

TWO NEW FEATHER MITES OF THE GENUS *PROCTOPHYLLODES* ROBIN (ACARIFORMES: PROCTOPHYLLODIDAE) ASSOCIATED WITH PASSERINES (AVES: PASSERIFORMES) IN THE RUSSIAN FAR EAST

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ABSTRACT: Two new species of the feather mite genus *Proctophyllodes* (Proctophyllodidae: Proctophyllodinae) are described from passerines in the Primorye Territory, Russia: *Proctophyllodes bochkovi* sp. n. from the blue-and-white flycatcher *Cyanoptila cyanomelana* (Temminck) (Muscicapidae) and *P. cyanopicae* sp. n. from the azure-winged magpie *Cyanopica cyanus* (Pallas) (Corvidae). *Proctophyllodes bochkovi* belongs to the *caulifer* species group. It differs from the most similar species, *P. cotyledon* Trouessart, 1899, in having the genital arch not extending to the level of epimerites IIIa, the terminal lamellae symmetrical with pennate venation and by the absence of the paragenital apodemes in males, and in having a longer lobar region (78–88 µm) in females. *Proctophyllodes cyanopicae* belongs to the *musicus* group and is readily distinguished from the most similar species, *P. picae* (Koch, 1841), in having the hysteronotal shield with well pronounced circular lacunae, and setae *g* situated closer to the level of setae *ps3* than to the genital arch tips in males, and in having the terminal cleft shaped as a longitudinal rectangle 50–55 µm long in females.

KEY WORDS: Feather mites, Proctophyllodidae, *Proctophyllodes*, Passeriformes, Russian Far East, systematics.

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INTRODUCTION

Proctophyllodes Robin, 1868 (Analgoidea: Proctophyllodidae) is the most species-rich genus among all feather mite families. To date, including the two new species described herein, the genus includes 177 species (Vitzthum 1922; Gaud and Mouchet 1957; Fritsch 1961; Atyeo and Braasch 1966; Gaud and Atyeo 1996; Mironov 2012, 2017; Mironov and OConnor 2014; Wang *et al.* 2014). Like most other representatives of the family Proctophyllodidae, members of the genus *Proctophyllodes* inhabit feathers with large and firm vanes (the remiges, greater coverts of the wings) and rectrices—where they are located in narrow corridors on the ventral surfaces of vanes. Mites of the genus *Proctophyllodes* are almost entirely restricted to birds of the order Passeriformes and have been recorded from representatives of 50 passerine families (as classified by Gill and Donsker 2019). There are only three *Proctophyllodes* species that do not occur on passerines, each of which is associated with a particular host group from the orders Apodiformes (Trochilidae), Charadriiformes (Scolopacidae: *Scolopax*) and Piciformes (Picidae: *Jynx*) (Atyeo and Braasch 1966; Kanegae *et al.* 2008; Mironov 2012; Yamasaki *et al.* 2018).

The latest taxonomic revision of *Proctophyllodes* carried out by Atyeo and Braasch (1966) provided (re)descriptions of all 121 species known at that time according to a uniform scheme and supplied them with a detailed synonymy and host-association data. This fundamental monograph is

the main publication on systematics of this genus and presently is the only key for identification of its species. An updated world checklist of 162 *Proctophyllodes* species and exhaustive references to papers, containing descriptions of new species published after the revision by Atyeo and Braasch (1966), were presented by Mironov (2012). In the subsequent years, only thirteen new species were added to the world fauna (Mironov and OConnor 2014; Wang *et al.* 2014; Mironov 2017; Mironov *et al.* 2017). Several new species were also illustrated in the thesis work by Su (2014), but their names are *nomina nuda* and unavailable.

The systematics of the genus *Proctophyllodes*, including its subdivision into species groups and species identification, is almost completely based on the structures of the opisthosoma and genital region in males, while features of females serve only as an additional complex of characters. Atyeo and Braasch (1966) proposed a subdivision of this vast genus into ten species groups based on morphological characteristics of males. Since then, two more species groups, *caulifer* and *mecistocaulus*, have been established within this genus (Gaud and Fain 1990; Mironov and Kopij 1996).

The genus *Proctophyllodes* is one of a few feather mite genera, in which inter- and intra-genic phylogenetic relationships have been analyzed based on molecular data. Recent phylogenetic studies, based on six genes of 133 proctophyllodid taxa (Klimov *et al.* 2017a, 2017b), have

shown that *Proctophyllodes* is one of the most derived genera constituting the crown of the subfamily Proctophyllodinae and confirmed monophyly of most species groups, previously established by classical taxonomic methods. Nevertheless, these works have expectedly shown that this genus appears paraphyletic in relation to the much less species-rich but morphologically highly derived proctophyllodine genera *Monojoubertia* Radford, 1950 and *Joubertophyllodes* Atyeo et Gaud, 1971. In addition, these phylogenetic studies revealed several lineages, deserving of treatment as new species-groups, and re-arranged the species composition of some groups previously established by Atyeo and Braasch (1966).

The present work continues an ongoing investigation of the diversity and taxonomy of feather mites associated with passerines in the Russian Far East (Mironov 2011; Mironov *et al.* 2012), a region of Russia that is almost unexplored in this aspect, and provides descriptions of two new *Proctophyllodes* species found on two passerine species that are common in this area.

MATERIALS AND METHODS

The material used in the present work was collected in the course of parasitological surveys conducted in Primorye Territory, the most south-eastern area of the Russian Far East, during autumn migrations of birds in 2007, 2016 and 2019. Passerine birds were captured with mist-nets, then identified, banded and finally checked for the presence of feather mites and other ectoparasites. Live birds were briefly placed under a stereomicroscope, and the detected feather mites were collected with a preparation needle or fine forceps and fixed in tubes with 96% ethanol. After processing, the captured birds were released back to the wild. In the laboratory, feather mites were mounted on slides in Hoyer's medium according to the standard technique for small mites (Krantz and Walter 2009). Investigation of the mite specimens and drawings were made using Leica DM 2500 and DM 5000B light microscopes equipped with DIC illumination and a camera lucida.

The description of species and measuring techniques follow the current schemes used for proctophyllodine feather mites (Hernandes *et al.* 2007; Badek *et al.* 2008; Mironov and González-Acuña 2009; Mironov 2012, 2017; Mironov *et al.* 2012, 2017). General morphological terms, as well as leg and idiosomal chaetotaxy follow Gaud and

Atyeo (1996) with minor corrections to the nomenclature of coxal setae by Norton (1998). All measurements are in micrometres (µm). The measuring techniques used for some structures are included in the descriptions.

The taxonomic system and scientific names of birds follow Gill and Donsker (2019). Abbreviations used in collection numbers and type material depositories include the following: BMOC—Museum of Zoology of the University of Michigan, Ann Arbor, USA; ZISP and SVM—Zoological Institute of the Russian Academy of Sciences, Saint-Petersburg, Russia.

SYSTEMATICS

Family **Proctophyllodidae Trouessart et Mégnin, 1884**

Subfamily **Proctophyllodinae Trouessart et Mégnin, 1884**

Genus ***Proctophyllodes* Robin, 1868**

***Proctophyllodes bochkovi* sp. n.**

(Figs. 1–4)

Type material. Male holotype (ZISP 8473), 9 male and 10 female paratypes (ZISP 8474–8492) from *Cyanoptila cyanomelana* (Temminck, 1829) (Muscicapidae) (SVM-07-0826-8), Russia, Primorye Territory, Partizansky District, Novolitovsk, 9 km N, 42°51'40"N; 132°53'5.5"E, 26 August 2007, leg. S.V. Mironov.

