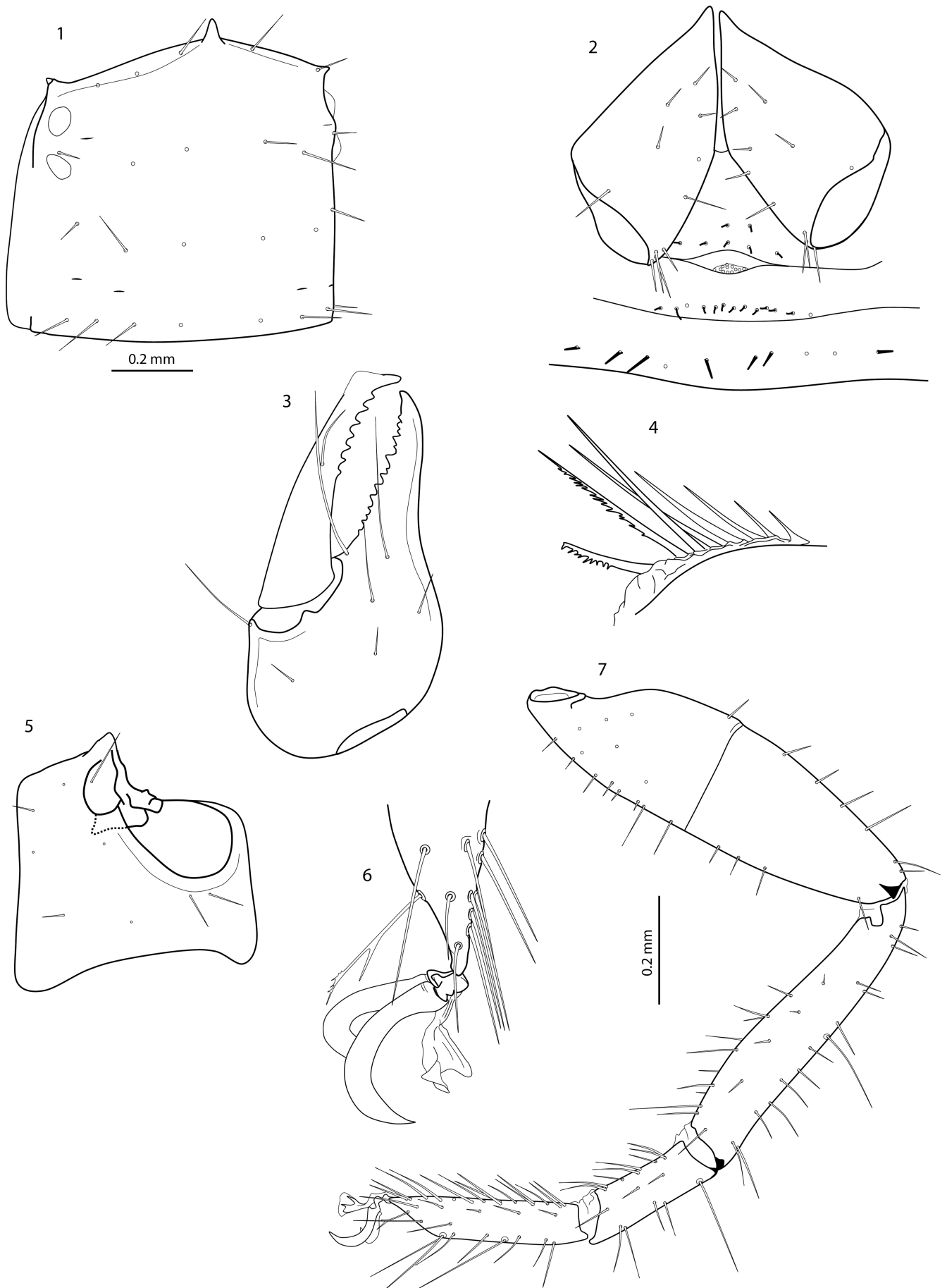
Tritonymph. Weakly sclerotized, opisthosoma and legs yellowish brown, carapace and chelicerae brown, pedipalps brown (in one specimen more sclerotized and reddish brown). Carapace: 1.19–1.32 times wider than long, small, blunt-tipped epistome present (Fig. 12), with two pairs of eyes, six microlyrifissures, chaetotaxy (Fig. 12): 4:6:6:8–10. Chelicera: hand with 6 setae, rallum with 7 blades, galea knob-like. Pedipalp: entirely smooth (Figs 13–14), dorsal ridge of trochanter with 2 stout setae, trochanter L/W 1.94–2.67, femur L/W 3.59–3.67, patella L/W 2.22–2.30, chela (with pedicel) L/W 3.77–3.82, chela (without pedicel) L/W 3.54–3.57, hand (with pedicel) 1.73–1.75, movable finger longer than hand (with pedicel), fixed finger with 7 and movable finger with 3 trichobothria (Fig. 14), fixed finger with trichobothrium ist at same level as st, isb absent, movable finger with trichobothrium st slightly closer to t than to b, sb absent, nodus ramosus situated distal to et on fixed chelal finger, basal half of fixed finger with 6 dorsal sensory setae (Em = 2, Mm = 4, Im = 0), fixed chelal finger with 47–48 and movable finger with 39–43 teeth. Legs: coxal setae 6:5–6:6:7–9, tibia, metatarsus and tarsus IV with a long tactile seta (tibia IV of one specimen without tactile seta).

