

New species of the feather mite subfamily Pterodectinae (Astigmata, Proctophyllodidae) from passerines in Senegal

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Abstract

Four new species of the feather mite subfamily Pterodectinae (Proctophyllodidae) are described from passerine birds examined in Senegal: *Dolichodectes gymnoris* sp. nov. from the Russet-browed Bush-sparrow *Gymnoris dentata* (Sundevall, 1850) (Passeridae), *Montesauria plocei* sp. nov. from the Village Weaver *Ploceus cucullatus* (Muller, 1776) (Ploceidae), *M. zosteropsis* sp. nov. from the African Yellow White-eye *Zosterops senegalensis* Bonaparte, 1850 (Zosteropidae), and *Proterothrix terpsiphone* sp. nov. from the African Paradise-flycatcher *Terpsiphone viridis* (Muller, 1776) (Monarchidae). Brief notes on systematics and host associations of the pterodectine genera *Dolichodectes* Park et Atyeo, 1971, *Montesauria* Oudemans, 1905, and *Proterothrix* Gaud, 1968 are also given.

Keywords

Feather mites, Proctophyllodidae, systematics, new species, Passeriformes, Senegal

Introduction

The feather mite subfamily Pterodectinae Park et Atyeo, 1971 (Proctophyllodidae), one of two subfamilies of the Proctophyllodidae (Astigmata, Analgoidea), currently includes about 165 species arranged in 19 genera (Park and Atyeo 1971, Gaud and Atyeo 1996, Mironov 2009, Valim and Hernandez 2010). As for all Proctophyllodidae, these mites are highly specialized inhabitants of feathers with firm and large vanes, such as the flight and covert feathers of wings and the tail feathers, where they are located in the ventral corridors of vanes formed by barbs. Representatives of the Pterodectinae are predominately distributed on passerines (Passeriformes) and hummingbirds (Apodiformes, Trochilidae), although several species are associated with Piciformes and Coraciiformes, and a few species have been recorded from Gruiformes, Musophagiformes and Caprimulgiformes.

Diversity of pterodectines associated with passerines has been most extensively explored in Africa (Gaud 1952, 1953, 1957, 1964; Till 1954, 1957; Gaud and Mouchet 1957; Gaud and Till 1961; Mironov and Kopij 1996a, b, 1997; Mironov and Fain 2003; Mironov and Wauthy 2010). In the New World, most representatives of pterodectines have been described from South America (Berla 1958, 1959a, b, c, 1960;

Černý 1974; OConnor *et al.* 2005; Hernandez and Valim 2005, 2006; Valim and Hernandez 2006, 2008, 2009, 2010; Mironov *et al.* 2008b). To a much lesser extent these mites have been studied in other parts of the Old World, where they were described generally from the Indo-Malayan region (Sugimoto 1941; Gaud and Petitot 1948; Gaud 1962, 1968; Atyeo and Gaud 1977; Mironov 1996, 2006, 2008; Kuroki *et al.* 2006; Mironov *et al.* 2008a; Mironov and Proctor 2009; Hernandez *et al.* 2010).

According to the recently proposed taxonomic concept based on a phylogenetic analysis of morphological features (Mironov 2009), all pterodectines associated with passerines and with avian hosts other than hummingbirds belong to the tribe Pterodectini, and its genera constitute two generic groups. The *Proterothrix* group (5 genera) unites morphologically archaic lineages of the tribe; mites of this group are associated with suboscine passerines and some representatives of the infraorder Corvida (oscines). The *Pterodectes* group incorporates 9 genera mainly distributed on oscine passerines belonging to the infraorders Corvida and Passerida. The latter group, in turn, consists of two distinct generic complexes. The *Montesauria* generic complex is restricted to avian hosts of the Old World. Mites of the *Pterodectes* complex are distributed on passerines of the New World, with the exception of

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Pterodectes rutilus Robin, 1877 associated with swallows (Hirundinidae) and occurring almost worldwide (Mironov 2009, Valim and Hernandez 2010).

In the present paper we describe four new pterodectine species from the genera *Dolichodectes* Park et Atyeo, 1971, *Montesauria* Oudemans, 1905, and *Proterothrix* Gaud, 1968 collected from passerine birds in Senegal.

Materials and methods

The material used in the present work was collected by I. Literák, M. Čapek and P. Koubek in Senegal from 7 to 18 September 2007. Birds were examined in three locations: Matam (15°37'N, 13°20'W), Dar Salam (13°15'N, 13°12'W), and in Niokolo Koba National Park and Kaolack (14°09'N, 16°06'W). Birds were mist-netted, identified and visually checked for the presence of mites. A small part of a flight feather infested with feather mites was cut off with scissors and placed into a tube with 70% ethanol. After the processing, captured birds were released back into the wild. Collected mite specimens were mounted on microslides in Faure medium according to standard techniques used for many groups of small-sized acariform mites (Evans 1992). Drawings were made by S.V. Mironov using a drawing tube attached to the Leica DM 5000B light microscope with DIC illumination. Comparative material of some pterodectine species living in Africa was loaned from the Musée royal de l'Afrique central in Tervuren, Belgium.

Species descriptions are given in the recent standard format used for species of pterodectine mites (Mironov and Fain 2003; Valim and Hernandez 2006; Mironov 2006, 2008). General morphological terms and the leg and idiosomal chaetotaxy follow Gaud and Atyeo (1996). Measuring techniques for particular structures are as proposed for proctophyllodid mites in Mironov *et al.* (2008b). All measurements are in micrometers (μm).

The authorship of all new species is attributed to the senior author. The depositories of type materials of the new species described in this paper are as follows: MRAC – the Musée royal de l'Afrique central, Tervuren, Belgium; UMMZ – Museum of Zoology, University of Michigan, Ann Arbor, USA; ZISP – Zoological Institute of the Russian Academy of Sciences, Saint-Petersburg, Russia. Systematics and scientific names of birds follow Dickinson (2003).

Results

Family Proctophyllodidae Trouessart et Mégnin, 1884
Subfamily Pterodectinae Park et Atyeo, 1971

Genus *Dolichodectes* Park et Atyeo, 1971

Among mites of the *Montesauria* generic complex, the genus *Dolichodectes* is characterized by a significantly elongated

opisthosoma in males with setae *ps3* situated posterior to the anal suckers and bases of setae *g* and *ps3* arranged in a long rectangle. Park and Atyeo (1971) originally referred five species to this genus. Later on, one more species was described by Mironov and Fain (2003). Hernandez and Valim (2006) proposed a key to known species of the genus and described *D. neotropicus* Hernandez et Valim, 2006 from Brazil. Subsequently, this species was moved to a separate genus *Berladectes* Valim et Hernandez, 2009 (*Pterodectes* complex). Of six species recently included in the genus *Dolichodectes*, five are known only from Africa, and only *D. edwardsi* (Trouessart, 1885), the type species of the genus, associated with warblers of the genera *Acrocephalus* Naumann et Naumann, 1811 and *Phylloscopus* Boie, 1826 (Sylviidae), is widely distributed in the Old World (Trouessart 1885, Gaud and Mouchet 1957, Gaud and Till 1961, Mironov 1996). A new *Dolichodectes* species described below is the first record of this genus from a passerine host from the superfamily Passeroidea.

Dolichodectes gymnoris sp. nov. (Figs 1–3A, B)

Type material: Holotype (ZISP 4515), 9 males, 7 female paratypes ex *Gymnoris dentata* (Sundevall, 1850) (Ploceidae), Senegal, Dar Salam (13°15'N, 13°12'W), 12 September 2007, I. Literák. Holotype, 3 male and 4 female paratypes – ZISP, remaining paratypes – MRAC, UMMZ.

Description

Male (holotype, range for 9 paratypes in parentheses). Length of idiosoma 485 (480–490), width 174 (170–175), length of hysterosoma 334 (330–335). Prodorsal shield: antero-lateral extensions connected to bases of epimerites Ia, lateral margins without incisions around scapular setae, posterior margins sinuous, length along midline 122 (120–124), width at posterior margin 124 (120–126), surface monotonously punctuated (Fig. 1A). Setae *ve* present, scapular setae *se* separated by 62 (60–65). Humeral shields poorly developed, separated from epimerites III, not encompassing setae *cp*. Setae *c2* on soft tegument anterior to humeral shields. Setae *c3* lanceolate, 26 (24–26) long, 8 (8–9) wide. Hysteronotal shield: greatest length 325 (320–330), width in anterior part 137 (135–150), anterior margin slightly concave, anterior angles extended and rounded, surface of shield punctuate, in anterior half with transverse striae. Opisthosomal lobes longer than wide, posterior end of lobes attenuate and bluntly rounded, setae *h3* near posterior margin, setae *h2* on rounded ledge of lateral margins. Terminal cleft U-shaped, narrow, 48 (48–54) long, 11 (7–12) wide in distal part. Supranal concavity ovoid. Setae *f2* slightly anterior to *ps2*. Setae *h1* at level of anterior end of supranal concavity. Setae *h3* narrowly lanceolate, with acute tips, length 55 (52–55), greatest width 13 (12–15); setae *ps2* 70 (70–78) long; setae *ps1* filiform, about 5 long, situated at level of setae *h2*. Distance between bases of dorsal setae:

$c2:d2$ 133 (130–135), $d2:e2$ 90 (88–94), $e2:h3$ 93 (90–94), $d1:d2$ 37 (35–48), $e1:e2$ 22 (20–24), $h1:ps2$ 26 (26–34), $h2:h2$ 59 (55–60), $h3:h3$ 35 (26–35), $h2:h3$ 20 (20–22), $ps2:ps2$ 66 (60–66).

Epimerites I fused into a Y, sternum about 1/3 of total length of epimerites, posterior end free (Fig. 1B). Coxal fields I, II without large sclerotized areas. Coxal fields I, II open, coxal fields III almost closed, coxal fields IV with wide sclerotized areas at bases of corresponding trochanters. Inner tips of epimerites IIIa with bar-like projections directed backward and bearing setae *3a*. Rudimentary sclerites rEpIIa absent.

