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THREE NEW FEATHER MITES OF THE SUBFAMILY PTERODECTINAE (ACARI: PROCTOPHYLLODIDAE) FROM PASSERINES (AVES: PASSERIFORMES) IN VIETNAM

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ABSTRACT

Three new species of the feather mite family Pterodectinae (Proctophyllodidae) are described from passerines captured in the Cát Tiên National Park (Vietnam): *Montesauria malacopteroni* sp. nov. from *Malacopteron cinereum* Eyton (Pellorneidae), *Proterothrix cyornis* sp. nov. from *Cyornis tickelliae* Blyth (Muscicapidae), and *P. hypothymis* sp. nov. from *Hypothymis azurea* Boddaert (Monarchidae). Brief comments on systematics of the pterodectine genera *Montesauria* Oudemans, 1905 and *Proterothrix* Gaud, 1968 are given.

Key words: feather mites, Astigmata, Proctophyllodidae, systematics, host associations Passeriformes, Vietnam

ТРИ НОВЫХ ВИДА ПЕРЬЕВЫХ КЛЕЩЕЙ ПОДСЕМЕЙСТВА PTERODECTINAE (ACARI: PROCTOPHYLLODIDAE) С ВОРОБЬЕОБРАЗНЫХ (AVES: PASSERIFORMES) ВЬЕТНАМА

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РЕЗЮМЕ

Три новых вида перьевых клещей подсемейства Pterodectinae (Proctophyllodidae) описаны с воробьинообразных из Национального Парка Кат Тьен (Вьетнам): *Montesauria malacopteronis* sp. nov. с *Malacopteron cinereum* Eyton (Pellorneidae), *Proterothrix cyornis* sp. nov. с *Cyornis tickelliae* Blyth (Muscicapidae) и *P. hypothymis* sp. nov. с *Hypothymis azurea* Boddaert (Monarchidae). Даны краткие комментарии по систематике родов *Montesauria* Oudemans, 1905 и *Proterothrix* Gaud, 1968.

Ключевые слова: перьевые клещи, Astigmata, Proctophyllodidae, систематика, паразито-хозяйинные связи, Passeriformes, Вьетнам

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INTRODUCTION

Feather mites are a diverse and highly specialized grouping of commensal and parasitic astigmatan mites (Acritiformes: Astigmata: Psoroptidia) permanently living on birds. These mites, currently including about 2500 species in 450 genera and 34–38 families, are known from representatives of all recent bird orders. On the body of their hosts, the great majority of these mites occupy various microhabitats in the plumage; and a smaller number of them are specialized for living on the skin or in nasal cavities of birds (Gaud and Atyeo 1996; Dabert and Mironov 1999; Mironov 2003; Proctor 2003; Mironov and Proctor 2008; OConnor 2009; Schatz et al. 2011).

In the present paper we describe three new species of the family Proctophyllodidae (Astigmata: Analgoidea) from passerine birds (Passeriformes) from Vietnam. Representatives of this family are mostly distributed on two major taxonomic groups of hosts, passerines (Passeriformes) and hummingbirds (Apothiformes: Trochilidae), with a few species known from other non-passeriform orders (Park and Atyeo 1971a; Gaud and Atyeo 1996; Mironov 2006, 2009; Valim and Hernandez 2010). In the plumage of their hosts, most proctophyllodids inhabit the primary and secondary feathers of the wings and tail, where they are located in corridors on the ventral surface of the vane. The exceptions are several genera from the tribe Rhamphocaulini (Pterodectinae) inhabiting quills of flight feathers of hummingbirds (Park and Atyeo 1971b, 1972; Mironov 2009).

The feather mite fauna from birds of Vietnam, as for all countries of the Indo-Malayan region, has been explored so far quite poorly. Thus, in the most extensive study of feather mites of the Indo-Malayan region, Atyeo (1973) investigated a vast material from ten countries (Vietnam was not included) representing collections from over 590 avian species and identified to the species level only 95 mite species from 84 genera and 17 families, while a much greater number of potentially new species was determined only to the generic level. The first purposeful study of feather mites in Vietnam was carried out by Gaud and Petitot (1948), who summarized scattered publications of early investigators and described four new species. These authors also suggested the probable presence of 22 more species in this country. Subsequently, Mironov

(1990, 1992, 1993) described eleven new species and two new genera of the family Pteronyssidae, and Mironov and Rumyantsev (1993) provided a short report on feather mites from Northern Vietnam. A brief overview of previous investigations of feather mites in Vietnam and descriptions of nine new species from the family Proctophyllodidae were recently presented by Mironov et al. (2012). To date, the feather mite fauna of Vietnam has included 57 species belonging to 26 genera and 12 families. Among them, 15 species in six genera belong to the Proctophyllodidae.

MATERIAL AND METHODS

The material used in the present work was collected by the junior coauthor (OOT) in the Cát Tiên National Park (Vietnam) in 2010 and 2011, during a field expedition carried out by the Joint Russian-Vietnamese Tropical Research and Technological Center (Southern Branch, Ho Chi Minh City, Vietnam). Passerine birds were captured by means of mist-nets, identified, ringed and visually investigated for the presence of feather mites. When mites were detected on the wing or tail feathers, a part of a feather with mites was cut off and placed into a tube with 70% ethanol. After processing, birds were released back into the wild. Collected mite specimens were mounted on microslides in Faure medium according to the technique for small-sized acariform mites (Krantz and Walter 2009).

Descriptions of new taxa are given according to the modern schemes for pterodectine taxa (Mironov and Fain 2003; Hernandez and Valim 2006; Mironov 2006; Mironov et al. 2008b). General morphological terms and leg chaetotaxy follow Gaud and Atyeo (1996); idiosomal chaetotaxy also follows these authors with subsequent corrections added by Norton (1998). All measurements are in micrometers (μm). Measuring techniques used for particular structures were recently described in Mironov et al. (2008b, 2012).

The taxonomic system and scientific names of birds follow Clements et al. (2012). Type material depositories: ZIN – Zoological Institute of the Russian Academy of Sciences (Saint Petersburg, Russia), UMMZ – Museum of Zoology, University of Michigan (Ann Arbor, USA).

SYSTEMATICS

Family Proctophyllodidae Trouessart et Mégnin, 1884

Subfamily Pterodectinae Park et Atyeo, 1971

Genus *Montesauria* Oudemans, 1905

The feather mite genus *Montesauria* Oudemans, 1905 belongs to the *Pterodectes* generic group (Pterodectinae: Pterodectini), which unites morphologically derived pterodectine genera, characterized by the posterior or postero-lateral position of setae *ps3* in relation to the anal suckers in males. Within this group, *Montesauria* and four more genera, *Alaudicola* Mironov, 1996, *Anisodiscus* Park et Atyeo, 1971, *Dolichodectes* Park et Atyeo, 1971, and *Pedanodectes* Park et Atyeo, 1971, constitute the *Montesauria* generic complex, representatives of which have the genital papillae situated at the level of the genital arch or posterior to it (Mironov 2006, 2009).

Montesauria is the most species-rich genus in the subfamily Pterodectinae and currently includes 59 species arranged in ten species groups (Park and Atyeo 1971a, Mironov and Kopij 1996a, 1996b, 1997; Mironov and Fain 2003; Kuroki et al. 2006; Mironov 2006, 2008, 2009; Hernandez et al. 2010; Mironov et al. 2010, 2012). The majority of described species are associated with passerines of the infraorders Passerida and Corvida (Mironov 2006), with two species recorded from a few non-passeriform hosts, namely from African barbets (Piciformes: Lybiidae) (Gaud and Mouchet 1957) and rails (Gruiformes: Rallidae) in New Guinea (Aty eo and Gaud 1977; Hernandez et al. 2010). All representatives of *Montesauria* have been recorded from birds distributed in the Old World. Eight species of this genus were previously recorded from passerines in Vietnam (Gaud and Petitot 1948; Mironov et al. 2012).

Montesauria malacopteroni sp. nov.

(Figs. 1–3)

Type material. Male holotype (ZIN 4966), 8 male and 10 female paratypes from *Malacopteron cinereum* (Pellorneidae), VIETNAM, Dong Nai Province, Cát Tiên National Park, Central farmstead, 11°25.583'N, 107°25.574'E, 11 March 2010, coll. O.O. Tolstenkov.

Type depository. Holotype, 7 male and 9 female paratypes – ZIN, 1 male and 1 female paratypes – UMMZ.