Dimensions (in mm). Carapace: 0.50–0.52/0.62–0.66. Pedipalp: trochanter 0.31–0.32/0.12–0.16, femur 0.55–0.61/0.15–0.17, patella 0.40–0.46/0.18–0.20, chela (with pedicel) 0.98–1.07/0.26–0.28, chela (without pedicel) 0.92–1.00, hand (with pedicel) L.0.45–0.49, movable finger L. 0.58–0.63.

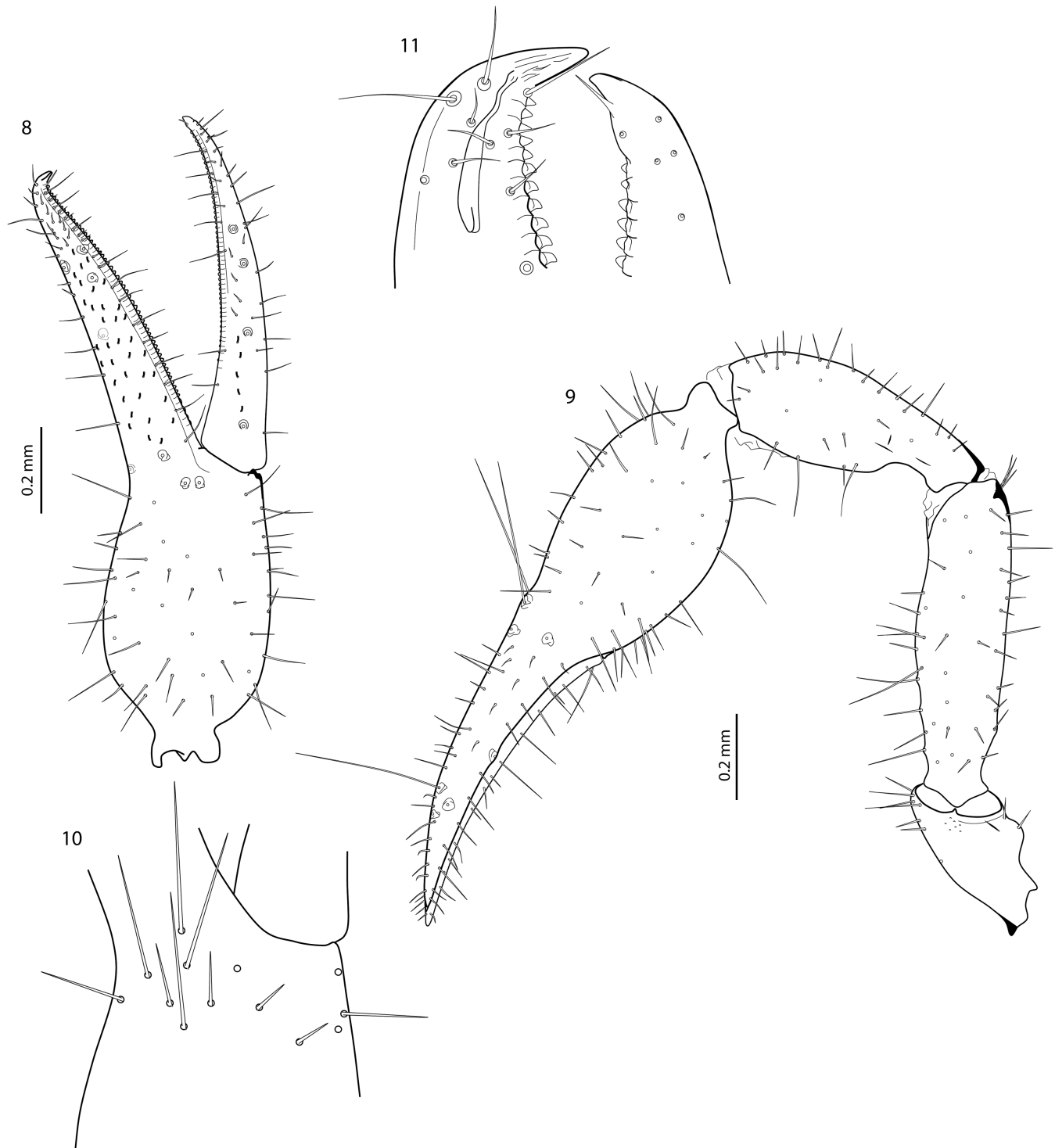
Deutonymph. Weakly sclerotized, opisthosoma, legs, carapace and chelicerae yellowish brown, pedipalps light brown, chela slightly darker than basal segments. Carapace: slightly shorter than broad, L/W 0.95, blunt-tipped epistome present (Fig. 15), with two pairs of eyes, six microlyrifissures, chaetotaxy (Fig. 15): 4:6:6:6. Chelicera: hand with 5 setae, rallum with 6 blades, galea knob-like. Pedipalp: entirely smooth (Figs 16–17), retrolateral face of trochanter with 1 stout seta, trochanter L/W 1.83, femur L/W 3.17, patella L/W 2.23, chela (with pedicel) L/W 3.52, chela (without pedicel) L/W 3.21, hand (with pedicel) L/W 1.63, movable finger longer than hand (with pedicel), fixed finger with 6 and movable finger with 2 trichobothria (Fig. 17), fixed finger lacking trichobothria isb and esb, movable finger with trichobothrium t situated at the same level as it, st and sb absent, nodus ramosus situated distal to et in fixed chelal finger, basal half of fixed finger with 3 dorsal sensory setae (Em=0, Mm=3, Im=0), fixed chelal finger with 36 and movable finger with 30 teeth. Legs: coxal setae 5:5:4:4, tibia, metatarsus and tarsus IV each with a long tactile seta.