Depository. Male holotype, 6 male and 6 female paratypes—ZISP, remaining paratypes—BMOC.

Additional material. 9 males and 9 females (ZISP 8493–8510) from *Cyanoptila cyanomelana* (SVM-07-0916-3/1), Russia, Primorye Territory, Partizansky District, Novolitovsk, 9 km N, 42°51'40"N; 132°53'5.5"E, 16 September 2007, leg. S.V. Mironov; 8 males and 8 females (ZISP 8512–8527) from *C. cyanomelana* (SVM-19-0815-3/1), Russia, Primorye Territory, Anuchinsky District, Vinogradovka, 2 km N, 43°46'50.5"N, 132°56'01.3"E, 15 August 2019, leg. S.V. Mironov.

Description. *Male* (holotype, range for 9 paratypes in parentheses) (Figs. 1, 3A–D, 4A–D). Idiosoma, length × width, 285 (275–290) × 145 (145–150); length of hysterosoma 175 (175–185). Prodorsal shield: setae *vi* absent, anterolateral extensions short and rounded, lateral margins with shallow incisions not encompassing bases of setae *se*, posterior corners rounded, posterior margin slightly concave, greatest length 75 (72–80), greatest width at posterior margin 87 (85–95), surface without

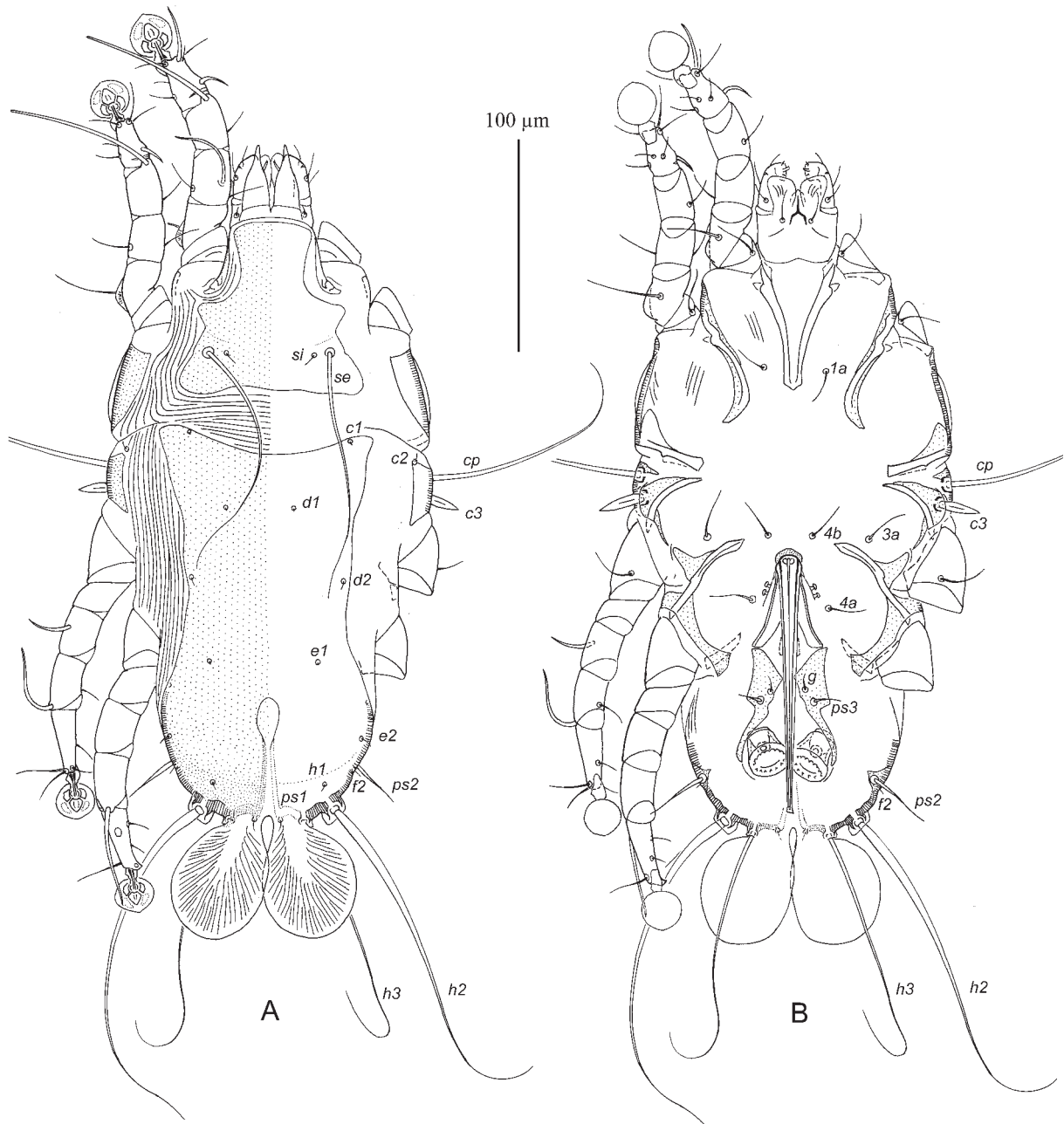


Fig. 1. *Proctophyllodes bochkovi* sp. n., male. A—dorsal view, B—ventral view.

ornamentation. Distance between bases of scapular setae *se* 57 (55–60). Scapular shields wide. Humeral shields well developed, not fused with epimerites III, touching bases of setae *cp*. Setae *c2* situated on anteromedial angles of humeral shields or off them. Subhumeral setae *c3* narrowly lanceolate, 17 (15–18) long, about 5 wide. Hysteronotal shield: anterior margin slightly concave, anterior corners acute and slightly extending laterally, length 175 (170–185), width at anterior margin 100 (92–100), surface without ornamentation. Distance between prodorsal and hysteronotal shields along midline 30 (23–30). Supranal concavity opened terminally,

anterior end extending to midlength between levels of setae *e1* and *e2*, length from anterior end to bases of setae *ps1* 60 (52–60). Posterior end of opisthosoma (posterior to setae *ps2*) rounded. Terminal lamellae widely ovate, slightly longer than wide, slightly overlapping by inner margins, with pennate venation; length of lamellae 52 (50–55), greatest width 42 (40–45). Distance between bases of lamellae about 5. Setae *ps1* minute. Distances between hysteronotal setae: *c2*:*d2* 55 (55–60), *d2*:*e2* 72 (70–75), *e2*:*h3* 40 (38–48), *d1*:*d2* 32 (30–35), *e1*:*e2* 35 (30–38), *h1*:*h3* 20 (17–20), *h2*:*h2* 63 (60–65), *h3*:*h3* 35 (32–38), *ps2*: *ps2* 82 (80–85).