Genital arch small, 22 (21–24) long, 31 (29–32) wide; basal sclerite of genital apparatus small, rectangular; aedeagus sword-shaped, 84 (80–84) long, extending to anterior margin of anal suckers. Genital papillae at midlevel of genital arch, poorly distinct. Genital shields, epimerites IVa, paragenital apodemes and shield-like areas of coxal fields IV fused altogether to form almost complete sclerotized ring surrounding genital apparatus. Setae *4a* on margins of paragenital apodemes, setae *g* on anterior margin of genital shield. Opisthoventral shields wide, fused together by T-shaped translobar apodeme; anal field flanked from posterior and lateral sides

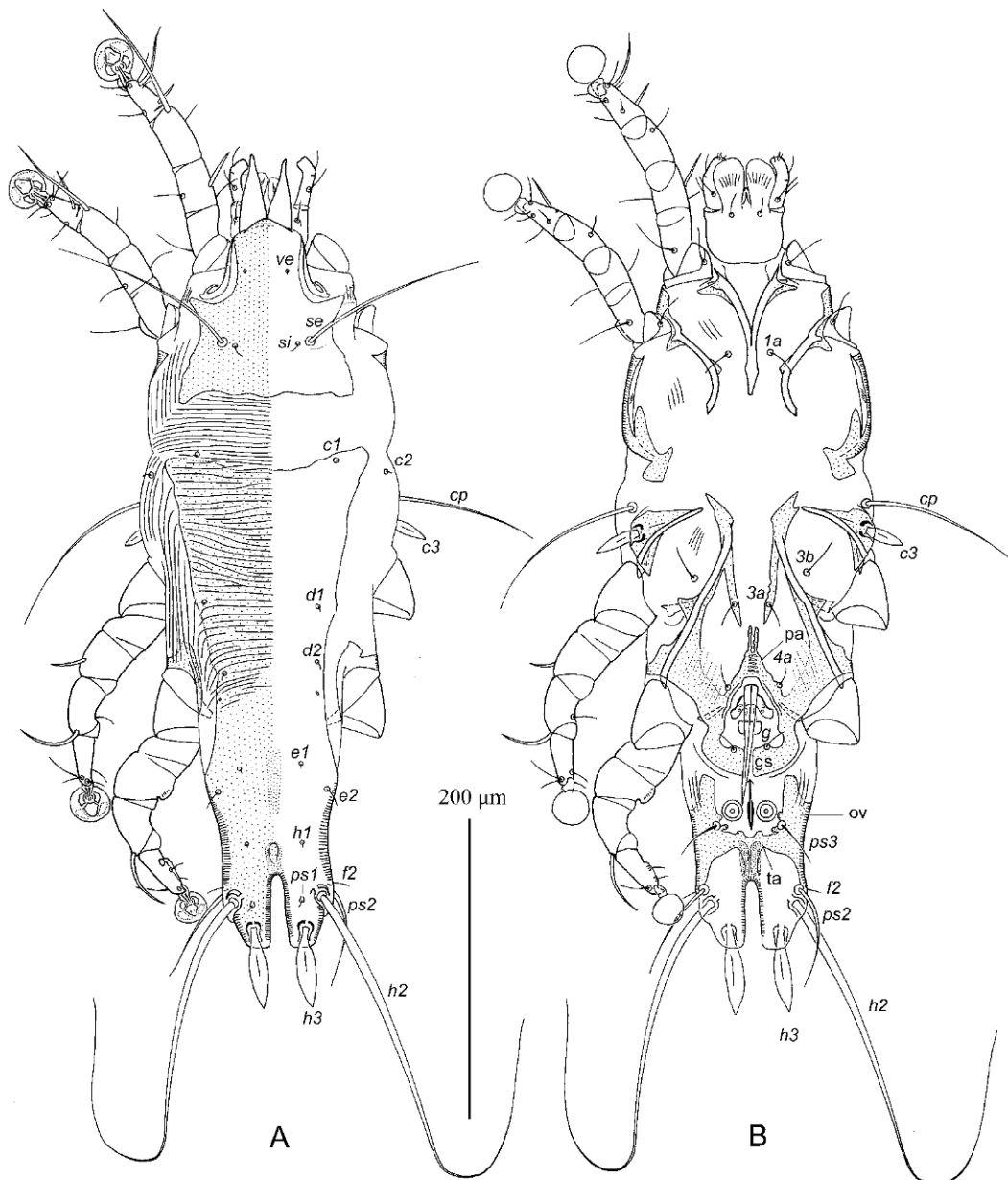


Fig. 1. *Dolichodectes gymnoris* sp. nov., male: **A** – dorsal view, **B** – ventral view; gs – genital shield, ov – opisthoventral shields, pa – paragenital apodeme, ta – translobar apodeme

by opisthoventral shield and translobar apodeme. Anal suckers 13 (13–14) in diameter, corolla without indentations. Setae *ps3* on inner margins of opisthoventral shields, postero-lateral to anal suckers. Distance between ventral setae: *3b:3a* 20 (13–20), *3a:4a* 57 (55–58), *4a:g* 42 (40–44), *g:ps3* 55 (51–55), *ps3:ps3* 44 (44–46), *ps3:h3* 73 (70–75).

Legs I, II subequal. Femora II with narrow ventral crests, other segments of legs I, II without processes. Solenidion σI of genu I spiculiform, 26 (24–26) long, situated at midlevel of segment; genual setae *cGI*, II, *mGI*, II filiform. Solenidion σI of genu III in distal part of segment. Genu IV with heavily

sclerotized ventral crest-like extension. Setae *d* of tarsi II, III shorter than corresponding setae *f*. Tarsus IV 40 (37–40) long, with apical claw-like process and longitudinal ventral crest; seta *d* hemispherical, with thick walls, situated in proximal part of segment; seta *e* indistinct. Solenidion ϕ of tibia IV extending to midlevel of ambulacral disc. Length of solenidia: ωI 20 (20–22), ωII 24 (23–24), ϕI 84 (79–85), ϕII 62 (62–66), ϕIII 37 (36–39), ϕIV 50 (50–52).

Female (range for 7 paratypes). Length of idiosoma (excluding terminal appendages) 580–595, width 205–225, length of hysterosoma 410–430. Prodorsal shield: antero-lateral ex-

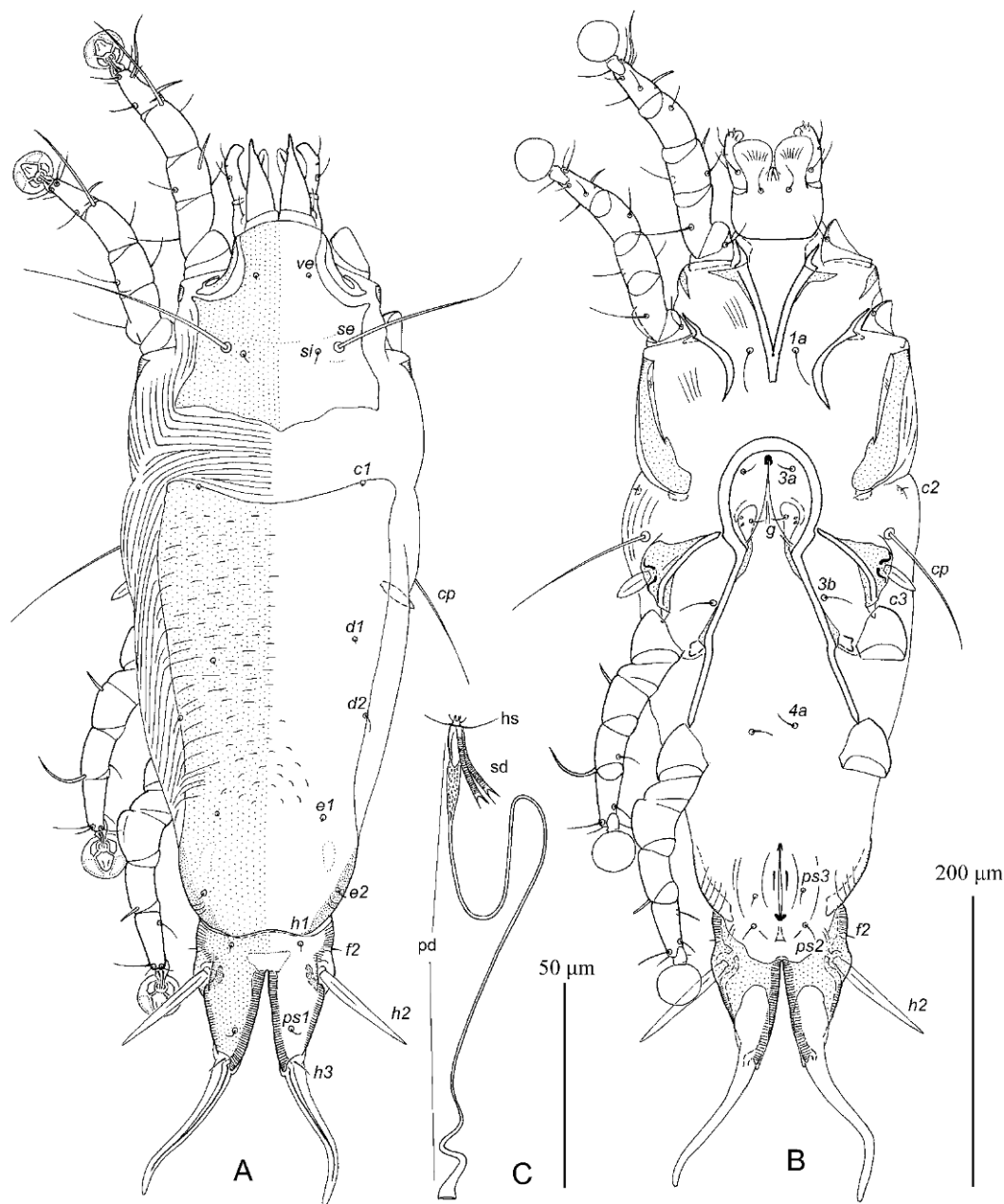


Fig. 2. *Dolichodectes gymnoris* sp. nov., female: **A** – dorsal view, **B** – ventral view, **C** – spermatheca and sperm ducts; *hs* – head of spermatheca, *pd* – primary sperm duct, *sd* – secondary sperm duct

tensions acute and not fused to epimerites Ia, posterior margin with blunt-angular median extension, 142–148 long, 144–146 wide; setae *se* separated by 78–88. Humeral shields absent, setae *cp* on soft tegument. Setae *c2* situated submarginally, on soft tegument. Setae *c3* lanceolate, 20–22 × 6.5–8.

Anterior and lobar parts of hysteronotal shields completely separated from each other by narrow transverse groove (Fig. 2A). Anterior hysteronotal shield slightly enlarged in anterior part, anterior margin concave, posterior margin convex in general shape, with shallow median concavity, greatest length 305–320, width at anterior margin 165–177; anterior two thirds of shield with dash-like transverse striae. Length of lobar region (excluding terminal appendages) 115–135, width at level of setae *h2* 100–110. Terminal cleft as a narrow V, 70–79 long. Supranal concavity represented by poorly sclerotized area of trapezoidal form. Setae *f2* present. Setae *h1* near to anterior margin of lobar shield. Setae *h2* spindle-like, 78–80 long, 7–9 wide. Setae *ps1* slightly closer to lateral margins of terminal cleft than to lateral margins of opisthosomal lobes. Setae *h3* filiform, 10–12 long, about 1/6 of terminal appendages. Distance between dorsal setae: *c2:d2* 140–150, *d2:e2* 124–144, *e2:h2* 60–64, *h2:h3* 62–66, *d1:d2* 35–52, *e1:e2* 48–52, *h1:h2* 22–26, *h1:h1* 44–46, *h2:h2* 78–88, *h3:h3* 47–51, *h2:ps1* 44–48.

