

**A NEW FEATHER MITE SPECIES OF THE GENUS *PROTEROTHRIX* GAUD
(ASTIGMATA, PROCTOPHYLLODIDAE) FROM *FICEDULA ZANTHOPYGIA* (HAY)
(PASSERIFORMES: MUSCICAPIDAE) IN CHINA**

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ABSTRACT: A new feather mite species *Proterothrix megacaula* sp. n. is described from the yellow-rumped flycatcher *Ficedula zanthopygia* (Hay, 1847) (Passeriformes: Muscicapidae) from a suburb of Beijing, China. The new species clearly differs from all known species of the genus *Proterothrix* Gaud, 1968 by the absence of dorsal setae *c1* in both sexes and by having an extremely long whip-like aedeagus in males, the length of which is comparable to the length of the idiosoma. Brief notes on the systematics of the genus *Proterothrix* are given. Formerly known species of the genus are provisionally arranged into two species groups, *wolffi* and *schizothyra*; the new species is a sole representative of the *megacaula* group. *Pterodectes (Proterothrix) hymenostomus* Gaud, 1968, formerly placed by Park and Atyeo (1971) in the genus *Proterothrix*, is removed to the genus *Neodectes* Park et Atyeo, 1971 and given a new name, *Neodectes hymenostomus* (Gaud, 1968) comb. n.

KEY WORDS: feather mite, Proctophylloidae, *Proterothrix*, Muscicapidae, *Ficedula*, China

INTRODUCTION

The feather mite genus *Proterothrix* Gaud, 1968 (Proctophylloidae: Pterodectinae) was originally established as a subgenus of the genus *Pterodectes* Robin, 1877 and included four species (Gaud 1968). In their generic revision of the subfamily Pterodectinae, Park and Atyeo (1971) elevated it to the generic rank and referred 15 species to this genus. Finally, Gaud (1979) described three more *Proterothrix* species.

In general appearance, mites of the genus *Proterothrix* are typical pterodectines, characterized by an elongated and narrow body, with a slightly convex and extensively sclerotized dorsal side. As for most other pterodectines, mites of this genus are commonly located on the ventral surface of vanes of the primary and secondary flight feathers of their avian hosts. Representatives of *Proterothrix* have been described from two relatively distantly related groups of hosts: passerines of the infraorder Corvina (Passeriformes), and kingfishers (Coraciiformes: Alcedinidae). *Proterothrix* species restricted to kingfishers were recorded from these hosts in Africa and Madagascar (Gaud 1979), and species associated with passerines have been found on birds from various families in Madagascar and the Indo-Malayan region (Trouessart 1899; Sugimoto 1941; Gaud 1952, 1962, 1968). Atyeo (in: McClure and Ratanaworabhan 1973) detected representatives of the genus *Proterothrix* on 56 species from 12 passerine families in Asia, including some non-Corvina families; unfortunately, *Proterothrix* species from that huge material were not described in

subsequent studies of this author. Thus, *Proterothrix* seems to be a species-rich pterodectine genus widely distributed on passerines of the Old World.

Here we describe a new *Proterothrix* species found on a host from the family Muscicapidae, representing the first described species from passerines of the infraorder Passerida. The investigation of comparative material representing most described *Proterothrix* species (the collection of Zoological Institute RAS, Saint Petersburg, Russia) allowed us to place formerly known species into two species groups and to propose a correction to species content of the genus.

MATERIAL AND METHODS

The material used was collected by the junior co-authors in the course of a research project on the ectoparasites of bird hosts in Beijing, China. Birds collected by mist nets in suburbs of Beijing were examined under binocular microscopes and then released. Collected mite specimens were preserved in 70% ethanol and then mounted on microslides in Faure medium according to standard technique for this group of mites (Evans 1992).

