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Three new species of the genus *Passeroptes* Fain (Astigmata: Dermationidae) from China

ZI-YING WANG[1], NING MU, XIAO-HUI SU & HUAI LIU
Institute of Entomology, College of Plant Protection, Southwest University, Chongqing 400716, China
[1]Corresponding author. E-mail: zhibaoy@swu.edu.cn

Abstract

Three new species of the genus *Passeroptes* (Acariformes: Dermationidae) are described from passerine birds (Passeriformes) in China: *Passeroptes formosus* **sp. nov**. from *Garrulax formosus formosus* (Verreaux) (Guizhou), *P. poecilorhynchus* **sp. nov**. from *Garrulax poecilorhynchus berthemyi* (David and Oustalet) (Guizhou), and *P. picae* **sp. nov**. from *Pica pica sericea* Gould (Henan). *Passeroptes garrulax* is redescribed from *Garrulax poecilorhynchus berthemyi* in Guizhou.

Key words: feather mites, Dermationidae, *Passeroptes*, new species, China

Introduction

Mites of the family Dermationidae (Astigmata: Analgoidea) live on the skin of birds. This family includes three subfamilies, Apocnemidocoptinae, Dermationinae and Otocoptoidinae (Mironov *et al*. 2005; Bochkov & Mironov 2011). Within the subfamily Dermationinae, the genus *Passeroptes* originally included two subgenera, *Passeroptes* and *Paddacoptes* (Fain 1964). The former subgenus was ranked to the generic status by Gaud & Atyeo (1996). To present, the genus *Passeroptes* includes 21 species (Fain & Bochkov 2003; Mironov *et al*. 2005; Bochkov & Mironov 2012).

To date, a single species from the genus *Passeroptes* has been reported in China, *P. dermicola* (Trouessart) from *Passer montanus* (Linnaeus) (Passeriformes: Passeridae) (Wang & Wang 2012). In this paper, we describe three new species of *Passeroptes* from passerines in China. We also include figures of *P. garrulax* Fain, 1965 because this species was only described but not figured (Fain 1965).

Material and methods

Mites were cleared in lactic acid, slide-mounted in polyvinyl lactophenol medium, and dried for 4 days at 50 °C. Drawings were made using a camera lucida attached to an Olympus BX51 (Japan) microscope with differential interference contrast optics. In species descriptions, all measurements are given in micrometres (μm). Idiosomal length was measured from the anterior margin of the propodonotum to the posterior end of the opisthosomal lobes. Widths of the idiosoma and hysteronotal shields were measured at the level of setae *cp*. The length of the propodonotal shield was measured along the median line of the shield. The width of the propodonotal shield was measured at its widest part, at the level of setae *se*. The length of the hysteronotal shield was measured along its lateral border. Lengths of the posterior legs were measured from the most basal point of the trochanter to the apex of the tarsus, excluding the pretarsus.

The terminology relating to the idiosomal setation follows Griffiths *et al*. (1990) with modifications of Norton (1998) concerning coxal setae. The leg setation follows Grandjean (1939). Holotypes (male) and paratypes of all species described here are deposited in the Institute of Entomology, Southwest University, Chongqing, China. Host systematics follows Zheng (2002, 2011).

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Systematics

Family Dermationidae Fain, 1965

Subfamily Dermationinae Fain, 1965

Genus *Passeroptes* Fain, 1964

***Passeroptes formosus* sp. nov.**
(Figs. 1, 2, 3)

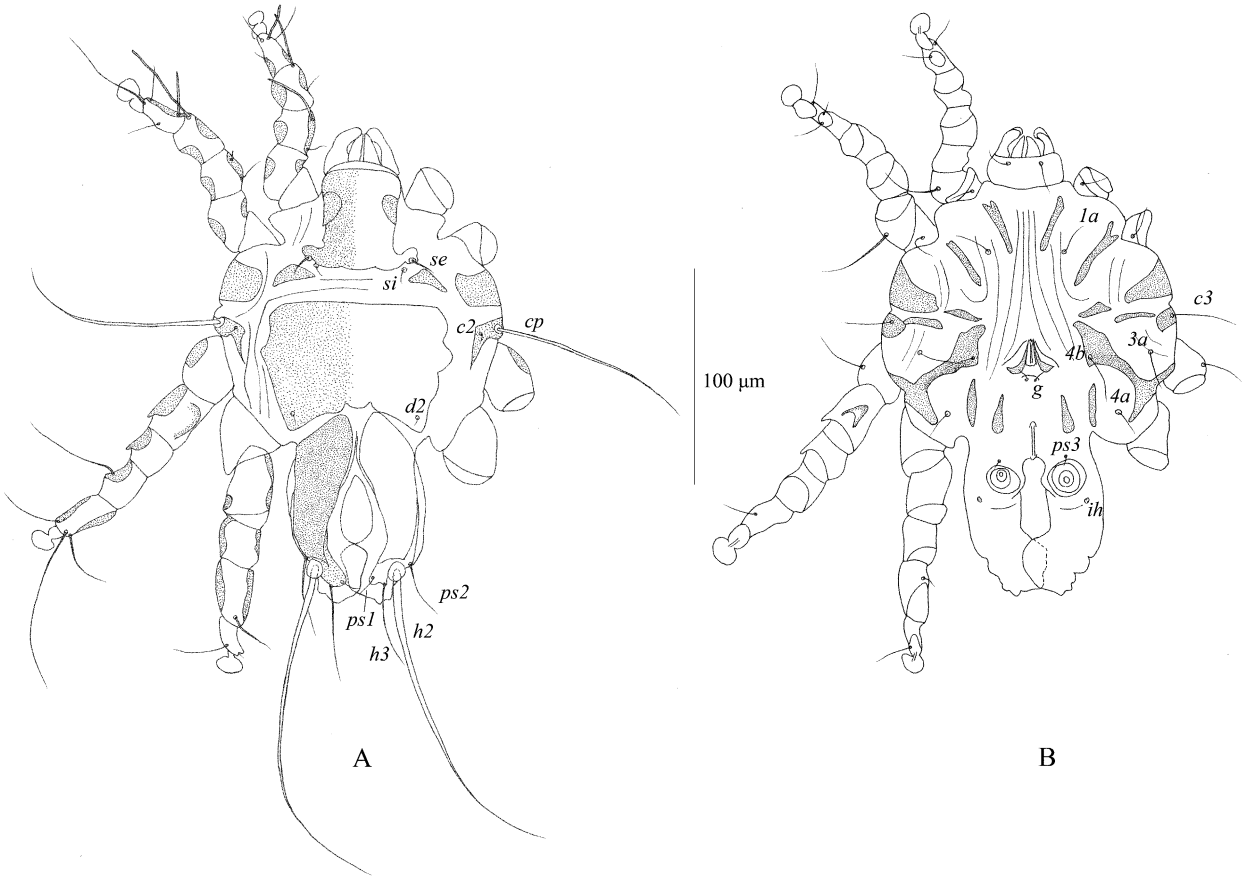

FIGURE 1. *Passeroptes formosus* **sp. nov.**, male. A—dorsal view, B—ventral view.