Dimensions (in mm). Carapace: 0.38/0.40. Pedipalp: trochanter 0.22/0.12, femur 0.38/0.12, patella 0.29/0.13, chela (with pedicel) 0.67/0.19, chela (without pedicel) 0.61, hand (with pedicel) L. 0.31, movable finger L. 0.39.

Protonymph. Weakly sclerotized, opisthosoma, legs, carapace and chelicerae yellowish brown, basal segments of pedipalps pale brown, chela light brown. Carapace: slightly wider than long, L/W 0.91, blunt-tipped epistome present (Fig. 18), with two pairs of eyes, with 4 microlyrifissures, chaetotaxy (Fig. 18): 4:6:4:4. Chelicera: hand with 4 setae, rallum with 5 blades, galea knob-like. Pedipalp: entirely smooth (Figs 19–20),



Figs 1-7: *Neobisium (Neobisium) alticola* Beier, 1973 ♀; **1.** carapace, dorsolateral view, **2.** coxae IV and sternites II-IV), **3.** chelicera, ventral view (serrulae omitted), **4.** rallum (distal blade broken), **5.** left coxa I, ventral view, **6.** tip of left tarsus IV, claws and arolium, **7.** right leg IV (trochanter omitted)



Figs 8-11: *Neobisium (Neobisium) alticola* Beier, 1973♀; **8.** right chela, lateral view, **9.** pedipalp, dorsal view, **10.** distal part of chelal hand and bases of fingers, ventrolateral view, **11.** tip of chelal fingers, lateral view