The species description is given in the format used for species of pterodectine mites (Mironov and Fain 2003; Valim and Hernandez 2006; Mironov 2006). General morphological terms and the leg and idiosomal chaetotaxy follow Gaud and Atyeo (1996). All measurements are in micrometres (µm). Measuring techniques for some particular structures:

- (i) length of idiosoma is measured from the anterior margin to lobar apices (in males) and to the lobar apices excluding the terminal appendages (in females), width of idiosoma is measured at level of the humeral shields;
- (ii) hysterosoma is measured from the level of sejugal furrow to bases of setae *h3*;
- (iii) distance between different pairs of setae is the shortest distance between the transverse levels formed by setae of respective pairs;
- (iv) prodorsal shield length is measured along the midline, and width is the greatest width at the posterior margin;
- (v) hysteronotal shield length in males is the greatest length from the anterior margin to bases of setae *h3*; width is measured at the anterior margin;
- (vi) anterior hysteronotal shield length in females is the greatest length from the anterior margin to the transverse furrow separating this shield from the lobar shield; width is measured at the anterior margin.
- (vii) length of the lobar region in females is the greatest length from its anterior margin to lobar apices (the terminal appendages excluded), and width is the greatest width at the level of the lateral extensions bearing setae *h2*.

Systematics and scientific names of birds mentioned in the paper follow Dickinson (2003). Type material depositories: CNU — the College of Life Sciences, Capital Normal University, Beijing, China; ZISP — the Zoological Institute of the Russian Academy of Sciences, Saint Petersburg, Russia.

Family Proctophyllodidae Trouessart et Mégnin, 1884

Subfamily Pterodectinae Park et Atyeo, 1971

Genus *Proterothrix* Gaud, 1968

The clearest diagnostic features differentiating the genus *Proterothrix* from other pterodectine genera is the combination of the following characters: in both sexes, solenidion $\sigma 1$ is shorter than solenidion $\omega 3$ on legs I; in males, pseudanal setae *ps3* are situated antero-mesal to the anal suckers, the genital papillae are situated anterior to the genital arch, and the lateral margins of the opisthosoma are without lateral membranes.

Up to now, the genus included 19 species (Gaud 1962, 1968, 1979; Park and Atyeo 1971). Based on our re-examination of the majority of these species, two distinct species groups may be recognized within the genus *Proterothrix*. Characteristics of the *wolffi* group are as follows: in males,

coxal fields III are closed or have a very narrow gap in antero-mesal part (not wider than width of sub-humeral seta *c3*); in females, the terminal cleft is narrow, much longer than wide and usually parallel-sided. Included species: *Proterothrix wolffi* (Gaud, 1962), *P. coscinonota* Gaud, 1968, *P. dicranochaeta* Gaud, 1968, *P. diminuta* (Trouessart, 1899), *P. emarginata* (Trouessart, 1899)*, *P. modesta* (Trouessart, 1899)*, *P. paradisiaca* (Trouessart, 1885), *P. phyllura* (Trouessart, 1899), *P. ranci* (Gaud, 1952)*, *P. sakatai* (Sugimoto, 1941)*, and *P. stenochaeta* Gaud, 1968. Species referred to this group are known from hosts of five passerine families of the infraorder Corvida: Acanthizidae, Dicuridae, Monarchidae, Paradisaeidae and Rhipiduridae. Characteristics of the *schizothyra* group are as follows: in males, coxal fields III clearly open; in females, terminal cleft angular (V-shaped) with widely divergent margins. Included species: *P. allothyra* Gaud, 1979, *P. melanura* Gaud, 1979, *P. schizothyra* (Gaud, 1952)*, *P. stenothyra* Gaud, 1979. Mites of this group are restricted to kingfishers (Coraciiformes: Alcedinidae).

In the course of our comparative analysis, we discovered that Park and Atyeo (1971) incorrectly placed *Pterodectes (Proterothrix) hymenostoma* Gaud, 1968 from *Myzomela cardinalis* (Gmelin, 1788) (Passeriformes: Meliphagidae) in the genus *Proterothrix*. The males of this species have the genital papillae situated posterior to the genital arch, which is the main character of the genus *Neodectes* Park et Atyeo, 1971 that distinguishes it from *Proterothrix*. Therefore this species is given here a new name *Neodectes hymenostomus* (Gaud, 1962) comb. n. Two poorly described species, *P. aculeata* (Canestrini, 1899)* and *P. xiphiura* (Trouessart, 1885)*, known from suboscines of the family Eurylaimidae, were not available for study and remain unassigned to any species group.

***Proterothrix megacaula* Mironov et Diao sp.n.**

Type material. Male holotype, 3 male and 191 female paratypes ex *Ficedula zanthopygia* (Hay, 1847) (Muscicapidae), China, Beijing, 26 May 2007, collectors: Diao Wenwen, Zhang Yanhua, and Zhang Caixia. Holotype, 1 male and 170 female paratypes (CNU-20070526-01-8006) — CNU; the rest paratypes — ZISP.

