



Phorytocarpais mishdaghensis – a new mite species (Parasitiformes: Parasitidae) from Iran

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Original research

ABSTRACT

A new species of Parasitidae, *Phorytocarpais mishdaghensis* n. sp., originating from Iran, is described with regard to female, male, and deutonymph.

Keywords mite taxonomy; new species; buffalo manure; fauna of Iran

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Introduction


Genus *Phorytocarpais* Athias-Henriot, 1979, with a type species *Gamasus fimetorum* Berlese, 1903: 238 comprises 16 valid species (Athias-Henriot, 1979, 1980; Hyatt, 1980). The main features of the genus in adults are as follows, i.e. separate podonotal and opisthonotal dorsal shields orthotrichous; some dorsal setae stouter than other, especially, the dorsal hexagon setae (*j5*, *j6*, *z5*), heterogenic in length and width; epigynium subtriangular or subtetragonal; sternal setae *st1* not split apically; opisthogaster with 8 pairs of setae; peritrematal shield of female not fused to the opisthogastral shield posteriorly; both adaxial (*al1*, *al2*) setae on palpgenu spatulate, adaxial *al* seta on palpfemur cleaved; corniculi in male entire or bifid; movable digit of female chelicera with three teeth; male chelicerae symmetrical, arthrodial membrane baculiform; tritosternum in male biramous, base closely associated with genital orifice; spurs on the genu and the tibia of leg II in male simple; gland pores *gv1* present, *gv2* openings triple.

The new species *Phorytocarpais mishdaghensis* n. sp. has been encountered (females, males, deutonymphs) in buffalo manure in the Khuzestan Province in Iran.

Methods

Mites were routinely extracted from buffalo manure using Berlese funnels into 70% ethanol, mounted in Hoyer's medium on glass slides, cured for several days in an oven (60° C) and studied using the Olympus BX51 microscope, fitted with a drawing tube. All measurements are expressed in micrometres, taken as follows: idiosoma measurements, as well as the dorsal shields, were acquired along the sagittal line (length), and in the widest place (width); the setal lengths were measured from the alveolus to the apex of the seta; the peritreme length was measured, including the stigma; Ta IV was measured without apotele. The drawings were made with the aid of Corel Draw X8 and a Wacom Intuos Graphic Tablet. The legs and pedipalps are considered as protruding laterally from the idiosoma and the gnathosoma, respectively, thus the antero- or posterolateral location of the setae or other structures is applied. The system of dorsal, ventral, palpal and leg setal notations was based on Evans and Till (1979), whereas

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the poroidotaxy and adenotaxy on Moraza and Peña (2005), with some necessary adjustments for Parasitidae. In the species under study both sexes and deutonymphs (DNs) were available. Larvae and protonymphs were not encountered.

Results

Phorytocarpais mishdaghensis n. sp.

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(Figures 1–9)

Diagnosis

Female and male — Idiosoma moderately sclerotised; podonotum with 22 pairs of setae, out of which four pairs are stouter (*j1*, *j4*, *z5*, *r3*); opisthonotum with 23 regular pairs of setae and three pairs of supplementary setae (*Sx*) in females, setae *J6*, *Z1* and *Z3* stouter.

Female — Gnathotectum lateral prongs narrow and acute, central prong shorter and usually obtuse; hypostome with eight rows of denticles, hypostomatic setae *h2* and *h3* undulated; the sternal shield anterior margin indistinct, presternal plates with thin and long anterior protrusions; posterior sternal margin with a concavity axially; epigynium with long, acute anterior prong; endogynium composed of a bowl-shaped endogynial sac (spermatheca), with a wide opening dorsally, and a ventral surface smooth or bearing several to numerous tubercles, as well as a complex bilateral structure located behind endogynial sac, showing many plications; cheliceral fixed digit with two teeth ahead, one by side, and three teeth behind the pilus dentilis, the proximal-most larger, and featuring at its base a cavity for the proximal tooth of a movable chelicera digit.

Male — Gnathotectum prongs similar, narrow and acute; hypostome with ca. five posterior rows of denticles and several poorly visible ones located anteriorly, in the anterior part, the hypostome also features a number of denticles not organised into rows; presternal plates as in the female; corniculi narrow and arcuate, hypostomatic setae straight; genital lamina with arcuate, double anterior margin, followed by two thickenings, posterolateral margins also thickened; cheliceral fixed digit obtuse terminally, and with an indistinct tooth behind the pilus dentilis, movable digit with two teeth and a larger tooth located adaxially, external margin of spermatodactyl with a characteristic indentation; leg II: ventrally, femoral main spur straight and axillary process curved posterolaterally, in the lateral perspective, the main spur relatively narrow, axillary process subtriangular and showing fine striae, genual and tibial spurs conical, the tibial one somewhat more elongated and pointed.

Deutonymph — Idiosoma moderately sclerotised; podonotum with 22 pairs of setae, setae *z1* on podonotum protrusions, setae *s1* and *s2* minute and the latter located on a soft cuticle, four seta pairs stouter (*j1*, *j4*, *z5* and *r3*); opisthonotum bearing 15 pairs of setae (*J5* and *Z3* somewhat stouter) and with angular posterior margin; sternal shield with concaved and thickened anterior margin; opisthogastral setae *ZVI* and *SVI* minute, pores *ivo1*, *ivo2* and setae *JVI* and *SVI* nearly at the same level; gnathotectum with the distinct, acute lateral prongs, and a central one obtuse and poorly discernible; cheliceral movable digit as in the female, fixed digit with two teeth ahead of the pilus dentilis, one by the side of it, and four teeth behind the pilus dentilis; on adaxial surface of the fixed digit there is a concavity corresponding to the proximal-most tooth of a movable digit.

Description

Female (Figures 1–4)

Idiosoma (Fig. 1)— Oval and moderately sclerotised, 810–860 x 515–560 (length x width, *n*=5). **Podonotum** – 365–375 x 465–500 (length x width) with 22 pairs of setae, out of which the setae *s1* and *s2* very small (12–17), four pairs stouter: *j1* (69–82), *j4* (60–67), *z5* (73–80), *r3*