Description. MALE (holotype). Body 205 long (185–240 in 9 paratypes) and 155 wide (135–175). Idiosomal shields devoid of ornamentation, soft idiosomal cuticle striated, without scales or tubercles. *Dorsum*. Distance between propodonotal and hysteronotal shields about 11. Propodonotal shield: 40 long (37–54) and 55 wide (52–74), its posterolateral extensions encompassing bases of setae *se*. Posterior margin of propodonotal shield not straight, corrugated. Setae *se* short, only about 9 long. Hysteronotal shield transversally separated at level of femora IV; its anterior part 65 long (57–66) and 94 wide (88–100), its lobar part paired, 79 long (74–84) and 28 wide (23–28). Distance between lobar hysteronotal shields 31 (28–34). Setae *d2* present. Humeral shields well developed, with bent extensions, forming acute angle. Terminal cleft about 75 long. Posterior interlobar membranes overlapping 9 wide (9–11). *Venter.* Coxal fields III opened in anterior third. Genital arch as an inverted V with tips strongly curved laterally. Aedeagus about 14 long. Adanal shields 18 long (16–19) and 4 wide (4–5), subparallel to each other. Coxal apodeme IVb 23 long (20–23) and 3 wide (3–4). Diameter of adanal suckers about 11. Cupules *ih* situated postero-lateral to adanal suckers. *Legs.* Legs III and IV subequal, 100–110 long. Femora III with 1 dorsal and 1 ventral moderately developed retrorse processes. Solenidion *ω1*I absent. Setae *ba*-I, II absent. Tarsi IV curved medially and produced apically. Length of setae: *cp* 83 (89–115), *c3* 25 (26–31), *h2* 155 (150–170),

h3 57 (56–69), *ps1* 17 (16–21), *ps2* 44 (39–47), *d* II 51 (50–65), *d* III 81 (76–95), *ω3* 16 (13–17), *ω1*II 16 (15–18), *φ* I 23 (29–32), *φ* II 43 (41–50), *φ* III about 5, *φ* IV about 10, *σ1*I 17 (13–17), *σ* II about 4.

FEMALE (10 paratypes). Body 185–215 long and 130–190 wide. Idiosomal shields without ornamentation, soft idiosomal cuticle striated, without scales or tubercles. *Dorsum*. Distance between propodonotal and hysteronotal shields about 30. Propodonotal shield 42–59 long and 57–77 wide, postero-1ateral extensions encompassing bases of setae *se* and *si*. Posterior margin of propodonotal shield circular. Setae *se* short, only about 10 long. Hysteronotal shield 82–105 long and 65–90 wide. Postero-lateral angles of hysteronotal shield with oval-shaped extensions. Setae *d2* present. Humeral shields well developed, with bent extensions. *Venter.* Coxal fields III closed. Adanal shields well developed, separated from each other, encompassing setae *ps1*, *ps2*, *ps3*, *h2,* and *h3*. *Legs.* Legs III and IV subequal, 110–130 long. Femora III and IV each with 1 dorsal and 1 ventral moderately developed retrorse processes. Solenidion *ω1*I absent. Setae *ba* I and II absent. Lengths of setae: *cp* 94–125, *c3* 19–27, *h2* 135–190, *h3* 29–48, *ps2* 19–23, *d* II 49–60, *d* III 60–69, *ω3* about 15, *ω1*II about 19, *φ* I about 32, *φ* II about 37, *φ* III and *φ* IV about 2, *σ1*I about 14, and *σ* II about 2.

Type material. Holotype male, 9 male and 10 female paratypes ex *Garrulax formosus formosus* (Verreaux) (Passeriformes: Timaliidae), **CHINA**: Guizhou, Guiyang, 26°56'04" N, 106°44'17" E, 5 January 2013, coll. X. -H. Su.

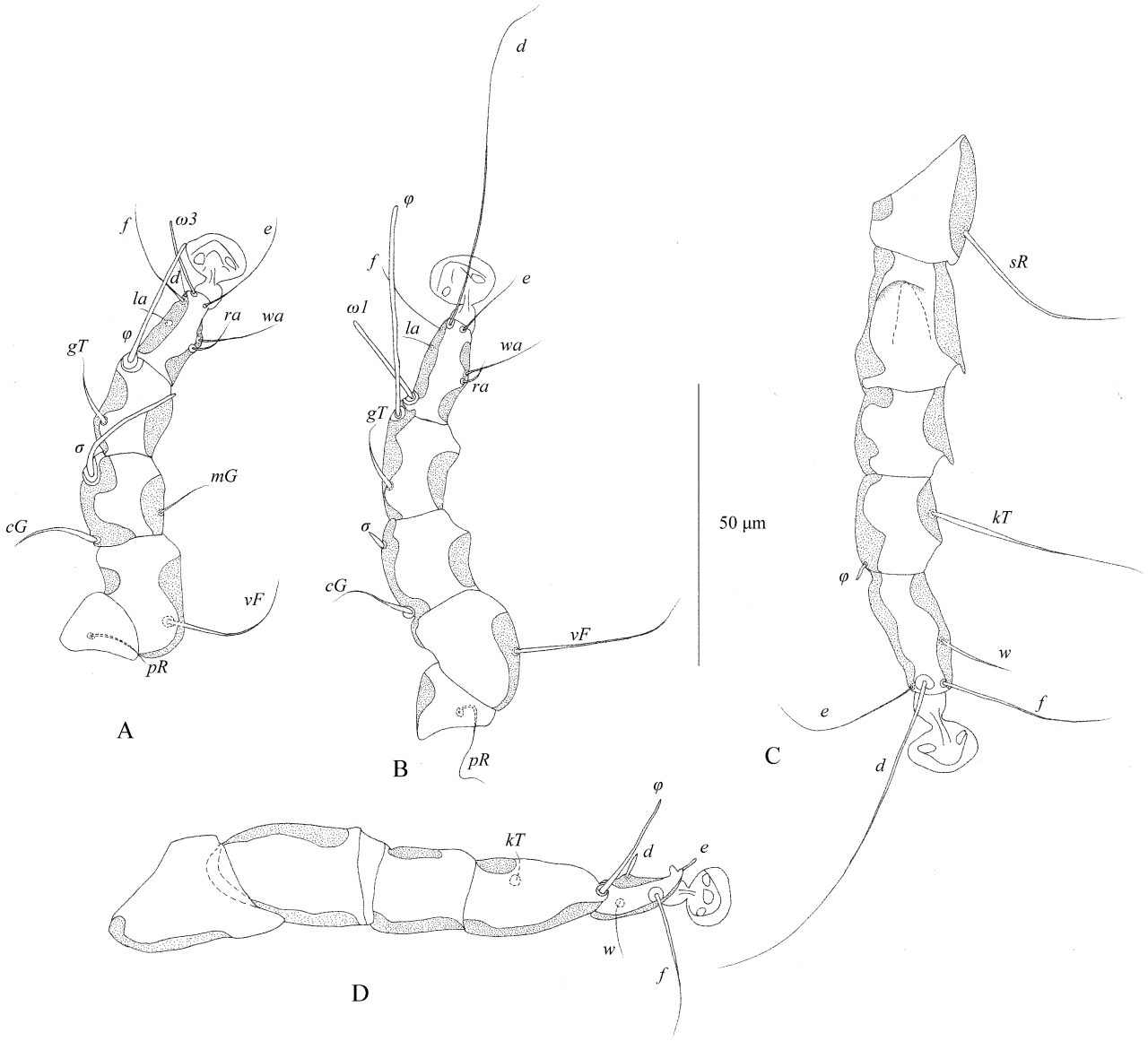

FIGURE 2. *Passeroptes formosus* **sp. nov.**, legs of male. A–D legs I– IV in dorsal view.