Differential diagnosis. Among known species, *Proterothrix megacaula* sp. n. (Figs 1 A, B) is comparable only with *P. coscinonotus* Gaud, 1968

* Marked species were not available for the present study.

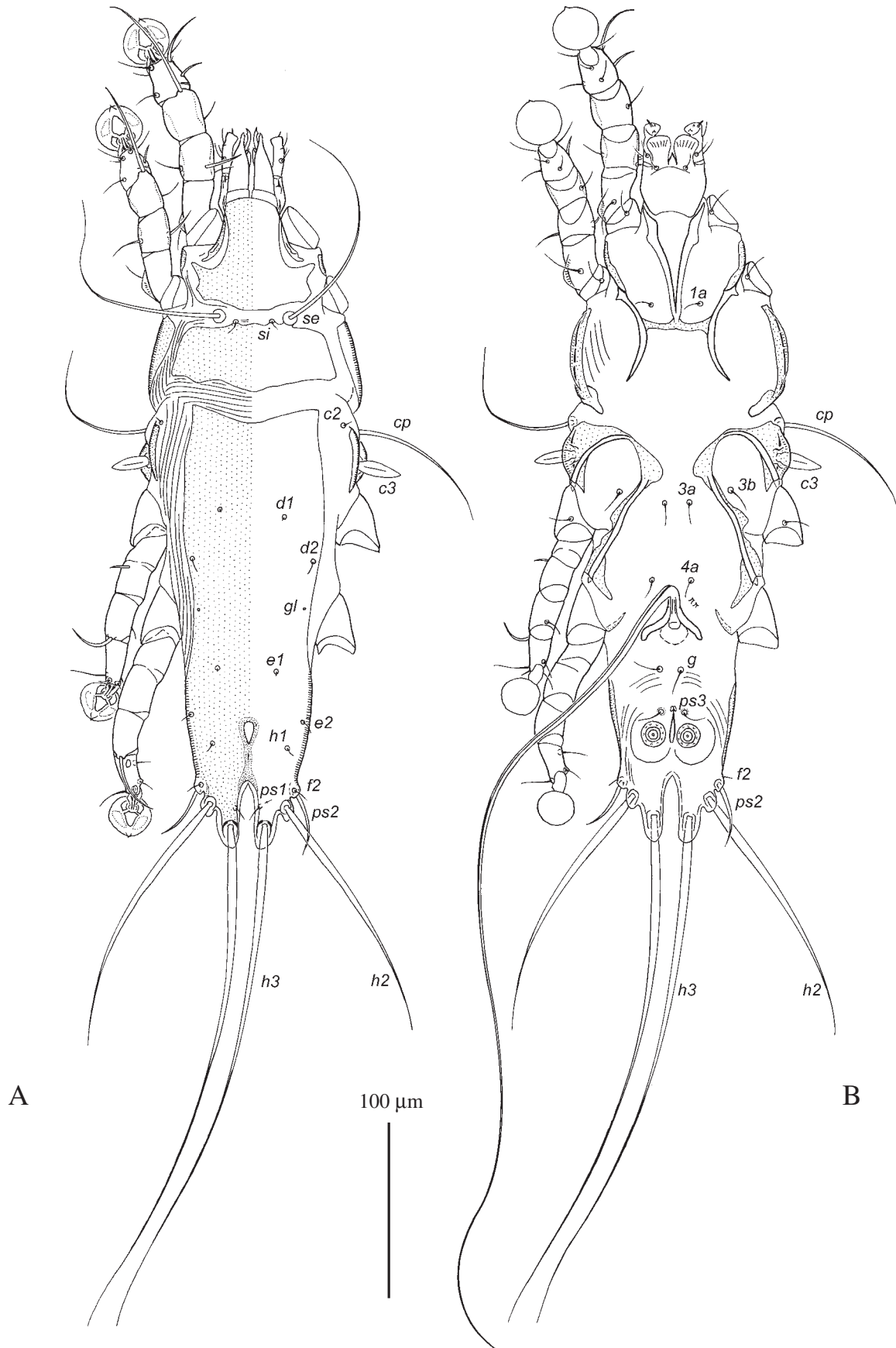


Fig. 1. *Proterothrix megacaula*, male. A — dorsal view, B — ventral view.