Epimerites I fused into a Y, sternum about 1/4 of total length of epimerites. Lateral parts of coxal fields I, II without wide sclerotized areas. Epimerites IVa absent. Translobar apodemes of opisthosomal lobes wide, not fused with each other anterior to terminal cleft (Fig. 2B). Head of spermatheca poorly sclerotized, primary sperm duct with punctuated enlargement in proximal part, remaining part smooth; secondary sperm ducts 17–20 long, with transverse striation (Fig. 2C). Distance between pseudanal setae: *ps2:ps2* 35–42, *ps3:ps3* 33–39, *ps2:ps3* 20–24.

Legs I, II as in male. Femur II with ventral crest. Solenidion *σI* of genu I spiculiform, 19–22 long. Seta *cGI*, II, *mGI*, II filiform. Genu IV with rounded dorsal crest. Setae *d* of tarsi II–IV shorter than corresponding setae *f*. Solenidion *φIV* about 1/4 of corresponding tarsus. Length of solenidia: *ωII* 20–22, *ωIII* 14–17, *φI* 71–84, *φII* 70–73, *φIII* 35–42, *φIV* 13–15.

Differential diagnosis

Dolichodectes gymnoris sp. nov. is most similar to the type species of the genus, *D. edwardsi* (Trouessart, 1885) by the form of sclerites around the genital apparatus and of opisthoventral shields in the males. In both species, the genital apparatus is encircled by a complete or almost complete sclerotized ring and the translobar apodemes form a T-shaped structure connecting the opisthoventral shields and the anterior end of terminal cleft (Fig. 1B). *Dolichodectes gymnoris* differs from *D. edwardsi* by the following features: in males, the sternum is free from epimerites II, coxal fields II are open, the apices of opisthosomal lobes are bluntly rounded, the paragenital apodeme (anterior to genital arch) is interrupted and

not connected to epimerites IIIa, and the aedeagus extends to the anterior margin of the anal suckers; in females, the anterior hysteronotal and lobar shields are completely separated from each other, the prodorsal shield is without transverse striae. In males of *D. edwardsi*, the sternum is connected with epimerites II by means of transverse sclerotized bands, coxal fields II are closed, the apices of opisthosomal lobes are acute, the paragenital apodeme is entire and its anterior branches are connected with epimerites IIIa, and the aedeagus extends to the posterior margin of the anal suckers; in females, the anterior hysteronotal and lobar shields remain connected ventrally by sclerotized bands, the posterior part of prodorsal shield has a pattern of transverse striae.

Etymology

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

Genus *Montesauria* Oudemans, 1905

Montesauria is the most species-rich genus in the subfamily Pterodectinae and currently includes 51 species (Park and Atyeo 1971; Mironov 2006, 2008, 2009; Hernandez *et al.* 2010). The majority of described species are associated with passerines with a few species recorded from African barbets (Piciformes, Lybiidae) and rails (Gruiformes, Rallidae). Most of these species, including those described by early authors (Trouessart 1885, Robin and Megnin 1877) and by Gaud and coauthors in the end of 1950s (Gaud and Petitot 1948, Gaud 1952, Gaud and Mouchet 1957) need redescription because many important details were missed. Mironov (2006) arranged all known *Montesauria* species into 9 species groups. Recent investigation of phylogeny based on morphological characters (Mironov 2009) showed that the genus *Montesauria* could be paraphyletic in relation to morphologically derived genera of the *Montesauria* complex (*Alaudicola* and *Dolichodectes*), but resolving this requires much more extensive investigation of the diversity of pterodectine mites.

Montesauria plocei sp. nov. (Figs 3C, D; 4 and 5)

Type material: Holotype (ZISP 4523), 3 male and 3 female paratypes ex *Ploceus cucullatus* (Muller, 1776) (Ploceidae), Senegal, Kaolack (14°09'N, 16°06'W), 7 September 2007, I. Literák. Holotype, 1 male and 1 female paratypes – ZISP, remaining paratypes – MRAC, UMMZ.

Description

Male (holotype, range for 3 paratypes in parentheses). Length of idiosoma 357 (343–362), width 130 (122–130), length of hysterosoma 245 (235–245). Prodorsal shield: 104 (102–106) in length along median line, 93 (90–95) in width at posterior margin, antero-lateral extensions acute, lateral margins with-

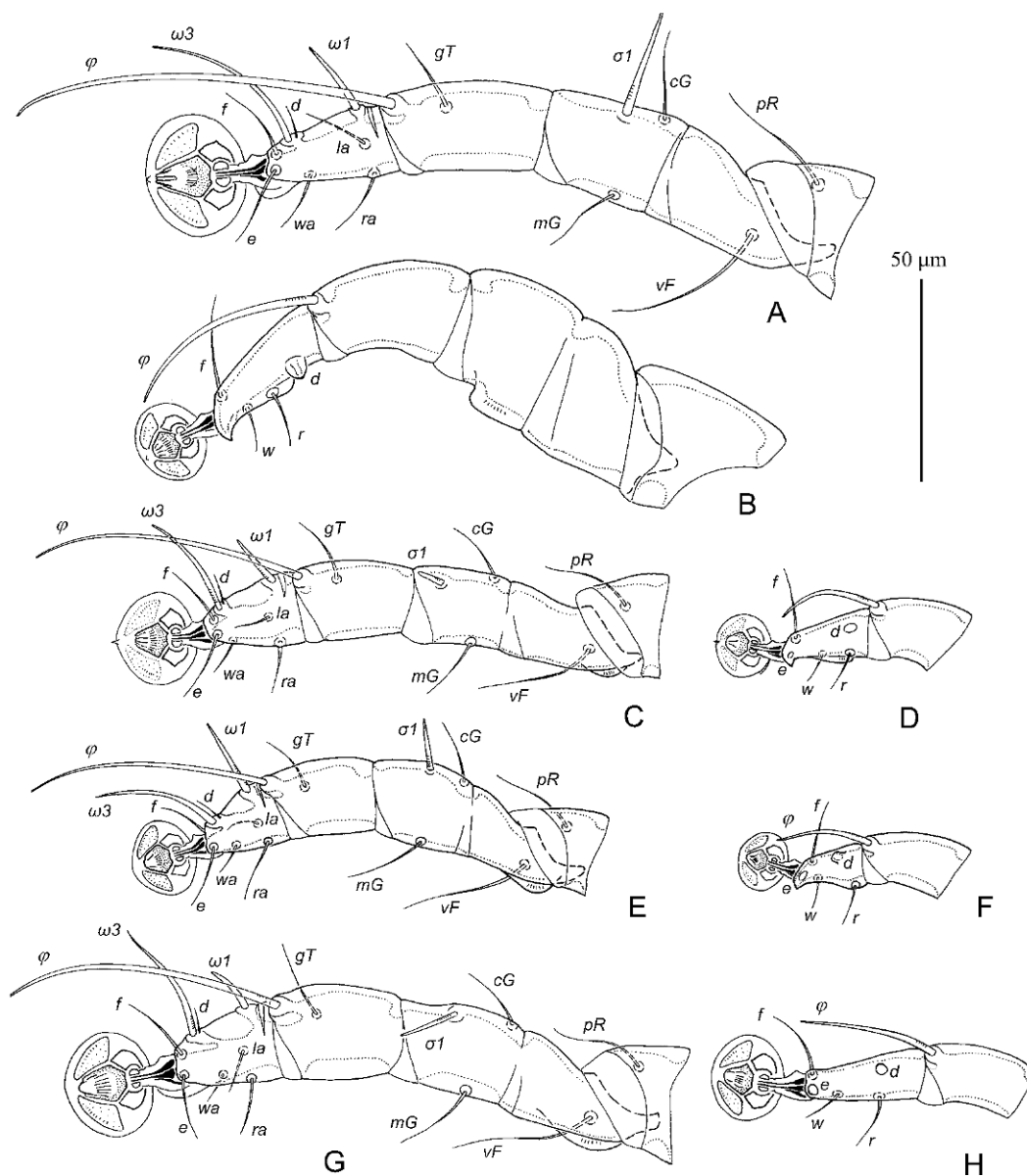


Fig. 3. Legs of Pterodectinae males: **A** – *Dolichodectes gymnoris* sp. nov., leg I; **B** – same, leg IV; **C** – *Montesauria ploccei* sp. nov., leg I; **D** – same, tibia and tarsus IV; **E** – *Montesauria zosteropis* sp. nov., leg I; **F** – same, tibia and tarsus IV; **G** – *Proterothrix terpsiphone* sp. nov., leg I; **H** – same, tibia and tarsus IV

out incisions around bases of scapular setae, posterior margin straight, surface without lacunae (Fig. 4A); scapular setae *se* separated by 42 (39–42). Humeral shields present, small, separated from epimerites III. Setae *cp* on soft tegument. Setae *c2* situated dorsally, slightly anterior to corresponding humeral shields. Subhumeral setae *c3* lanceolate, 22 (20–22) long, 6.5 (5–6.5) wide. Hysteronotal shield: greatest length 236 (230–240), width in anterior part 88 (84–90), anterior margin straight, anterior angles widely rounded, surface monotonously punctuated (in some specimens with small lacunae in anterior third). Opisthosomal lobes small, slightly longer than wide, roughly rectangular, posterior margin with blunt exten-

sions at base of setae *h2* and *h3*. Terminal cleft narrow, parallel-sided, 27 (25–31) long, 5 (4–6) wide. Supranal concavity distinct, ovoid. Setae *f2* present. Setae *h1* at level of supranal concavity. Setae *h3* widely lanceolate, with acute tips, 35 (33–37) long, 12 (11–14) wide; setae *ps2* 66 (60–66) long; setae *ps1* filiform, minute, about 5 long, situated approximately at level of setae *ps2*, equidistant from outer and inner margins of opisthosomal lobes. Distance between bases of dorsal setae and setal pairs: *c2:d2* 93 (88–90), *d2:e2* 88 (86–90), *e2:h3* 55 (48–55), *d1:d2* 44 (35–44), *e1:e2* 17 (17–22), *h1:ps2* 20 (17–20), *h2:h3* 38 (33–38), *h3:h3* 15 (13–17), *ps2:ps2* 45 (42–48), *ps1:h3* 13 (11–13).