Description. *Male* (holotype, range for 8 paratypes). Length of idiosoma 348 (340–360), width 122 (115–125), length of hysterosoma 236 (215–240). Prodorsal shield: entire, antero-lateral extensions wide, connected with epimerites Ia, lateral margins with incisions extending to bases of setae *se*, posterior margin almost straight, length of shield 102 (98–108), width 93 (84–98), surface sparse transverse dashes posterior to level of scapular setae (Fig. 1A). Setae *ve* absent. Scapular setae *se* separated by 56 (49–56). Scapular shields narrow. Humeral shields absent. Setae *cp* and *c2* situated on striated tegument. Subhumeral setae *c3* lanceolate, 24 (22–25) × 7 (7–8). Hysteronotal shield: length 242 (235–245), width at anterior margin 69 (66–72), anterior margin straight, anterior part may bear sparse transverse dashes. Opisthosomal lobes short, slightly longer than wide, straight, posterolateral margin at base of setae *h2* slightly convex; lobar apex with pair of blunt teeth at bases of setae *h3*. Terminal cleft narrow, parallel-sided, length 36 (32–36), width about 5. Supranal concavity circular, well outlined, 12 (10–13) in diameter. Setae *f2* anterior to bases of setae *ps2*. Setae *h1* situated at level of anterior margin of supranal concavity. Setae *ps1* situated in anterior half of opisthosomal lobes, approximately equidistant from outer and inner margins of these lobes. Setae *h3* lanceolate with strongly narrowed distal part, 51 (50–53) long, 12 (10–12) greatest wide; setae *ps2* 33 (30–35) long. Distance between dorsal setae: *c2:d2* 86 (78–88), *d2:e2* 82 (80–84), *e2:h3* 66 (60–68), *d1:d2* 35 (35–40), *e1:e2* 22 (20–25), *h1:ps2* 20 (22–24), *ps1:h3* 20 (17–20), *h2:h2* 44 (42–44), *h3:h3* 20 (20–24), *ps2:ps2* 53 (50–53).

Epimerites I fused into a Y, sternum over ½ of total length of epimerites, posterior end of sternum connected to middle parts of epimerites II by transverse branches (in some specimens these branches may be interrupted) (Fig. 1B). Epimerites II elongate, extending to level of sejugal furrow. Coxal fields I, II without wide sclerotized areas. Rudimentary sclerites rEpIIa absent. Coxal fields I closed, coxal fields II, III almost closed. Anterior tips of epimerites IIIa connected to each other by narrow transverse band. Medial part of epimerites IIIa with long extensions directed backward and bearing bases of setae *4b*. Coxal fields IV without sclerotized area at bases of trochanters IV. Epimerites IVa present, short, poorly sclerotized. Genital arch small, with short and rounded wing-like extensions, 19 (18–21) in length,

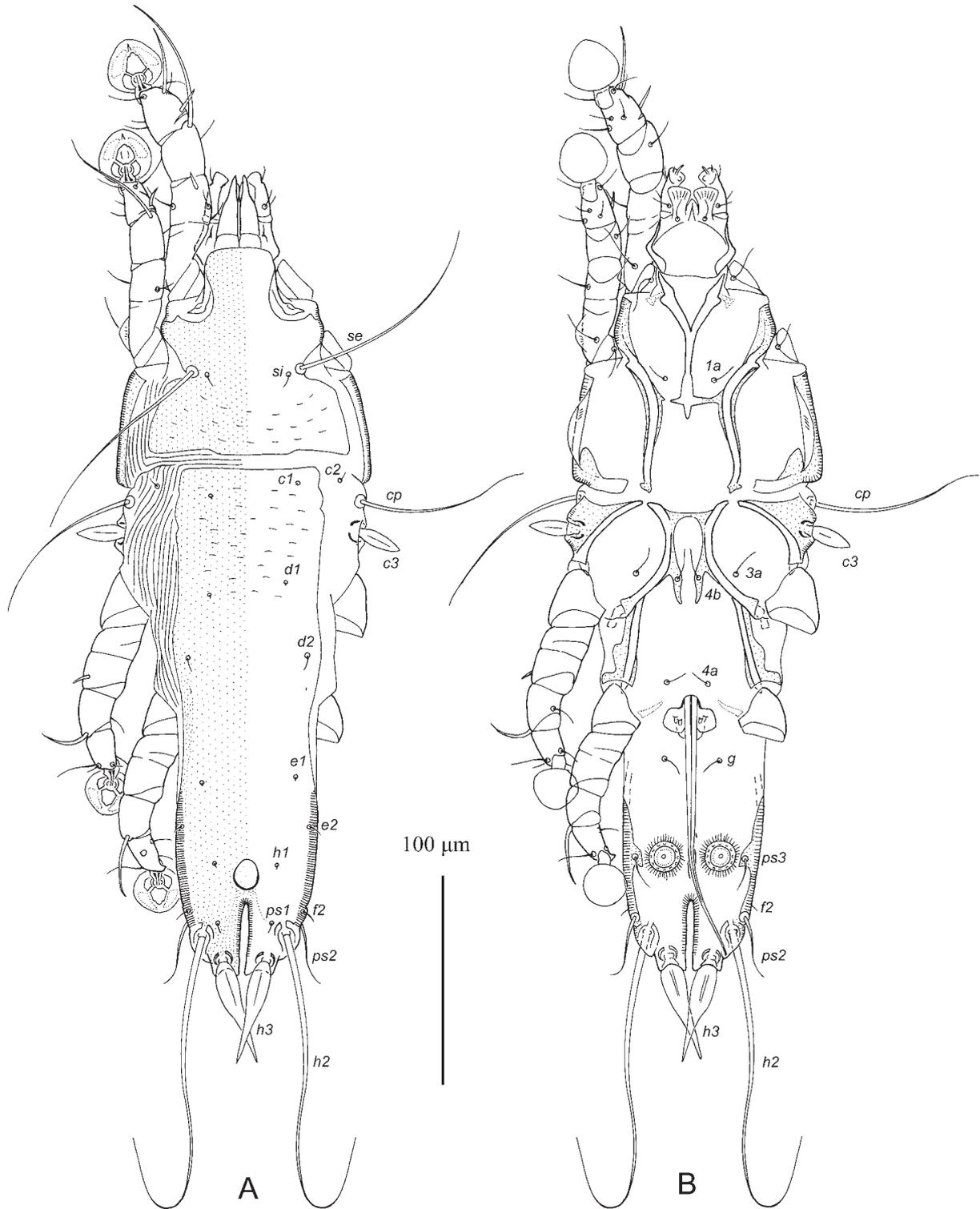


Fig. 1. *Montesauria malacoferoni* sp. nov., male. A – dorsal view; B – ventral view.

24 (22–24) in width including extensions; basal sclerite of genital apparatus shaped as inverted trapezium; aedeagus 130 (129–135) long, extending to level of setae *h3* bases (Fig. 3E). Genital papillae situated at midlevel of genital apparatus, not connected by their bases. Anal suckers 15.5 (14–16) in diameter, corolla with 12–14 indentations, surrounding membrane with radial striae. Opisthoventral shields narrow, with short and oblique extensions bearing setae *ps3* situated at midlevel of anal suckers. Setae *3a* and *4b* approximately at same transverse level. Distance between ventral setae: *4b:4a* 49 (48–53), *4a:g* 37 (37–44), *g:ps3* 47 (42–48), *ps3:ps3* 55 (49–55), *ps3:h3* 49 (46–53).

Legs I thicker and slightly longer than legs II; femora I, II with ventral crest, other segments of legs I, II without processes. Solenidion $\sigma 1$ of genu I spiculiform, 7 (6.5–7.5) long, situated in distal half of segment (Fig. 3A). Genual setae *cGI*, *cGII*, *mGI*, *mGII* filiform. Seta *d* of tarsi II, III shorter than corresponding seta *f*. Legs III, IV similar in size. Trochanters III without setae *sRIII*. Solenidion ϕ of tibia IV extending to midlevel of ambulacral disc. Tarsus IV 22 (21–22) long, with short apical claw-like process; setae *d* button-like, situated at midlevel of segment, seta *e* indistinct (Figs. 3D). Length of solenidia: $\omega 1I$ 13 (10–13), $\omega 1II$ 6 (5.5–7), ϕI 62 (62–68), ϕII 51 (48–52), ϕIII 27 (24–28), ϕIV 27 (27–28).