from *Rhipidura rennelliana* Mayr, 1931 (Rhipiduridae), based on the presence of two pairs of very long setae (*h2*, *h3*) on the opisthosomal lobes in males and the whip-like aedeagus. In other *Proterothrix* species, setae *h2* are much longer than *h3*, and the aedeagus is straight and sword-like. The new species differ from *P. coscinonotus* and all other known *Proterothrix* species by having two unique features: the absence of dorsal setae *c1* in both sexes and extremely long whip-like aedeagus extending far beyond the lobar apices and comparable in length to the length of idiosoma. In all other known species (including *P. coscinonotus*), setae *c1* are present and aedeagus either does not extend beyond the lobar apices or has only a short terminal part (shorter than one quarter of total length) that extends beyond the lobar apices. Named discriminate features of *Proterothrix megacaula* put it into a separate position within the genus, and it may be treated as a sole representative of one more species group, which we term the *megacaula* group.

Description. Male (holotype, measurements for 3 paratypes in brackets). Length of idiosoma 366 (348–365), width 122 (130–135), length of hysterosoma 235 (227–245). Prodorsal shield: split into anterior and posterior fragments at level of scapular setae (*se*, *si*), antero-lateral extensions acute, posterior margin with short and blunt median extension, total length of shield along midline 104 (104–108), width of posterior piece 88 (90–102), surface uniformly punctured (Fig. 1 A). Scapular setae *se* on soft tegument between anterior and posterior fragments (or on anterior margin of posterior fragment), separated by 38 (40–42); setae *si* on anterior margin of posterior fragment or on soft tegument between shield fragments. Scapular shields narrow. Humeral shields narrow, separated from outer sclerotization of epimerites III; setae *cp* situated ventrally, on soft tegument. Setae *c2* situated dorsally, near to anterior ends of humeral shields. Subhumeral setae *c3* lanceolate, 24 (20–24) × 8 (7.5–9). Hysteronotal shield: greatest length 228 (223–232), width in anterior part 70 (68–75), anterior margin slightly concave, surface uniformly punctured. Distance between prodorsal and hysteronotal shields along midline 15 (15–20). Opisthosomal lobes elongated, distal part narrow, with rounded membranous margin; lateral margins of lobes with semi-ovate lobules bearing setae *h2* and with small and blunt extensions bearing setae *ps2*; setae *h3* situated near to lobar apices. Terminal cleft narrowly U-shaped, 33 (33–35) in length, 9 (7–9) in width.

Supranal concavity clearly outlined. Setae *f2* and *ps2* situated at same transverse level. Setae *h1* at level of posterior end of supranal concavity, closer to level of setae *e2* than of setae *f2*. Setae *h3* represented by macrosetae, approximately as long as idiosoma, length 370 (330–370), greatest width 4.5 (4.5–5); setae *ps2* slightly thickened, 37 (28–37) long; setae *ps1* filiform, minute, 7 (6–10) long, situated on margins of terminal cleft, at levels of setae *h2*. Setae *c1* absent. Distance between dorsal setae: *se:c2* 66 (62–69), *c2:d2* 73 (75–79), *d2:e2* 92 (78–88), *e2:h3* 58 (57–62), *d1:d2* 22 (24–28), *e1:e2* 26 (22–28), *h1:ps2* 22 (19–24), *h2:h2* 42 (40–44), *h3:h3* 19 (17–20), *ps2:ps2* 49 (48–55).

Epimerites I fused as a V, fused part connected with central parts of epimerites I by transverse sclerotized bands (Fig. 1 B). Coxal fields I, II without wide sclerotized areas; epimerites IIa with narrow longitudinal membrane on inner margin. Rudimentary sclerites rEpIIa absent. Coxal fields II open, coxal fields III closed. Coxal fields IV with angle-shaped sclerotized area at bases of trochanters IV. Epimerites IVa rudimentary. Genital arch of moderate size, 16 (13–17) long, 33 (28–35) wide; basal sclerite of genital apparatus large, poorly sclerotized; aedeagus long whip-shaped, directed anterior from genital arch, bent backward at level of anterior margins of trochanters IV and extending far beyond apices of opisthosomal lobes, length of aedeagus from its anterior bend to tip 450 (445–460). Genital papillae anterior to genital arch. Genital and adanal shields absent. Anal suckers 12 (12–15) in diameter, corolla with indentations. Opisthoventral shields not developed; setae *ps3* situated anterior to anal suckers, closer to each other than centers of these suckers. Distance between ventral setae: *3b:3a* 5 (5–9), *3a-4a* 45 (44–48), *4a-g* 49 (44–47), *g-ps3* 24 (24–26), *ps3-ps3* 13 (12–14), *ps3:h3* 58 (55–60).