Epimerites I fused as a Y, posterior end of sternum connected to medial part of epimerites II by narrow transverse bands (Fig. 4B). Coxal fields I–II without large sclerotized areas. Coxal fields I closed, coxal fields II, III open. Coxal fields IV without narrow triangular plates at corresponding trochanter. Inner margin of epimerites IIIa with short and acute extension directed backward. Rudimentary sclerites rEpIIa absent. Epimerites IVa absent. Genital arch small and low, with acute tips directed laterally, 9 (9–11) long, 25 (24–30) wide; basal sclerite of genital apparatus indistinct. Aedeagus straight, sword-like, 57 (55–58) long, extending to anterior margin of anal suckers. Genital papillae situated anterior to genital arch apex and arranged in transverse row. Genital and adanal shields absent. Anal suckers 11 (11–12) in diameter, corolla

with 13–15 indentations. Opisthoventral shields narrow, with oblique finger-like extensions situated posterior to anal suckers and bearing setae *ps3* at base. Distance between ventral setae: *3b:3a* 22 (17–22), *3a:4a* 48 (48–52), *4a:g* 20 (20–22), *g:ps3* 53 (50–53), *ps3:ps3* 45 (42–45), *ps3:h3* 31 (28–33).

Legs I slightly thicker and longer than legs II. Femora I, II with narrow ventral crests, other segments of legs I, II without processes. Solenidion $\sigma 1$ of genu I short stick-like, 5 (5–6) long, situated in anterior half of segment; genual setae *cGI*, II, *mGI*, II filiform (Fig. 3C). Solenidion $\sigma 1$ of genu III in distal half of segment. Setae *d* of tarsi II, III much shorter than corresponding setae *f*. Tarsus IV 22 (20–24) long, with apical claw-like process and with narrow ventral crest; setae *d*, *e* button-like, seta *d* situated in basal part of segment; seta *e* situated

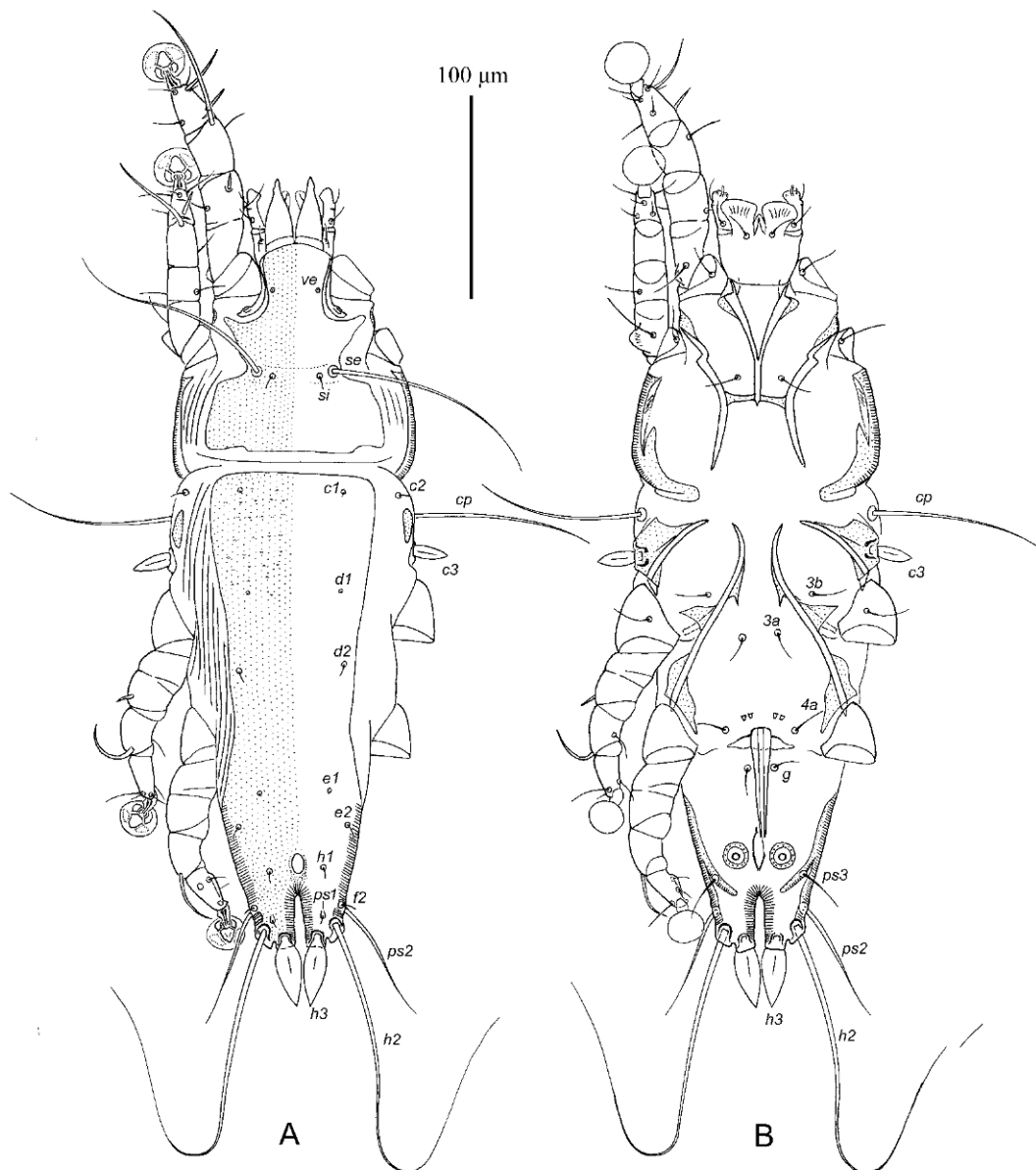


Fig. 4. *Montesauria plocei* sp. nov., male: A – dorsal view, B – ventral view

at base of apical claw; solenidion ϕ of tibia IV extending to tarsal apex (Fig. 3D). Length of solenidia: ω /I 13 (13–14), ω /II 11 (11–12), ϕ I 64 (57–64), ϕ II 42 (40–60), ϕ III 26 (25–28), ϕ IV 26 (24–26).

Female (range for 3 paratypes). Length of idiosoma 445–465, width 150–160, length of hysterosoma 332–345. Prodorsal shield: general form as in the male, except for posterior margin with short and wide median projection, surface with small pit-like lacunae, 120–125 long, 110–124 wide, setae *se* separated by 55–60. Humeral shields poorly developed, separated from epimerites IV (in some specimens these shields absent), setae *cp* on soft tegument. Setae *c2* situated dorsally, on soft tegument. Setae *c3* lanceolate, 20–22 $\times$ 6–7. Anterior and lobar parts of hysteronotal shield separated from each other, delimited dorsally by narrow transverse groove (Fig.

5A). Anterior hysteronotal shield roughly rectangular, anterior and posterior margins straight, anterior angles rounded, greatest length 254–265, width at anterior margin 110–115; surface except for posterior quarter with small pit-like lacunae. Length of lobar region 70–75, width at level of setae *h2* 66–73. Terminal cleft narrow, U-shaped, 40–42 long, 12–17 wide at midlevel. Supranal concavity present, circular. Setae *f2* present. Setae *h1* on lobar shield, near its anterior margin. Setae *h2* spindle-like, 30–32 long, 6–7 wide. Setae *ps1* closer to lateral margins of opisthosomal lobes than to margins of terminal cleft. Setae *h3* 20–24 long, about 1/5 of terminal appendages. Distance between dorsal setae: *c2*:*d2* 110–118, *d2*:*e2* 110–115, *e2*:*h2* 64–68, *h2*:*h3* 22–25, *d1*:*d2* 55–60, *e1*:*e2* 26–39, *h1*:*h2* 30–33, *h1*:*h1* 30–32, *h2*:*h2* 55–62, *h3*:*h3* 32–35, *h2*:*ps1* 11–13.

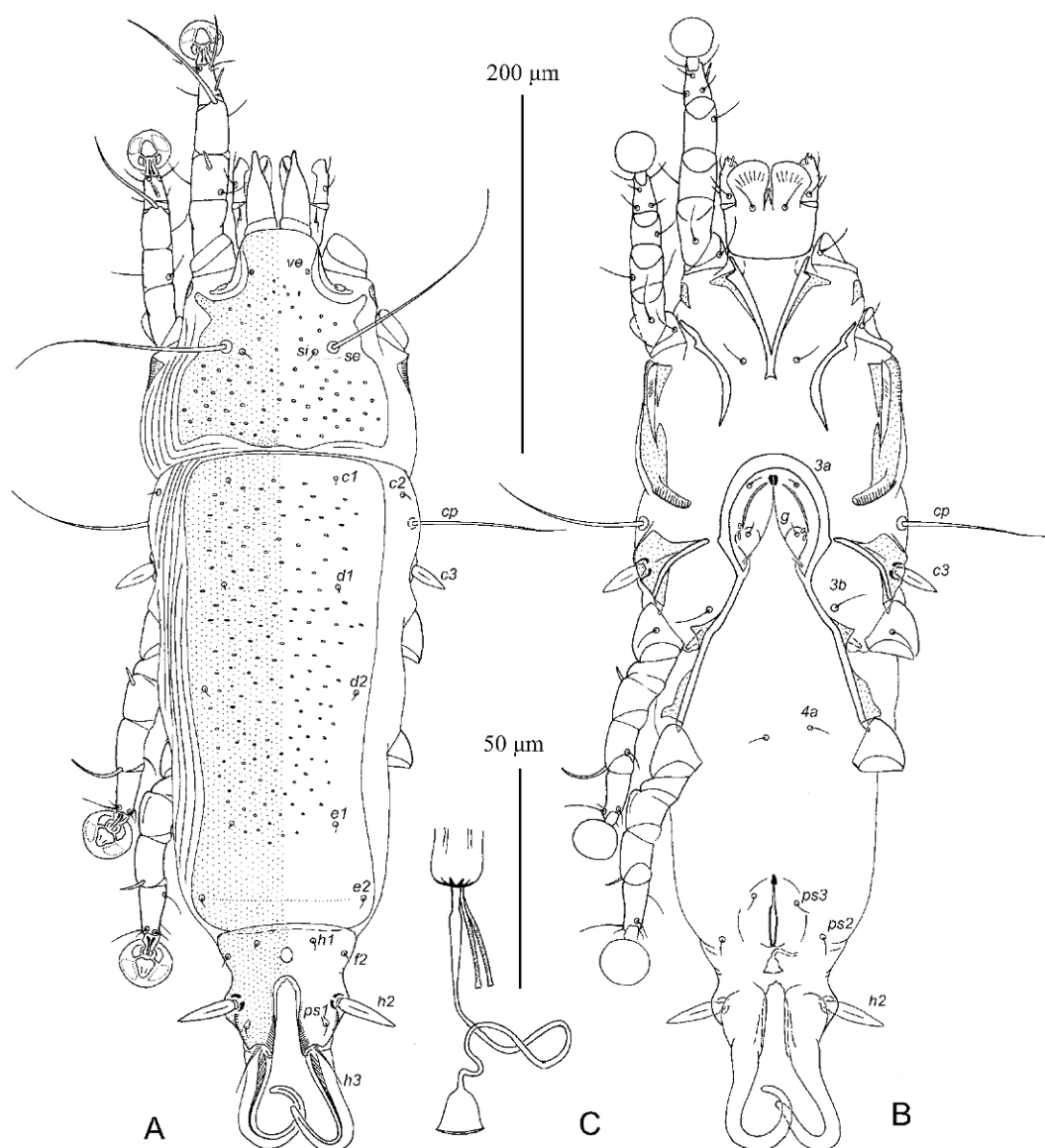


Fig. 5. *Montesauria plocei* sp. nov., female: A – dorsal view, B – ventral view, C – spermatheca and sperm ducts