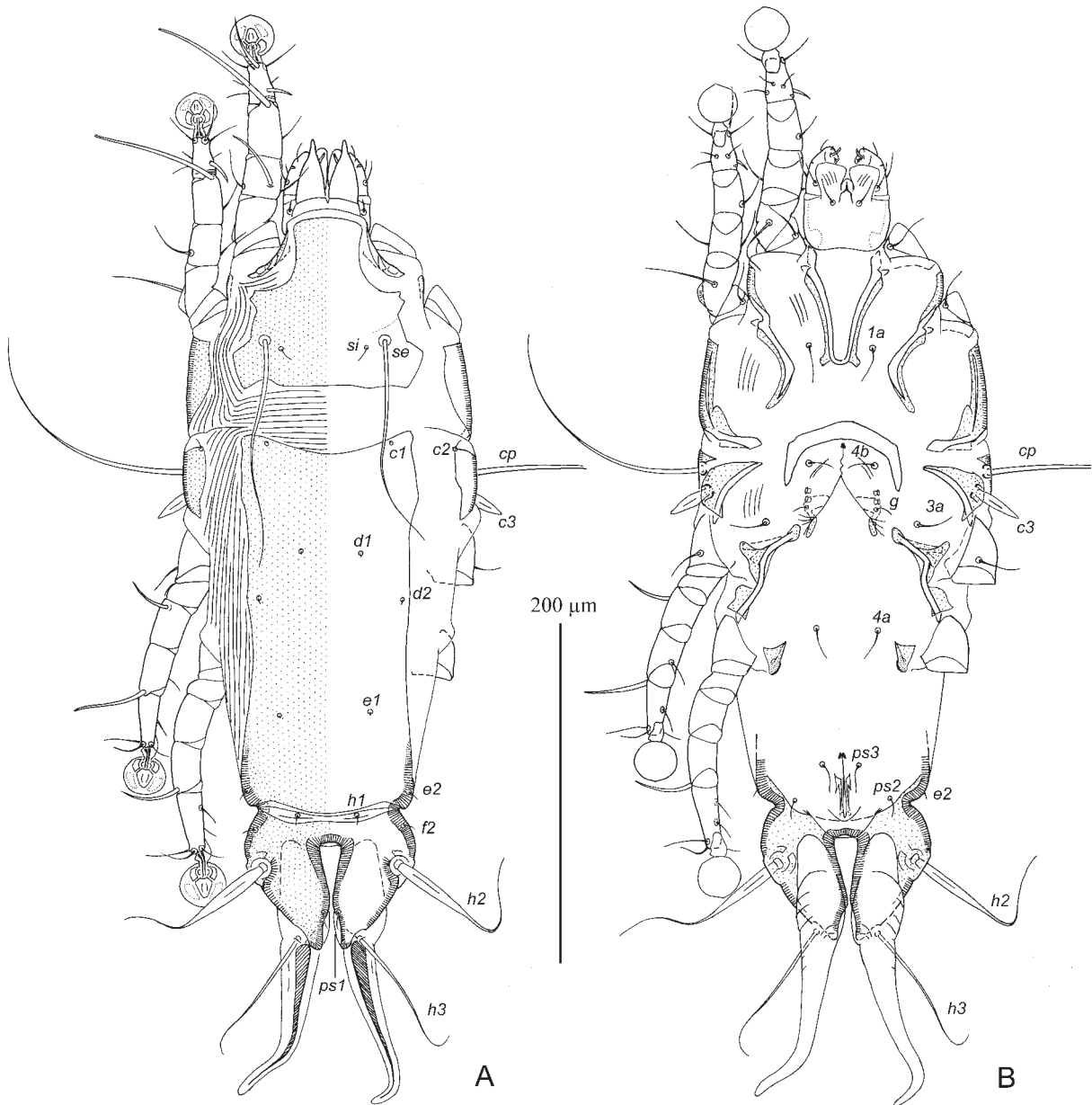


Fig. 2. *Proctophyllodes bochkovi* sp. n., female. A—dorsal view, B—ventral view.

Epimerites I fused into a narrow U, without lateral extensions. Epimerites IVa well developed, bases of trochanters IV flanked by entire sclerotized band. Setae 4b and 3a situated at same transverse level, slightly anterior to level of inner tips of epimerites IIIa. Genital arch elongated, 42 (40–44) in length, 35 (32–38) in width at base, apex slightly extending to midlevel of trochanters IV and not extending beyond epimerites IIIa tips, base at midlevel of trochanters IV. Aedeagus long sword-like, completely wrapped in genital sheath, reflected rearward from genital arch apex and almost extending to level of setae h2, 120 (115–120) in length; genital sheath slightly longer than aedeagus, mo-

notonously attenuate apically, with asymmetric apex (Figs. 1B, 3A, B). Distance from genital arch apex to level of setae ps1 100 (95–105). Setae 4a situated at midlevel of genital arch apex. Genital papillae at level of anterior half of genital arch, bases of papillae not connected. Paragenital apodemes absent. Epiandrum present, with short acute tips rarely extending to genital papillae. Opisthogastric shield represented by a pair of long longitudinal sclerites widely separated from each other; anterior part of these sclerites wide, with anterior adjoining genital arch tips, and with distinct lateral extension of variable shape (simply rectangular, claw-shaped or long bow-shaped; Figs. 3A–D); posterior ends