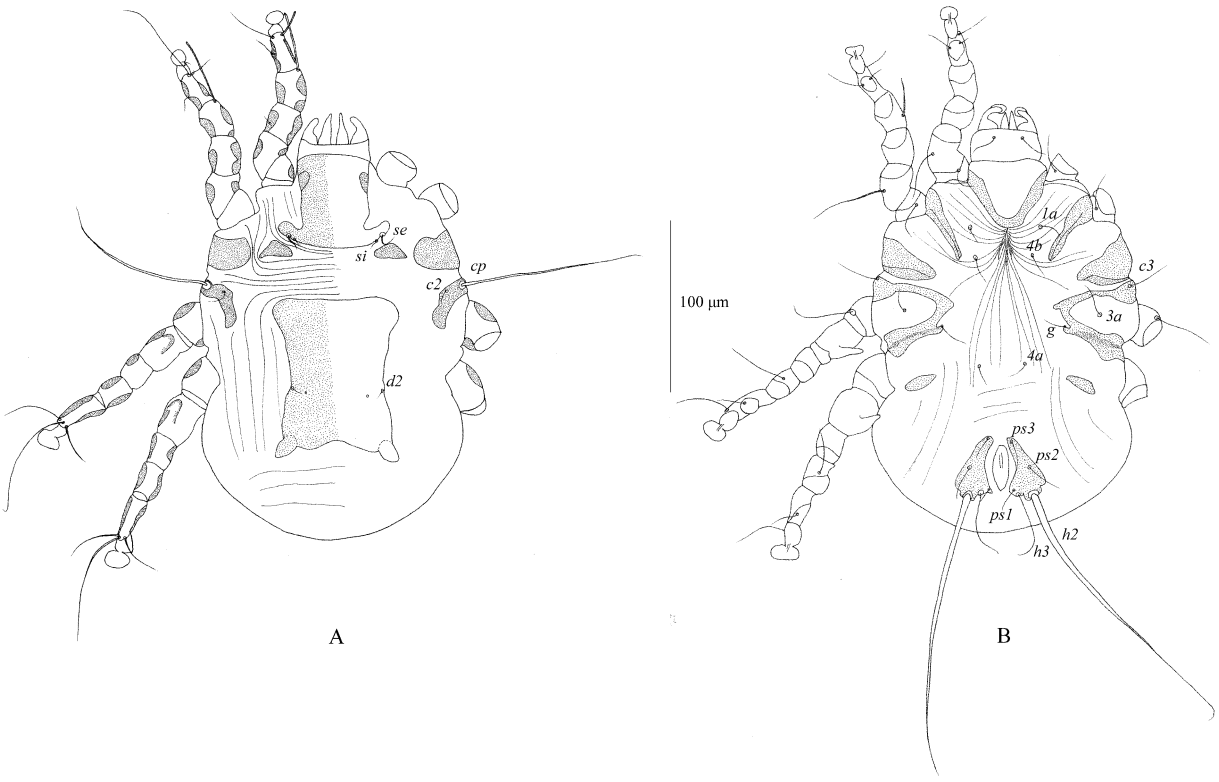

FIGURE 3. *Passeroptes formosus* **sp. nov.**, female. A—dorsal view, B—ventral view.

Etymology. The specific epithet derives from the specific name of the host.

Differential diagnosis. The new species is closest to *Passeroptes eulabis* Fain, 1965 from *Gracula religiosa* Linnaeus (*Eulabes javana* Cuvier was used in Fain's original paper) (Passeriformes: Sturnidae) (Fain 1965). In both sexes of these two species, setae *se* are short and setae *d2* are present; in males, only femora III have retrorse processes and tarsi IV are curved medially and produced apically; in females, coxal fields III are closed and femora III and IV each bear the one dorsal and one ventral retrorse process. The new species differs from *P. eulabis* in the following features. In both sexes of *P. formosus* **sp. nov.**, trochanters I and II have no processes, setae *ba* I and II are absent, and the humeral shields have bent extensions; in males, the hysteronotal shield is transversely separated, and coxal apodemes IVb are subequal to the adanal shields; in females, the posterior angles of the hysteronotal shield have oval-shaped extensions and the adanal shields are well developed and bear setae *ps3*. In both sexes of *P. eulabis*, setae *ba* I, II are present; in males, the hysteronotal shield is not separated transversally and the adanal shields are wider than the coxal apodemes IVb; in females, the posterior angles of the hysteronotal shield are round and not produced, the adanal shields are short and setae *ps3* are situated off these shields, and trochantera I and II have small conical lateral processes.

***Passeroptes poecilorhynchus* sp. nov.**
(Figs. 4, 5)

Description. MALE (holotype). Body 190 long (185–200 in 3 paratypes) and 125 wide (120–145). Idiosomal shields devoid of ornamentation, soft idiosomal cuticle striated, without scales or tubercles. *Dorsum*. Distance between propodonotal and hysteronotal shields about 22. Propodonotal shield 47 long (42–51) and about 68 wide (51–70), posterolateral extensions encompassing bases of setae *se* and *si*. Posterior margin of propodonotal shield not straight, corrugated. Setae *se* about 32 long. Hysteronotal shield transversely separated. Its anterior part 57 long (52–57) and 83 wide (75–83), its lobar part paired, 73 long (63–74) and 29 wide (26–33). Setae *d2* absent. Humeral shields well developed, with bent extensions. Opisthosomal lobes about 70 long, separated from each other.

Terminal cleft longer than its greatest width. *Venter.* Coxal apodeme IIIa weakly developed, not entire shields, coxal fields III opened. Genital arch as an inverted V with tips strongly curved laterally. Aedeagus 22 long (15–22). Adanal shields 29 long (26–29) and about 4 wide, subparallel to each other. Coxal apodeme IVb about 18 long (15–18) and 2 wide (2–3). Diameter of adanal suckers 9 (7– 9). Cupules *ih* situated at posterior of adanal suckers. *Legs.* Legs III thinner than legs IV, about 92 long. Femora III with 1 dorsal and 1 ventral weakly developed retrorse processes. Other processes on legs III and IV absent. Solenidion *ω1*I absent. Setae *ba* I, II absent. Tarsi IV curved medially and produced apically. Lengths of setae: *cp* 115 (95–110), *c3* 28 (22–26), *h2* 160 (150–160), *h3* 21 (21–32), *ps1* 18 (17–19), *ps2* 26 (24–28), *d* II 69 (64–72), *d* III 80 (66–80), *ω3* about 15, *ω1*II about 22, *φ* I 28 (30–33), *φ* II 45 (44–49), *φ* III about 3, *φ* IV about 22, *σ1*I 14 (12–15), and *σ* II about 3.