Female (10 paratypes). Length of idiosoma 432–450, width 145–155, length of hysterosoma 300–310. Prodorsal shield: entire, antero-lateral extensions narrow, connected to bases of epimerites Ia, lateral margins with incisions extending to bases of setae *se*, posterior margin slightly convex, length 118–124, width 105–110, surface without ornamentation (Fig. 2A). Setae *ve* absent. Setae *se* separated by 58–60. Scapular shields narrow. Humeral shields absent; setae *cp* and *c2* situated on soft tegument. Setae *c3* lanceolate, 20–22 \times 7–8. Anterior and lobar pieces of hysteronotal shield separated dorsally by narrow transverse groove but remain connected ventro-laterally by narrow bands. Anterior hysteronotal part of shield roughly rectangular, anterior margin straight or slightly concave, length 215–225, width at anterior margin 95–100, surface without ornamentation. Length of lobar region 88–92, width 82–86, anterior margin shallowly concave. Terminal cleft parallel-sided, very narrow, lateral margins almost touching, length 58–62, width at midlevel about 3. Supranal concavity circular, small, strongly outlined. Setae *h1*

situated approximately at level of supranal concavity. Setae *h2* spindle-like, 45–47 \times 7–8.5. Setae *ps1* equidistant from inner and outer margins of opisthosomal lobes. Setae *h3* 15–18 long, about 1/5–1/6 the length of terminal appendages. Distance between dorsal setae: *c2:d2* 102–106, *d2:e2* 85–98, *e2:h2* 40–44, *h2:h3* 64–66, *d1:d2* 44–48, *e1:e2* 28–34, *h1:h2* 9–11, *h2:ps1* 33–35, *h1:h1* 26–31, *h2:h2* 57–64.

Epimerites I fused into a Y with very short stem (Fig. 2B). Lateral parts of coxal fields I, II without heavily sclerotized areas. Epimerites IVa absent. Translobar apodemes of opisthosomal lobes present, wide, fused to each other anterior to terminal cleft. Epigynum horseshoe-shaped, lateral part noticeably thickened, outer margins without ledges, greatest width 66–68. Copulatory opening situated immediately anterior to margin of fused translobar apodemes; proximal end of primary spermaduct slightly thickened; head of spermatheca shaped as tea cup, with sinuous margin; secondary spermaducts short, 15–20 long (Fig. 3F). Distance between pseudanal setae: *ps2:ps2* 42–44, *ps3:ps3* 22–24, *ps2:ps3* 12–17.

Legs I slightly thicker than legs II; femur II with rounded ventral crest; other segments of legs I, II without processes. Solenidion $\sigma 1$ of genu I 7.5–8.5 long. Genual setae *cGI*, *cGII*, *mGI*, *mGII* filiform. Setae *d* of tarsi II–IV much shorter than corresponding setae *f*. Genua IV without noticeable dorsal inflation. Trochanteral setae *sRIII* absent. Length of solenidia: $\omega 1I$ 9–13, $\omega 1II$ 7–8, ϕI 64–68, ϕII 49–51, ϕIII 22–25, ϕIV 6–7.

Differential diagnosis. The new species *Montesauria malacopteroni* sp. nov. belongs to the *macronois* species group (Mironov et al. 2012), which is most clearly characterized by having the following features: in both sexes: setae *f2* are present, setae *c2* are situated dorsally and off hysteronotal shield, trochanteral setae *sRIII* are absent; in male, epimerites II are strongly elongated and extend to level of sejugal furrow, setae *h1* are situated anterior to terminal cleft; setae *ps1* situated in the middle of opisthosomal lobes, distant from inner margins of lobes; apices of opisthosomal lobes slightly narrowed and with a pair of blunt teeth, setae *h3* are lanceolate, genital arch small with short lateral extensions. Among two previously known species of this group, the new species is most similar to *M. macronoi* Mironov et al. 2012 by having epimerites II not connected with anterior tips of epimerites III and IIIa. Males of *M. malacopteronis* sp. nov. differ from *M. macronoi* by having the

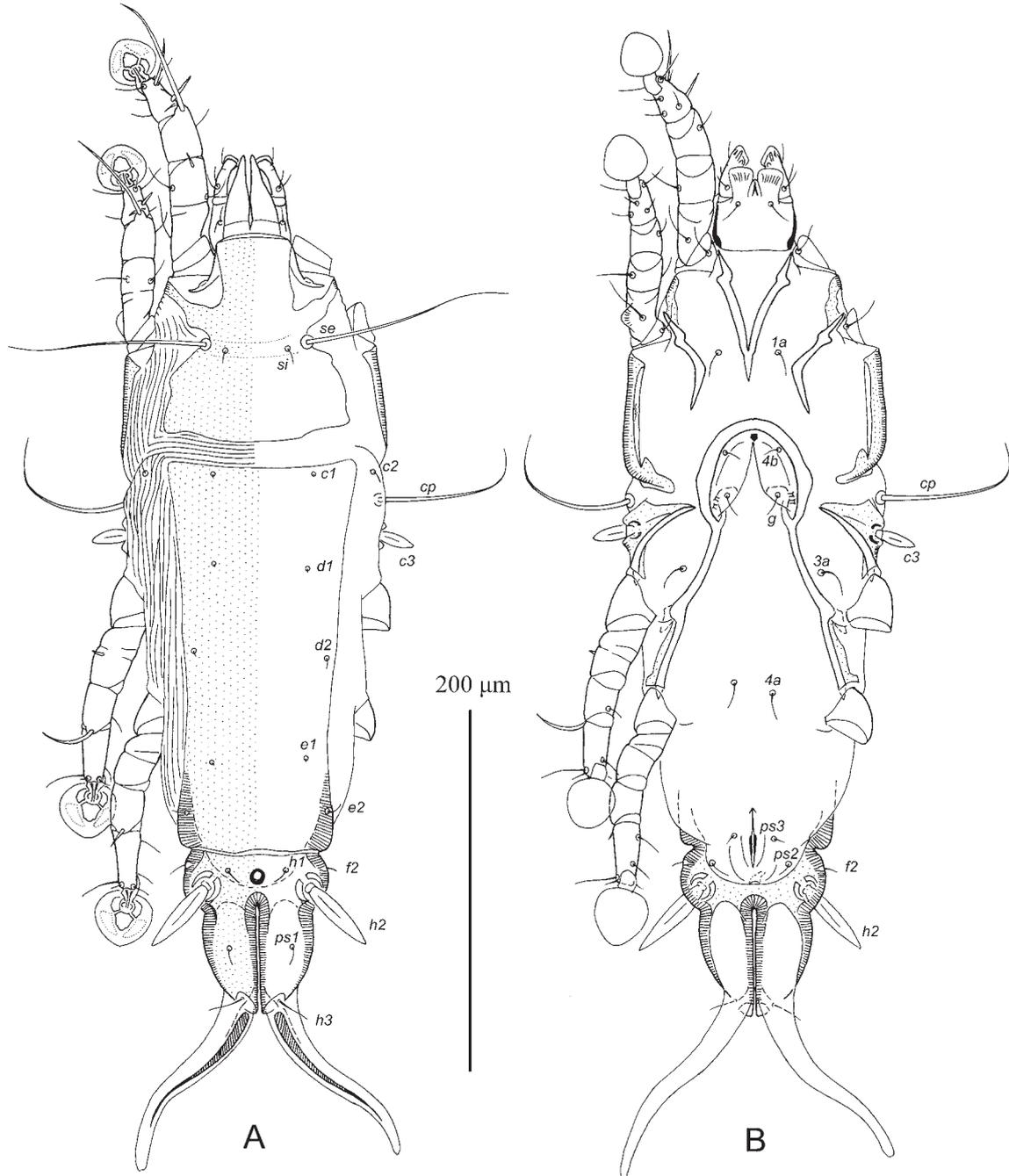


Fig. 2. *Montesauria malacopteroni* sp. nov. female. A – dorsal view; B – ventral view.