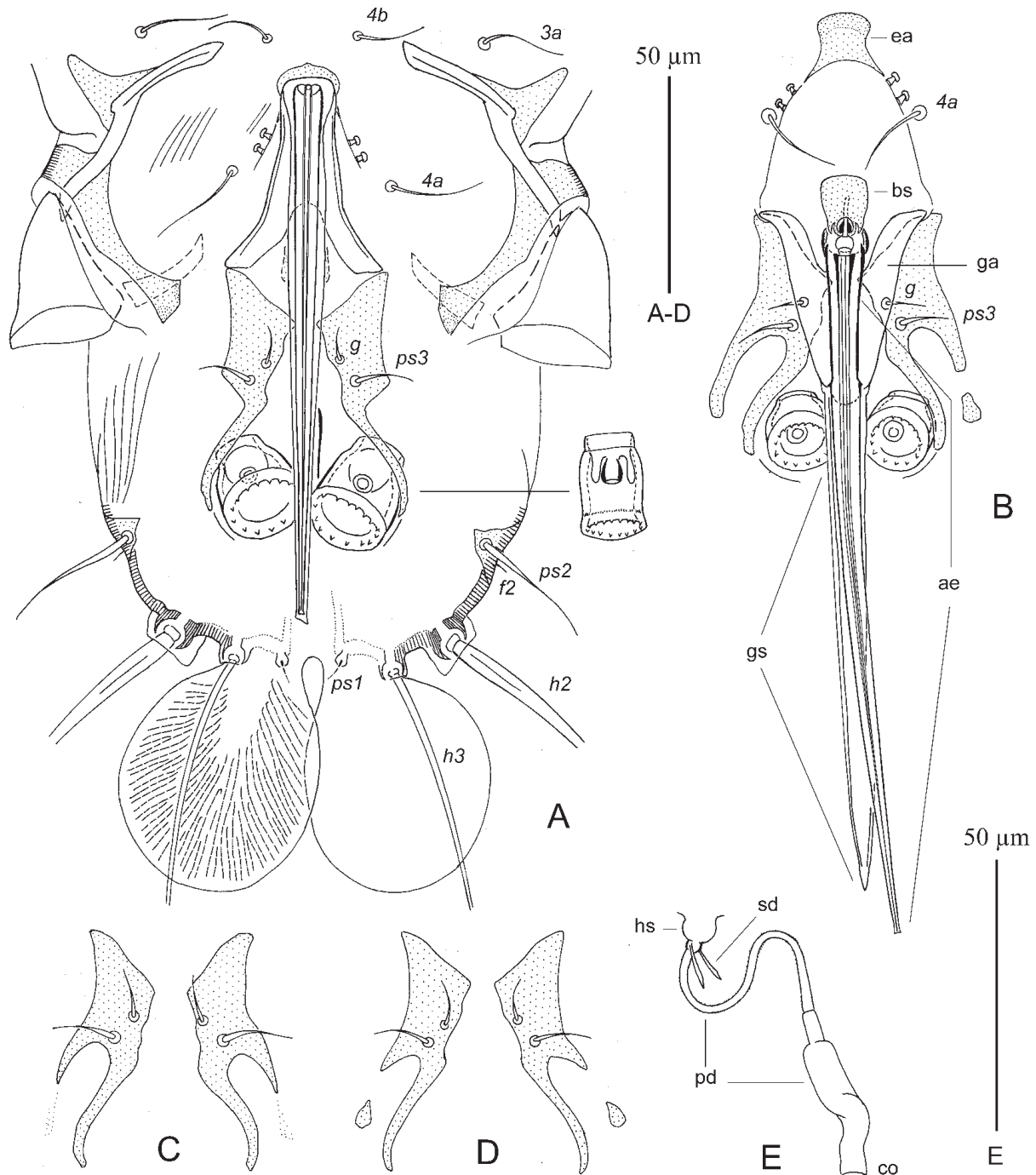


Fig. 3. *Proctophyllodes bochkovi* sp. n., details of genital apparatus. A—ventral view of male opisthosoma, B—genital apparatus of male in protruded position, C, D—variation of opisthogastric shield in male, E—spermatheca and spermaducts. Abbreviations: ae—aedeagus, bs—basal sclerite, co—copulatory opening, ea—epiandrum, ga—genital arch, gs—genital sheath, hs—head of spermathecal, pd—primary spermaduct, sd—secondary spermaduct.

of opisthogastric sclerites narrow bow-shaped, flanking adanal suckers laterally; greatest length of sclerites 58 (50–58), distance between outer margins of their anterior ends 37 (35–40). Accessory and postanal sclerites absent. Setae *g* and *ps3* in trapezoidal arrangement, both situated on opisthogastric shields. Adanal suckers cylindrical, slightly en-

larged apically, 25 (22–26) in length, 20 (19–22) in width at base, corolla with 15–17 small denticles. Distances between setal bases: *g:g* 17 (16–18), *g:ps3* 5 (5–6), *ps3:ps3* 25 (25–28), *4b:4a* 32 (30–34), *4a:g* 38 (37–42), *ps3:h3* 65 (62–65).

Femora I and II without noticeable ventral crests. Genual solenidia σ II and σ III situated

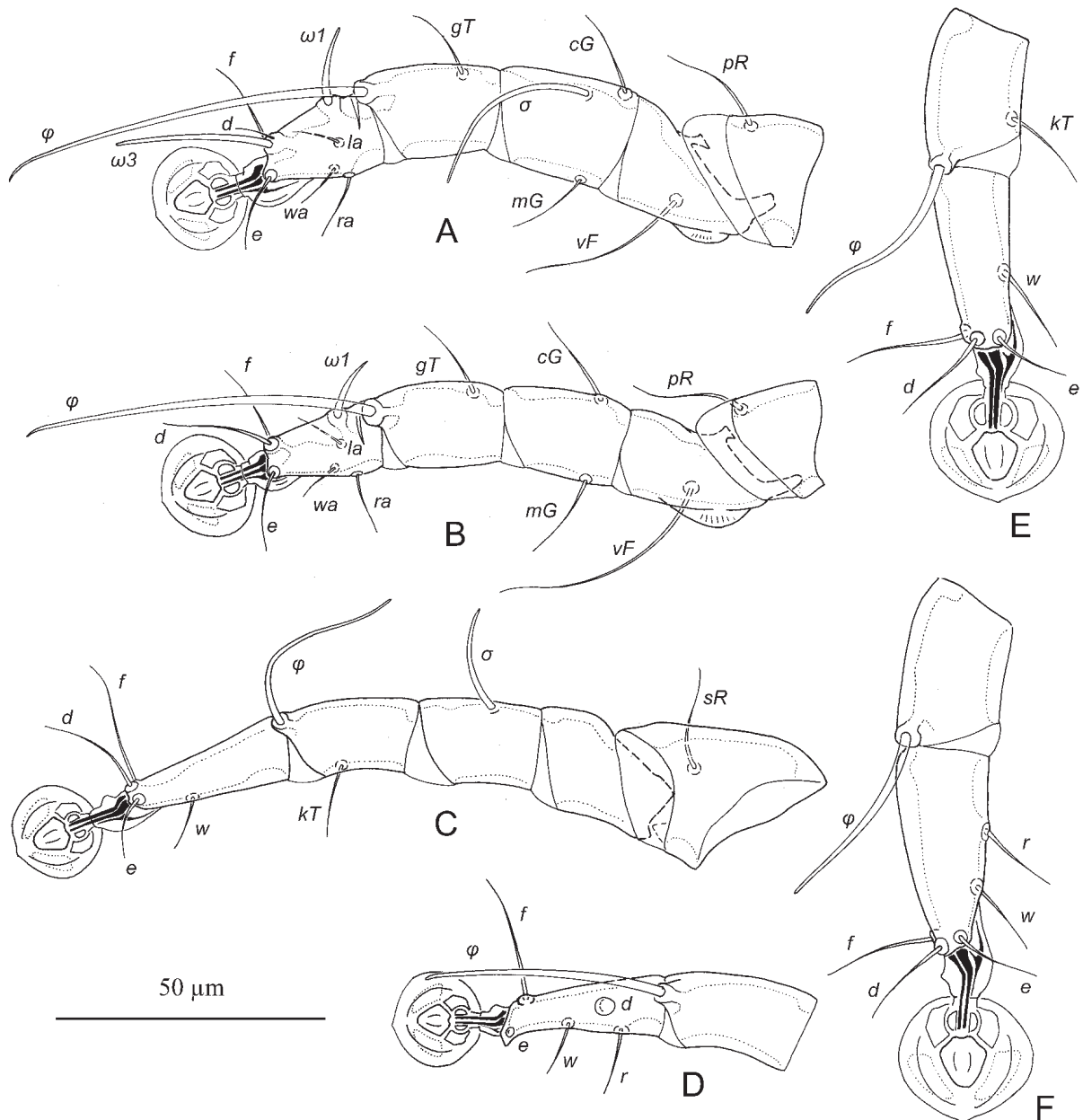


Fig. 4. *Proctophyllodes bochkovi* sp. n., details. A–C—legs I–III of male, respectively, D—tibia and tarsus IV of male, E, F—tibiae and tarsi III, IV of female, respectively.

slightly closer to bases of corresponding segments (Fig. 4A, C). Tarsus IV 30 (30–34) long, with angular hook-like apical extension; button-shaped seta *d* situated in basal half of this segment and approximately two times larger in diameter than seta *e* (Fig. 4D). Length of solenidia: σ I 35 (35–43), σ III 18 (17–20), ϕ IV 45 (40–45).

Female (10 paratypes; Figs 2, 3E, 4E, F). Idiosoma, length $\times$ width, 410–445, width 165–185, length of hysterosoma 285–315. Prodorsal shield: setae *vi* absent, anterolateral extensions short and usually bidentate, lateral margins with shallow incisions, posterior corners obliquely cut, poste-

rior margin almost straight or slightly sinuous, greatest length 90–105, width 105–115 (Fig. 2A). Distance between scapular setae *se* 67–75. Scapular shields wide. Humeral shields not fused with epimerites III, touching bases of setae *cp*. Setae *c2* situated in anteromedial angles of humeral shields. Subhumeral setae *c3* narrowly lanceolate, 20–22 long, 6–7.5 wide. Distance between prodorsal and hysteronotal shields 35–40. Lobar region of opisthosoma distinctly separated from remaining part of hysterosoma, hysteronotal shield split into anterior and lobar parts by narrow transverse furrow but connected ventrolaterally by narrow bands.