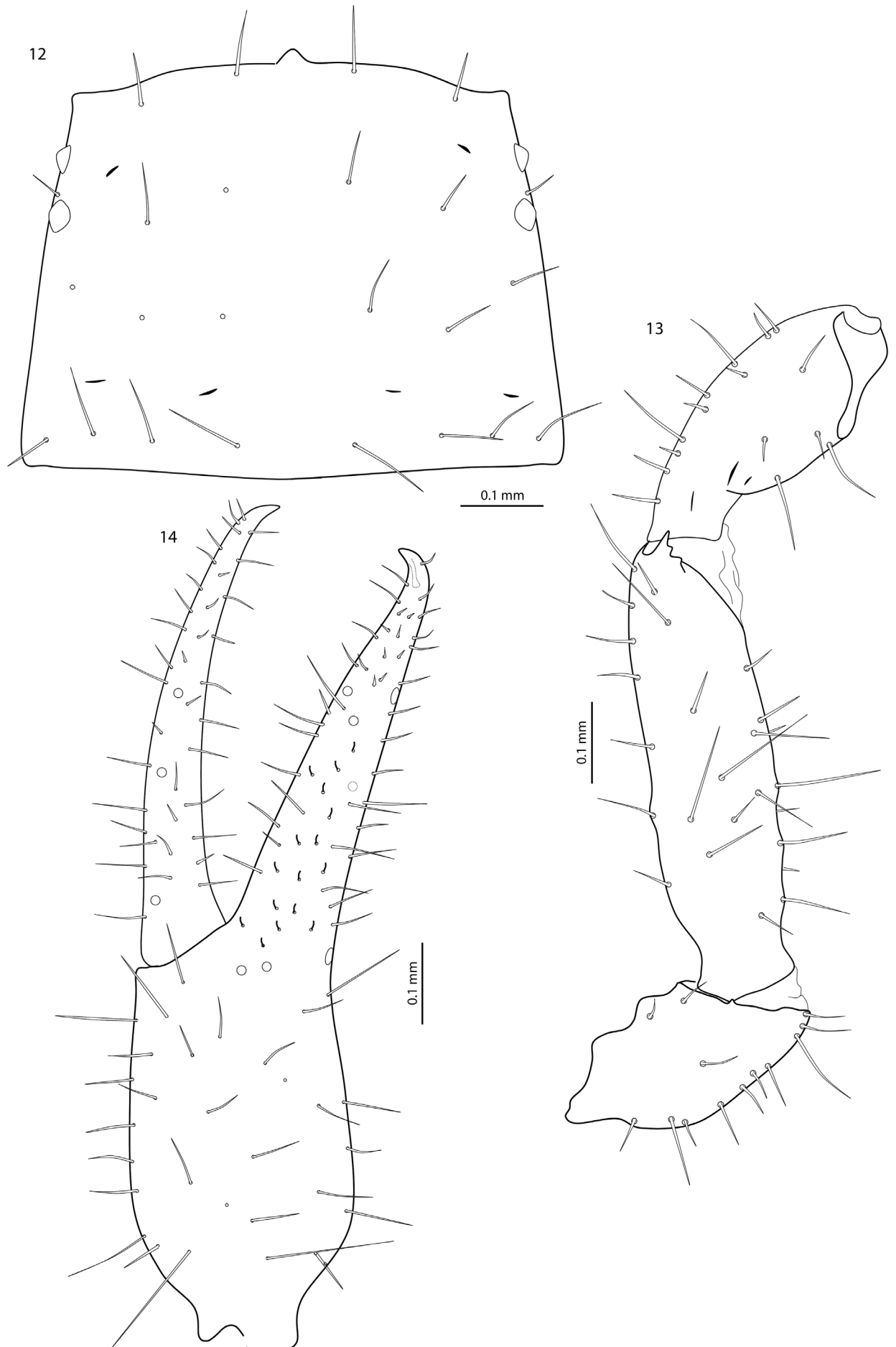
retrolateral face of trochanter without stout seta, trochanter L/W 1.87, femur L/W 2.78, patella L/W 1.30, chela (with pedicel) L/W 3.43, chela (without pedicel) L/W 3.21, hand (with pedicel) L/W 1.64, movable finger longer than hand (with pedicel), fixed finger with 3 and movable finger with 1 trichobothria (Fig. 20), fixed finger lacking trichobothria isb, ib, it, est and esb, movable finger with trichobothrium t situated basally, nodus ramosus situated distal to et in fixed chelal finger, basal half of fixed finger without dorsal sensory setae, fixed chelal finger with 36 and movable chelal finger

with 30 teeth. Legs: all coxae with one seta, tibia, metatarsus and tarsus IV each with a tactile seta.