Epimerites I fused as a Y with a very short stem, posterior end of sternum with a pair of short acute extensions (Fig 5B). Coxal fields I, II without wide sclerotized areas. Rudimentary sclerites rEpIIa absent. Epimerites IVa absent. Translobar apodemes of opisthosomal lobes absent. Greatest width of epigynum 60–65. Head of spermatheca poorly sclerotized; primary sperm duct slightly enlarged in proximal part, distal end forming bell-shaped enlargement (bursa copulatrix), outer surface of this sperm duct smooth; secondary sperm ducts 25–38 long, with verrucate outer surface (Fig. 5C). Distance between pseudanal setae: *ps2:ps2* 55–58, *ps3:ps3* 22–24, *ps2:ps3* 17–20.

Legs I, II as in male. Femur II with ventral crest. Solenidion *σ1* of genu I stick-like, short, situated in distal part of segment, 9–10 long. Setae *cGI*, II, *mGI*, II filiform. Genu IV with low dorsal crest. Setae *d* of tarsi II–IV much shorter than corresponding setae *f*. Length of solenidia: *ω1I* 11–12, *ω1II* 7–9, *φ1* 64–66, *φII* 48–50, *φIII* 24–26, *φIV* 7–9.

Differential diagnosis

Montesauria plocei sp. nov. belongs to the *papillo* species group (Mironov 2006) and is most close to *M. buettikeri* Till, 1954 from *Ploceus ocularis* Smith A., 1839 by having a very low genital arch, sternum connected to epimerites II, the genital papillae are situated anterior to the genital arch, and widely lanceolate setae *h3* in males. *Montesauria plocei* differs from that species by the following features: in males, any pregenital apodeme anterior to genital arch is absent, and the aedeagus is 55–58 long; in female, the prodorsal and anterior hysteronotal shields with numerous small pit-like lacunae, and lobar shield is 70–75 long. In the males of *M. buettikeri*, the pregenital apodeme in a form of narrow inverted Y is present, and the aedeagus is longer (65–68); in females, the prodorsal and anterior hysteronotal shields are monotonously punctuated, and the lobar region is 95–100 long.

Remarks

The unique feature of *Montesauria buettikeri* and *M. plocei* within the genus *Montesauria* is the anterior position of the genital papillae in relation to the genital arch (Fig. 4B), because in other known species they are situated at the level or the genital arch or even posterior to it. The posterior position of genital papillae is considered the main characteristic of the *Montesauria* generic complex, while in other pterodectines including the *Pterodectes* complex these papillae are situated anterior to the genital arch (Mironov 2006, 2009; Mironov *et al.* 2008b; Valim and Hernandez 2010). Nevertheless we consider that this character state in *M. buettikeri* and *M. plocei* does not correspond to the ancestral state observed in the *Pterodectes* complex. The anterior position of papillae in these two species could probably be caused by strong shortening of the genital arch (Fig. 4B). Besides, these two pairs of papillae are arranged in almost transverse row, while in mites of the

Pterodectes group the papillae of each side are usually situated one after another. Additionally the following male characters give evidence that *M. buettikeri* and *M. plocei* belong to the genus *Montesauria*: the well developed sternum formed by epimerites I, epimerites IIIa extending almost to the level of epimerites III tips, and strongly lanceolate setae *h3*. These minor features occur in some species of the genus *Montesauria*, but were not observed in genera of the *Pterodectes* complex associated with oscine passerines (*Amerodectes* Valim et Hernandez, 2010 and *Pterodectes*).

Etymology

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

Montesauria zosteropsis sp. nov. (Figs 3E, F and 6)

Type material: Male holotype (ZISP 4526), 2 male paratypes ex *Zosterops senegalensis* Bonaparte, 1850 (Zosteropidae), Senegal, Dar Salam (13°15'N, 13°12'W), 11 September 2007, I. Literák. Holotype – ZISP, remaining paratypes – MRAC.

Description

Male (holotype, range for 2 paratypes in parentheses). Length of idiosoma 348 (340–350), width 122 (110–125), length of hysterosoma 245 (235–245). Prodorsal shield: 97 (95–102) in length, 95 (84–95) in width at posterior margin, antero-lateral extensions short and rounded, lateral margins without incisions, posterior margin straight, surface without lacunae (Fig. 6A); scapular setae *se* separated by 44 (42–45). Humeral shields absent, setae *cp* on soft tegument. Setae *c2* situated dorsally, on anterior angles of hysteronotal shield. Subhumeral setae *c3* lanceolate, 20 (20–22) long, 5 (4.5–6) wide. Hysteronotal shield: greatest length 240 (230–240), width in anterior part 110 (100–115), anterior margin straight, anterior angles blunt, surface with dash-like transverse striae in anterior part. Opisthosomal lobes attenuate posteriorly, posterior margin with short and wide extensions at bases of setae *h2* and *h3*. Terminal cleft narrow, almost parallel-sided, with acute anterior end, 31 (30–33) long, 7 (6–8) wide in posterior part. Supranal concavity ovoid. Setae *f2* present. Setae *h1* anterior to terminal cleft, approximately at level of supranal concavity. Setae *h3* narrowly lanceolate, with acute tips, 45 (44–48) long, 7 (7–8) wide. Setae *ps2* 38 (38–40) long; setae *ps1* filiform, minute, about 5 long, situated slightly anterior to level of macrosetae *h2*. Distance between bases of dorsal setae: *c2:d2* 106 (98–105), *d2:e2* 84 (75–85), *e2:h3* 51 (48–50), *d1:d2* 35 (25–35), *e1:e2* 20 (20–23), *h1:ps2* 37 (25–35), *h2:h3* 34 (33–36), *h3:h3* 16 (15–18), *ps2:ps2* 44 (42–44), *ps1:h3* 15 (9–15).

Epimerites I fused as a Y, sternum about 1/4 of total length of epimerites, not connected to epimerites II (Fig. 6B). Lateral half of coxal fields I–IV without large sclerotized areas. Coxal fields I–III open. Coxal fields IV with acute sclerotized

area at base of trochanter. Rudimentary sclerites rEpIIa absent. Epimerites IVa absent. Genital arch small, end of its branches widened and rounded, 24 (22–24) long, 7 (6–7) wide; basal sclerite of genital apparatus small, crescent-shaped; genital papillae at level of genital arch base. Aedeagus straight, sword-shaped, 90 (82–90) long, extending to anterior end of terminal cleft. Genital and adanal shields absent. Anal suckers 13 (11–13) in diameter, corolla with 13–14 indentations, surrounding membrane with radial striae. Opisthoventral shields narrow, finger-like extension on its inner margin and setae *ps3* posterior to level of anal suckers. Distance be-

tween ventral setae: *3b:3a* 20 (13–20), *3a:4a* 35 (32–35), *4a:g* 26 (24–26), *g:ps3* 51 (46–50), *ps3:ps3* 48 (46–48), *ps3:h3* 37 (35–38).

Legs I slightly thicker and longer than legs II. Femora I, II with narrow ventral crests, other segments of legs I, II without processes. Solenidion $\sigma 1$ of genu I thin stick-like, 13 (11–13) long, situated in basal part of segment; genual setae *cGI*, II, *mGI*, II filiform (Fig. 3E). Solenidion $\sigma 1$ of genu III in distal part of segment. Setae *d* of tarsi II, III slightly shorter than corresponding setae *f*. Tarsus IV 20 (17–20) long, slightly inflated in basal part, with apical claw-like process; seta *d* stub-like, sit-