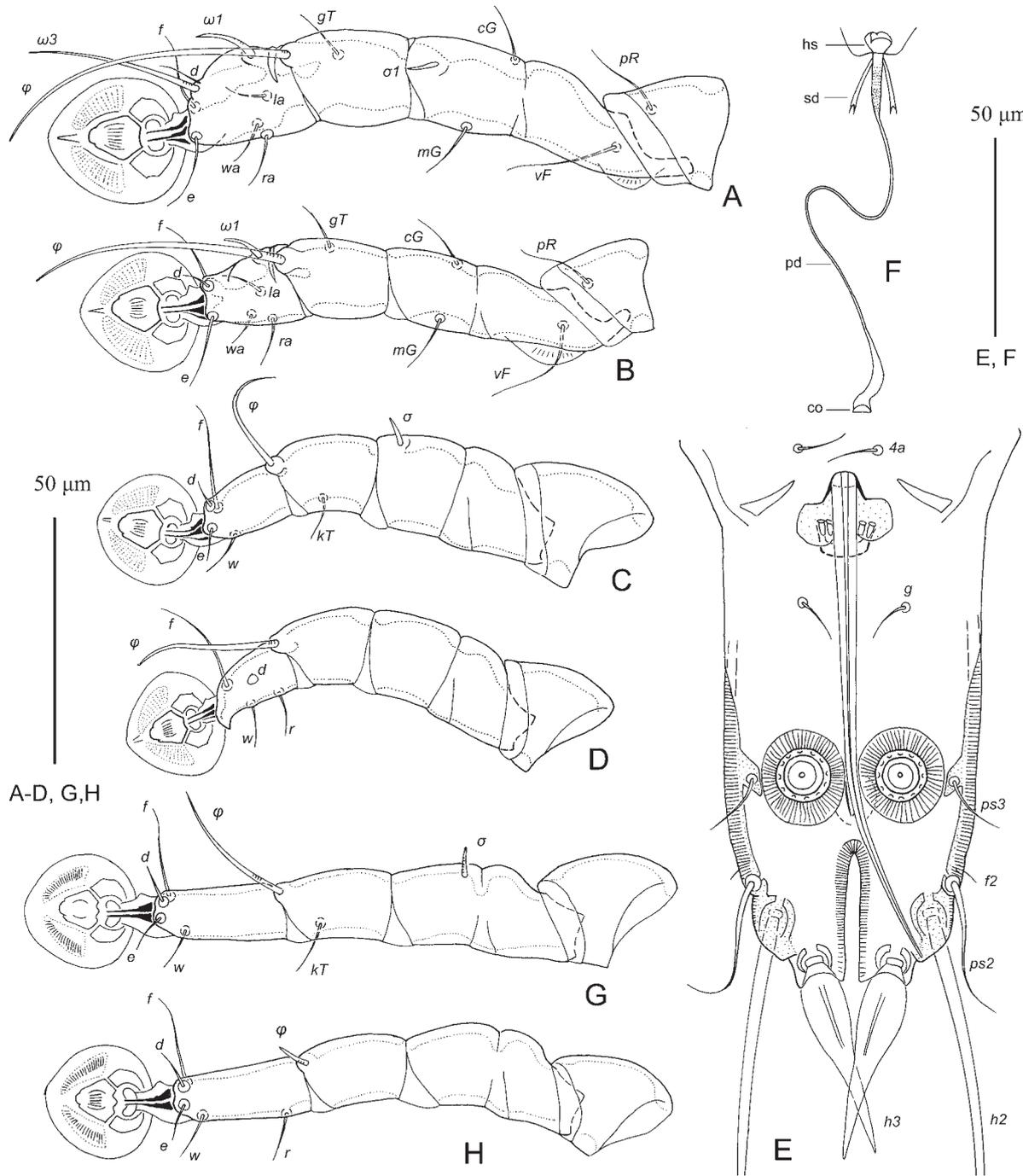


Fig. 3. *Montesauria malacopteroni* sp. nov., details. A–D – legs I–IV of male, dorsal view; E – opisthosoma of male, ventral view; F – spermatheca and spermatheca; G, H – legs III, IV of female, dorsal view. *Abbreviations:* co – copulatory opening, hs – head of spermatheca, pd – primary spermatheca, sd – secondary spermatheca.

prodorsal shield connected with epimerites Ia, legs IV not extending to the level of setae *ps2*, and setae *h3* strongly narrowed in apical half (Fig. 3E); females are distinguished by having an almost straight posterior margin of the prodorsal shield and the anterior hysteronotal shield uniformly sclerotized. In males of *M. macronoi*, the prodorsal shield is not connected with epimerites Ia, legs IV extend by the ambulacral disc to the level of setae *ps2*, and lanceolate setae *h3* are monotonously attenuate to their apices; in females, the posterior margin of the prodorsal shield has a rounded median extension, and the median area of the anterior hysteronotal shield is sclerotized much more strongly than lateral areas.

Etymology. The specific epithet derives from the generic name of the type host and is a noun in apposition.

Genus *Proterothrix* Gaud, 1968

The genus *Proterothrix* Gaud, 1968 belongs to the *Proterothrix* generic group (Pterodectinae: Pterodectini), which unites morphologically archaic pterodectine genera characterized by the anterior position of setae *ps3* in relation to the anal suckers in males and occurring on passerines, piciforms, and coraciiforms (Gaud 1968; Mironov 2009; Mironov et al. 2012). Within this group, the genus has included 23 species, of which 21 species were provisionally arranged in three species groups, *megacaula*, *schizothyra*, and *wolffi* (Mironov et al. 2008a, 2010; Mironov and Proctor 2009). All described representatives of this genus are known from birds of the Old World. The *wolffi* group (16 species), and a sole species of the *megacaula* group (*P. megacaula* Mironov et Diao, 2008) are associated with passerines; mites of the *schizothyra* group (5 species) are restricted to kingfishers (Coraciiformes: Alcedinidae) in Africa (Gaud 1979). A single species, *Proterothrix alcippeae* Mironov et al., 2012, has been reported so far from Vietnam (Mironov et al. 2012).

Proterothrix cyornis sp. nov.

(Figs. 4–6)

Type material. Male holotype (ZIN 4986), 5 male and 5 female paratypes from *Cyornis tickelliae* Blyth (Muscicapidae), VIETNAM, Dong Nai Province, Cát Tiên National Park, 11°25.543'N, 107°25.743'E, 28 April 2011, coll. O.O. Tolstenkov.

Type depository. Holotype, 4 male and 4 female paratypes – ZIN, 1 male and 1 female paratypes – UMMZ.

Description. *Male* (holotype, range for 5 paratypes in parentheses). Pseudorutellar lobes with long and acute lateral extensions protruding beyond palps. Length of idiosoma 338 (335–350), width 122 (120–135), length of hysterosoma 218 (215–230). Prodorsal shield: entire, antero-lateral extensions rounded, lateral margin shallowly concave, posterior margin slightly convex, length 110 (110–122), width 95 (95–98), entire surface with ovate lacunae (Fig. 4A). Setae *ve* absent. Scapular setae *se* separated by 42 (42–48). Scapular shields narrow. Humeral shields present, narrow, separated from epimerites III. Setae *cp* touching ventral margins of humeral shields. Setae *c2* situated on striated tegument. Subhumeral setae *c3* lanceolate, 18 (16–18) × 7 (6–7.5). Hysteronotal shield: length 223 (220–230), width at anterior margin 88 (85–90), anterior margin slightly concave, surface with small circular lacunae as on prodorsal shield. Lateral hysteronotal sclerites absent. Opisthosomal lobes trapezoidal, short, and slightly wider than long, posterior margin almost straight; setae *h2* and *h3* situated at same transverse level near distal margin of lobes. Terminal cleft angular, 18 (18–22) in length; margins of terminal cleft without membranes. Supranal concavity as inverted tear-drop. Setae *f2* slightly posterior to bases of setae *ps2*. Setae *h1* at midlevel of supranal concavity, near lateral margins of opisthosoma. Setae *ps1* short filiform, less than 10 in length, situated near lateral margins of terminal cleft, slightly anterior to bases of setae *h3*. Setae *h3* long, lanceolate with filiform apex, 120 (106–125) in length, 9 (8–10) in greatest width; macrosetae *h2* 160 (140–170) in length; setae *ps2* setiform, 24 (20–25) in length. Distance between dorsal setae: *c2:d2* 80 (78–84), *d2:e2* 52 (80–84), *e2:h3* 49 (45–55), *d1:d2* 33 (33–42), *e1:e2* 28 (26–28), *h1:ps2* 17 (15–18), *h2:h2* 44 (44–50), *h3:h3* 22 (22–25), *ps2:ps2* 57 (55–62).

Epimerites I fused into a narrow V, posterior end of fused epimerites connected with middle parts of epimerites II by transverse sclerotized bands. Epimerites II long, but not extending to level of sejugal furrow, their posterior ends free (Fig. 4B). Rudimentary sclerites rEpIIa absent. Coxal fields I closed, coxal fields II open, coxal fields III almost closed, with narrow gaps between tips of corresponding epimerites. Coxal fields IV with narrow sclerotized area at bases