FEMALE (5 paratypes). Body 200–220 long and 155–165 wide. Idiosomal shields without ornamentation, soft idiosomal cuticle striated, without scales or tubercles. *Dorsum*. Distance between propodonotal and hysteronotal shields about 35. Propodonotal shield 42–50 long and 46–58 wide, postero-1ateral extensions encompassing bases of setae *se* and *si*. Posterior margin of propodonotal shield not straight. Setae *se* about 30 long. Hysteronotal shield 80–91 long and 62–70 wide. Posterior margin curved inwards at medium. Setae *d2* absent. Humeral shields well developed, with bent extensions. *Venter.* Coxal fields III closed. Adanal shields well developed, separated from each other, encompassing setae *ps1*, *ps2*, *ps3*, *h2* and *h3*. *Legs.* Legs III and IV subequal, about 96 long. Femora III and IV each with 1 dorsal and 1 ventral moderately developed retrorse processes. Inner side of basal tarsi III and IV with small projection each. Other processes on legs III and IV absent. Solenidion *ω1*I absent. Setae *ba* I, II absent. Lengths of setae: *cp* 95–105, *c3* 24–28, *h2* 150–170, *h3* 40–48, *ps2* 21–26, *d* II 49–60, *d* III 60–79, *ω3* 14–19, *ω1*II 16–21, *φ* I about 35, *φ*II about 40, *φ* III and *φ* IV about 2, *σ1* I about 13, and *σ* II about 2.

Type material. Holotype male, 3 male and 5 female paratypes ex *Garrulax poecilorhynchus berthemyi* (David and Oustalet) (Passeriformes: Timaliidae), **CHINA**: Guizhou, Guiyang, 26°56'04" N, 106°44'17" E, 5 January 2013, coll. X.-H. Su.

Etymology. The specific epithet derives from the specific name of the host.

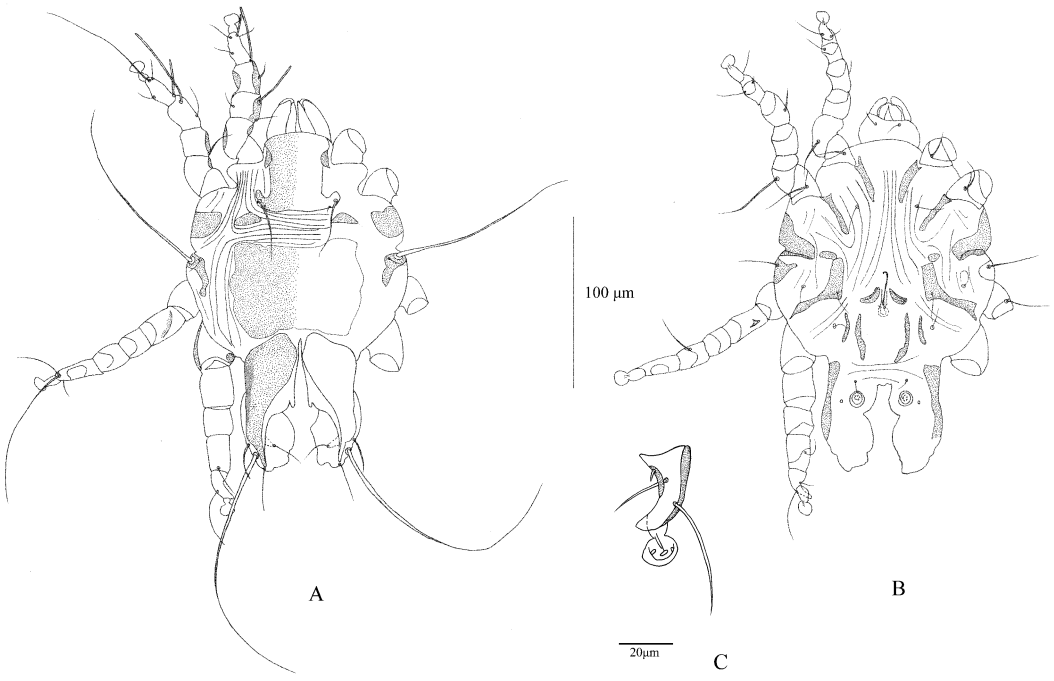

FIGURE 4. *Passeroptes poecilorhynchus* **sp. nov.**, male. A—dorsal view, B—ventral view, C—dorsal view of tarsus IV.

Differential diagnosis. The new species is closest to *Passeroptes turdoides* Fain and Bochkov, 2003 from *Turdoides jardineii* (Passeriformes: Timaliidae) (Fain & Bochkov 2003). In both sexes of these two species, setae *d2* are absent; in males legs IV are slightly thicker than legs III; and in females, setae *se* do not extend to the anterior margin of the hysteronotal shield, coxal fields III are closed, and femora III and IV each bear one dorsal and one ventral retrorse process. The new species differs from *P. turdoides* by the following features. In both sexes

of *P. poecilorhynchus* **sp. nov.**, setae *ba*-I, II are absent; setae *se* are 4–5 times longer than *si*; in males, the hysteronotal shield is transversely separated and legs IV lack processes; in females, the ventral retrorse processes on femora III and IV are moderately developed. In both sexes of *P. turdoides*, setae *ba*-I, II are present; in males, the hysteronotal shield is not transversely separated, setae *se* are only 1–2 times longer than *si*, and tibia IV bears a strong sub-basal ventral process directed apically; in females, the ventral retrorse processes on femora III and IV are well developed.