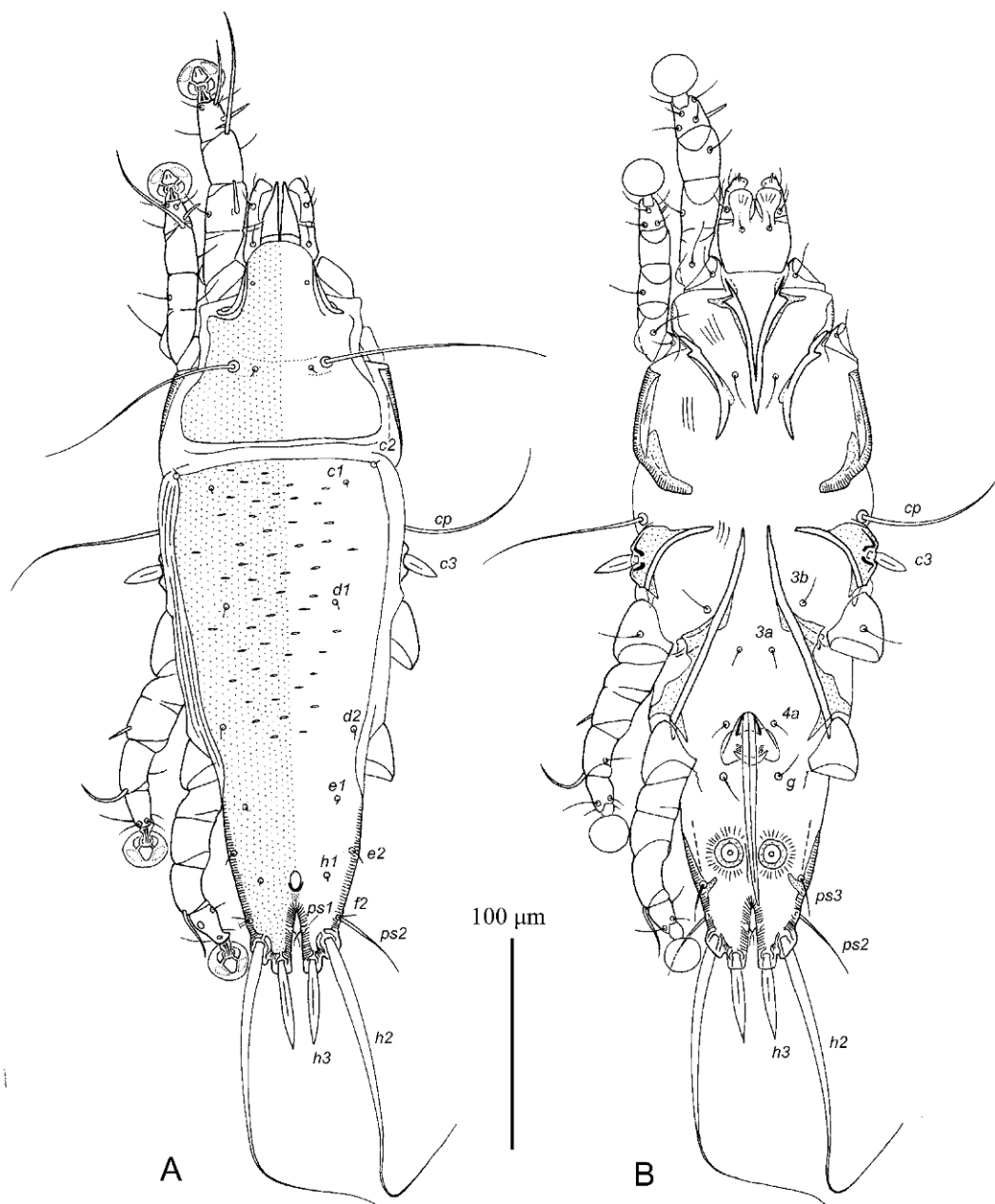


Fig. 6. *Montesauria zosteropis* sp. nov., male: **A** – dorsal view, **B** – ventral view

uated slightly closer to base than apex of segment; seta *e* button-like, situated at base of apical claw; solenidion ϕ of tibia IV extending slightly beyond apex of segment (Fig. 3F). Length of solenidia: ω /I 13 (13–15), ω /II 12 (12–15), σ /III 10 (9–10), ϕ /I 55 (55–64), ϕ /II 44 (40–45), ϕ /III 26 (24–26), ϕ /IV 26 (24–26).

Female unknown.

Differential diagnosis

The new species belongs to the *emberizae* species group (Mironov 2006) and is most similar to *M. tetralobula* Mironov et Kopij, 1996 from *Pytilia melba* (Linnaeus, 1758) (Estrildidae) by having well developed extensions at bases of setae *h2* and *h3*, and the aedeagus extending to the anterior end of terminal cleft in males. The new species differs from that species by the following features in males: setae *h3* are lanceolate and about 44–48 long, epimerites IIIa are without finger-like extensions on inner margins, the length of setae *cp* exceeds half the width of the idiosoma. In males of *M. tetralobula*, setae *h3* are spiculiform and 25–30 long, epimerites IIIa with finger-like extension directed to setae *3a*, setae *cp* are much shorter than half the width of the idiosoma.

Etymology

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

Genus *Proterothrix* Gaud, 1968

This genus belongs to the *Proterothrix* generic group uniting morphologically archaic pterodectine genera (Mironov 2009). To date this genus includes 21 species, most of which (19 species) are arranged into three species groups, *megacaula*, *schizothyra*, and *wolffi* (Mironov *et al.* 2008a, Mironov and Proctor 2009). Most representatives of the *wolffi* groups are associated with passerine birds of the infraorder Corvida in the Australian and Indo-Malayan regions, and only *Proterothrix ranci* (Gaud, 1952) from this species group, was described from a corvidan host in Madagascar (Gaud 1952, 1968; Park and Atyeo 1971). Three species of the *wolffi* group and a sole species of the *megacaula* group (*P. megacaula* Mironov et Diao, 2008) were described from hosts of the infraorder Passerida in China (Mironov *et al.* 2008a, Mironov and Proctor 2009). Species of the *schizothyra* group are associated exclusively with kingfishers (Coraciiformes: Alcedinidae) in Africa (Gaud 1979).

***Proterothrix terpsiphone* sp. nov.** (Figs 3G, H; 7 and 8)

Type material: Holotype (ZISP 4527), 5 male and 7 female paratypes ex *Terpsiphone viridis* (Muller, 1776) (Monarchidae), Senegal, Dar Salam (13°15'N, 13°12'W), 15 September 2007, I. Literák. Holotype, 3 male and 3 female paratypes – ZISP, remaining paratypes – MRAC and UMMZ.

Description

Male (holotype, range for 5 paratypes in parentheses). Length of idiosoma 370 (365–380), width 148 (144–150), length of hysterosoma 245 (240–255). Prodorsal shield: separated in two parts by transverse band of soft cuticle at level of scapular setae, total length along median line 95 (95–110), width at posterior margin, posterior margin slightly convex, surface of anterior piece with several small lacunae; scapular setae *se*, *si* situated on anterior margin of posterior piece; distance between bases of setae *se* 51 (50–52); setae *ve* absent, represented only by poorly sclerotized patch at their normal locations. Humeral shields present, separated from epimerites III, setae *cp* on soft tegument. Setae *c2* situated dorsally on soft tegument, slightly anterior to humeral shield. Subhumeral setae *c3* lanceolate, 17 (17–20) long, 7 (7–8) wide. Hysteronotal shield: greatest length 249 (245–255), width in anterior part 95 (88–96), anterior margin slightly concave, anterior angles nearly right-angular, surface without lacunae. Opisthosomal lobes angular, length approximately equal to their width at base, setae *h3* on lobar apices, setae *h2* on outer margin of lobes. Terminal cleft triangular, anterior end acute, entire margin of cleft with narrow membrane, 26 (26–30) long (Fig. 7A). Supranal concavity present, narrowly ovoid. Setae *f2* situated slightly posterior to setae *ps2*. Setae *h1* at level of supranal concavity, close to lateral margins of opisthosoma. Setae *h3* represented by macrosetae with basal half having a lanceolate enlargement, length 200 (185–205), greatest width 8 (8–10). Setae *ps2* 35 (35–40) long. Setae *ps1* filiform, minute, about 10 long, situated on lateral margins of terminal cleft at level of setae *h2*. Distance between bases of dorsal setae: *c2:d2* 88 (85–90), *d2:e2* 88 (88–93), *e2:h3* 62 (57–65), *d1:d2* 33 (26–34), *e1:e2* 18 (18–23), *h1:ps2* 13 (11–12), *h2:h2* 55 (52–55), *h3:h3* 37 (35–37), *ps2:ps2* 66 (65–66), *ps1:h3* 9 (8–11).

Epimerites I fused as a V, posterior end of this structure connected by transverse band to medial part of epimerites II (Fig. 7B). Epimerites I, II with narrow sclerotized areas. Coxal fields II, III closed. Coxal fields IV with small triangular sclerotized areas at base of corresponding trochanters. Rudimentary sclerites rEpIIa absent. Epimerites IVa present, short, not extending to setae *4a*. Genital arch of moderate size, with thin branches, 20 (20–22) long, 44 (42–46) wide; basal sclerite of genital apparatus as small slightly curved transverse plate; aedeagus straight, sword-shaped, 80 (80–88) long, extending to anterior margin of anal suckers. Genital papillae at level of genital arch apex. Genital shield absent. Pair of small adanal sclerites slightly anterior to level of anal opening. Anal suckers 15 (15–16) in diameter, corolla with 8–9 indentations. Setae *ps3* antero-mesal to anal suckers, their bases may be surrounded by sclerotized cuticle (in 3 of 6 specimens). Inner margin of opisthoventral shields with poorly expressed extensions at base of setae *ps2*. Distance between ventral setae: *3b:3a* 5 (5–7), *3a:4a* 44 (40–45), *4a:g* 48 (46–50), *g:ps3* 46 (46–48), *ps3:ps3* 13 (13–17), *ps3:h3* 46 (45–49).

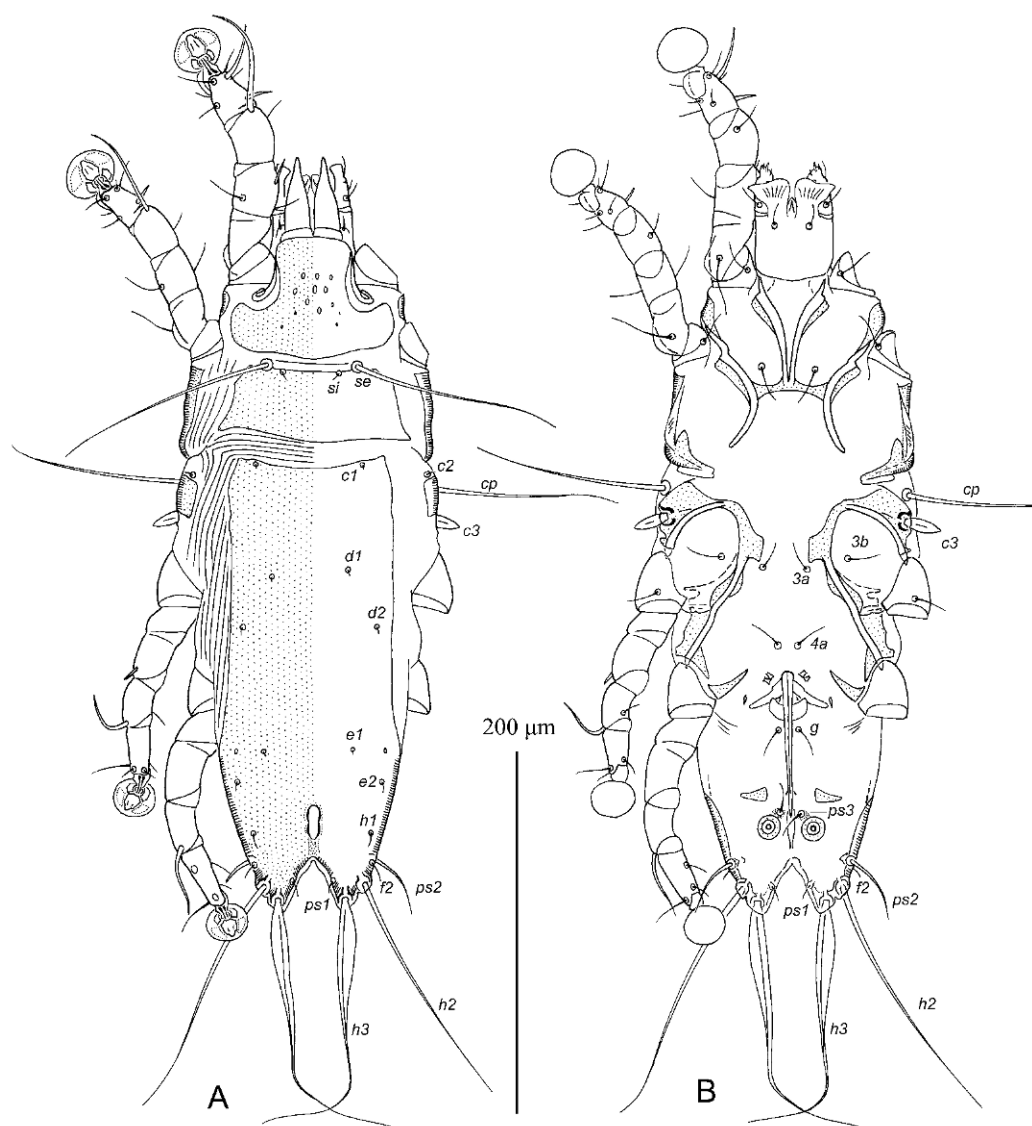


Fig. 7. *Proterothrix terpsiphone* sp. nov., male: **A** – dorsal view, **B** – ventral view