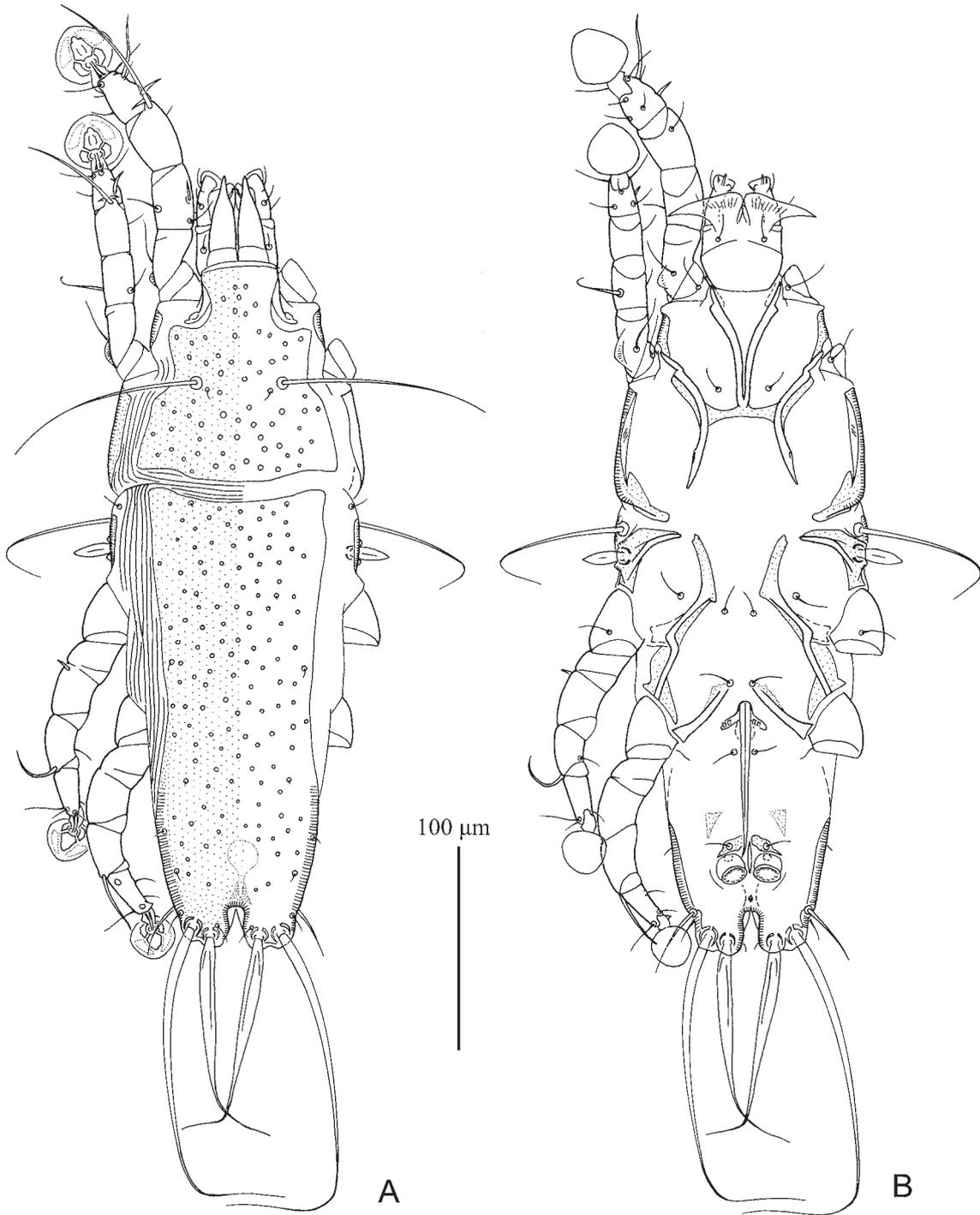


Fig. 4. *Proterothrix cyornis* sp. nov., male A – dorsal view; B – ventral view.

of trochanters IV. Epimerites IVa present, well developed, their anterior tips extending beyond apex of genital arch and bearing bases of setae *4a*. Pregenital sclerites absent. Genital arch small, 13 (11–13) in length, 22 (22–24) in width at base; basal sclerite of genital apparatus rounded posteriorly; aedeagus 71 (70–76) long, extending to anterior margin of anal suckers. Genital papillae situated at midlevel of genital arch. Adanal shields represented by two pairs of small sclerites: median pair situated immediately anterior to anal suckers, antero-lateral pair approximately equidistant from genital arch and lobar apices. Anal suckers pot-like, with noticeably inflated lateral surfaces, 14 (13–14) in diameter; corolla with 10–11 indentations, surrounding membrane without striae. Opisthoventral shields not developed. Setae *ps3* situated on median pair of adanal sclerites, distance between them subequal to distance between centers of anal suckers. Distance between ventral setae: *3a:4b* 7 (7–9), *4b-4a* 35 (32–35), *4a-g* 33(32–35), *g-ps3* 47 (46–49), *ps3-ps3* 20 (17–21), *ps3:h3* 51 (50–52).

Legs I longer and slightly thicker than legs II; femora I, II with wide ventral crest (Figs. 6A, B); other segments of legs I, II without processes. Solenidion $\sigma 1$ of genu I small spiculiform, 6 (6–8) long, situated at midlevel of segment; setae *cGI*, *cGII* *mGI* filiform, seta *mGII* thickened basally, with filiform apex. Setae *d* of tarsi II, III much shorter than corresponding setae *f*. Legs III, IV similar in size. Solenidion σ of genu III situated at base of segment. Solenidion φ of tibia IV extending beyond tarsal apex. Tarsus IV 24 (24–26) long, with a small apical claw; setae *d*, *e* button-like subequal in diameter, situated in basal and apical parts of segment, respectively (Fig. 6D). Length of solenidia: $\omega 1$ I 9 (8–9), $\omega 1$ II 8 (7–9), φ I 59 (58–66), φ II 42 (42–44), φ III 28 (26–28), φ IV 24 (24–26).

Female (5 paratypes). Pseudorutellar lobes with long and acute lateral extension as in males. Length of idiosoma 455–480, width 144–165, length of hysterosoma 320–340. Prodorsal shield: entire, antero-lateral extensions with rounded tips, lateral margins without incisions, posterior margin straight, length 133–166, width 115–125, surface with numerous small ovate lacunae up to 5 in diameter (Fig. 5A). Setae *ve* absent. Setae *se* separated by 55–60. Scapular shields narrow, not developed dorsally. Humeral shields present, poorly developed, separated from epimerites III. Setae *cp* and *c2* situated on soft tegument. Setae *c3* lanceolate, 22–24 × 7–9. Anterior and

lobar pieces of hysteronotal shield separated dorsally by narrow transverse band but remain connected ventro-laterally. Anterior hysteronotal shield roughly rectangular, anterior margin straight, greatest length 240–245, width at anterior margin 115–125, entire surface with numerous small circular lacunae as in prodorsal shield. Length of lobar region 88–94, width 77–86, anterior margin straight. Terminal cleft very narrow, with margins almost touching; length 57–66, greatest width near lobar apices about 5. Supranal concavity well developed, circular. Setae *h1* on lobar shield, at level of supranal concavity. Setae *h2* spindle-like, with short terminal filaments, length including filaments 73–80, width 7–8. Setae *ps1* near inner margins of opisthosomal lobes. Setae *h3* 15 (15–17) long, about 1/5th the length of terminal appendages. Distance between dorsal setae: *c2:d2* 95–100, *d2:e2* 122–133, *e2:h2* 50–60, *h2:h3* 38–41, *d1:d2* 44–48, *e1:e2* 44–47, *h1:h2* 28–33, *h2:ps1* 22–26, *h1:h1* 38–49, *h2:h2* 60–69.

Epimerites I fused as a V, fused part with short acute lateral extensions. Lateral parts of coxal fields I, II without heavily sclerotized areas (Fig. 5B). Epimerites IVa absent. Translobar apodemes of opisthosomal lobes present, wide, fused to each other anterior to terminal cleft. Epigynum horseshoe-shaped, greatest width 62–68. Copulatory opening situated ventrally, at anterior margin of fused translobar apodemes. Primary spermaduct without proximal enlargement; secondary spermaducts thin, 9–10 long (Fig. 6F). Distance between pseudanal setae: *ps2:ps2* 22–24, *ps3:ps3* 15–18, *ps2:ps3* 16–18; setae *ps2* situated at midlevel of anal opening.

Legs I slightly longer and thicker than legs II; femora I, II with narrow ventral crest; other segments of legs I, II without processes. Solenidion $\sigma 1$ of genu I, 7–10 long, situated at midlevel of this segment. Genua setae *cGI*, *cGII*, *mGI* filiform, *mGII* spiculiform with filiform terminal part. Setae *d* of tarsi II–IV about 1/3 the length of corresponding setae *f*. Genu IV not inflated dorsally (Figs. 6G). Solenidion j of tibia IV much shorter than that on tibia III. Length of solenidia: $\omega 1$ I 12–13, $\omega 1$ II 10–13, φ I 70–78, φ II 51–55, φ III 29–33, φ IV 7–9.