Anterior hysteronotal shield roughly rectangular, 205–225 in length, 95–105 in width, with anterior margin shallowly concave, with posterior margin slightly convex, surface without ornamentation. Lobar shield entire, with strongly convex lateral margins and without noticeable extensions bearing setae *h2*, 78–88 in length, 100–110 in width. Opisthosomal lobes attenuate apically, nearly twice as long as their width at base; terminal cleft narrow hourglass-shaped, 60–68 in length, 13–18 in width in anterior part. Supranal concavity absent. Setae *h1* on narrow band of soft tegument between anterior hysteronotal and lobar shields. Setae *ps1* on lateral margins of terminal cleft. Setae *h2* with enlargement in basal half and with long apical filament, 95–115 long, 7–7.5 wide; setae *h3* filiform, 75–95 long, about 3/4 the length of terminal appendages. Distance between dorsal setae: *c2:d2* 80–90, *d2:e2* 105–120, *e2:h2* 42–48, *h2:h3* 40–45, *d1:d2* 30–38, *e1:e2* 37–50, *h1:h2* 30–35, *h2:ps1* 24–32, *h1:h1* 35–38, *h2:h2* 80–85.

Epimerites I shaped as in males, with short lateral extensions. Epimerites IVa small triangular. Epigynum nearly semicircular, tips almost extending to level of genital papillae, lateral extensions not developed, length 32–40, width 68–75. Copulatory opening situated immediately posterior to anal opening and covered with posterior ends of anal flaps. Head of spermatheca as small spheroid; secondary spermaducts 6–8 long, situated on small spherical enlargement of proximal end of primary spermaduct; proximal half of primary spermaduct narrow; distal half of primary spermaduct nearly 3 times wider than proximal one, transitional piece shaped like the neck of a bottle (Fig. 3E). Translobar apodemes wide, connected to each other anterior to terminal cleft. Setae *ps2* situated at level of posterior half of anal opening and widely separated from each other; distance between pseudanal setae: *ps2:ps2* 55–58, *ps3:ps3* 20–24, *ps2:ps3* 20–23.

Legs I and II as in males, femur II with narrow ventral crests. Genua solenidion σ III situated in basal part of segment. Length of solenidia: σ I 42–48, σ III 22–25, ϕ III 40–45, ϕ IV 32–35. Legs IV with ambulacral discs extending slightly beyond level of setae *h2*.

Differential diagnosis. *Proctophyllodes bochkovi* sp.n. belongs to the *caulifer* species group (Mironov and Kopij 1996; Klimov *et al.* 2017a) in having the genital organ (aedeagus wrapped in genital sheath) very long and extending to or beyond the posterior end of the body and by the absence of reniform accessory sclerites in males.

Within this group, the new species is most similar to *P. cotyledon* (Trouessart, 1899), which is associated with various muscicapids and timaliids in the following: in males, the epiandrium is present, the genital organ almost reaches to the posterior end of the body, and the terminal lamellae are widely lanceolate; in females, the terminal cleft is shaped as a narrow hourglass. *Proctophyllodes bochkovi* sp.n. differs from *P. cotyledon* in the following features. In males, the genital arch does not extend to the level of epimerites IIIa tips, the paragenital apodemes are absent, the corolla of adanal sucker bears 15–17 denticles, and the terminal lamellae are symmetrical and have pennate venation. In females, the lobar region is longer (78–88) and the anterolateral extensions of the prodorsal shield are bidentate or blunt. In males of *P. cotyledon*, the genital arch extends beyond the level of epimerites IIIa tips and even to setae *4b*, the paragenital apodemes are present and fused with the epiandrium, each adanal sucker has numerous denticles (20–28), and the terminal lamellae are asymmetrical, cordiform, with outer margin strongly convex and with palmate venation. In females, the lobar region is about 70 long and the anterolateral extensions of the prodorsal shield are acute.

Remarks. 1. The closest species, *Proctophyllodes cotyledon*, was described by Trouessart (1899: 39) from a single male collected from the California Thrasher *Toxostoma redivivum* (Gambel, 1845) (Mimidae) in Brazil. This mite, with very characteristic features, such as the genital apparatus extending to the posterior margin of the body and the terminal lamellae resembling the embryonic seed leaf of plants (Lat. *cotyledon*), has never been recollected from the type host or from any other species of mockingbirds. Contrary, this species was further reported from many genera of flycatchers (Muscicapidae: *Copsychus*, *Enicurus*, *Muscicapa*, *Phoenicurus*, *Saxicola*, and *Tarsiger*), babblers (Timaliidae: *Stachyris*) and even fantails (Rhipiduridae: *Rhipidura*) in the Old World, from Europe to Malaya (Gaud 1957; Vassilev 1958; Fritsch 1961; Atyeo and Braasch 1966). Vassilev (1958) and Fritsch (1961) independently described two new species, *Proctophyllodes dontchevi* Vassilev, 1958 and *P. cardifolius* Fritsch, 1961, respectively, also having these distinctive characteristics. Both mite species were collected from the Black Redstart *Phoenicurus ochruros* (Gmelin, SG, 1774) in Europe. The description by Fritsch (1961: 6–10, figs. 2c, d, 3–5) included very careful and detailed illustrations. In their revision of the genus *Procto-*

phylloides, Atyeo and Braasch (1966) synonymized *P. dontchevi* and *P. cardifolius* with *P. cotyledon* and concluded that the primary record from *T. redivivum* was obviously a museum contamination, and that this mite species is distributed on muscicapids and related taxa in the Old World. Atyeo and Braasch (1966) examined many samples that referred to *P. cotyledon*, including the type specimen, and noted a morphological variability between the mites collected from different hosts and areas of the Old World. These differences consisted in the presence and the pattern of lacunae on dorsal shields in both sexes and as well in the size of terminal lamellae in males. Nevertheless, these authors were not able to determine the most likely host of the *P. cotyledon* type specimen. In their redescription of *P. cotyledon*, the drawing of the male was based on the holotype of this species (from *T. redivivum*), but that for the female was based on the paratype of *P. dontchevi*. From the modern point of view, it is quite clear that Atyeo and Braasch certainly dealt with a complex of closely related species. It is necessary to note that the drawing of the *P. cotyledon* male provided by these authors does not completely correspond to that of *P. cardifolius* from *Phoenicurus ochruros* given by Fritsch (1961) and to the specimens from this host deposited in the collection in the Zoological Institute (ZISP), in particular with regard to the lateral contour of the opisthogastric shields. This allows the conclusion that the type specimen of *P. cotyledon* was not from *Ph. ochruros* but from some other as yet undetermined host. In the differential diagnosis above, *P. bochkovi* was compared with the specimens of *P. cotyledon* from *Ph. ochruros*, the most common host of this species in Europe.

2. *Proctophyllodes bochkovi* was also found on *Cyanoptila cyanomelana* in South Korea (personal communication of Y.-D. Han, Inha University, Incheon, South Korea).

Etymology. The species is named after Andrei (André) Vladimirovich Bochkov (1968–2018)—a world-renowned acarologist and my very good friend and colleague, who passed away so early.