Legs I slightly thicker than legs II. Femora I, II with narrow ventral crests, other segments of legs I, II without processes. Solenidion σI of genu I stick-like, 12 (12–14) long, situated at midlevel of segment; genual setae cGI , II, mGI , II filiform (Fig. 3G). Solenidion σI of genu III in distal part of segment. Setae d of tarsi II, III much shorter than corresponding setae f . Tarsus IV 33 (28–33) long, with apical process; setae d , e button-like, seta d situated closer to base of segment than to apex; seta e button-like, situated near tarsal apex; solenidion ϕ of tibia IV extending to apex of tarsus (Fig. 3H). Length of solenidia: ωI 11 (11–17), ωIII 9 (9–13), ϕI 59 (60–66), ϕII 51 (50–52), ϕIII 20 (20–24), ϕIV 33 (32–37).

Female (range for 7 paratypes). Length of idiosoma (excluding terminal appendages) 440–485, width 165–177, length of hysterosoma 330–357. Prodorsal shield: lateral margin with deep incision extending to setae si (Fig. 8A) (in 1 specimen,

shield completely separated into two parts as in males, Fig. 8C), posterior margin with blunt and short median projection, total length 115–120, width 115–130, surface without lacunae; setae se separated by 62–68 (Figs 8A, C). Humeral shields as in the male, separated from epimerites III and not encompassing setae cp . Setae $c2$ situated dorsally, on soft tegument. Setae $c3$ lanceolate, 20–22 $\times$ 7–9. Anterior and lobar parts of hysteronotal shield delimited dorsally from each other by narrow transverse groove and connected ventro-laterally (Fig. 8B). Anterior hysteronotal shield rectangular, anterior margin straight, posterior margin slightly convex, anterior angles right angular, greatest length 235–254, width at anterior margin 88–115; surface without lacunae.

Length of lobar region excluding terminal appendages 90–95, width at level of setae $h2$ 85–104. Terminal cleft as a narrow U with margins slightly diverging posteriorly, 66–88 long,

7–11 wide at midlevel. Supranal concavity present, ovoid, small. Setae *f2* present. Setae *h1* on lobar shield near its anterior margin. Setae *h2* with spindle-like basal part and filiform apical part, length of enlarged part 50–55, greatest width 7–8. Setae *ps1* on lateral margins of terminal cleft. Setae *h3* filiform, 11–17 long, 1/5–1/6 of terminal appendages. Distance between dorsal setae: *c2:d2* 90–105, *d2:e2* 115–126, *e2:h2* 62–72, *h2:h3* 33–37, *d1:d2* 31–37, *e1:e2* 37–42, *h1:h2* 33–36, *h1:h1* 53–62, *h2:h2* 78–82, *h3:h3* 36–44, *h2:ps1* 24–26.

Epimerites I fused into a V, fused part with pair of acute and short extensions directed laterally but not connected with epimerites II. Coxal fields I, II without heavy sclerotized areas. Rudimentary sclerites rEpIIa absent. Epimerites IVa absent. Translobar apodemes of opisthosomal lobes present, fused to each other anterior to terminal cleft. Width of epigynum 55–68. Proximal quarter and very distal parts of primary sperm duct with transverse striae on outer surface, remaining part smooth;

secondary sperm ducts 10–12 long, with finely verrucous surface (Fig. 8D). Distance between pseudanal setae: *ps2:ps2* 46–52, *ps3:ps3* 28–31, *ps2:ps3* 22–27.

Legs I, II as in male. Solenidion σI of genu I thin stick-like, 16–20 long, situated approximately at midlevel of segment. Seta *cGI*, II, *mGI*, II filiform. Genu IV with rounded dorsal crest. Setae *d* of tarsi II–IV much shorter than corresponding setae *f*. Solenidion ϕIV nearly 3 times shorter than corresponding tarsus. Length of solenidia: ωI 15–17, ωIII 11–13, ϕI 72–75, ϕII 60–64, ϕIII 20–24, ϕIV 9–11.

Differential diagnosis

The new species belongs to the *wolffi* species group (Mironov *et al.* 2008a) and is close to *Proterothrix ranci* (Gaud, 1952) described from the Madagascar Paradise-flycatcher *Terpsiphone mutata* (Linnaeus, 1766). The new species differs from

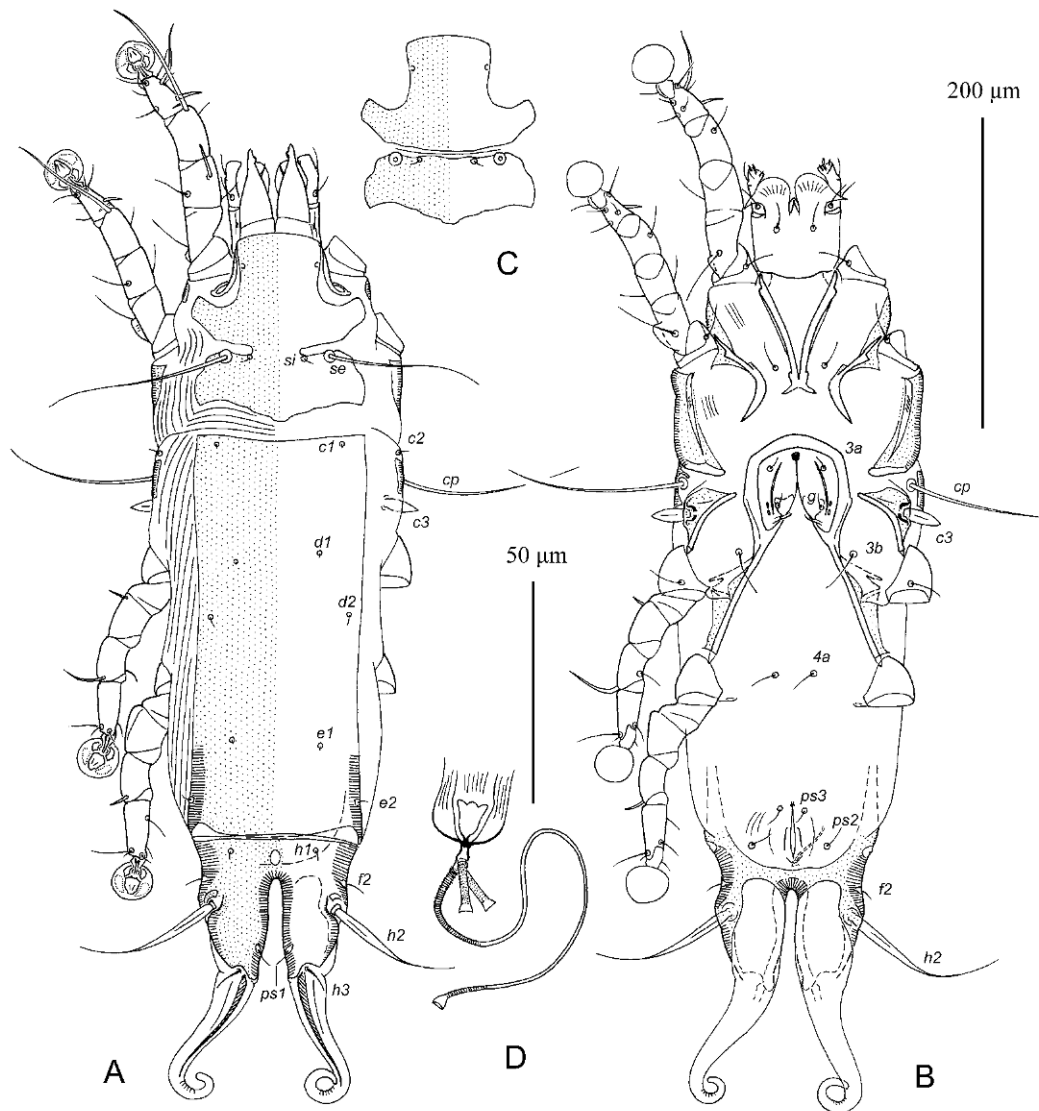


Fig. 8. *Proterothrix terpsiphone* sp. nov., female: A – dorsal view, B – ventral view, C – prodorsal shield, D – spermatheca and sperm ducts

that species by the following features: in both sexes, the prodorsal and hysteronotal shields are without lacunae (only the anterior part of the prodorsal shield in males occasionally bears some lacunae); in males, the terminal cleft is V-shaped, legs IV extend beyond the lobar apices; in females, the prodorsal and anterior hysteronotal shields are monotonously punctuated, without lacunae, the length of idiosoma is 440–480. In both sexes of *P. ranci*, the surfaces of prodorsal and hysteronotal shields is entirely covered with small circular lacunae; in males, the terminal cleft is U-shaped (lateral margins almost parallel-sided), legs IV extend by ambulacral discs to the level of lobar apices; in females, the length of idiosoma is much longer, over 600.