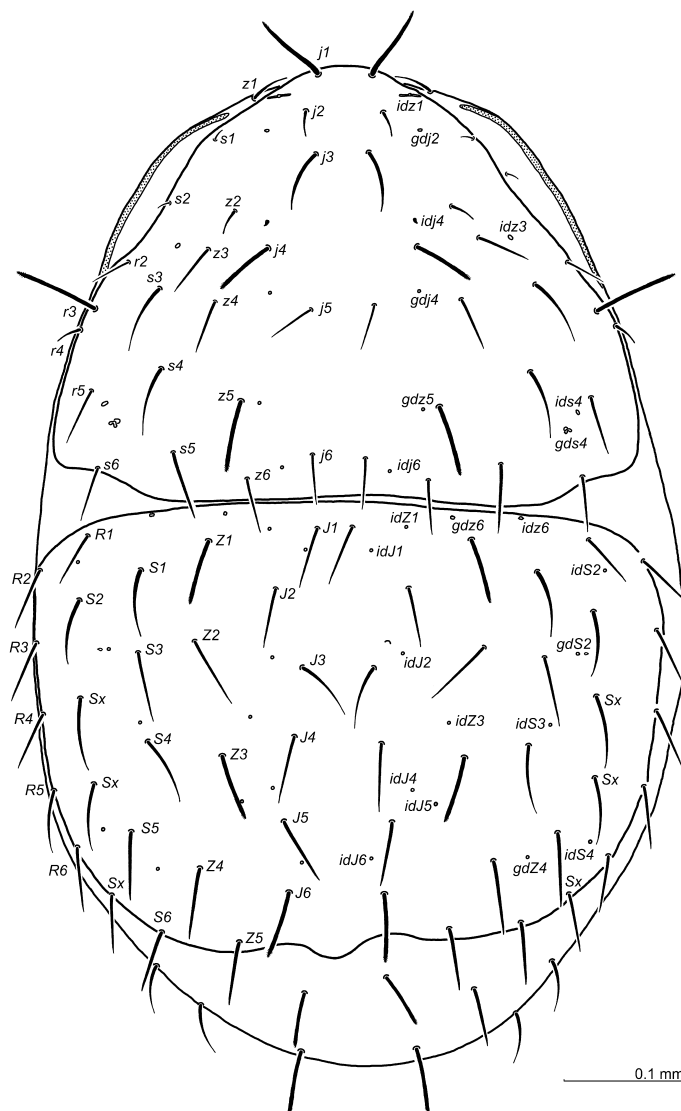


Figure 1 *Phorytocarpais mishdaghensis* n. sp., female: idiosoma dorsal side. Abbreviations: regular podosomal (*j, z, s, r*) and opisthosomal (*J, Z, S, R*) setae; podosomal (*idj, idz, ids*) and opisthosomal (*idJ, idZ, idS*) pores; gland openings on the podonotum (*gdj, gdz, gds*) and the opisthonotum (*gdZ, gdS*). Note supplementary setae *Sx*, as well as the podonotal pore *idz6*, and gland opening *gdz6*, located at the opisthonotum anterior margin.

(94–103), other podonotal setae from ca. 21 (*j2*) up to 57 (*z4, s5*). **Opisthonotum** – 375–395 x 505–545 (length x width) with 23 regular pairs of setae and three pairs of supplementary setae. Stouter setae: *J6* (65–68), *Z1* (76–78) and *Z3* (68–73), other opisthonotal setae range between approx. 45 and 60. Dorsal setae simple, except the stouter ones, which are finely pilose terminally. The pairs of setae located axially on a soft cuticle behind the opisthonotum enlarged and stouter. Posterior opisthonotal margin somewhat protruded behind *J6* setae. Podonotum and opisthonotum reticulated. **Adenotaxy** – podonotum with 4 pairs of glands (*gdj2, gdj4, gdz5, gds4*) and opisthonotum with 3 pairs of glands: *gdZ4*, and *gdS2*, as well as podonotal gland *gdz6*, located on the opisthonotum. Podonotal pore *idz6* located at the anterior opisthonotal margin. **Peritreme** length 340–350, ending anteriorly ahead of the gland pores *gdj2* level (Figs 1, 2).

Ventral idiosoma (Figs 2, 3A) — Setae length in paratypes: *st1–st5* (45–55), *JV1–JV3*

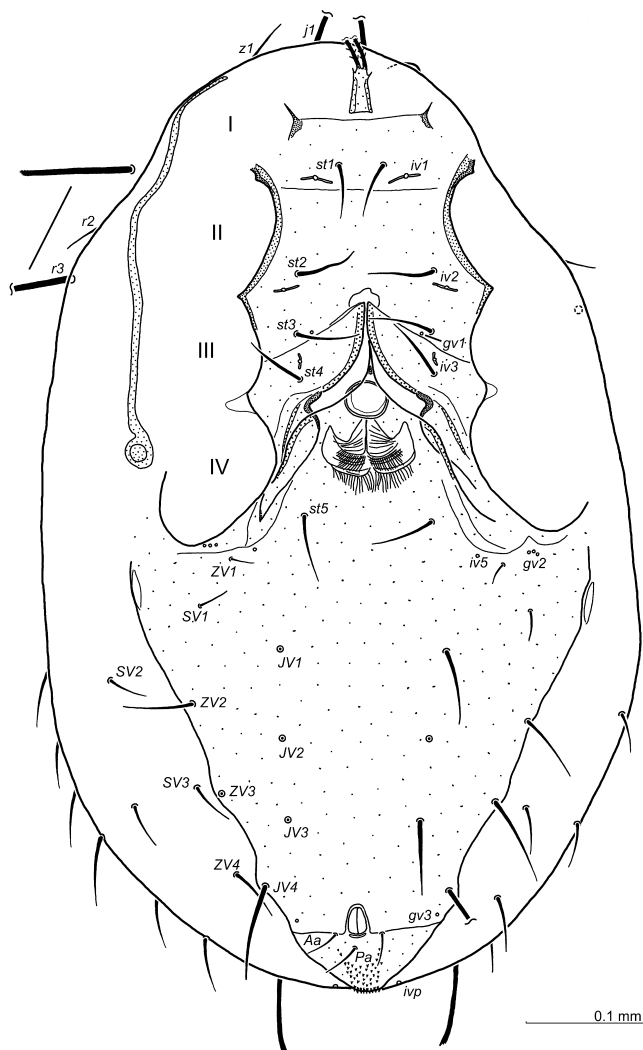


Figure 2 *Phorytocarpais mishdaghensis* n. sp., female (holotype): idiosoma ventral side. Abbreviations: I–IV the openings for coxae I to IV; *j1*, *z1*, *r2*, *r3* podonotal setae; *st1*–*st3* sternal setae; *st4*, *st5* paragnathal and epignathal setae, respectively; *JV*, *ZV* and *SV* opisthogastral setae series; *Aa* adanal seta; *Pa* postanal seta; *iv1*–*iv3*, *iv5*, *ivp* pore openings; *gv1*–*gv3* gland openings.