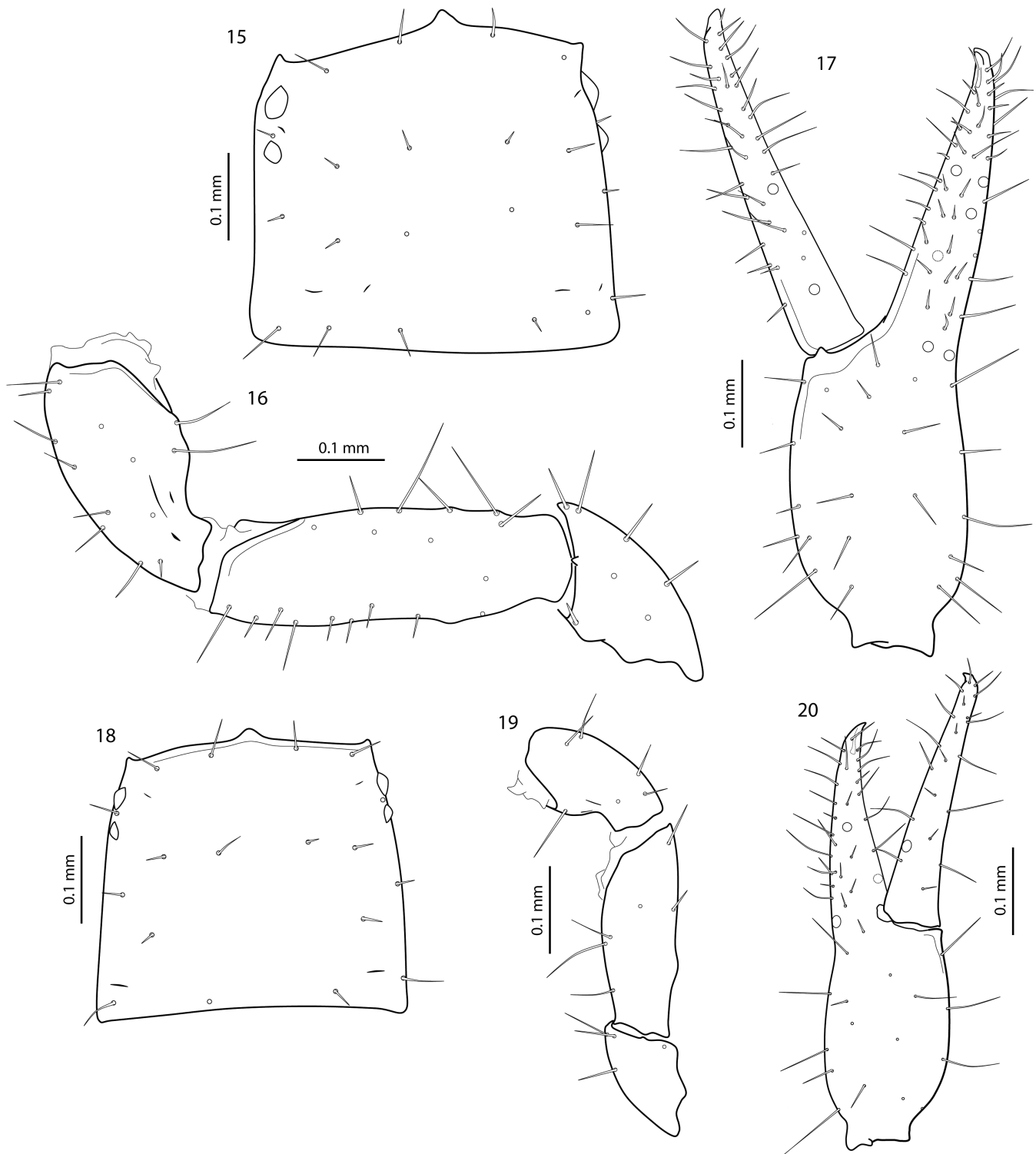
Dimensions (in mm). Carapace: 0.30/0.33. Pedipalp: trochanter 0.15/0.08, femur 0.25/0.09, patella 0.13/0.10, chela (with pedicel) 0.48/0.14, chela (without pedicel) 0.45, hand (with pedicel) L. 0.23, movable finger L. 0.28.

Remarks

Neobisium (Neobisium) alticola Beier, 1973 was originally described from specimens collected in Turkey, and has been since



Figs 12-14: *Neobisium (Neobisium) alticola* Beier, 1973 tritonymph; **12.** carapace, dorsal view, **13.** pedipalp minus chela, dorsal view, **14.** left chela, lateral view (teeth omitted)