Legs I slightly longer and thicker than legs II; femoragena I, II with ventral crest, other segments of legs I, II without crests or other apophyses. Solenidion σI of genu I spiculiform, 15 (13–16) long, situated in basal part of segment; seta *cGI* setiform, 9 (7–11) long; seta *cGII* thin spiculiform, 11 (11–15) long; setae *mGI* and *mGII* setiform, 7 (7–10) and 13 (13–15) long, respectively (Figs 2 A–C). Setae *d* of tarsi II, III much shorter than setae *f* of respective segments. Legs III and IV similar in form and size. Solenidion σI of genu III in proximal part of segment. Solenidion φ of tibia IV extending to midlevel of ambulacral disc. Tarsus IV 24 (22–24) long, without apical claw, with small

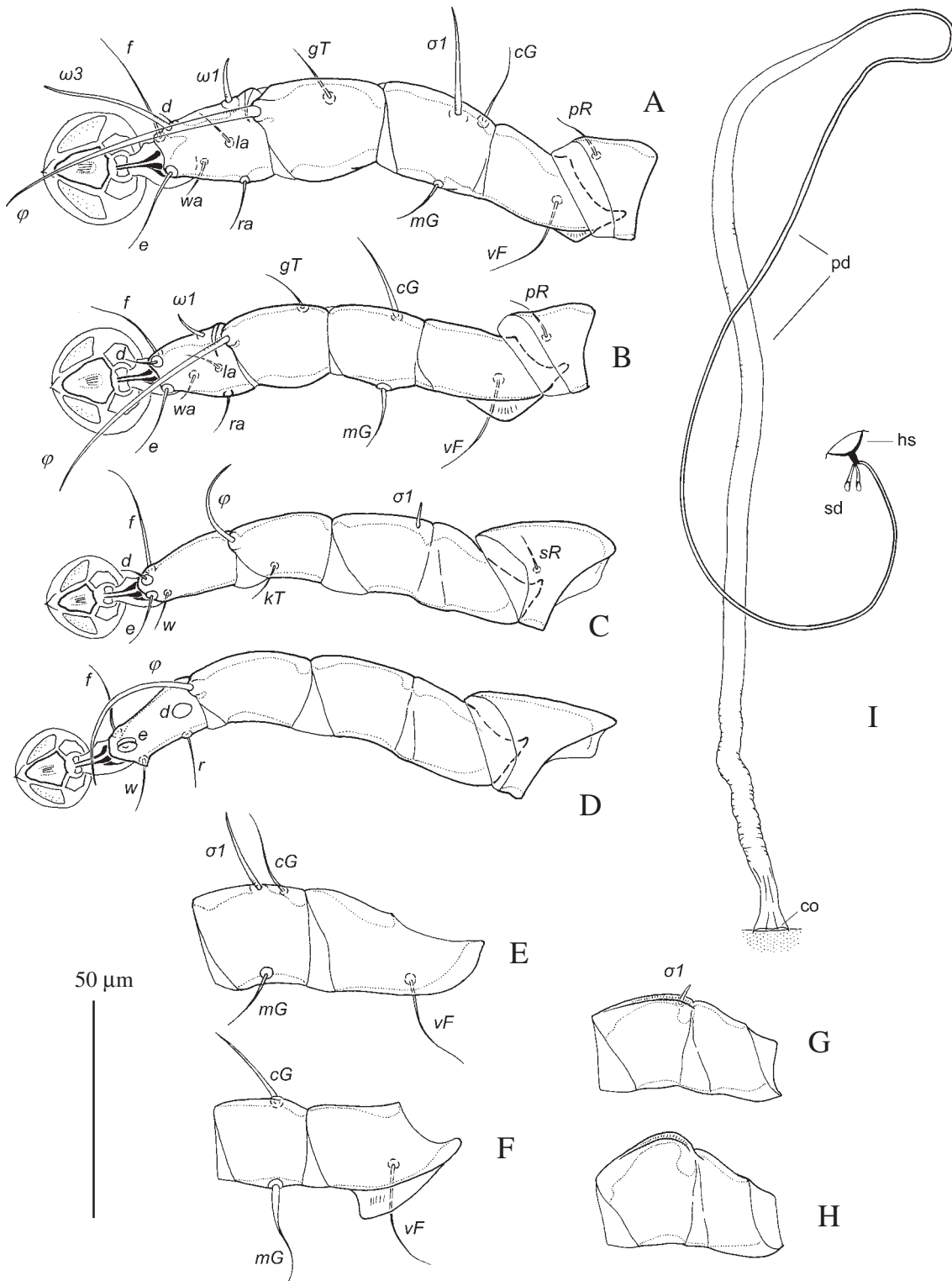


Fig. 2. *Proterothrix megacaula*, details. A–D — legs I–IV of male, respectively; E–H — femoragena I–IV of female, respectively; I — spermatheca and spermaducts. co — copulatory opening, hs — head of spermatheca, pd — primary spermaduct, sd — secondary spermaduct.

apico-ventral extension bearing seta *w*; setae *e* button-like, situated in basal parts of segment, setae *d* barrel-shaped with flat apical cap, situated in apical part of segment (Fig. 2 D).

Female (191 paratypes, 10 paratypes measured). Length of idiosoma excluding terminal appendages 465–495, width 142–160, length of hysterosoma 325–340. Prodorsal shield: entire, lateral