Differential diagnosis. *Proterothrix cyornis* sp. nov. belongs to the *wolffi* species group by having almost closed coxal fields III in males and parallel-sided terminal cleft in females (Mironov et al. 2008a). Within this group, the new species is closest to *P. wolffi* (Gaud, 1962) from *Gerygone flavolateralis*

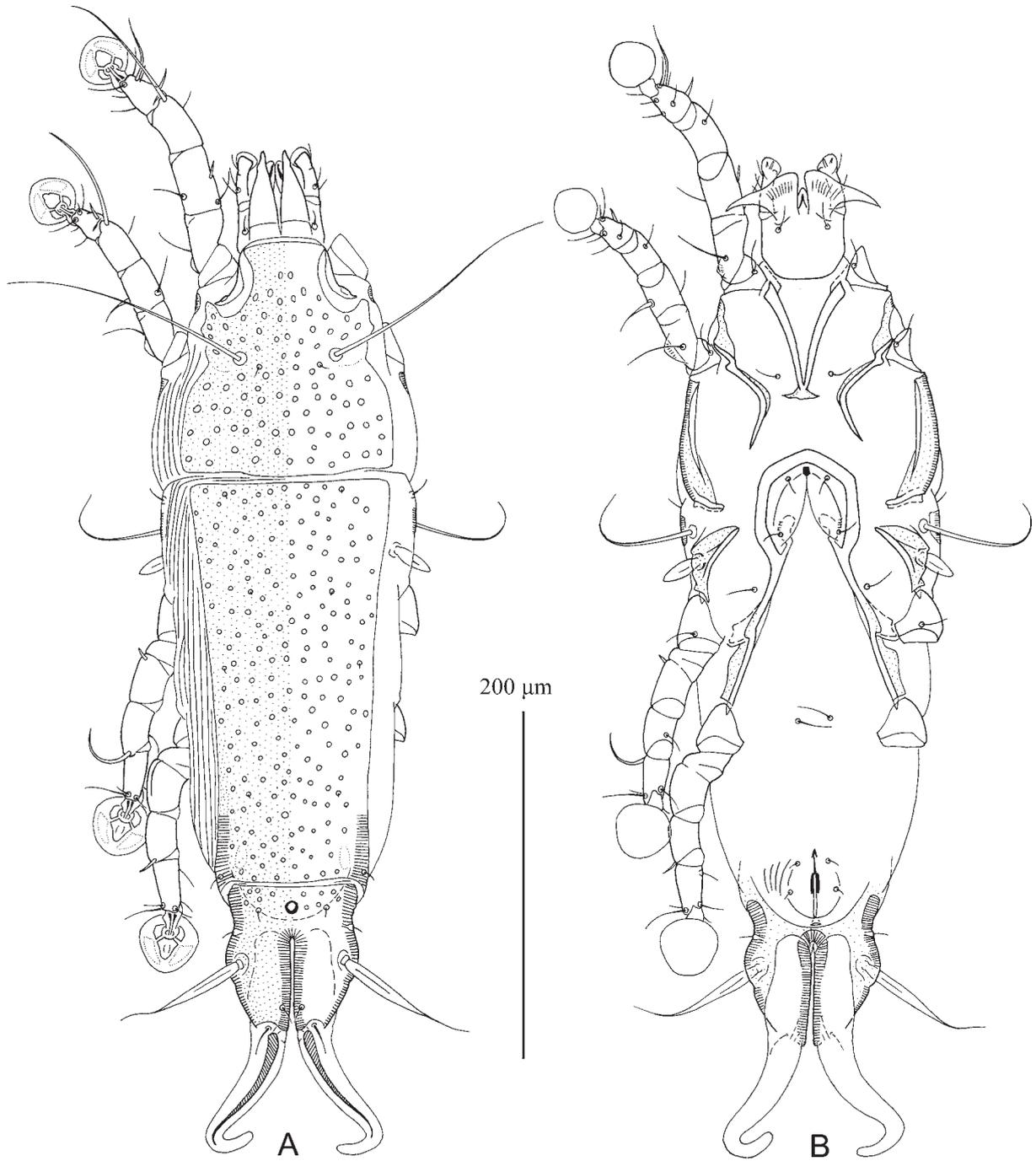


Fig. 5. *Proterothrix cyornis* sp. nov., female A – dorsal view; B – ventral view.

citrina Mayr (Acanthizidae) by having pseudorutellar lobes with acute lateral extensions in both sexes (Figs. 4B, 5B) and setae *h3* enlarged and flattened basally and continuing with terminal filament in males. *Proterothrix cyornis* differs from that species by the following features: in both sexes, the prodorsal and hysteronotal shields bear circular and ovate lacunae; in males, the aedeagus extends to the level of the anal suckers, only one pair of adanal shields bearing setae *ps3* is present, setae *c2* are situated off the humeral shields, coxal fields III remain open in the antero-mesal angles; in females, the terminal filament of setae *h2* is about 1/4th of the total length of these setae (Fig. 5A). In both sexes of *P. wolffi*, the prodorsal and hysteronotal shields are covered with very small (not larger than alveoli of microsetae on the hysteronotal shield) and sparsely disposed lacunae; in males, the aedeagus extends slightly beyond lobar apices, the adanal shields are represented by two pairs of sclerites, setae *c2* are situated on the humeral shields, coxal fields III are closed; in females, the terminal filament of setae *h2* is half as long as the total length of these setae.

Etymology. The specific epithet is taken from the specific name of the type host and is a noun in apposition.

***Proterothrix hypothymis* sp. nov.**

(Figs. 7–9)

Type material. Male holotype (ZIN 4996), 12 male and 12 female paratypes from *Hypothymis azurea* Boddart (Monarchidae), VIETNAM, Dong Nai Province, Cát Tiên National Park, 11°25.543'N, 107°25.743'E, 28 April 2011, coll. O.O. Tolstenkov.

Type depository. Holotype, 11 male and 11 female paratypes – ZIN, 1 male and 1 female paratypes – UMMZ.

Description. *Male* (holotype, range for 10 paratypes in parentheses). Pseudorutellar lobes without acute lateral extensions. Length of idiosoma 330 (315–335), width 120 (120–125), length of hysterosoma 196 (190–200). Prodorsal shield: split into two pieces by transverse band of soft tegument at level of scapular setae, antero-lateral extensions short and acute, posterior margin straight, total length 117 (113–125), width 102 (96–106), surface without ornamentation (Fig. 7A). Setae *ve* rudimentary, represented by alveoli. Scapular setae *se* separated by 48 (44–48). Scapular shields narrow. Humeral shields

present, narrow, separated from epimerites III. Setae *cp* and *c2* situated on striated tegument. Subhumeral setae *c3* lanceolate, 22 (20–22) × 6.5 (6.5–8). Hysteronotal shield: length 205 (196–208), width at anterior margin 88 (86–90), anterior margin straight, surface without ornamentation. Lateral hysteronotal sclerites absent. Opisthosomal lobes short, at base wider than long, posterior margin rounded; setae *h2* and *h3* situated apically. Terminal cleft wide, with rounded anterior end and divergent lateral margins, 16 (13–16) in length; narrow membrane along margins present. Supranal concavity circular, closed. Setae *f2* and *ps2* situated at same transverse level. Setae *h1* at level of supranal concavity, distant from lateral margins of opisthosoma. Setae *ps1* situated on inner margins of opisthosomal lobes slightly anterior to bases of setae *h3*. Setae *h3* short spiculiform, 13 (13–17) long; macrosetae *h2* 160 (155–170) long; setae *ps2* setiform, 33 (33–37) long; setae *ps1* minute about 10 long. Distance between dorsal setae: *c2:d2* 84 (77–85), *d2:e2* 79 (82–86), *e2:h3* 40 (33–40), *d1:d2* 22 (22–25), *e1:e2* 31 (31–37), *h1:ps2* 14 (14–19), *h2:h2* 42 (37–44), *h3:h3* 29 (24–29), *ps2:ps2* 55 (50–56).

Epimerites I fused into a Y, sternum about 1/3rd of total length of epimerites, posterior end of fused part with transverse extensions poorly connected with middle parts of epimerites II (in some specimens these connections can be interrupted in one or both sides). Epimerites II long, but not extending to level of sejugal furrow, posterior ends free (Fig. 7B). Rudimentary sclerites rEpIIa absent. Coxal fields I closed, coxal fields II open, coxal fields III nearly closed. Coxal fields IV without sclerotized area at bases of trochanters IV. Epimerites IVa present, short, their anterior tips not extending to level of setae *4a*. Pre-genital sclerites absent. Genital arch small, with small wing-like lateral extensions, 11 (11–13) in length, 20 (18–20) in width including extension; basal sclerite of genital apparatus rounded posteriorly; aedeagus 62 (60–65) long, almost extending to anterior end of terminal cleft (Fig. 9E). Genital papillae situated anterior to genital arch, at level of tips of epimerites IV. Adanal shields represented by pair of small triangular sclerites situated anterior to anal field. Anal suckers cylindrical 13 (11–13) in diameter, corolla with 15–16 indentations, surrounding membrane with striae. Opisthoventral shields not developed. Setae *ps3* situated on adanal sclerites, closer to each other than distance between centers of anal suckers. Setae *3a* and *4b* approximately at same transverse level.