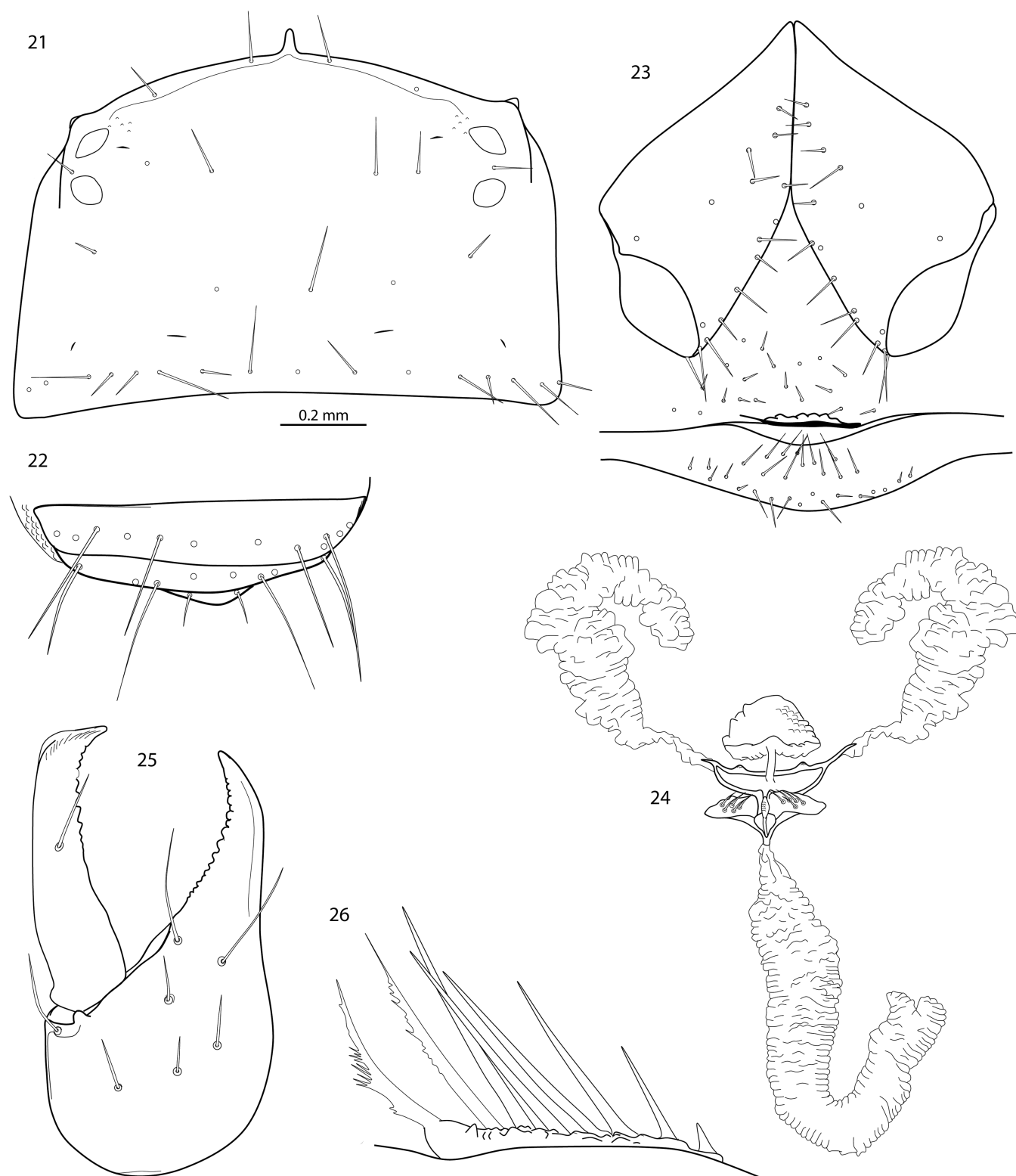


Figs 15-20: *Neobisium (Neobisium) alticola* Beier, 1973; **15-17** deutonymph, **18-20** protonymph; **15.** carapace, dorsal view, **16.** pedipalp minus chela, dorsal view, **17.** left chela, lateral view (teeth omitted), **18.** carapace, dorsal view, **19.** pedipalp minus chela, dorsal view, **20.** right chela, ventrolateral view (teeth omitted).

reported from Iran and Azerbaijan (Schawaller 1983a, Dashdamirov & Schawaller 1992a, 1992b). It was first recorded from Iran by Schawaller (1983a) in the north-west. The newly collected specimens from Iran are similar to the type of *N. (N.) alticola*, e.g., in the Iranian females, there are 7-8 setae on the posterior margin of the carapace (6-10 in the types), the pedipalpal femur size is 0.75-0.80/0.20-0.21 mm (0.80/0.20 mm for the type), and the fixed chelal finger bears 54-58 teeth (60 in the type). In addition, the trichobothrial pattern is very

similar, with trichobothrium it being situated at approximately the same level as et, and ist located in the middle of the fixed finger (see Beier 1973: Fig. 1). The only notable difference between the Iranian specimens and the types is the presence of a median tactile seta on tibia IV of the Iranian females which was not described for the types by Beier (1973).