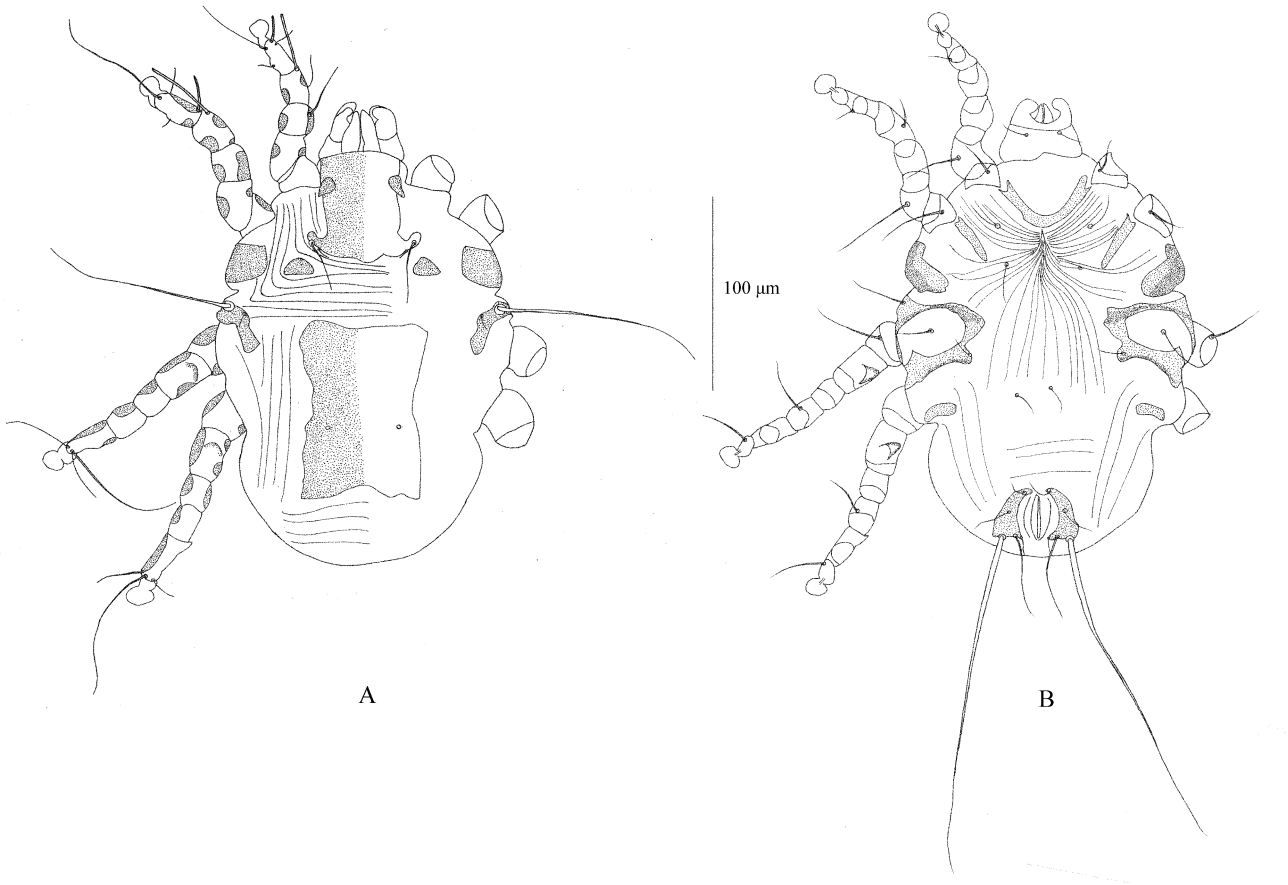

FIGURE 5. *Passeroptes poecilorhynchus* **sp. nov.**, female. A—dorsal view, B—ventral view.

***Passeroptes picae* sp. nov.**
(Figs. 6, 7, 8)

Description. MALE (holotype). Body 195 long (190–205 in 3 paratypes) and 130 wide (140–160). Idiosomal shields devoid of ornamentation, soft idiosomal cuticle striated, without scales or tubercles. *Dorsum*. Distance between propodonotal and hysteronotal shields about 23. Propodonotal shield 54 long (46–52) and 80 (56–67) wide, postero-lateral extensions encompassing bases of setae *se* and *si*. Posterior margin of propodonotal shield not straight. Setae *se* about 38 long. Hysteronotal shield 120 (120–125) long, its length along midline 78 (81–85); with pair of deep lateral incisions at leve1 of femora IV; anterior edge of lateral incisions not straight. Anterior part of hysteronotal shield (at lateral incisions) narrower than posterior part of hysteronotal shield. Setae *d2* absent. Humeral shields well developed, with bent extensions. Opisthosomal lobes about 39 long, widely separated from each other. *Venter.* Coxal apodeme I to IV free. Genital arch an inverted V with tips strongly curved laterally. Aedeagus short, about 10 long. Adanal shields present, separated from each other, 22 long (21–24) and 5 wide (4-6). Diameter of adanal suckers about 7. Cupules *ih* situated posterior of adanal suckers. *Legs.* Legs III and IV subequal, 85–95 long. Genua I and II each with 1 dorsal weakly developed retrorse processes. Processes on femora III reduced to very small and indistinct transversal crest on dorsal surface. Solenidion *ω1*I absent. Tarsi IV straight. Lengths of setae: *cp* 96 (97–101), *c3* 28 (30–32), *h2* (160–170), *h3* 35 (33–48), *ps1* 19 (19–23), *ps2* 37 (32–36), *d*

II 79(62–72), *d* III 88 (76–80), *ω3* about 15, *ω1*II about 22, *φ* I 27 (24–28), *φ* II 38 (34–40), *φ* III about 3, *φ* IV about 16, *σ1*I 20 (20–23), and *σ* II about 3.

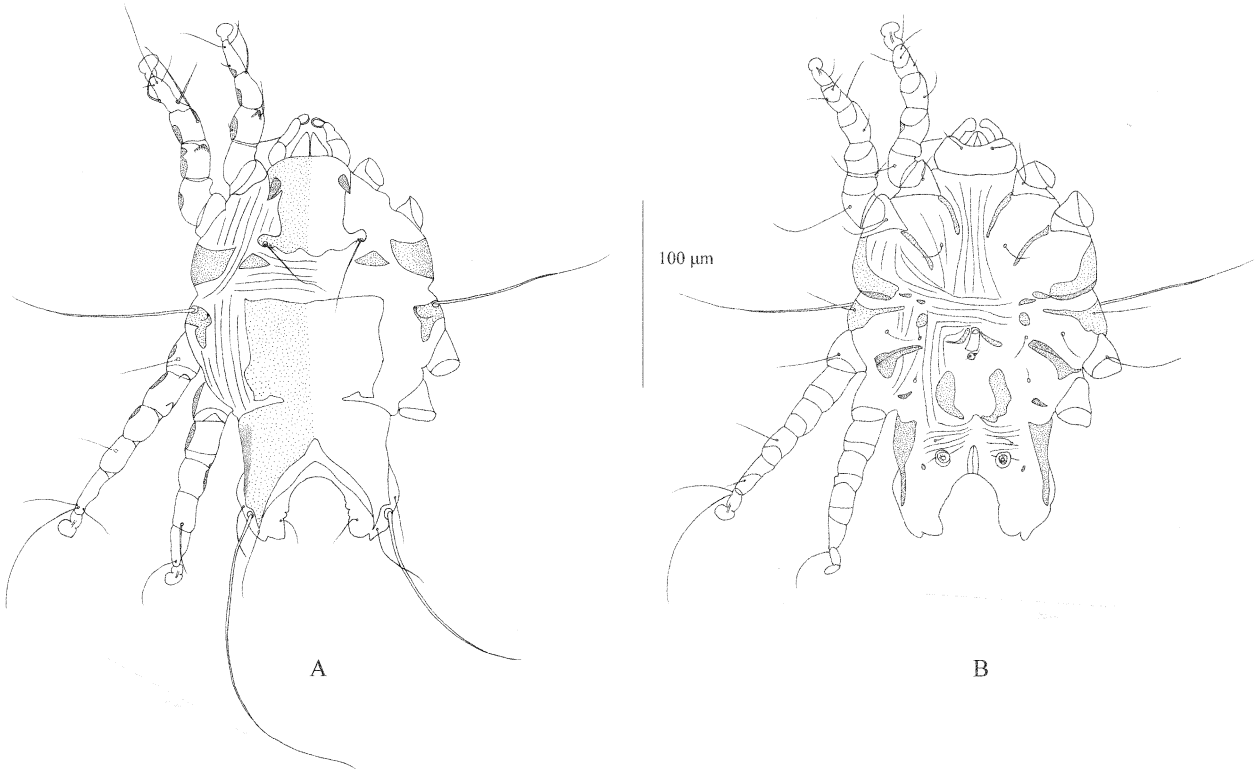

FIGURE 6. *Passeroptes picae* **sp. nov.**, male. A—dorsal view, B—ventral view.