(56–64), *JV4* (78–84), *ZV1* (16–18), *ZV2* (52–59), *ZV3* (72–77), *ZV4* (46–50), *SV1* (20–24), *SV2* (33–44), *SV3* (39–47), *Aa* (26–29), *Pa* (33–35). In holotype: *st1* (48), *st2* (56), *st3* (56), *st4* (54), *st5* (55), *JV1* (63), *JV3* (61), *JV4* (81), *ZV1* (20), *ZV2* (59), *ZV3* (76), *ZV4* (46), *SV1* (26), *SV2* (35), *SV3* (39), *Aa* (29), *Pa* (31), *JV2* not available. Setae *SV2*, *SV3* and *ZV4* located out of opisthogastral shield on a soft cuticle. Ventral setae simple, opisthogastral with horizontal reticulation. The anterior margin of the sternum (Fig. 2) indistinct, presternal plates showing thin and long anterior protrusions, a line joining plates discernible. Setae *st1* much closer to the other than setae *st2*. Posterior sternal margin with concavity axially. Gland pores *gv1* close to *st3* setae (Figs 2, 3B). Paragnathal shields (Figs 2, 3B) poorly separated from the sternum, their adaxial margins thickened. Epignathal shield (Fig. 2) with relatively long and narrow anterior prong bearing a tooth on dorsal surface (Fig. 3C) and poorly discernible posterior margin. Endogynium (Fig. 2) made of two parts, the anterior one (endogynial sac, spermatheca) bowl-shaped, subcircular in the ventral perspective, with a wide opening on the dorsal side, with none, or up to many tubercles on the ventral surface (Fig. 3D–F), as well as a complex

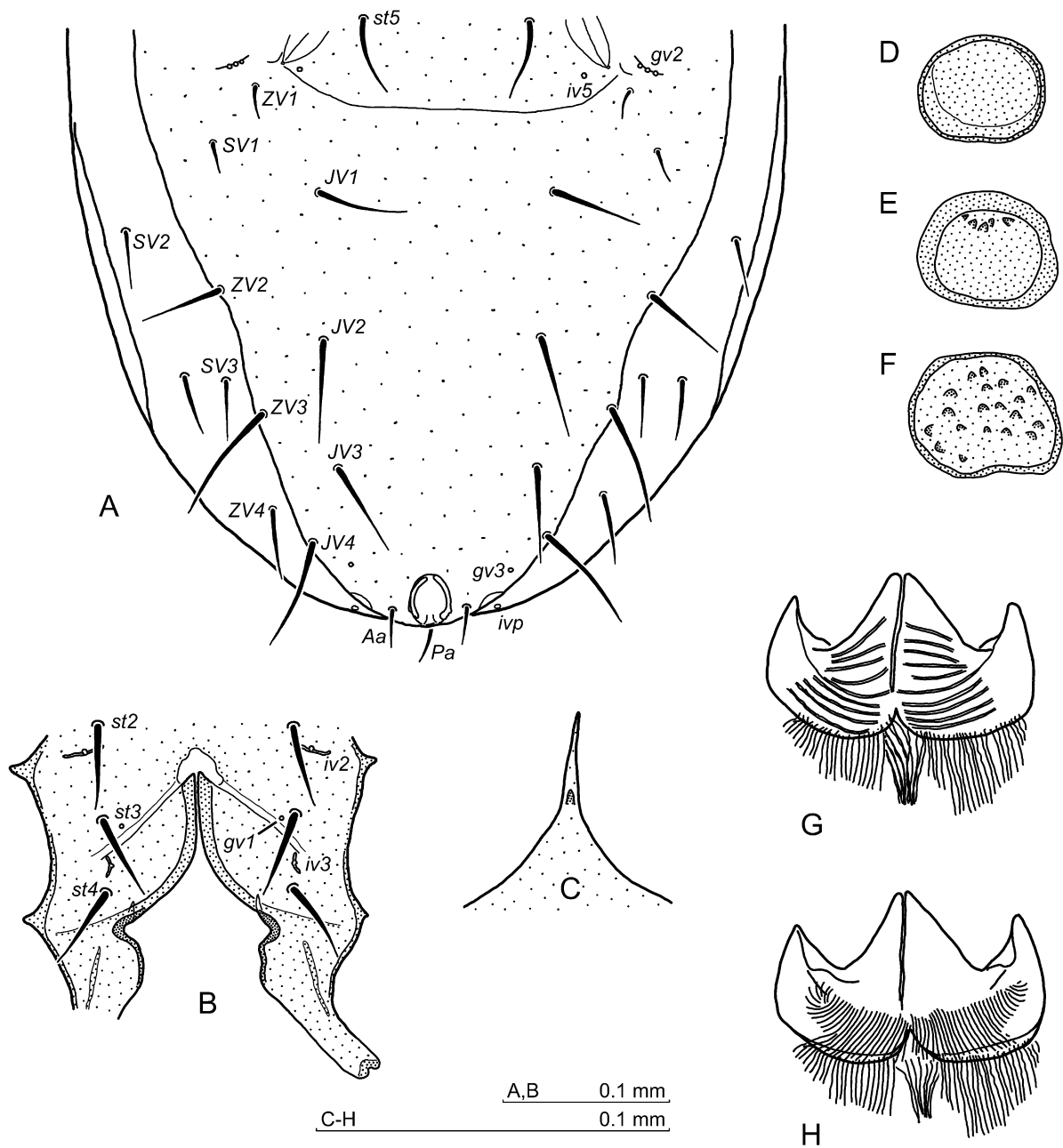


Figure 3 *Phorytocarpais mishdaghensis* n. sp., female: A – opisthogaster; B – paragynia; C – central epigynial prong; D–F – endogynial sac ventrally, different aspects; G, H – posterior endogynial structure, ventral (G) and dorsal (H) aspect. C, G, H – holotype. Abbreviations as in Figure 2.

posterior part showing two lateral, wing-shaped structures and many plications (Figs 2, 3G, H). Pores *iv5* closer to setae *ZV1* than to *st5*. Gland openings *gv2* triple. Opisthogaster (Figs 2, 3A) triangular, setae *ZV1* and *SV1* short, *JV4* and *ZV3* somewhat enlarged, whereas *ZV4*, *SV2* and *SV3* moderately long and located out of the opisthogastral shield. Pores *ivo* not discernible, pores *ivp* and gland pores *gv3* present.