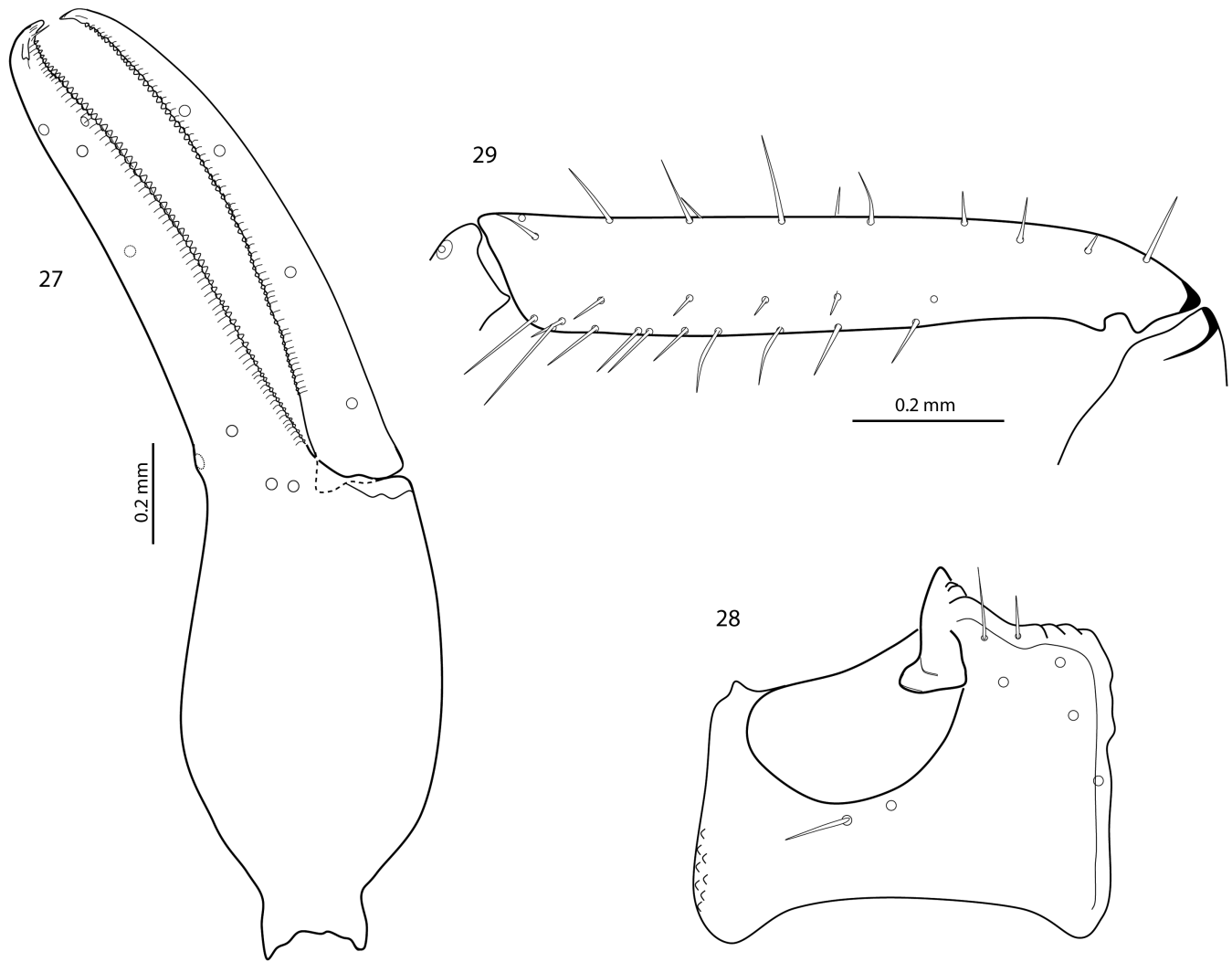
Neobisium (N.) alticola resembles *N. (N.) validum* (L. Koch, 1873), which is distributed around the Middle East, central Asia and eastern Europe (Harvey 2013). They can be



Figs 21-26: *Neobisium (Neobisium) validum* (L. Koch, 1873) ♂; **21.** carapace, dorsal view, **22.** tergites X-XI, dorsal view, **23.** coxae IV and genital opercula, **24.** genitalia, **25.** chelicera, dorsal view, **26.** rallum

differentiated by the following characters: in *N. (N.) validum*, the chelal hand is more rounded in dorsal view, the chelal teeth are greater in number, trichobothrium *et* is situated distinctly proximal to it, and *ist* is situated proximal to the middle of the fixed finger (see Beier 1949: Fig. 8, Beier 1963: Fig. 98, Ćurčić 1984: Fig. 13, Dashdamirov & Schawaller 1992a: Fig. 30, Dashdamirov & Schawaller 1992b: Fig. 7r, Schawaller & Dashdamirov 1988: Figs 29-30).

Because of the presence of only a small number of nymphs and because of the absence of males, only limited comparison with the development of other *Neobisium* species can be made. Nonetheless, the sequence of the appearance of individual trichobothria on the chelal fingers, the rallar blades and the setae on the cheliceral hand during development resemble those documented for the other *Neobisium* species (e.g. Gabbutt 1965, Gabbutt & Vachon 1965).



Figs 27–29. *Neobisium (Neobisium) validum* (L. Koch, 1873), ♂: **27.** right chela, lateral view (setae omitted), **28.** right coxa I, ventral view, **29.** left tibia IV

***Neobisium (Neobisium) validum* (L. Koch, 1873)**

(Figs 22–29)

Obisium validum L. Koch, 1873: 56–57

Material examined. IRAN. 3♂ under stone, Firooz-Abad, 33°42'35"N, 45°48'06"E, altitude 2000 m, Kermanshah Province, 18 May 2013, coll. M. Kahrarian (IAUA).

Redescription

Male

Carapace. Mostly smooth, a few minute granules present beside anterior eyes (Fig. 21), 1.35–1.37x wider than long (in flattened specimens), with 2 pairs of corneate eye, 30–31 setae, chaetotaxy: 4:6:5–6:14–16.

Tergites. Undivided, smooth, all setae simple and acute, uniseriate, X–XI each with four long tactile setae (Fig. 22), anal cone with two pairs of short setae, chaetotaxy: 12–13: 12: 12: 12: 11: 13: 12: 12: 10–11: 2T1T2T1T2: T1T2T1T: 2.

Sternites. Entirely smooth, IV–VI with median suture line, anterior operculum with 19 setae, posterior operculum with 12 long anterior setae and 17 short setae (fig. 23), genital organ with long lateral and median genital sacs, 5 pairs of glandular setae (Fig. 24), anterior spiracles with 5 and posterior spiracles with 4 suprastigmal setae, uniseriate, X with two

and XI with four long tactile setae, chaetotaxy: 19: (5)29(5): (4)13(4): 18: 13: 12: 12: 12: 4T1T4: T2T2T2T: 2.