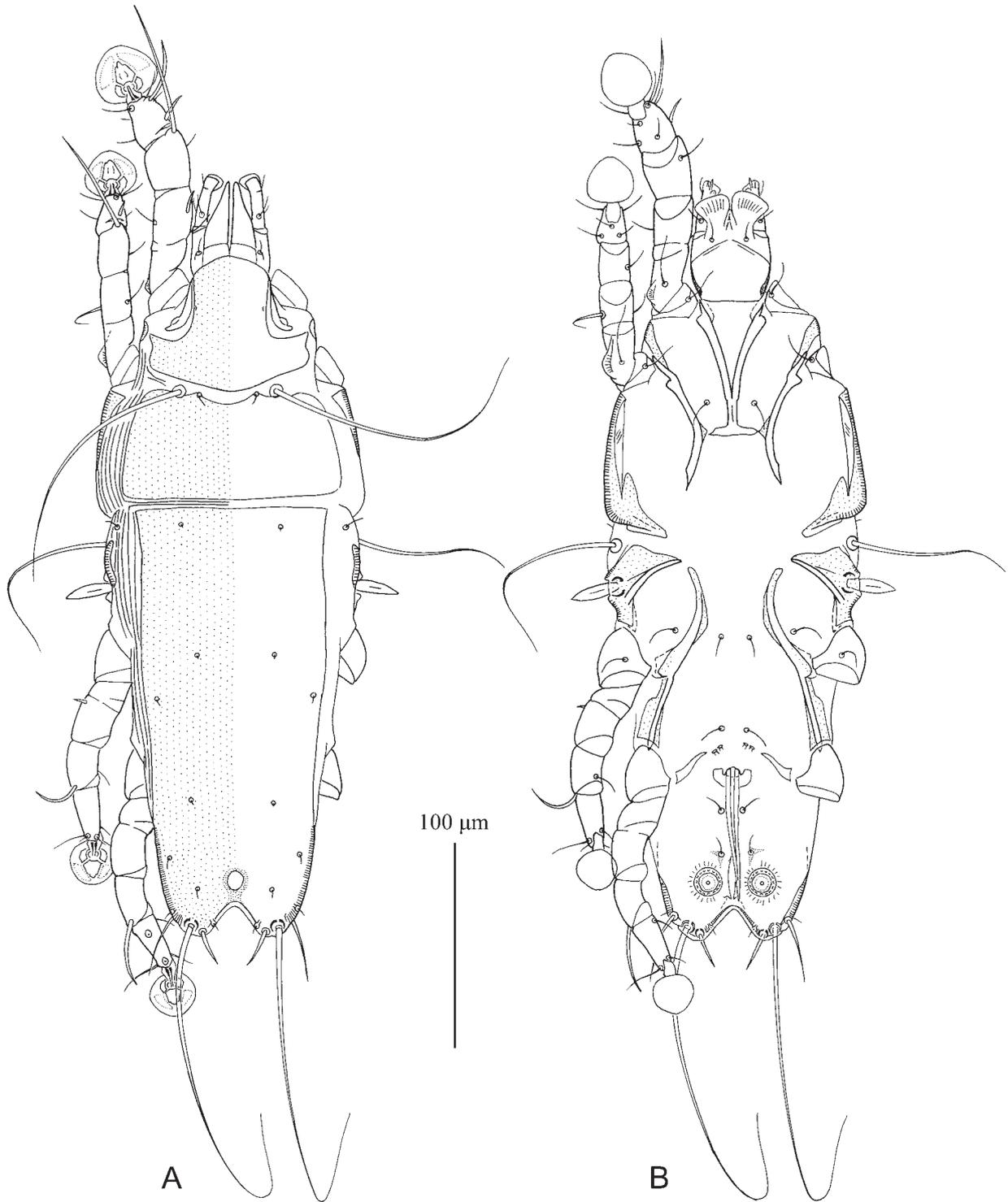


Fig. 7. *Proterothrix hypothymis* sp. nov., male A – dorsal view; B – ventral view.

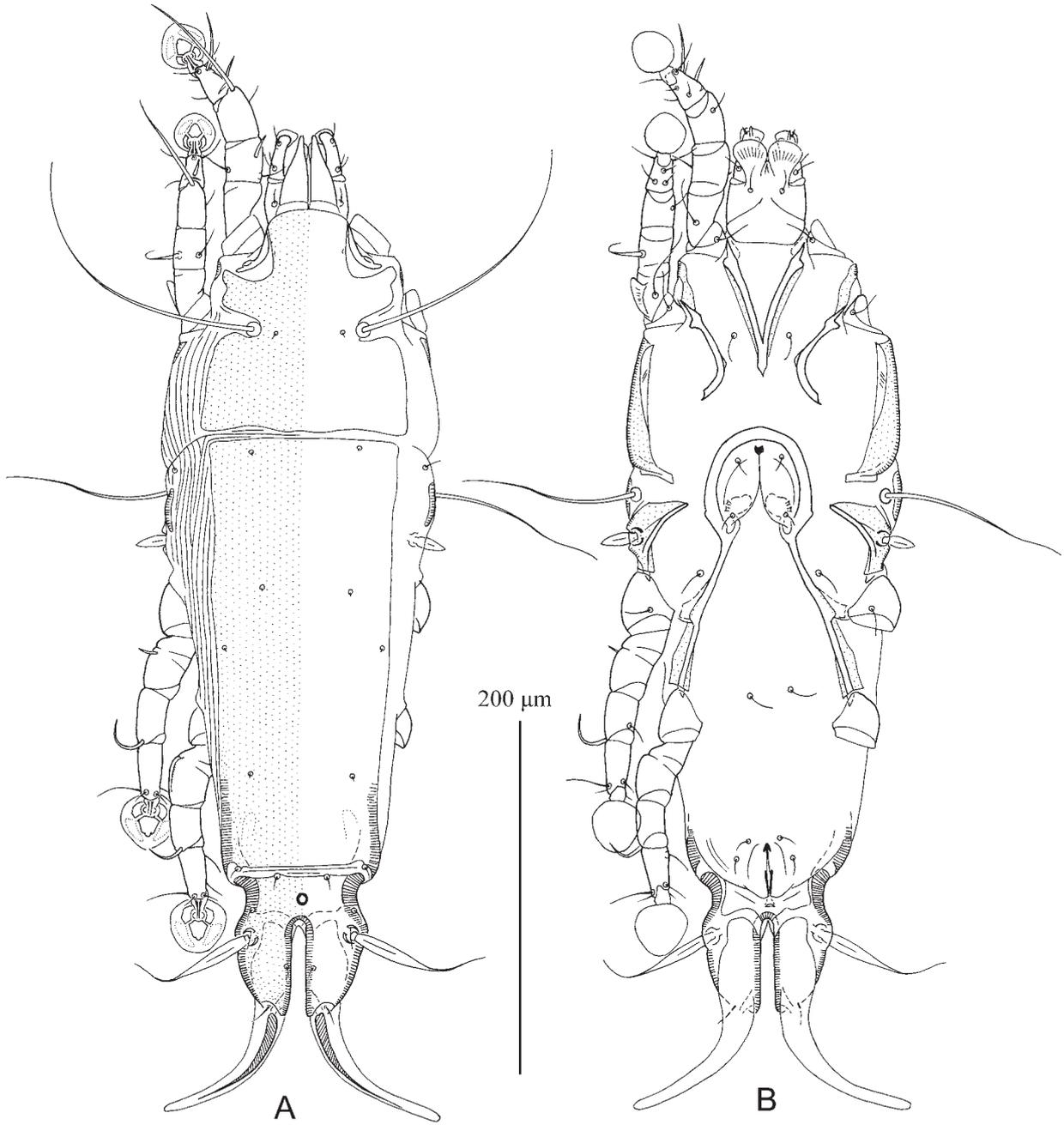


Fig. 8. *Proterothrix hypothymis* sp. nov., female A – dorsal view; B – ventral view.