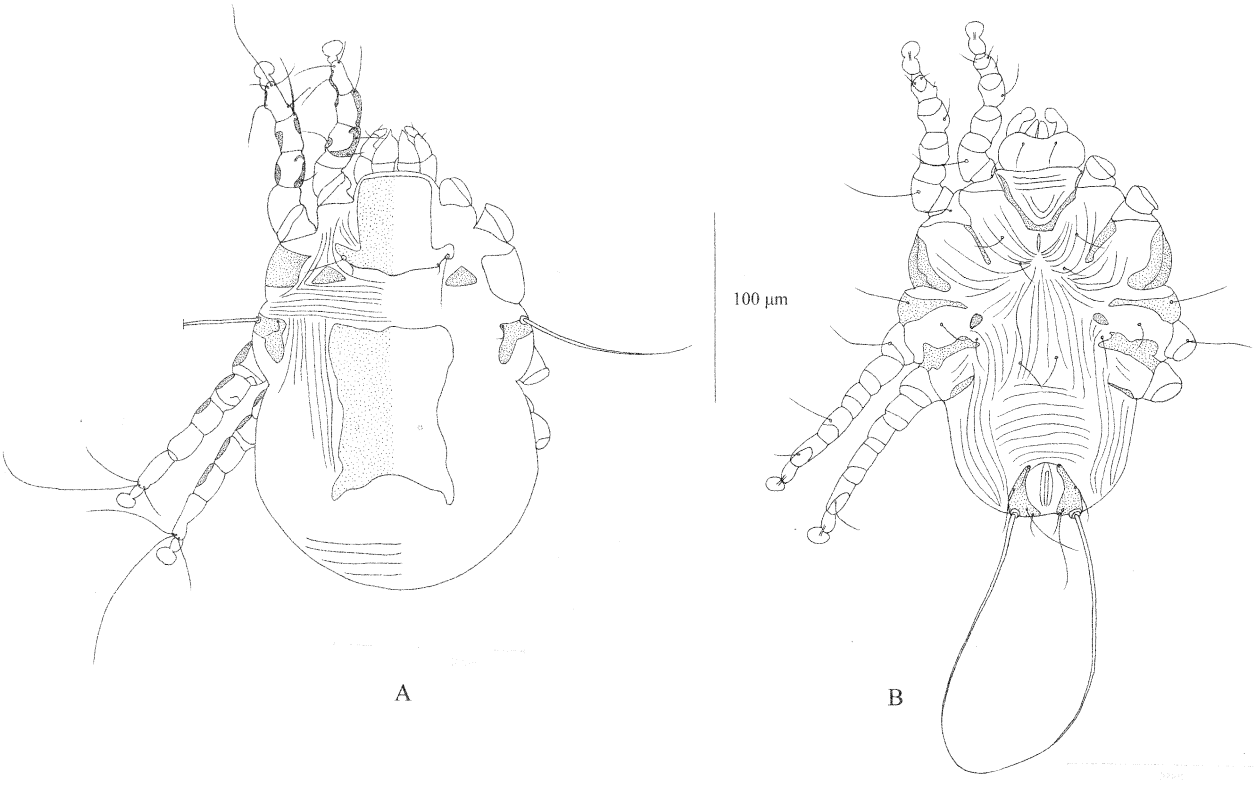

FIGURE 7. *Passeroptes picae* **sp. nov.**, female. A—dorsal view, B—ventral view.

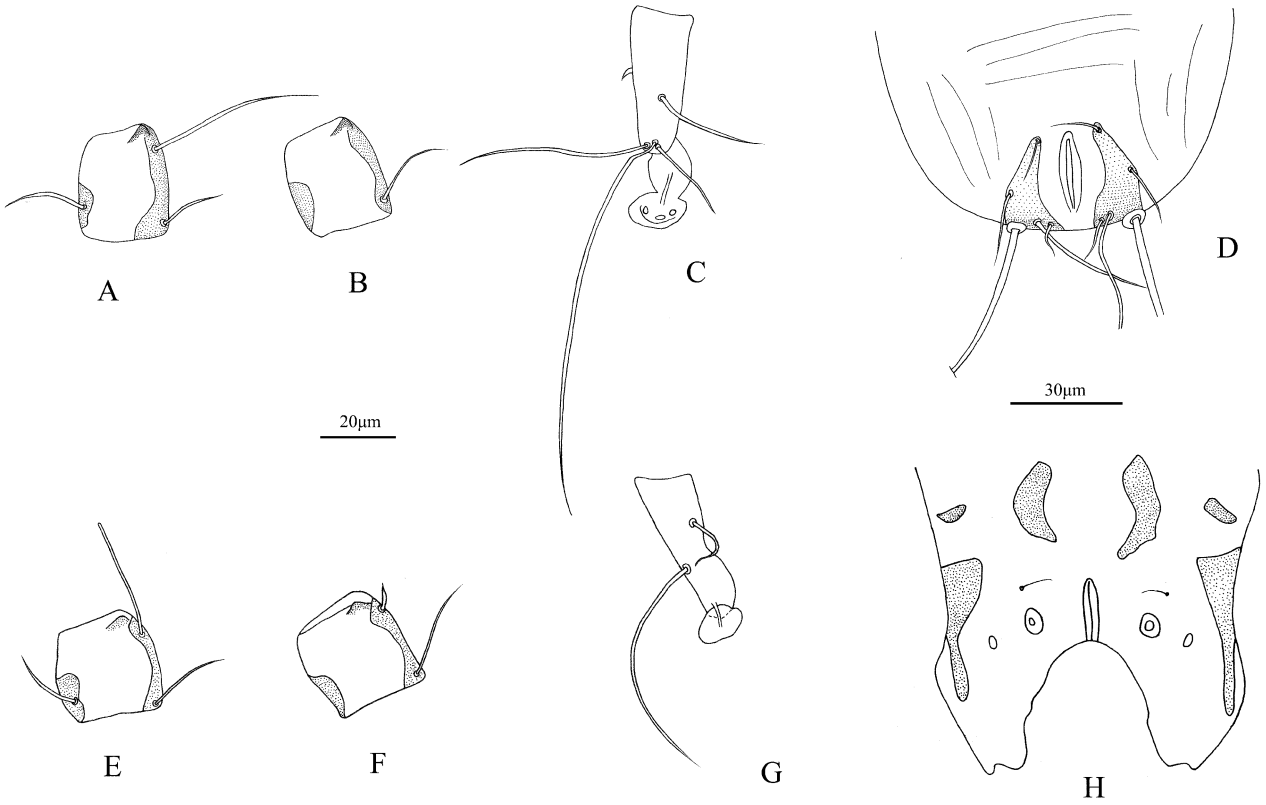

FIGURE 8. *Passeroptes picae* **sp. nov.**, dorsal view of female. A—genu I, B—genu II, C—tarsus IV, D—the end of lobar membrane; dorsal view of male. E—genu I, F—genu II, G—tarsus IV, H—the end of lobar membrane.