Pleural membrane. Coarsely granulate

Chelicera. Brown, hand with 7 acuminate setae (Fig. 25), galea knob-like, galeal seta situated medially, fixed finger with 15 and movable finger with 7 teeth, serrula interior with 25 and serrula exterior with 29 blades, rallum with 8 blades (Fig. 26).

Pedipalps. Trochanter L/W 2.17–2.21, femur L/W 4.43–4.61, patella with 3 lyrifissures situated basally, L/W 2.56–2.57, chela (with pedicel) L/W 3.58–3.61, chela (without pedicel) L/W 3.39–3.42, movable finger 1.14–1.16 times longer than hand (with pedicel), fixed finger with 8 and movable finger with 4 trichobothria (Fig. 27), fixed finger with trichobothrium it situated slightly distal to et, ist located slightly distal to middle, basal half of fixed finger with 17–27 dorsal sensory setae (Em=10–15, Mm=5–9, Im=2–3), fixed finger with 68–71 retroconical and contiguous teeth, basal teeth smaller, reaching to level of trichobothrium ib, movable finger with 60–66 small and contiguous teeth, not reaching to level of trichobothrium b, nodus ramosus only present in fixed chelal finger and situated distinctly distal to et.

Legs. Brown, smooth, coxa I with long, triangular, sclerotized and apically pointed anterolateral process (Fig. 28), coxal

chaetotaxy: 8:6:6:16. Leg I: femur L/D 5.16–5.54, patella L/D 3.07–3.50, femur 1.45–1.60x longer than patella, tibia L/D 5.11–5.50, metatarsus L/D 4.00–4.67, tarsus L/D 4.85–4.86. Leg IV: femur L/D 1.83–1.89, patella L/D 2.14–2.17, femur + patella L/D 3.96–4.11, tibia without tactile seta (fig. 29), L/D 6.00–6.13, metatarsus with one tactile seta situated basally (TS=0.13), L/D 4.30–4.40, tarsus with a tactile setae situated proximal to middle (TS=0.40), L/D 5.50–5.89.

Dimensions (in mm). ♂ Carapace: 0.85–0.89/1.15–1.19. Pedipalp: trochanter 0.62–0.65/0.28–0.30, femur 1.20–1.24/0.26–0.28, patella 0.90–0.92/0.35–0.36, chela (with pedicel) 1.90–1.95/0.53–0.54, chela (without pedicel) 1.78–1.85, hand (with pedicel) L 0.97–1.00, movable finger L 1.11–1.16. Leg I: femur 0.61–0.62/0.11–0.12, patella 0.40–0.42/0.12–0.13, tibia 0.44–0.46/0.08–0.09, metatarsus 0.28/0.06–0.07, tarsus 0.34/0.07. Leg IV: femur 0.53–0.55/0.28–0.30, patella 0.62–0.65/0.29–0.30, femur + patella 1.15–1.20, tibia 0.90–0.92/0.15, metatarsus 0.43–0.44/0.10, tarsus 0.53–0.55/0.09–0.10.

Remarks

Neobisium (*N.*) *validum* was previously reported from Mazandaran Province in northern Iran by Beier (1951) and Schawaller (1983a), and from Fars Province in southern Iran by Beier (1971). The species *Neobisium* (*N.*) *caucasicum* (Beier, 1932) from Armenia, *N.* (*N.*) *turcicum* Beier, 1949 from Turkey and *N.* (*N.*) *baniskhevii* Kobakhidze, 1960 from Georgia were synonymized with *N.* (*N.*) *validum* by Schawaller (1983b). In addition, Dashdamirov & Schawaller (1992a) synonymized *N.* (*N.*) *zhiltovae* Čurčić, 1984 from Turkmenistan with *N.* (*N.*) *validum*.

On the basis of the carapacal chaetotaxy (see Dashdamirov & Schawaller 1992a: Fig. 29), trichobothriotaxy (see Čurčić 1984: Fig. 13), pedipalpal shape (see Dashdamirov and Schawaller 1992a: Figs 30–31, Schawaller & Dashdamirov 1988: Fig. 28), the entirely smooth pedipalp, the pedipalpal size and the numbers of chelal teeth, the males found in Iran are very similar to the female from Turkmenistan described by Čurčić (1984). For example, there are 29 setae on the carapace of the female from Turkmenistan, 13 of which are situated on the posterior margin. Also, the size of the pedipalpal femur is 1.23/0.28 mm, and the chela is 2.16/0.63 mm for the Turkmen material (Čurčić 1984). The only observable difference is the absence of a tactile seta on tibia IV of the males from Iran, which is present in the specimen collected from Turkmenistan (see Čurčić 1984: Fig. 15).

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