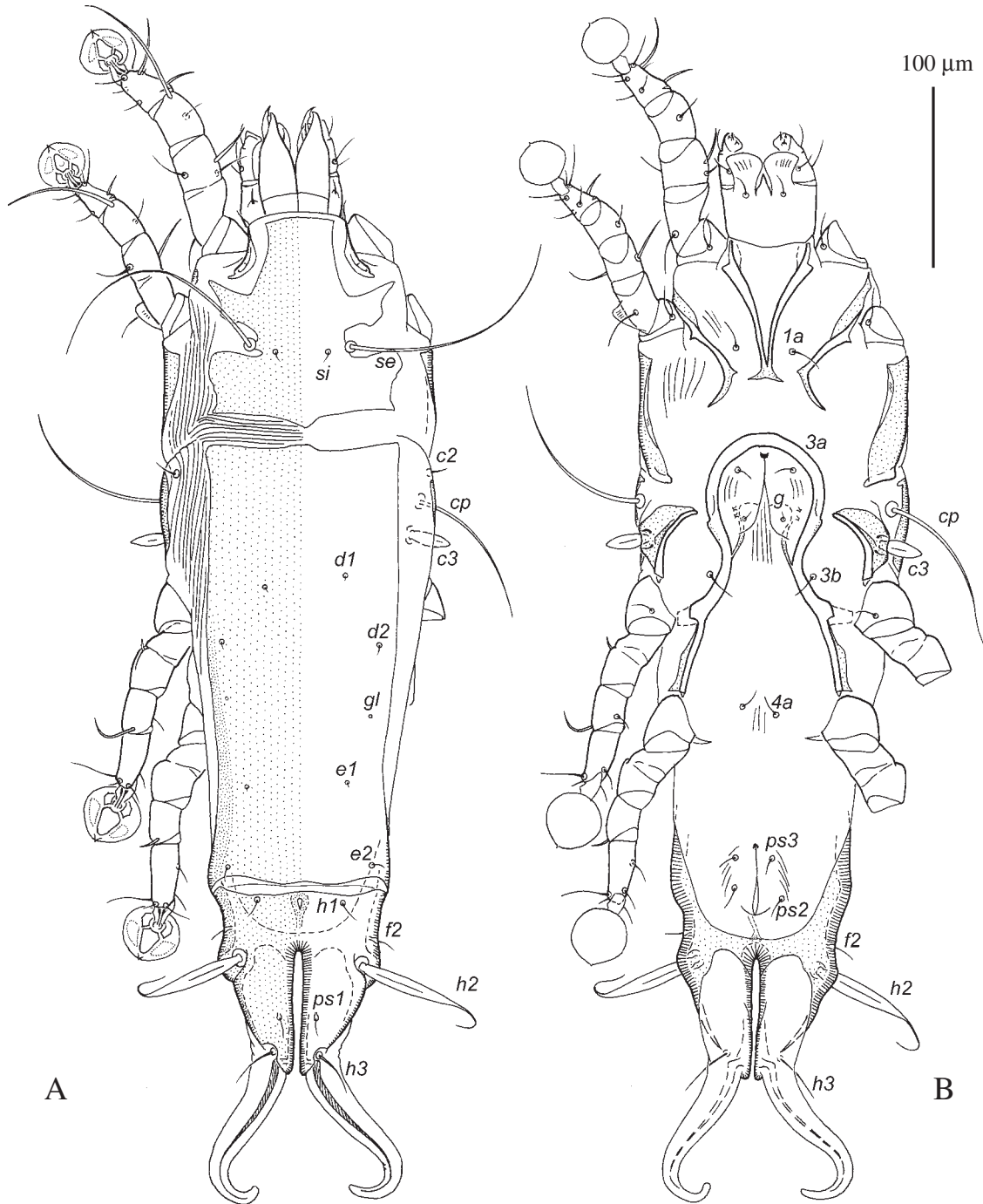


Fig. 3. *Proterothrix megacaula*, female. A — dorsal view, B — ventral view.

margins with deep incision extending to bases of setae *se*, antero-lateral extensions long and acute, posterior margin straight with short and blunt median extension, length of shield 108–117, width at posterior margin 93–100, setae *se* separated by 55–57 (Fig. 3 A). Scapular shields narrow. Humeral shields narrow, separated from outer sclerotization of epimerites III; setae *cp* situated on soft tegument between them and epimerites III. Setae *c2* situated dorsally, near to anterior ends of humeral shields.

Setae *c3* lanceolate, 20–22 × 7–7.5. Distance between prodorsal and hysteronotal shields 10–15. Anterior and lobar pieces of hysteronotal shield separated dorsally by narrow transverse band but remain connected ventro-laterally (Fig. 3 B). Anterior hysteronotal part of shield almost rectangular, anterior margin straight with short and blunt median extension, greatest length 232–240, width at anterior margin 102–106, surface uniformly punctured, lateral margins of posterior 2/3 sclerotized

darker than remaining area of this shield. Length of lobar region 100–102, greatest width 84–88. Terminal cleft parallel-sided, narrow; length 69–73, greatest width 4–9. Supranal concavity present. Setae *h1* on anterior margin of lobar shield. Setae *h2* spindle-like with short terminal filaments, length including filament 70–76, width 7–7.5. Setae *ps1* near to inner margins of opisthosomal lobes. Setae *h3* short, 13–22 in length, about 1/6 of terminal appendages. Distance between dorsal setae: *se:c2* 69–73, *c2:d2* 93–97, *d2:e2* 117–126, *e2:h2* 56–53, *h2:h3* 59–53, *d1:d2* 29–37, *e1:e2* 44–47, *h1:h2* 31–33, *h1:h1* 42–47, *h2:h2* 62–69, *h3:h3* 26–36.