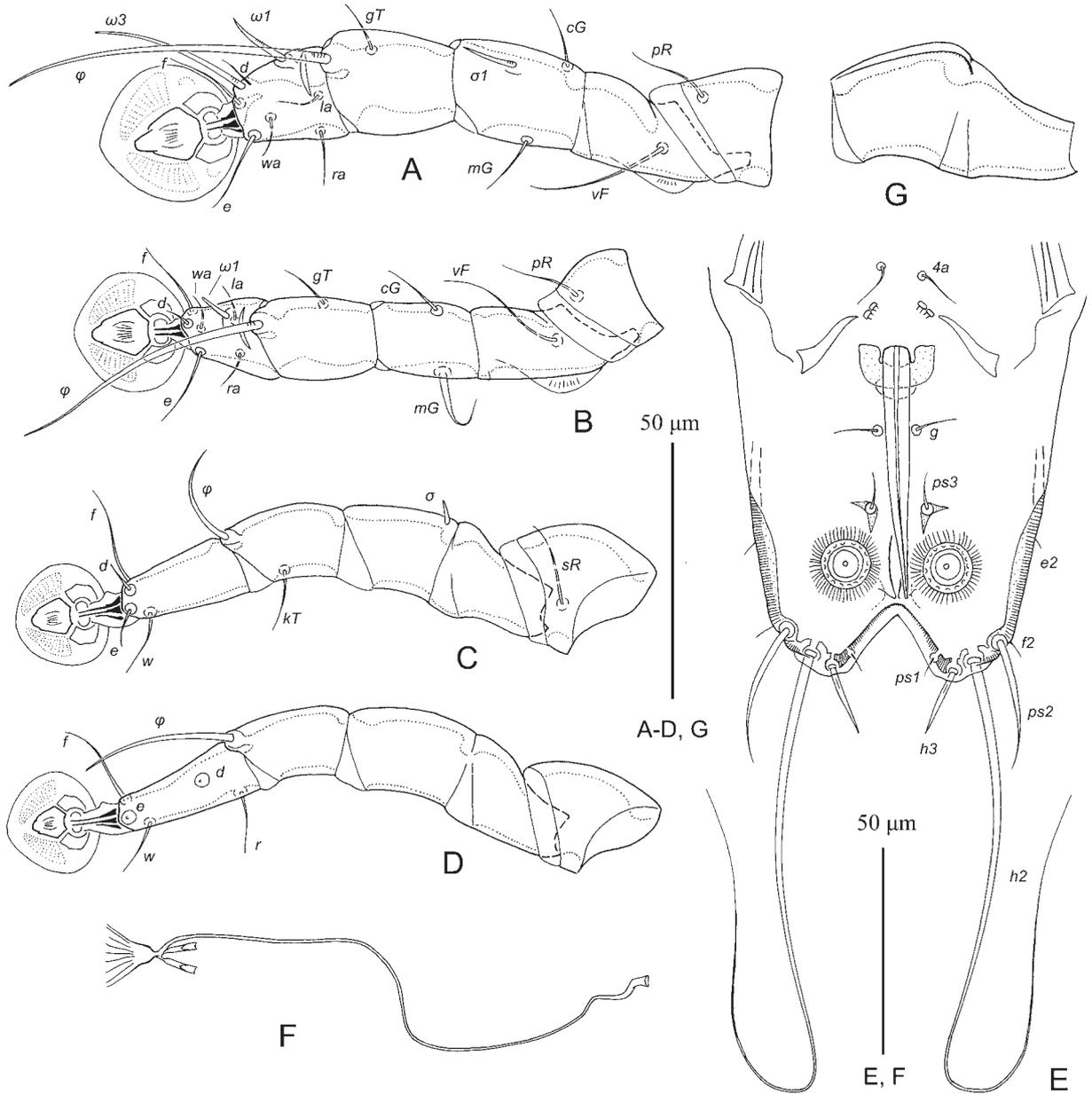


Fig. 9. *Proterothrix hypothymis* sp. nov., details. A – D – legs I–IV of male, dorsal view; E – opisthosoma of male, ventral view; F – spermatheca and spermaducts; G – femur and genu IV of female, dorsal view.

Distance between ventral setae: $4b-4a$ 44 (40–44), $4a-g$ 40 (39–44), $g-ps3$ 24 (20–24), $ps3-ps3$ 15 (14–16), $ps3:h3$ 44 (37–44).

Legs I longer and thicker than legs II; femora I, II with wide ventral crest (Fig. 9A, B); other segments of legs I, II without processes. Solenidion $\sigma 1$ of genu I small spiculiform, 7 (7–8) long, situated at midlevel of segment; setae cGI , $cGII$, mGI filiform, seta $mGII$ strongly thickened basally, with filiform apex. Seta d of tarsus II, III much shorter than corresponding setae f . Legs III, IV similar in size. Solenidion σ of genu III situated at base of segment (Fig. 9C). Solenidion ϕ of tibia IV extending to base of ambulacral disc. Tarsus IV 29 (26–29) long, with small apical claw; setae d , e button-like, subequal in diameter, situated in basal and apical parts of segment, respectively (Fig. 9D). Length of solenidia: $\omega 1I$ 12 (10–12), $\omega 1II$ 5 (5–6), ϕI 62 (60–62), ϕII 46 (44–46), ϕIII 18 (18–20), ϕIV 29 (28–30).

Female (range for 10 paratypes). Pseudorutellar lobes without acute lateral extensions. Length of idiosoma 445–480, width 142–150, length of hysterosoma 303–330. Prodorsal shield: entire, antero-lateral extensions with rounded tips, lateral margins with incisions extending to bases of setae se , posterior margin straight, length 120–128, width 113–128, surface without ornamentation (Fig. 8A). Setae ve rudimentary. Setae se separated by 60–62. Scapular shields narrow, not developed dorsally. Humeral shields present, narrow, separated from epimerites III; setae cp situated on soft tegument near ventral margin of humeral shields. Setae $c2$ situated on soft tegument. Setae $c3$ lanceolate, 17–20 \times 6.5–7.5. Anterior and lobar pieces of hysteronotal shield separated dorsally by narrow transverse band but remain connected ventro-laterally. Anterior hysteronotal shield roughly rectangular, anterior margin straight, greatest length 232–258, width at anterior margin 106–122, surface without ornamentation. Length of lobar region 84–90, width 75–82, anterior margin straight. Terminal cleft parallel-sided, narrow; length 55–58, greatest width 7–10. Supranal concavity well developed, circular. Setae $h1$ on anterior margin of lobar shield. Setae $h2$ spindle-like, with short terminal filaments, length including filaments 65–70, width 7–8. Setae $ps1$ near inner margins of opisthosomal lobes. Setae $h3$ 6–9 long, about 1/5th the length of terminal appendages. Distance between dorsal setae: $c2:d2$ 95–108, $d2:e2$ 119–139, $e2:h2$ 35–45, $h2:h3$ 40–46,

$d1:d2$ 29–39, $e1:e2$ 53–62, $h1:h2$ 31–35, $h2:ps1$ 17–20, $h1:h1$ 30–35, $h2:h2$ 62–66.

Epimerites I fused as a Y with very short stem, fused part without lateral extensions. Lateral parts of coxal fields I, II without heavily sclerotized areas (Fig. 8B). Epimerites IVa absent. Translobar apodemes of opisthosomal lobes present, narrow, not fused to each other anterior to terminal cleft. Epigynum horseshoe-shaped, greatest width 55–62. Apodemes of oviporus fused with tips of epimerites IIIa. Copulatory opening situated ventrally at anterior margin of fused translobar apodemes. Primary spermaduct slightly enlarged near copulatory opening; secondary spermaducts 10–12 long (Fig. 9F). Distance between pseudanal setae: $ps2:ps2$ 31–37, $ps3:ps3$ 15–20, $ps2:ps3$ 11–12; setae $ps2$ situated at midlevel of anal opening.

Legs I, II subequal in size; femur II with angular ventral crest; other segments of legs I, II without processes. Solenidion $\sigma 1$ of genu I, 13–14 long, situated at midlevel of this segment. Genual setae cGI , $cGII$, mGI filiform, $mGII$ spiculiform with filiform terminal part. Setae d of tarsi II, III, IV about 3 times shorter than corresponding setae f . Genu IV slightly inflated dorsally, with narrow crest (Figs. 9G). Solenidion j of tibia IV much shorter than that on tibia III. Length of solenidia: $\omega 1I$ 11–14, $\omega 1II$ 7–9, ϕI 66–73, ϕII 50–55, ϕIII 20–24, ϕIV 14–16.

Differential diagnosis. *Proterothrix hypothymis* sp. nov. belongs to the *wolffi* species group and is closest to *P. stenochaetus* Gaud, 1968 from *Clytorhynchus hamlini* Mayr (Monarchidae) from the Rennell Island (Gaud 1968) by the following features in males: the branches of the genital arch are extremely short, the genital papillae are situated anterior to the genital arch apex, approximately at level of inner tops of epimerites IV, setae $ps1$ are very short, not exceeding the lengths of tarsi. *Proterothrix hypothymis* differs from *P. stenochaetus* by the following features: in males, the aedeagus is 60–65 long and extends slightly beyond the anal suckers, epimerites I are fused into a Y, lateral extensions of sternum are poorly connected with epimerites II or not connected at all; in females, the supranal concavity is clearly distant from the anterior of the lobar shield and situated approximately equidistant from the margin of the shield and anterior end of the interlobar cleft. In males of *P. stenochaetus*, the aedeagus is about 100 long and extends beyond the level of lobar apices, epimerites I are fused into a V, and the fused part of these epimerites is connected

with epimerites II by clear transverse bands; in females, the supranal concavity is situated at the very anterior margin of the lobar shield (at the same level with setae *h1*).

Etymology. The specific epithet is taken from the specific name of the type host and is a noun in apposition.

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