Gnathosoma — Gnathotectum (Fig. 4B, C) lateral prongs narrow and acute, usually directed divergently, the central one shorter, more or less terminally obtuse and not pigmented. Margins between the prongs thickened. Corniculi conical, hypostome with visible eight rows

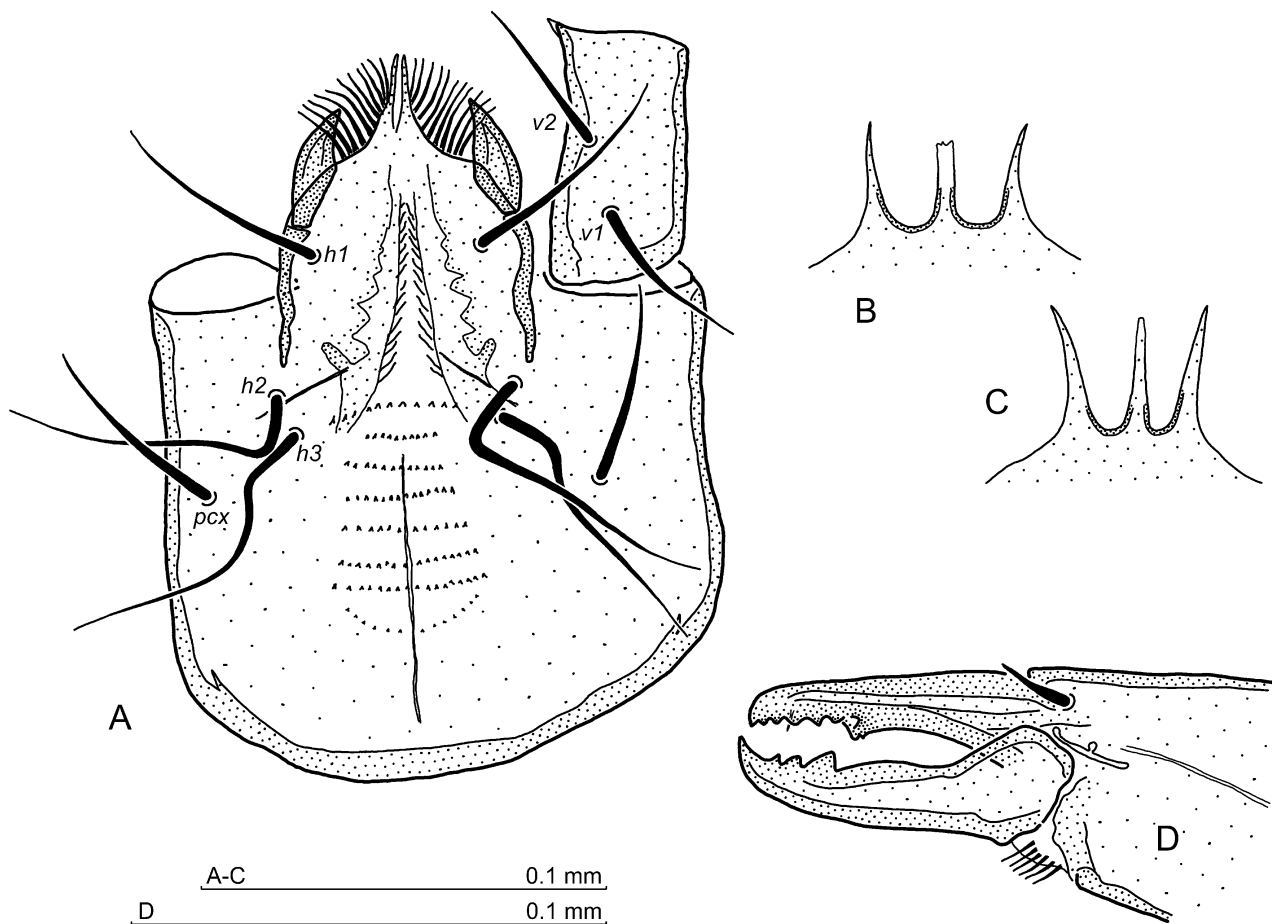


Figure 4 *Phorytocarpais mishdaghensis* n. sp., female: A – gnathosoma, ventrally; B, C – gnathotectum, two aspects; D – chelicera, antiaxial view. Abbreviations: *v1* and *v2* palptrochanter ventral setae, *h1*–*h3* hypostomatic setae, *pcx* palpcoxal setae.

of denticles, the proximal-most arcuate, hypostomatic setae *h2* and *h3* undulate, hypostomatic setae *h1* and palpcoxal setae straight (Fig. 4A). Gnathosoma and palptrochanter setae simple. Chelicera (Fig. 4D) – movable digit with three teeth, proximal-most larger, fixed digit with two teeth ahead of the pilus denticis, one by the side of it, followed by three teeth proximally. The proximal-most much larger, occasionally with an apical indentation and with basally located concavity on the antiaxial side, in order to host the largest tooth of a movable digit.

Legs — Some dorsal setae on leg II and leg III, especially on Ge and Ti, are somewhat thickened and finely pilose terminally. Leg IV: seta *ad1* on the Fe IV shorter and terminally barbed, lateral and dorsal setae on Ge IV and Ti IV somewhat thickened and terminally finely pilose, seta *pd1* on Ta IV stouter and terminally pilose. Ta IV 275–295 long (276 in holotype). Other aspects of legs I–IV unremarkable.

Male (Figures 5, 6)

Idiosoma — Oval and moderately sclerotised, 645–690 x 390–415 (length x width, n=5). **Podonotum** – 22 pairs of setae, as in the female. **Opisthonotum** – with ca. 23 pairs of similar simple setae ranging in length from 43 to 60, out of which Z3 are somewhat stouter and can be finely pilose terminally. Between *J6* setae a low protrusion is discernible. Podonotum and opisthonotum are separated with incomplete dorsal suture, and reticulated. **Peritreme** length 327–340, ending anteriorly as in the females.

Ventral idiosoma — Setae length: *st1*–*st5* (34–59), *JV1*–*JV3* (43–51), *JV4* (59–61), *ZV1*