FEMALE (4 paratypes). Body 195–210 long and 140–160 wide. Idiosomal shields without ornamentation, soft idiosomal cuticle striated, without scales or tubercles. *Dorsum*. Distance between propodonotal and hysteronotal shields about 30. Propodonotal shield 45–51 long and 63–68 wide, postero-1ateral extensions encompassing bases of setae *se* and *si*. Posterior margin of propodonotal shield not straight, corrugated. Setae *se* short, about 30 long. Hysteronotal shield 78–92 long and 67–77 wide. Setae *d2* absent. Humeral shields well developed, shape as in males. *Venter.* Coxal apodemes II to IV free. Adanal shields well developed, separated from each other, encompassing the setae *ps1*, *ps2*, *ps3*, *h2* and *h3*. *Legs.* Legs III and IV subequal, 90–95 long. Genua I and II each with 1 dorsa1 weakly developed retrorse processes. Processes on femora III reduced to a very small and indistinct transversal crest on dorsal surface. Solenidion *ω1*I absent, setae *ba* present. Lengths of setae: *cp* 92–98, *c3* 30–33, *h2* 160–175, *h3* 31–43, *ps2* 28–31, *d* II 58–77, *d* III 81–85, *ω3* about 12, *ω1*II about 17, *φ* I about 27, *φ* II about 31, *φ* III and *φ* IV about 2, *σ1* I about 17, and *σ* II about 2.

Type material. Holotype male, 3 male and 4 female paratypes ex *Pica pica sericea* Gould (Passeriformes: Corvidae), **CHINA**: Henan, Luoyang, 34°8'21" N, 111°55'34" E, 18 February 2013, coll. X.-H. Su.

Etymology. The specific epithet derives from the generic name of the host.

Differential diagnosis. Among species devoid of setae *d2* the new species is closest to *Passeroptes inermis* Fain, 1965 from *Calocitta formosa* (Swainson) (Passeriformes: Corvidae) (Fain 1965). In both sexes of these two species the retrorse processes of femora III and IV are absent or reduced to a very small and indistinct transverse crest on the dorsal surface; the shape of the humeral shields is similar, with bent extensions; coxal apodemes II to IV are free. In males the hysteronotal shield is not transversely divided, the anterior part of the hysteronotal shield is narrower than the lobar part of the shield; in females, setae *se* are short and not extending the anterior margin of the hysteronotal shield, and the adanal shields are well developed and not fused. The new species differs from *P. inermis* by the following features. In both sexes of *P. picae* **sp. nov.**, one weakly developed dorsal retrorse process is present on each of genua I and II; in males, setae *se* extend beyond the anterior margin of the hysteronotal shield and the adanal shields are short and wide; in females, setae *se* extend beyond a level halfway between the propodonotal and hysteronotal shields. In both sexes of *P. inermis*, genua I and II are without retrorse processes; in

males, setae *se* do not extend beyond the anterior margin of the hysteronotal shield; in females, setae *se* do not extend beyond halfway between the propodonotal and hysteronotal shields.

Passeroptes garrulax Fain, 1965
(Figs. 9, 10)

Passeroptes garrulax Fain, 1965: 87–90; 124–125

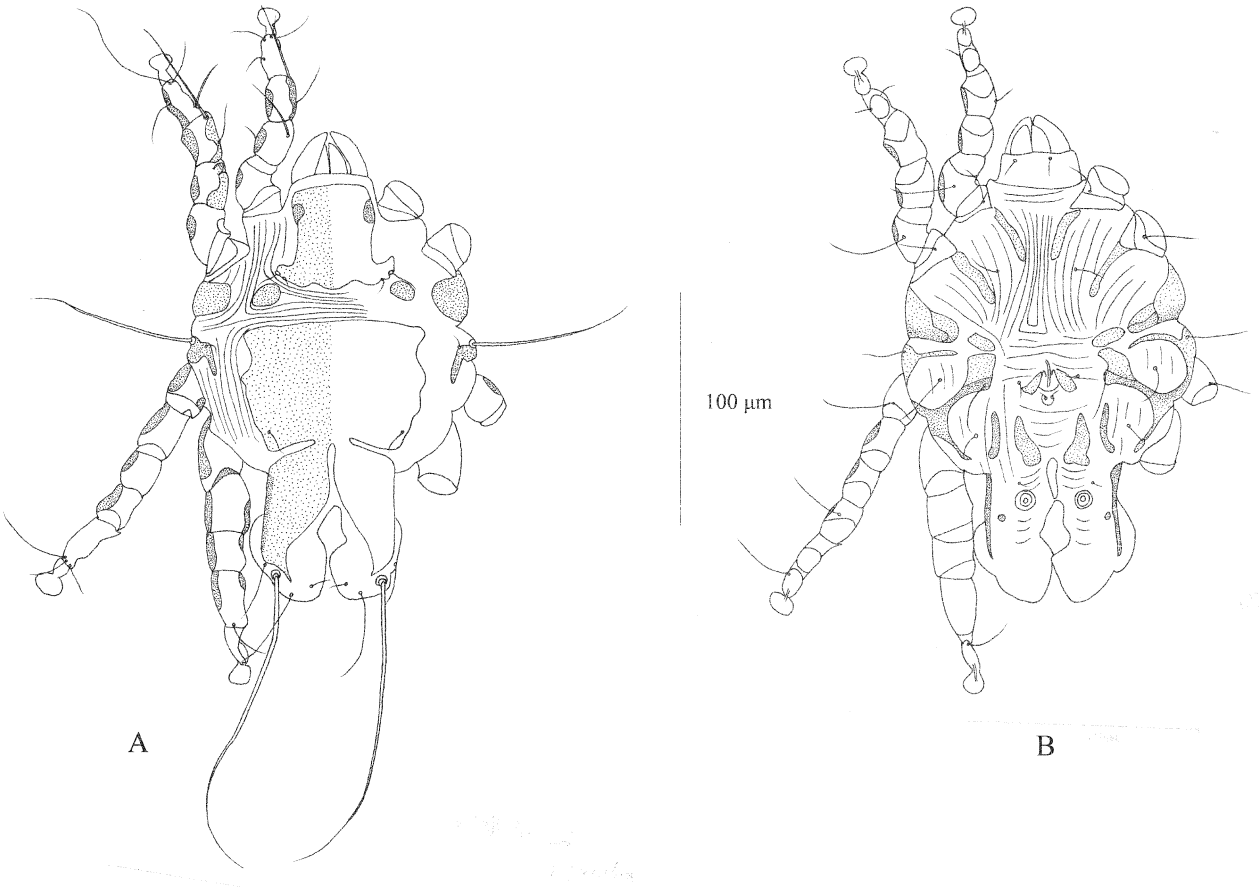

FIGURE 9. *Passeroptes garrulax* Fain, male. A—dorsal view, B—ventral view.