***Proctophyllodes cyanopicae* sp. n.**

(Figs. 5–7)

Type material. Male holotype (ZISP 8528), 10 male and 11 female paratypes (ZISP 8529–8549) from *Cyanopica cyanus* (Pallas, 1776) (Corvidae) (SVM-07-0828-8), Russia, Primorye Territory, Partizansky District, Novolitovsk, 9 km N, 42°51'40"N; 132°53'5.5"E, 28 August 2007, leg. S.V. Mironov.

Depository. Male holotype, 8 male and 8 female paratypes—ZISP, remaining paratypes—BMOC.

Additional material. 4 males and 4 females (ZISP 8461–8467) from *Cyanopica cyanus* (SVM-16-0829-2), Russia, Primorye Territory, Ussuriysky district, Aleksey-Nikolskoye, 3 km S, 43°48'49.8"N 131°32'30"E, 29 August 2016, leg. S.V. Mironov; 15 males and 20 females (ZISP 8550–8584) from *C. cyanus* (SVM-19-0824-1/1), Russia, Primorye Territory, Spassky District, Gayvoron, 44°45'04"N, 132°46'50"E, 24 August 2019, leg. S.V. Mironov.

Description. *Male* (holotype, range for 8 paratypes in parentheses) (Figs. 5, 6A–D). Idiosoma, length × width, 265 (260–280) × 135 (135–160); length of hysterosoma 170 (160–175). Prodorsal shield: setae *vi* absent, anterolateral extensions short and acute, lateral margins with shallow incisions not encompassing setae *se*, posterior corners obliquely cut, posterior margin with wide and short median extension, greatest length 75 (72–78), greatest width at posterior margin 80 (72–80), surface without ornamentation. Distance between bases of scapular setae *se* 55 (52–65). Scapular shields wide. Humeral shields well developed, not fused with epimerites III, touching bases of setae *cp*. Setae *c2* situated in anteromedial angles of humeral shields. Subhumeral setae *c3* narrowly lanceolate, 17 (15–18) long, about 5 (4–5) wide. Distance between prodorsal and hysteronotal shields 23 (22–28). Hysteronotal shield: anterior margin slightly concave, anterior corners acute and slightly extending laterally, length 175 (165–180), width at anterior margin 90 (85–95), entire surface with numerous circular and ovate lacunae, up to 5 in diameter. Supranal concavity opened terminally, anterior end extending slightly beyond level of setae *e2*, length from anterior end to bases of setae *ps1* 38 (37–42). Posterior end of opisthosoma between setae *e2* roughly trapezoidal. Terminal lamellae ovate, with widely rounded posterior margin, slightly overlapping by inner margins, with pennate venation; length of lamellae 48 (37–50), greatest width 35 (30–38). Distance between bases of lamellae about 2.5. Setae *ps1* minute. Distances between hysteronotal setae: *c2:d2* 63 (62–65), *d2:e2* 65 (62–65), *e2:h3* 35 (32–38), *d1:d2* 35 (32–38), *e1:e2* 35 (20–40), *h1:h3* 25 (22–26), *h2:h2* 55 (52–60), *h3:h3* 38 (34–38), *ps2: ps2* 65 (62–70).

Epimerites I fused into a narrow U, without lateral extensions. Epimerites IVa well developed, bases of trochanters IV not flanked by sclerotized band. Setae *4b* situated posterior to level of tips of

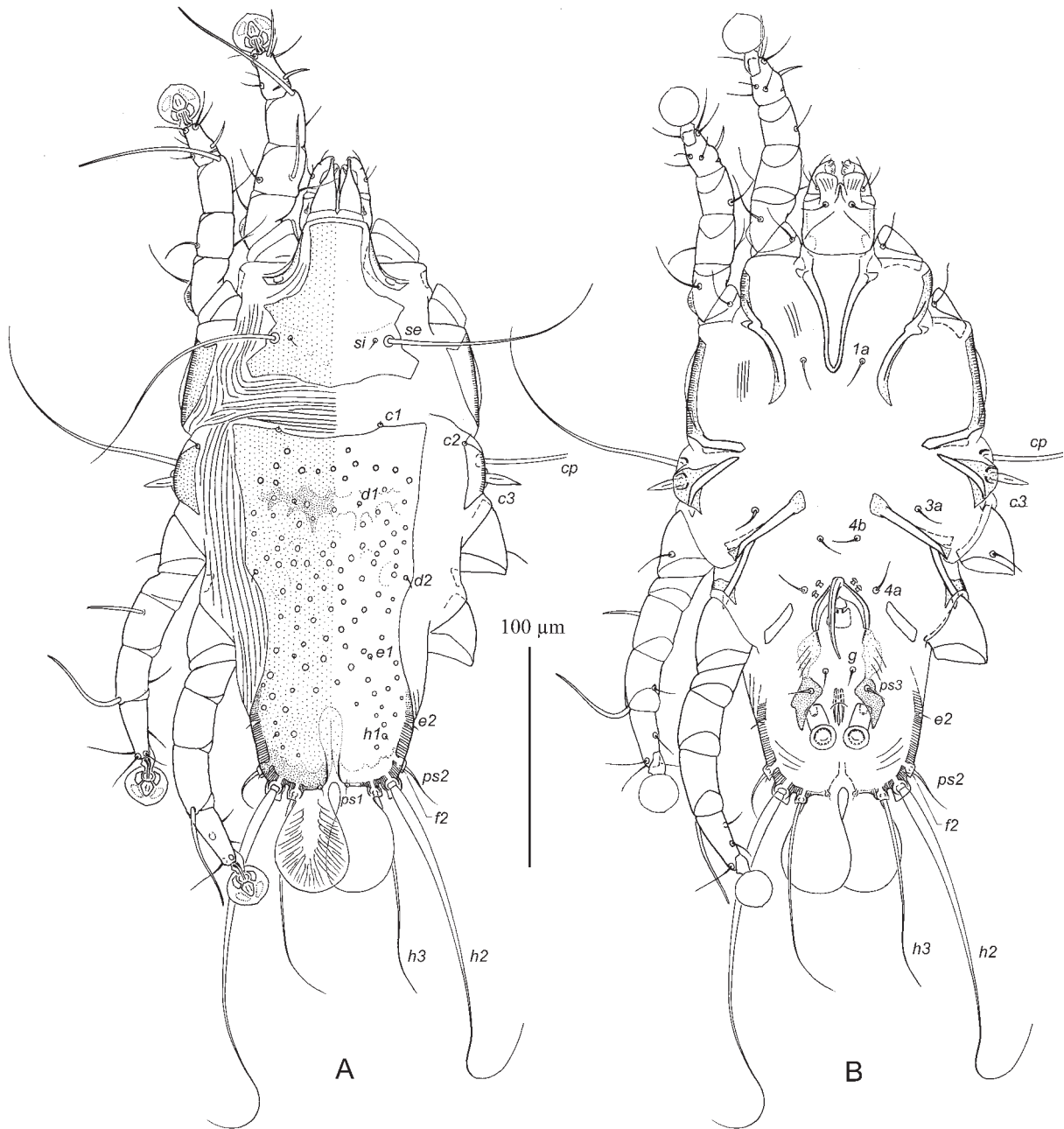


Fig. 5. *Proctophyllodes cyanopicae* sp. n., male. A—dorsal view, B—ventral view.

epimerites IIIa and setae 3a. Genital arch of moderate size, 25 (25–88) in length, 28 (25–28) in width, genital arch apex slightly extending beyond level of anterior margins of trochanters IV, base of genital arch at midlevel of trochanters IV. Aedeagus stylet-like, completely wrapped in genital sheath, slightly curved, reflected rearward immediately from genital arch apex, almost extending to setae g, 25 (24–26) in length; genital sheath strongly tapering apically and equal in length to aedeagus (Fig. 7A). Distance from genital arch apex to level of setae *ps1* 98 (97–110). Setae 4a and genital papillae situated at level of genital arch apex.