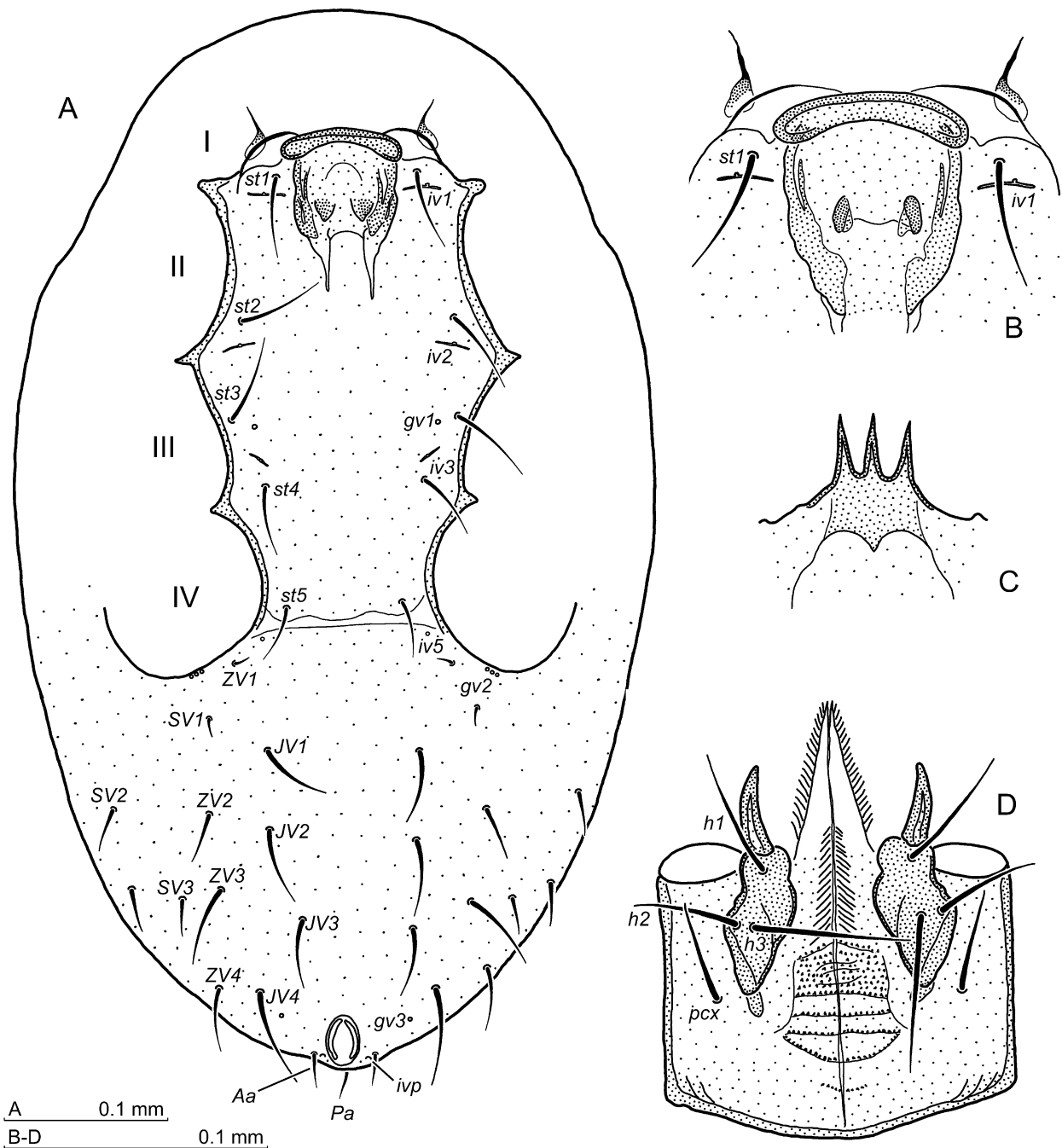


Figure 5 *Phorytocarpais mishdaghensis* n. sp., male: A – idiosoma ventral side; B – genital region of the sternum with genital lamina and presternal plates; C – gnathotectum; D – gnathosoma, ventrally. Abbreviations as in Figure 2, *h1–h3* hypostomatic setae, *pcx* palpcoxal setae.

(10–12), *ZV2* (29–37), *ZV3* (44–52), *ZV4* (35–39), *SV1* (12–13), *SV2* (27–30), *SV3* (26–30), *Aa* (23–25), *Pa* (24–26). Ventral setae simple. **Sternal region** (Fig. 5A, B) – presternal plates oval, with very long and thin anterior protrusions, overlapped with anterolateral arcuate margins of the sternum. Genital lamina (Fig. 5A, B) wide, with arcuate anterior part showing a thickened anterior margin, posterior part subrectangular, with thickened lateral margins and two thickenings located more centrally. Sternal gland pores *gv1* widely distributed, near setae *st3*

(Fig. 5A). Sternal shield and opisthogaster separated between *st5* setae and *iv5* pores. Sternal and opisthogastral setae simple and moderately long, except for *ZV1* and *SV1* which are very short, as well as *ZV2*, *SV2* and *SV3* which are shorter than setae of the *JV* series. Pores *iv5* in a middle position between *st5* and *ZV1* setae, gland pores *gv2* triple, pores *ivo* not discernible, pores *ivp* and gland pores *gv3* present.

Gnathosoma (Fig. 5C, D) — Gnathotectum (Fig. 5C) with all prongs similarly long, narrow and acute, with a margin somewhat thickened. Behind the prongs, a more pigmented area is discernible. Corniculi (Fig. 5D) slim and arcuate, settled on a more sclerotised parts. Hypostome (Figs 5D, 6A) features four to five posterior rows of denticles, out of which the posterior-most is arcuate. Several poorly visible rows of denticles can also be discernible more anteriorly. Furthermore, the anterior part of the hypostome is covered with a number of denticles not organised into the rows. Hypostomatics and palpcoxal setae straight. Palptrochanter ventral setae simple. Chelicera (Fig. 6B, C) –fixed digit obtuse terminally, and with an indistinct tooth behind the pilus dentilis, a movable digit with two teeth and a larger tooth located adaxially and posteriorly directed. The external margin of spermatodactyl shows a characteristic indentation. Arthroal membrane baculiform (Fig. 6B).

Legs — Some dorsal setae on leg IV can be finely pilose terminally. Seta *pdl* on Ta IV stouter and terminally pilose. Leg II (Fig. 6D, E) spurred as follows: when viewed from the ventral side (Fig. 6D), femoral main spur straight and the axillary process curved posterolaterally. Spurs on the genu and the tibia with the rounded tips, genual spur located closer to the distal article margin than the tibial one. From the lateral side (Fig. 6E), the main spur relatively narrow, axillary process subtriangular and showing a fine striation, genual and tibial spurs conical, the tibial one somewhat more elongated and pointed. Other aspects of legs I–IV unremarkable.

Deutonymph (Figures 7–9)

Idiosoma (Fig. 7, 9A, B) — Oval and moderately sclerotised, 645–680 x 380–435 (length x width, n=5). **Podonotum** – 310–335 x 375–400 (length x width) with 22 pairs of setae, out of which setae *z1* located on the podonotum protrusions (Fig. 9A, B), setae *s1* and *s2* minute (6–9) and *s2* located on a soft cuticle out of the podonotal shield, four pairs stouter (*j1*, *j4*, *z5* and *r3*). **Opisthonotum** – 220–235 x 325–350 (length x width), with 15 pairs of setae, setae *J5* and *Z3* somewhat stouter. Dorsal setae simple except *r3*, being distally finely pilose. Posterior margin of the opisthonotum V-shaped. Both dorsal shields reticulated. **Adenotaxy** – podonotum with 4 pairs of glands (*gdj2*, *gdj4*, *gdz5*, *gds4*) and opisthonotum with 2 pairs of glands: *gdS2*, as well as the glands *gdz6* which are located close to the anterior opisthonotal margin. **Peritreme** length 315–320, ending anteriorly as in the females.