Etymology

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

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References

- Atyeo W.T., Gaud J. 1977. Gruiformes, a new host group for pterodectine feather mites (Acarina: Analgoidea). *Journal of Parasitology*, 63, 141–144. DOI: 10.2307/3280121.
- Berla H.F. 1958. Analgesidae neotropicais. I. Duas novas espécies de *Pterodectes* Robin, 1868 (Acarina-Proctophyllodinae) coletadas em Fringillidae, Aves, Passeriformes. *Boletim do Museu Nacional de Rio de Janeiro, n.s., Zoologia*, 186, 1–6.
- Berla H.F. 1959a. Analgesoidea neotropicais. IV. Sobre algumas espécies novas ou pouco conhecidas de acarinos plumícolas. *Boletim do Museu Nacional de Rio de Janeiro, n.s., Zoologia*, 209, 1–17.
- Berla H.F. 1959b. Analgesoidea neotropicais. V. Sobre uma espécie nova de “*Proctophyllodes*” Robin, 1868 e redescricao de “*Pterolichus varians selenurus*” Trouessart, 1898 (Acarina, Pterolichinae). *Revista Brasileira de Biologia*, 19, 203–206.
- Berla H.F. 1959c. Analgesoidea neotropicais. VI. Um novo gênero de acarinos plumícolas (Acarina, Proctophyllodinae), hospede de Oxyruncidae (Aves, Passeriformes). *Studia Entomologica*, 2, 31–32.
- Berla H.F. 1960. Analgesoidea neotropicais. VII. Novas espécies de acarinos plumícolas. *Anais da Academia Brasileira de Ciências*, 32, 95–105.
- Černý V. 1974. Parasitic mites of Surinam XXXI. New species of Proctophyllodidae (Sarcoptiformes, Analgoidea). *Folia Parasitologica*, 21, 349–361.
- Dickinson E.C. 2003. The Howard and Moore Complete Checklist of the Birds of the World. 3rd Edition. Princeton University Press, Princeton, N.J., 1056 pp.
- Evans G.O. 1992. Principles of Acarology. C.A.B. International, Wallingford, 563 pp.
- Gaud J. 1952. Sarcoptides plumicoles des oiseaux de Madagascar. *Mémoires de l'Institut Scientifique de Madagascar, Séries A*, 7, 81–107.
- Gaud J. 1953. Sarcoptides plumicoles des oiseaux d'Afrique occidentale et centrale. *Annales de Parasitologie Humaine et Comparée*, 28, 193–226.
- Gaud J. 1957. Acariens plumicoles (Analgesoidea) parasites des oiseaux du Maroc. I. Proctophyllodidae. *Bulletin de la Société de Sciences Naturelles et Physiques du Maroc*, 37, 105–136.
- Gaud J. 1962. Sarcoptiformes plumicoles (Analgesoidea) parasites d'oiseaux de l'Ile Rennell. *Natural History of Rennell Island, British Solomon Islands*, 4, 31–51.
- Gaud J. 1964. Mission de Zoologie médicale au Maniema (Congo, Léopoldville) (P.L.G. Benoit, 1959). 8. Acariens plumicoles (Analgesoidea). *Musée Royal de l'Afrique Centrale, Annales, Séries in-8, Sciences Zoologiques*, 136, 119–132.
- Gaud J. 1968. Sarcoptiformes plumicoles (Analgoidea) parasites d'oiseaux de l'Ile Rennell. *Natural History of Rennell Island, British Solomon Islands*, 5, 121–151.
- Gaud J. 1979. Sarcoptiformes plumicoles des oiseaux Coraciiformes d'Afrique. II. Parasites des Alcedinidae. *Revue de Zoologie Africaines*, 93, 245–266.
- Gaud J., Atyeo W.T. 1996. Feather mites of the World (Acarina, Astigmata): the supraspecific taxa. *Musée Royal de l'Afrique Centrale, Annales, Sciences Zoologiques*, 277, Pt. 1: 193 pp., Pt. 2: 436 pp.
- Gaud J., Mouchet J. 1957. Acariens plumicoles (Analgesoidea) des oiseaux du Cameroun. I. Proctophyllodidae. *Annales de Parasitologie Humaine et Comparée*, 32, 491–546.
- Gaud J., Petitot M.L. 1948. Sarcoptides plumicoles des oiseaux d'Indochine. *Annales de Parasitologie Humaine et Comparée*, 23, 337–347.
- Gaud J., Till W.M. 1961. Suborder Sarcoptiformes. In: (Ed. F. Zumpt) *The arthropod parasites of vertebrates in Africa south of the Sahara (Ethiopian Region)*. Vol. I. (Chelicerata). Publications of the South African Institute of Medical Research, No. L (Vol. IX), South Africa, Johannesburg, 180–352.
- Hernandes F.A., Valim M.P. 2005. A new species of *Pterodectes* Robin, 1877 (Proctophyllodidae: Pterodectinae) from the pale-breasted thrush, *Turdus leucomelas* (Passeriformes: Turdidae). *Zootaxa*, 1081, 61–68.
- Hernandes F.A., Valim M.P. 2006. Two new species of the feather mite subfamily Pterodectinae (Acari: Astigmata: Proctophyllodidae) from Brazil. *Zootaxa*, 1235, 49–61.
- Hernandes F.A., Valim M.P., Mironov S.V. 2010. On the identity of *Pterodectes ralliculae* Atyeo and Gaud, 1977 (Astigmata: Proctophyllodidae). *Journal of Natural History*, 44, 367–377. DOI: 10.1080/00222930903383594.
- Kuroki T., Nagahori M., Mironov S.V. 2006. Two new feather mite species of the genus *Montesauria* (Astigmata: Proctophyllodidae) from thrushes of the genus *Zoothera* (Passeriformes: Turdidae) in Japan. *Journal of the Acarological Society of Japan*, 15, 55–68.
- Mironov S.V. 1996. A new genus of the feather mite subfamily Pterodectinae (Analgoidea: Proctophyllodidae). *Parazitologiya*, 30, 398–403 (In Russian).
- Mironov S.V. 2006. Feather mites of the genus *Montesauria* Oudemans (Astigmata: Proctophyllodidae) associated with starlings (Passeriformes: Sturnidae) in the Indo-Malayan region, with notes on systematics of the genus. *Acarina*, 14, 21–40.
- Mironov S.V. 2008. New feather mites of the subfamily Pterodectinae (Astigmata: Proctophyllodidae) from passerines (Aves: Passeriformes) in Africa. *Annales Zoologici*, 58, 403–418. DOI: 10.3161/000345408X326744.
- Mironov S.V. 2009. Phylogeny of feather mites of the subfamily Pterodectinae (Acariformes: Proctophyllodidae) and their host associations with passerines (Passeriformes). *Proceedings of the Zoological Institute of the Russian Academy of Sciences*, 313, 97–118.

- Mironov S.V., Fain A. 2003. New species of the feather mite subfamily Pterodectinae (Astigmata: Proctophyllodidae) from African passerines (Aves: Passeriformes). *Bulletin de la Société Royale Belge d'Entomologie*, 139, 75–91.
- Mironov S.V., Kopij G. 1996a. New feather mite species (Acarina: Analgoidea) from some starlings (Passeriformes: Sturnidae) of South Africa. *Journal of African Zoology*, 110, 257–269.
- Mironov S.V., Kopij G. 1996b. Three new species of the feather mite family Proctophyllodidae (Acarina: Analgoidea) from some South African passerine birds (Aves: Passeriformes). *Acarina*, 4, 27–33.
- Mironov S.V., Kopij G. 1997. New feather mites of the subfamily Pterodectinae (Astigmata: Analgoidea) from some passerines (Aves: Passeriformes) of South Africa. *Journal of African Zoology*, 111, 449–463.
- Mironov S.V., Diao W., Zhang Y., Zhang C., Yan Z. 2008a. A new feather mite species of the genus *Proterothrix* Gaud (Astigmata, Proctophyllodidae) from *Ficedula zanthopygia* (Hay) (Passeriformes: Muscicapidae) in China. *Acarina*, 16, 31–38.
- Mironov S.V., Literák I., Čapek M. 2008b. New feather mites of the subfamily Pterodectinae (Acari: Astigmata: Proctophyllodidae) from passerines (Aves: Passeriformes) in Mato Grosso do Sul, Brazil. *Zootaxa*, 1947, 1–38.
- Mironov S.V., Proctor H.C. 2009. Feather mites of the genus *Proterothrix* Gaud (Astigmata: Proctophyllodidae) from parrot-bills (Passeriformes: Paradoxornithidae) in China. *Journal of Parasitology*, 95, 1093–1107. DOI: 10.1645/GE-1961.1.
- Mironov S.V., Wauthy G. 2010. *Afroproterothrix* n. gen. of the feather mite subfamily Pterodectinae (Astigmata: Proctophyllodidae) from passerines (Aves: Passeriformes) in Africa. *International Journal of Acarology*, 35, 175–182. DOI: 10.1080/01647950903524158.
- OConnor B.M., Foufopoulos J., Lipton D., Lindström K. 2005. Mites associated with the small ground finch, *Geospiza fuliginosa* (Passeriformes: Emberizidae), from the Galapagos Islands. *Journal of Parasitology*, 91, 1304–1313. DOI: 10.1645/GE-581R.1.
- Park C.K., Atyeo W.T. 1971. A generic revision of the Pterodectinae, a new subfamily of feather mites (Sarcoptiformes: Analgoidea). *Bulletin of the University of Nebraska State Museum*, 9, 39–88.
- Robin C., Megnin P. 1877. Mémoire sur les Sarcoptides plumicoles. *Journal de l'Anatomie et de la Physiologie Normales et Pathologiques de l'Homme et des Animaux*, Paris, 13, 209–248, 391–429, 498–520, 629–656.
- Sugimoto M. 1941. Studies on the Formosan mites (Fourth Report) (On the feather mites, Analgesidae Canestrini, 1892, Part II). *Sylvia (Journal of the Taihoku Society of Agriculture and Forestry)*, 5, 129–149.
- Till W.M. 1954. Five new feather mites of the genus *Pterodectes* (Acarina: Analgesidae). *Moçambique*, 79, 85–100.
- Till W.M. 1957. Two new *Pterodectes* species from passeriform birds (Acarina: Proctophyllodidae). *Journal of the Entomological Society of Southern Africa*, 20, 450–453.
- Trouessart E.L. (1884) 1885. Note sur la classification des Analgésiens et diagnoses d'espèces et de genres nouveaux. *Bulletin de la Société d'Etudes Scientifiques d'Angers*, 14, 46–89.
- Valim M.P., Hernandez F.A. 2006. Redescription of four species of the feather mite genus *Pterodectes* Robin, 1877 (Acari: Proctophyllodidae: Pterodectinae) described by Herbert F. Berla. *Acarina*, 14, 41–55.
- Valim M. P., Hernandez F.A. 2008. Redescription of five species of the feather mite genus *Pterodectes* Robin, 1877 (Acari: Proctophyllodidae: Pterodectinae) with the proposal of a new genus and a new species. *Acarina*, 16, 131–158.
- Valim M.P., Hernandez F.A. 2009. A new species of the feather mite genus *Cotingodectes* and a new genus of Pterodectinae (Astigmata: Proctophyllodidae). *International Journal of Acarology*, 35, 262–272. DOI: 10.1080/01647950903071143.
- Valim M.P., Hernandez F.A. 2010. A systematic review of feather mites of the genus *Pterodectes* complex (Acari: Proctophyllodidae: Pterodectinae) with redescrptions of species described by Vladimír Černý. *Acarina*, 18, 3–35.