Bases of genital papillae not connected. Paragenital apodemes absent. Epiandrum absent. Opisthogastric shield: represented by a pair of longitudinal sclerites with irregular margins and widely separated from each other, anterior ends of these sclerites adjoining genital arch tips, posterior halves of opisthogastric sclerites noticeably more strongly sclerotized than anterior ones, posterior ends extending to and laterally flanking adanal suckers; greatest length of sclerites 42 (42–50), distance between outer margins of their anterior parts 38 (35–40). Setae g and *ps3* in trapezoidal arrangement; setae *ps3* situated on opisthogastric shields,

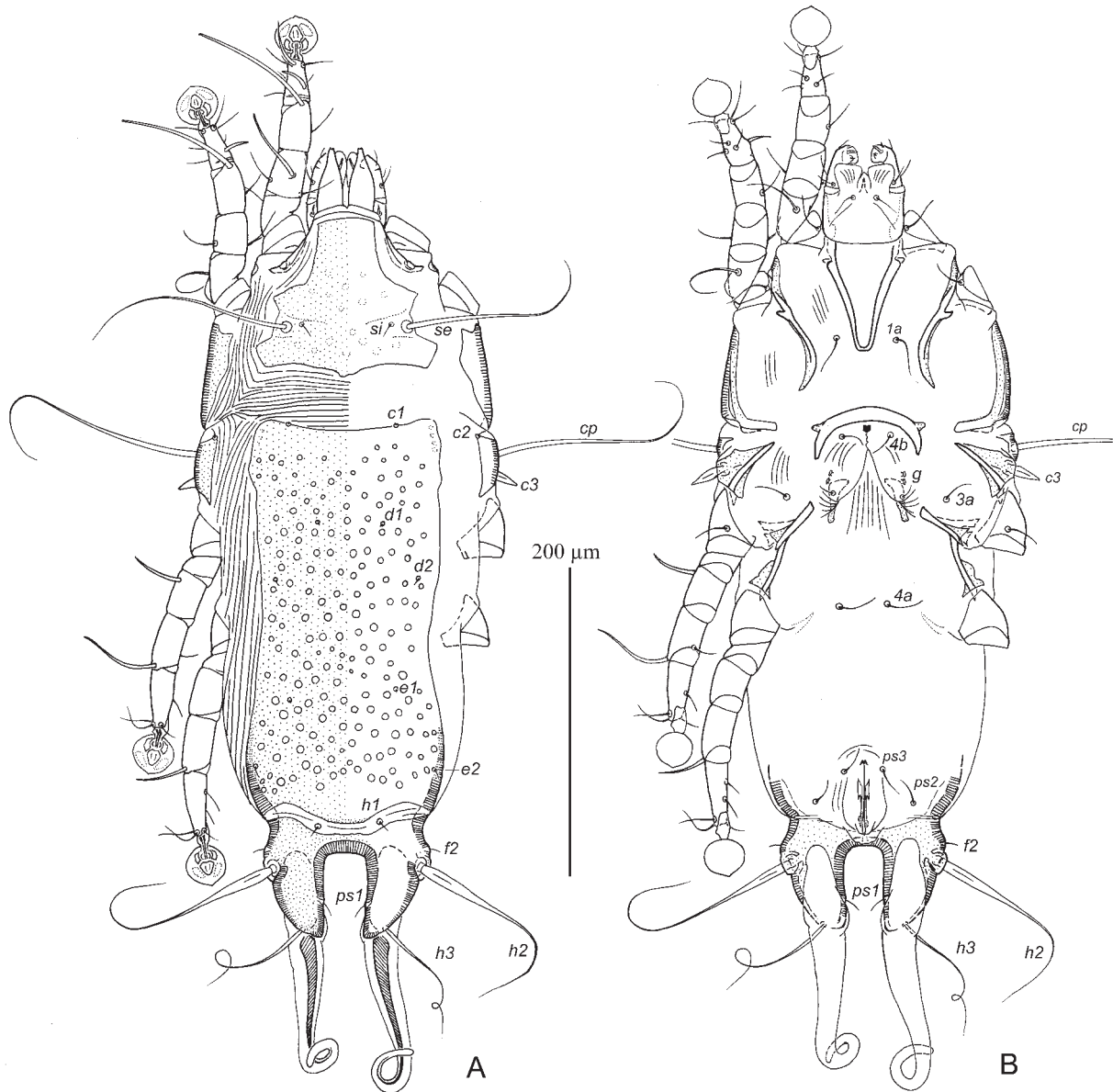


Fig. 6. *Proctophyllodes cyanopicae* sp. n., female. A—dorsal view, B—ventral view.

setae *g* on soft tegument between these shields. Adanal suckers cylindrical, 25 (22–26) in length, 13 (11–13) in width; corolla thickened, with 14–16 small denticles. Accessory and postanal sclerites absent. Distances between setal bases: *g:g* 12 (10–13), *g:ps3* 8 (7.5–10), *ps3:ps3* 25 (22–26), *4b:3a* 25 (23–27), *4b:4a* 15 (10–15), *4a:g* 38 (34–38), *ps3:h3* 50 (50–55).

Femora I and II without noticeable ventral crests. Genua solenidia σ /I and σ /III situated slightly closer to bases of corresponding segments (Fig. 7B, C). Tarsus IV 30 (30–35) long, without apical process; button-shaped seta *d* situated at midlevel of this segment and approximately 2 times larger in diameter than button-shaped seta *e* (Fig.

7E). Length of solenidia: σ /I 25 (25–30), σ /III 18 (17–20), ϕ /IV 43 (42–45).

Female (10 paratypes; Figs. 6, 7G, F): Idiosoma, length $\times$ width, 465–480 $\times$ 190–205, length of hysterosoma 320–330. Prodorsal shield shaped as in males, 100–105 long, 115–125 long, surface can bear barely distinct lacunae (Fig. 6A). Distance between bases of scapular setae *se* 78–85. Scapular shields wide. Humeral shields not fused with epimerites III, touching bases of setae *cp*. Setae *c2* situated in anteromedial angles of humeral shields. Subhumeral setae *c3* lanceolate, 20–23 long, 7–7.5 wide. Lobar region of opisthosoma separated from remaining part of hysterosoma, hysteronotal shield split into anterior and lobar