Epimerites I fused as a V, fused part with acute lateral extensions not reaching to epimerites II. Lateral parts of coxal fields I, II without heavily sclerotized areas, inner margin of epimerites IIa with narrow longitudinal membrane (Fig. 3 B). Epimerites IVa rudimentary. Translobar apodemes of opisthosomal lobes present, fused to each other anterior to terminal cleft. Epigynum horseshoe-shaped, outer margin with small ledges at level of epimerites III, greatest width 62–65.

Primary spermaduct comparable in total length to idiosoma length, its proximal half narrow, distal half approximately 3 times wider than proximal half; secondary spermaducts 11–13 long; copulatory opening ventral, situated at anterior margin of translobar apodeme (Fig. 2 I). Distance between pseudanal setae: *ps2:ps2* 22–24, *ps3:ps3* 16–20, *ps2:ps3* 12–20; setae *ps2* situated at level of posterior half of anal opening.

Legs I slightly larger than legs II; femur I without ventral crest, femur II with wide ventral crest; other segments of legs I, II without apophyses. Solenidion $\sigma 1$ of genu I thin stick-like, 17–21 long, situated approximately at midlevel of segment. Seta *cGI* setiform, 12–13 long; seta *cGII* thin spiculiform, 17–20 long. Setae *mGI* and *mGII* setiform, 12–15 and 14–22 long, respectively. Genu III with narrow longitudinal dorsal crest; genu IV dorsally inflated, with narrow longitudinal crest (Figs 2 G, H).

Etymology. The specific epithet derives from *mega* (giant, Gr.) and *kaulos* (stem, stalk, Gr.) to refer to the extraordinarily long aedeagus in male; a noun in apposition, feminine gender.

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