Ventral idiosoma (Fig. 8) — Sternal setae are progressively shorter from *st1* (55–60) to *st5* (31–33), opisthogastral setae length discriminated: 35–37 (*JV1*), 35–38 (*JV2*), 35–37 (*JV3*), 37–43 (*JV4*), 5–7 (*ZV1*), 25–26 (*ZV2*), 37–38 (*ZV3*), 27–29 (*ZV4*), 7–9 (*SV1*), 14–16 (*SV2*), 24–28 (*SV3*), 18–21 (*Aa*), 11–13 (*Pa*). Ventral setae simple and those on the opisthogaster located on the cuticular platelets. Presternal plates subtriangular, rudimentary (Figs 8, 9C). The sternal shield anterior margin slightly concaved and thickened, followed by a non-pigmented band between setae *st1* (Figs 8, 9C), the remaining part weakly cross-reticulated. Metapodal shields elongated. Opisthogastral setae *ZV1* and *SV1* minute, pores *ivo1*, *ivo2* and setae *JV1* and *SV1* nearly at the same level, pores *iv5* located in the middle between *st5* and *ZV1* setae, gland openings *gv2* triple. Pores *ivo3*, *ivp* and gland pores *gv3* well discernible.

Gnathosoma — Gnathotectum margin arcuate, with two unpigmented acute prongs, and the third central prong rather poorly discernible, shorter and apically blunt (Fig. 9D). Corniculi conical, hypostome with 8–9 rows of denticles, in the posterior-most row the lateral denticles larger. Hypostomatic and palpcoxal setae simple and straight, the latter somewhat longer. Palptrochanter (Fig. 9E) with two low tubercles posterolaterally to the ventral setae and a lamellar elevation located between *v1* and *v2* setae; ventral setae simple. Chelicera (Fig. 9F) – a movable digit with three teeth, the proximal one distinctly larger, fixed digit with two teeth ahead of the pilus dentilis, one tooth by the side it, and four teeth behind the pilus

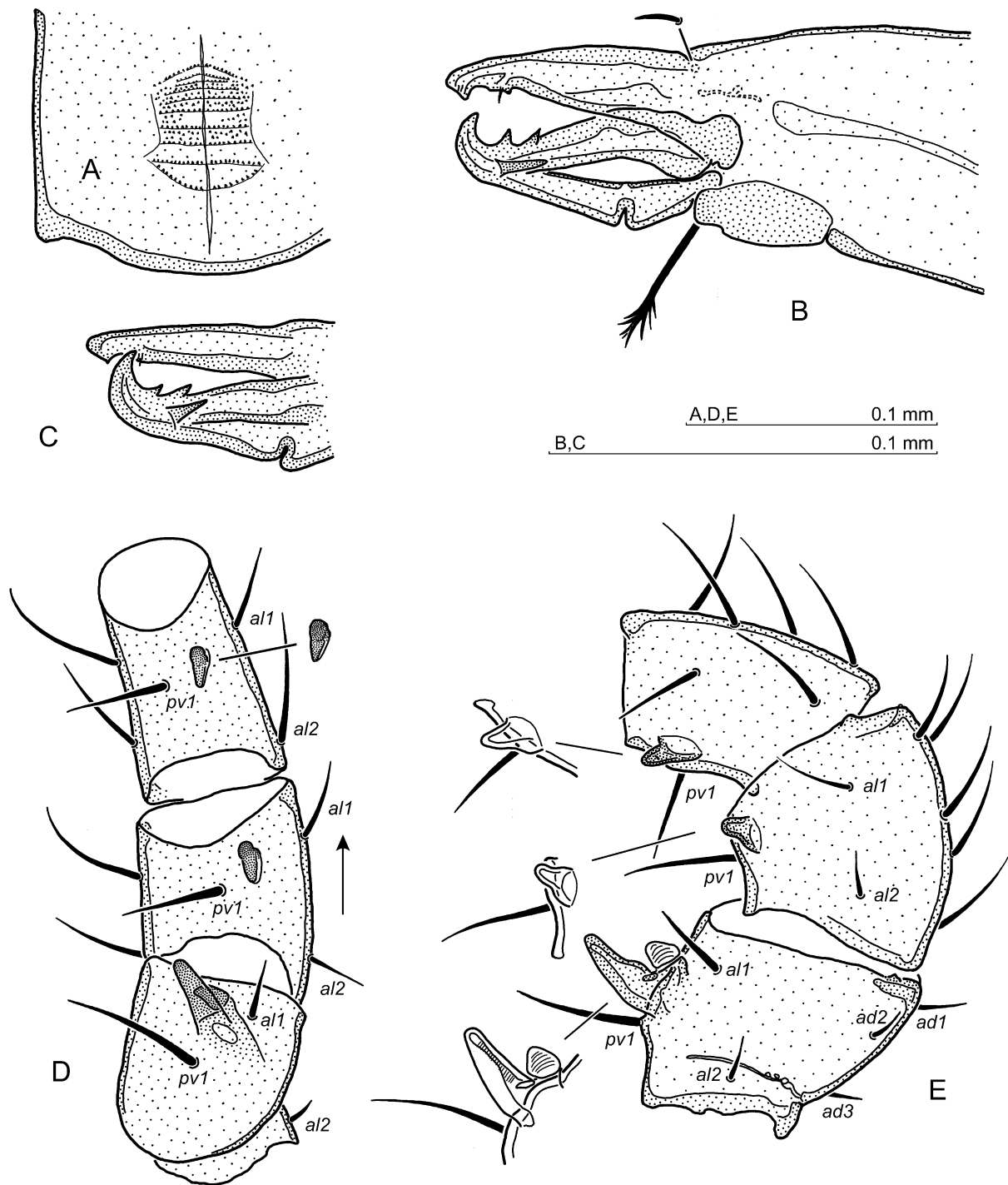


Figure 6 *Phorytocarpais mishdaghensis* n. sp., male: A – gnathosoma, ventrally, another aspect of hypostome denticles; B, C – chelicera, adaxial (B) and slightly oblique (C) view; D, E – leg II ventrally (D) and anterolaterally (E). Abbreviations: posteroventral (*pv*), some antero-lateral (*al*) and anterodorsal (*ad*) setae are marked.

dentilis. A lateral concavity corresponding to the proximal tooth of movable digit is below two proximal-most teeth on the adaxial digit surface.