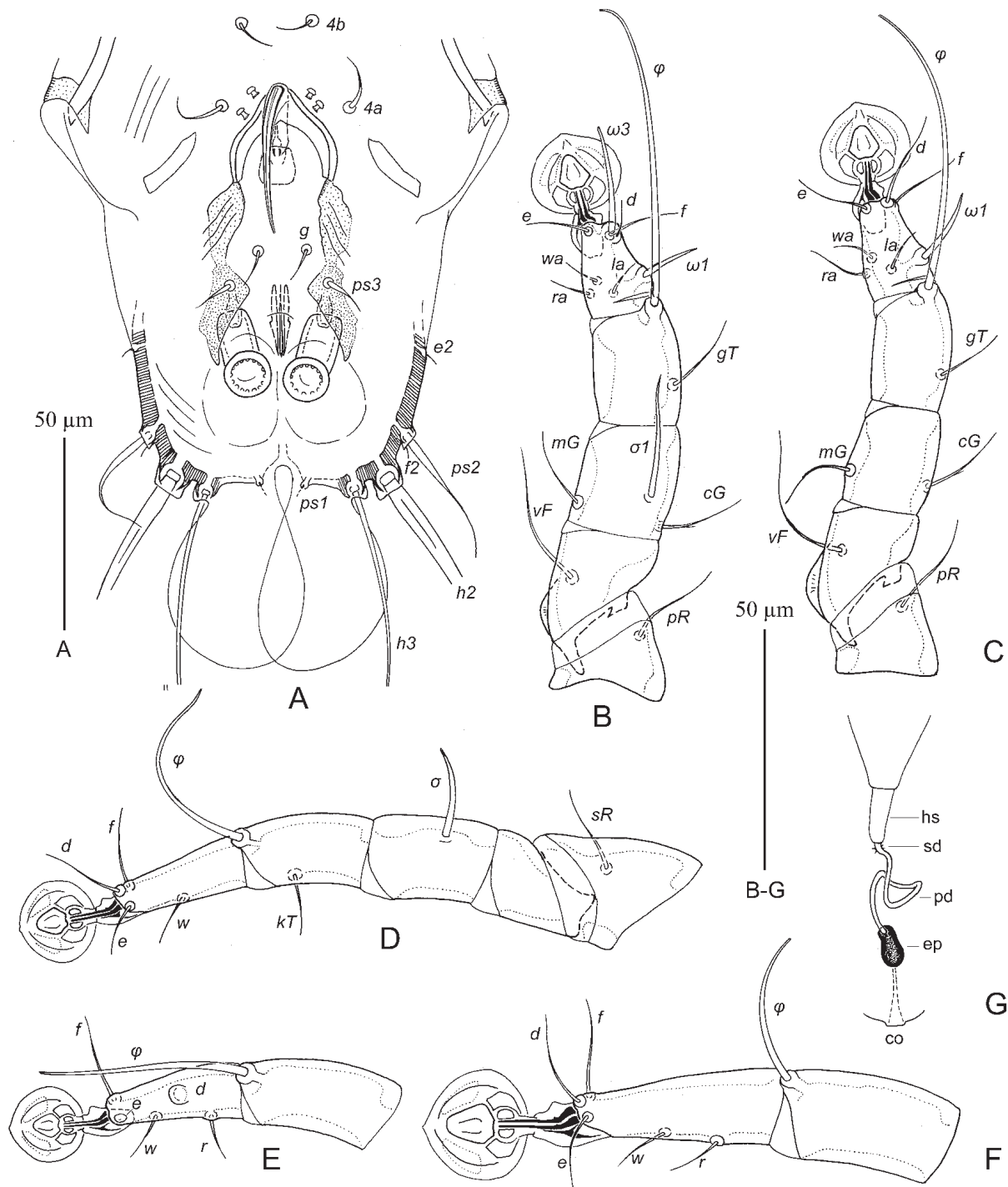


Fig. 7. *Proctophyllodes cyanopicae* sp. n., details. A—ventral view of male opisthosoma, B–D—legs I–III of male, respectively, E—tibia and tarsus IV of male, F—tibia and tarsus IV of female, G—spermatheca and spermaducts. Abbreviations: co—copulatory opening, ep—enlargement of primary spermaduct, hs—head of spermathecal, pd—primary spermaduct, sd—secondary spermaduct.

parts by narrow transverse furrow, but remains connected ventrolaterally by narrow sclerotized bands. Distance between prodorsal and hysteronotal shield 30–45. Anterior hysteronotal shield roughly rectangular, 250–260 in length, 120–125 in width, anterior margin shallowly concave, pos-

terior margin slightly convex medially, entire surface with numerous circular and ovate lacunae up to 7 in diameter. Lobar shield entire, 77–83 in length, 105–115 in width at level of short lateral extensions. Opisthosomal lobes slightly narrowed apically, with length 1.2–1.3 times exceeding their

width at base; terminal cleft rectangular, 50–55 in length, 27–30 in width in at level of setae *ps1*. Supranal concavity absent. Setae *h1* on narrow band of soft tegument between anterior hysteronotal and lobar shields. Setae *ps1* on lateral margins of terminal cleft. Setae *h2* with spindle-shaped enlargement in basal part and with long apical filament, 120–140 long, 7–7.5 wide; setae *h3* filiform, 85–100 long, about 2/3 the length of terminal appendages. Distance between dorsal setae: *c2:d2* 92–98, *d2:e2* 120–125, *e2:h2* 55–62, *h2:h3* 42–48, *d1:d2* 35–40, *e1:e2* 50–58, *h1:h2* 27–30, *h2:ps1* 22–25, *h1:h1* 38–40, *h2:h2* 95–100.

Epimerites I shaped as in males. Epimerites IVa rudimentary, barely sclerotized. Epigynum short, nearly semicircular, tips not extending to level of genital papillae, lateral extensions well developed, length 32–40, width 70–75. Copulatory opening situated posterior to anal opening, near margin of terminal cleft. Head of spermatheca cylindrical; secondary spermaducts extremely short; distal part of primary spermaduct with ovate or pyriform fragment having strongly thickened and heavily sclerotized wall (Fig. 7G). Translobar apodemes wide, connected to each other anterior to terminal cleft. Setae *ps2* situated at level of posterior half of anal opening and widely separated from each other; distance between pseudanal setae: *ps2:ps2* 65–65, *ps3:ps3* 25–27, *ps2:ps3* 17–23.

Legs I and II as in males, femur II with almost indistinct ventral crests. Genua solenidion σ III situated in basal part of segment. Length of solenidia: σ I 37–40, σ III 27–33, ϕ III 48–52, ϕ IV 30–35. Legs IV with ambulacral discs extending to level of setae *h2*.

Differential diagnosis. *Proctophyllodes cyanopicae* sp.n. belongs to the *musicus* species group (Atyeo and Braasch 1996) in having, in males, the opisthogastric shield split into two longitudinal widely separated pieces, the genital sheath of moderate length without terminal bifurcation and setae *ps3* situated on the opisthogastric shields. Within this group, the new species is most similar to *P. picae* (Koch, 1841) described from the Eurasian magpie *Pica pica* (Linnaeus, 1758) (Corvidae) in the following: in males, the anterior and posterior parts of the opisthogastric shield are weakly connected, and the genital sheath extends almost to the level of setae *g*; in females, the hysteronotal shield bears numerous ovate lacunae. *Proctophyllodes cyanopicae* differs from *P. picae* by the following features. In males of *P. cyanopicae*, the hysteronotal shield bears well defined ovate

lacunae, setae *g* are closer to the level of setae *ps3* than to the level of genital arch tips, the anterior ends of the opisthogastric shields lack triangular extensions, the adanal suckers have 15–17 denticles, and setae *c3* are narrowly lanceolate. In females of *P. cyanopicae*, the terminal cleft is rectangular, 50–55 long, and the lacunae on the anterior hysteronotal shield are large, up to 7 in diameter. In males of *P. picae*, lacunae on the hysteronotal shield are absent or barely distinct, setae *g* are situated either closer to the genital arch tips than to setae *ps3* or equidistant from these levels, the anterior ends of opisthogastric shields have anterolateral angular extensions, the adanal suckers bear 20–22 denticles, and setae *c3* are spiculiform. In females of *P. picae*, the terminal cleft is trapezoidal, slightly divergent posteriorly, 28–32 long, and the lacunae on the anterior hysteronotal shield are small, 2–3 in diameter.

Etymology. The specific epithet is derived from the generic name of the type host and is a noun in the genitive case.

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