Redescription. MALE (3 specimens). Body 180–195 long and 125–135 wide. Idiosomal shields devoid of ornamentation, soft idiosomal cuticle striated, without scales or tubercles. *Dorsum*. Distance between propodonotal and hysteronotal shields about 13. Propodonotal shield: 45– 53 long and about 51–69 wide, posterolateral extensions encompassing bases of setae *se* and *si*. Posterior margin of propodonotal shield not straight, corrugated. Setae *se* short, 10–12 long. Hysteronotal shield 120–125 long, its length along midline 68–73; with pair of deep lateral incisions at level of femora IV. Setae *d2* present. Humeral shields well developed, with bent extensions. Opisthosomal lobes about 61–70 long, near each other. *Venter.* Coxal fields III almost closed. Genital arch an inverted V. Aedeagus 12–14 long. Coxal apodemes IVb well developed, band-shaped, 20-23 long and about 3 wide. Adanal shields 21-23 long and about 7 wide. Diameter of adanal suckers 7–8. Cupules *ih* situated posterior to adanal suckers. *Legs.* Legs III 93–100 long, slightly thinner than legs IV, legs IV 82–88 long. Processes on legs III and IV absent. Solenidion *ω1*I absent. Setae *ba* I, II absent. Tarsi IV curved medially and with forked apex. Lengths of setae: *cp* 79–84, *c3* 13–16, *h2* 130–140, *h3* 32–40, *ps1* 8–10, *ps2* 22–25, *d* II 59–69, *d* III 66–68, *ω3* about 15, *ω*1II about 23, *φ* I about 40, *φ* II about 46, *φ* III about 2, *φ* IV about 24, *σ1* I about 31, and *σ* II about 2.

FEMALE (5 specimens). Body 205–235 long and 140–175 wide. Idiosomal shields without ornamentation, soft idiosomal cuticle striated, without scales or tubercles. *Dorsum*. Distance between propodonotal and hysteronotal shields about 30. Propodonotal shield 45–56 long and 60–65 wide, postero-lateral extensions

relatively broad and encompassing bases of setae *se* and *si*. Posterior margin of propodonotal shield not straight, corrugated. Setae *se* short, 8–13 long. Hysteronotal shield 89–99 long and 66–78 wide. Posterior margin curved inwards at medium. Setae *d2* thin. Humeral shields well developed, with bent extensions. *Venter.* Coxal fields III closed. Adanal shields well developed, separated from each other, encompassing setae *ps1*, *ps2*, *ps3*, *h2,* and *h3*. *Legs.* Legs III and IV subequal, 95–110 long. Femora III and IV each with 1 dorsal and 1 ventral moderately developed retrorse processes. Other processes on legs III and IV absent. Solenidion *ω1*I absent. Setae *ba* I, II absent. Lengths of setae: *cp* 72–84, *c3* 15–23, *h2* 140–155, *h3* 30–48, *ps2* 15–19, *d* II 52–61, *d* III 60–74, *ω3* and *ω*1II about 15, *φ* I about 30, *φ* II about 36, *φ* III and *φ* IV about 2, *σ1* I about 16, and *σ* II about 2.

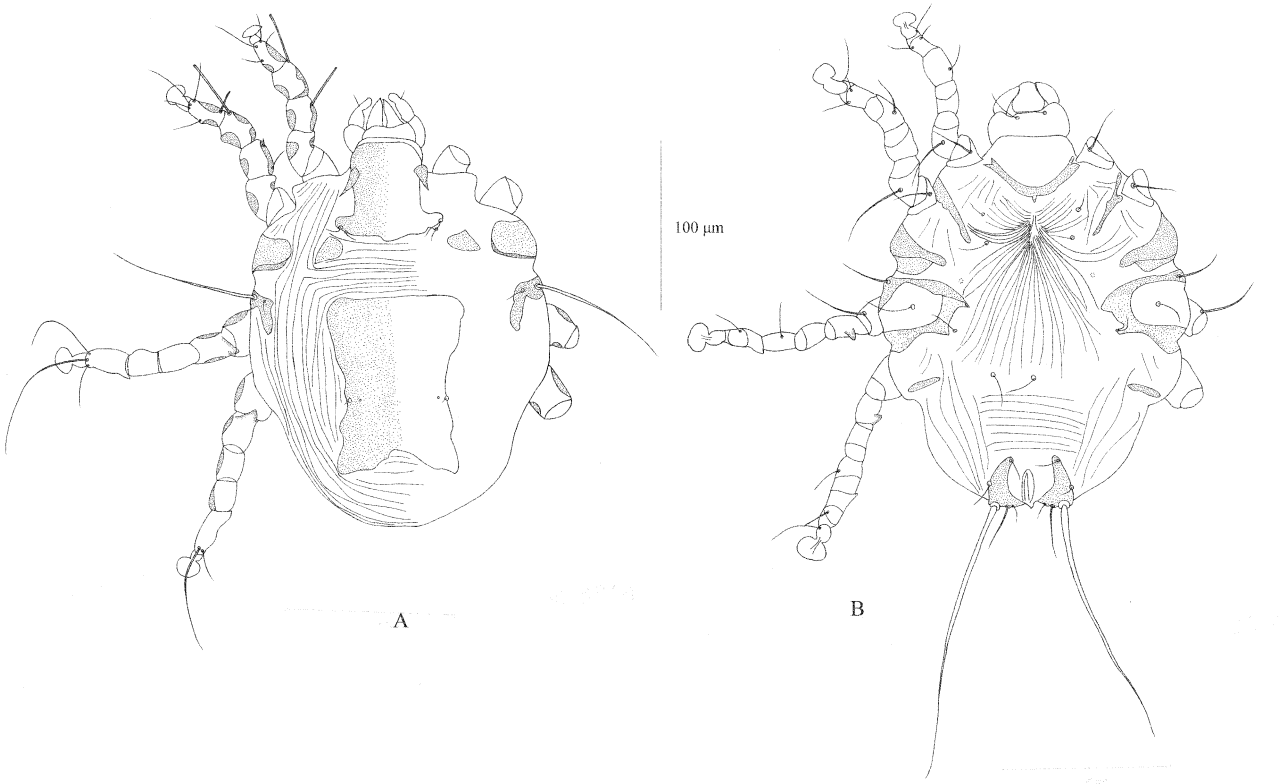

FIGURE 10. *Passeroptes garrulax* Fain, female. A—dorsal view, B—ventral view.

Material examined. 3 males and 5 females ex *Garrulax poecilorhynchus berthemyi* (David and Oustalet) (Passeriformes: Timaliidae), **CHINA**: Guizhou, Guiyang, 26°56'04" N, 106°44'17" E, 5 January 2013, coll. X.-H. Su.

Remark. Specimens of *P. garrulax* and *P. poecilorhynchus* **sp. nov.** were collected from the same individual of *Garrulax poecilorhynchus berthemyi* (David and Oustalet).

In the original description of *Passeroptes garrulax* Fain, 1965 from *Garrulax leucolopbus bicolor*, which had been imported from Indonesia and died in the Antwerp Zoo, Fain (1965) stated that the leg setation is as in *P. dermicola* and that tarsi I and II of *P. dermicola* possess setae *ba*. However, in our examined specimens of *P. garrulax*, setae *ba* were absent on tarsi I and II. Furthermore, in two other species, *P. formosus* **sp. nov.** and *P. poecilorhynchus* **sp. nov.**, collected by us from birds of the genus *Garrulax*, setae *ba*-I, II are also absent.

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