Legs — Ta I shows a short acrotarsus segment, Ta IV 277–296 long. Leg setation – setae

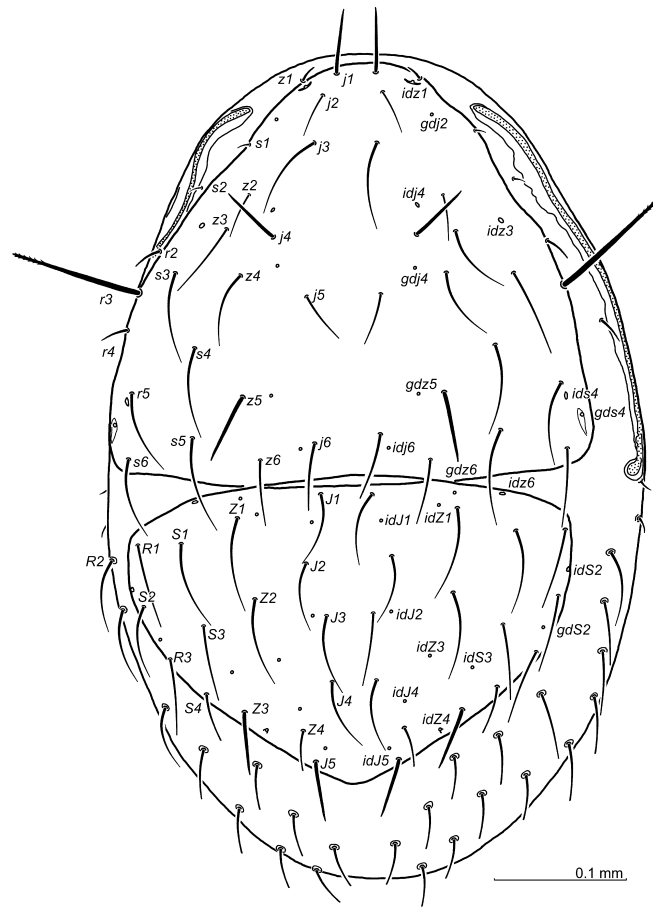


Figure 7 *Phorytocarpais mishdaghensis* n. sp., deutonymph: idiosoma dorsal side. Abbreviations as in Figure 1.

simple, only seta *pdl* on Ta IV can be finely barbed terminally. Other aspects of legs I–IV unremarkable.

Material examined

Holotype — Female (slide no. 2993), Hamidieh, Khuzestan Province, Iran; GPS: 31.4225N, 48.3892E, alt. ca. 18 m a.s.l.; 20 Oct. 2016, buffalo manure; leg. Sara Farahi.

Paratypes — 12 females (slides no. 2994–3000), 8 males (slides no. 3001–3005) and 14 DNs (slides no. 3006–3008), as well as 8 females (slides no. SF150–SF152), 3 males (slides no. SF153–SF154), and 4 DNs (slides no. SF155–SF158), *ibid*.

Other material — 9 females (slides no. 3009–3011), 2 males (slide no. 3012), and 9 DNs (slides no. 3013–3015), *ibid*.

Material deposition — Holotype and 26 paratypes (12 females, 8 males and 6 DNs), slides no. 2993–3008, are deposited in the Zoological Division of the Nature Education Centre, Jagiellonian University, Kraków, Poland, whereas 15 paratypes (8 females, 3 males and 4 DNs), slides no. SF150–SF158, are deposited in the Insect and Mite Collection of Ahvaz, Department of Plant Protection, Shahid Chamran University of Ahvaz, Iran.

The other material (not paratypes) is held in the Author's (WW) collection.

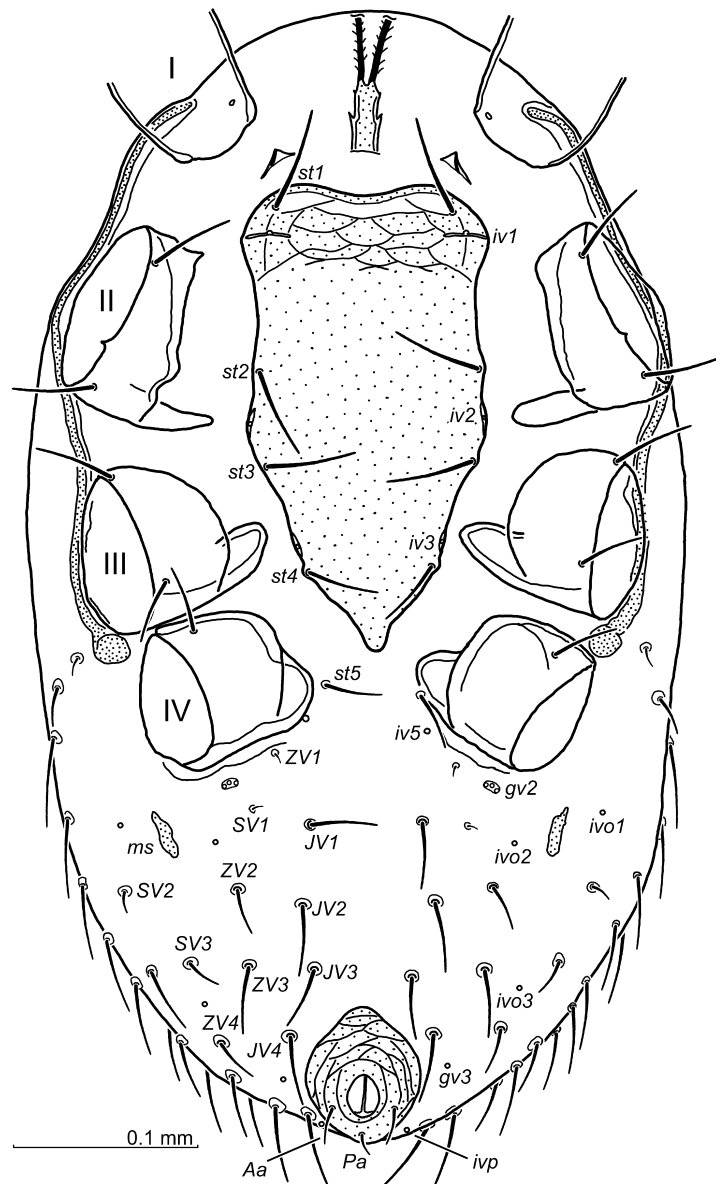


Figure 8 *Phorytocarpais mishdaghensis* n. sp., deutonymph: idiosoma ventral side. Abbreviations as in Figure 2, *ms* metapodal shield, *ivo1–ivo3* pore openings.

Etymology

The specific name *mishdaghensis* refers to the Mishdagh Protected Area, 30 km north of the material collection site. This area is the habitat of various animal species, including mammals, birds, reptiles, amphibians, etc. Persian gazelle, *Gazella subgutturosa* which is a vulnerable species according to IUCN, lives in Mishdagh protected area.

Differential taxonomy

Phorytocarpais mishdaghensis n. sp. is very similar to *P. distinctus* (Berlese, 1903: 239; 1906: 132), both in the females (endogynium) and the males (gnathotectum, corniculus shape, chelicera and leg II armature). The discriminating features in the females are as follows:

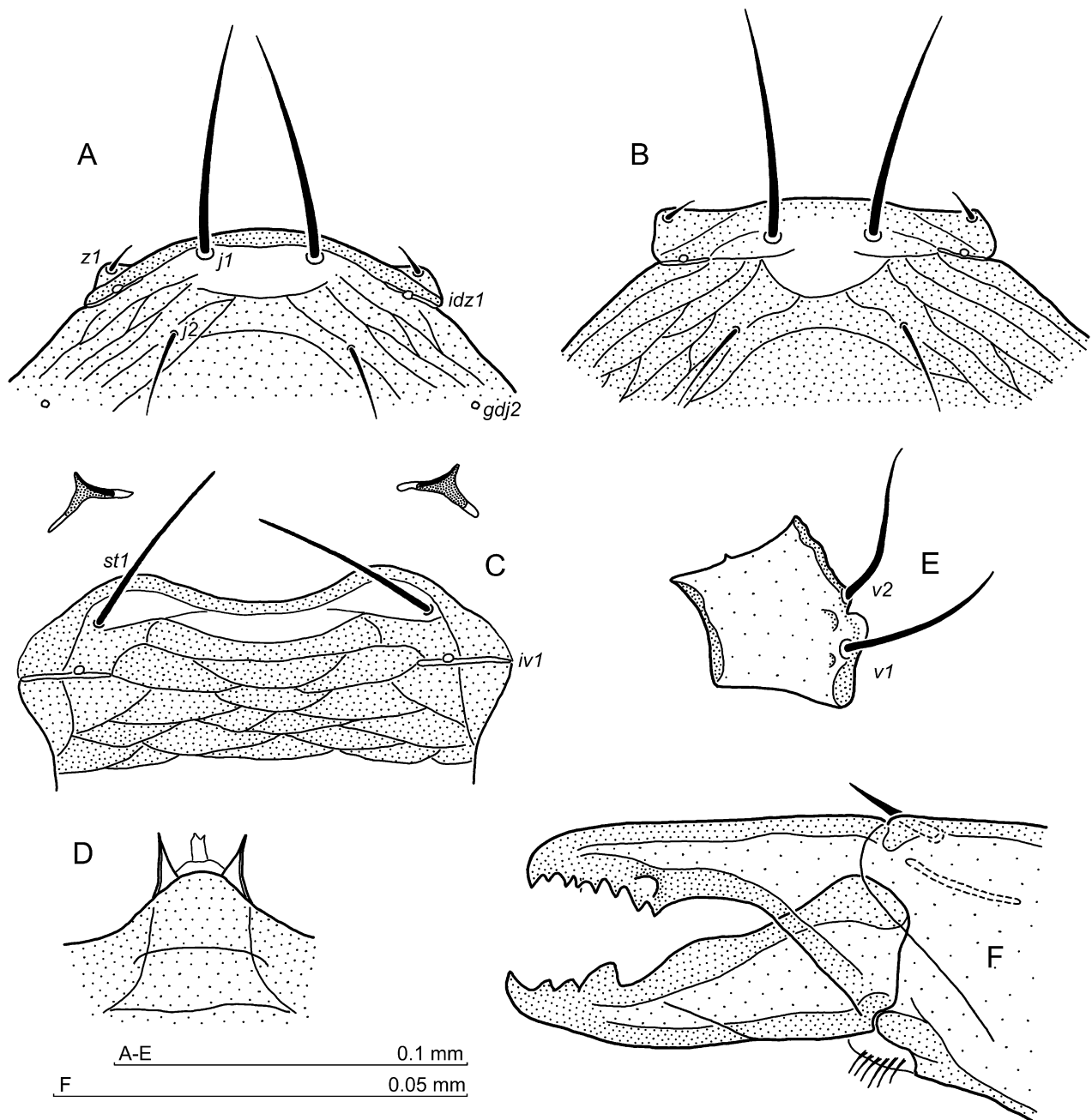


Figure 9 *Phorytocarpais mishdaghensis* n. sp., deutonymph: A, B – anterior end of the podonotum, two aspects; C – presternal plates and anterior part of the sternum; D – gnatotectum; E – Co I anterolaterally; F – chelicera in the adaxial view. Abbreviations: podonotal (*j1*, *j2*, *z1*) and sternal (*st1*) setae, podonotal (*idz1*) and sternal (*iv1*) pores, gland opening (*gdj2*), Co I ventral setae (*v1*, *v2*).

gnathotectum central prong is obtuse in both species, but in *P. distinctus* it is much longer than the lateral prongs, whereas in *P. mishdaghensis* n. sp. it is evidently shorter. Chelicera fixed digit in *P. mishdaghensis* n. sp. features 6 teeth, out of which only the proximal-most is larger, whereas in *P. distinctus* there are five teeth, out of which both the first and the last one is enlarged. Furthermore, both digits in *P. mishdaghensis* n. sp. are equally long, but in *P. distinctus* the fixed digit is distinctly longer. In the case of males, the differences are rather subtle. A characteristic, backward directed adaxial tooth on the chelicera movable digit

is encountered in both species, but a tooth on the cheliceral fixed digit in *P. mishdaghensis* **n. sp.** is minute, whereas in *P. distinctus* it is well pronounced. The axillary process on Fe II is subtriangular in *P. mishdaghensis* **n. sp.**, but oval in *P. distinctus*. As far as deutonymphs are concerned, the chelicera fixed digit in *P. distinctus* features four teeth, whereas in the newly described species, approx. seven. Gnathotectum is also different, i.e. central prong in *P. distinctus* is obtuse and longer than the lateral ones, which are slim. In *P. mishdaghensis* **n. sp.**, the prongs protrude from the arcuate solid margin of the gnathosoma, the central prong is obtuse, short and rather poorly discernible, but the lateral ones are triangular, with the thickened external margins.

Phorytocarpais mishdaghensis **n. sp.** can also be compared with *P. beta* (Oudemans et Voigts, 1904) (Voigts and Oudemans, 1904) and *P. scapulatus* Athias-Henriot, 1980. In these species, endogynium comprises anterior circular part followed by a posterior complicated structure, as well as a gnathotectum in the female is of a similar type. However, the endogynium posterior structure in the species under comparison is different than that in the *P. mishdaghensis* **n. sp.**, as well as a characteristic paragynium metagynial sclerites, as observed in *P. scapulatus*, are not to be found in the newly described species. In the males, the main differences are as follows, i.e. armature of leg II, shape of gnathotectum and chelicera structure. In *P. beta* the main femoral spur and axillary process are minute, much smaller than the tibial spur. In *P. scapulatus*, the main femoral spur is relatively short and wide, whereas both the genual and the tibial spurs differ in shape and size from the spurs in *P. mishdaghensis* **n. sp.** Gnathotectum in *P. beta* male is similar to the one in *P. mishdaghensis* **n. sp.**, but in *P. scapulatus*, the central prong is obtuse and much longer than the lateral ones. When the deutonymphs in *P. mishdaghensis* **n. sp.** and *P. beta* are compared, in the former species a stout podonotal setae *s5*, a characteristic feature for *P. beta* (Hyatt, 1980), is not to be found.

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