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Feather mites of the genus *Passeroptes* Fain (Acariformes: Dermationidae) from passerines (Aves: Passeriformes) of China

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Abstract

Five new species of the feather mite genus *Passeroptes* (Acariformes: Dermationidae) are recorded from birds of the order Passeriformes in China: *P. lioparis* **sp. nov.** from *Chrysotus chrysotis* (Blyth) (Paradoxornithidae); *P. motacillae* **sp. nov.** from *Motacilla cinerea* Tunstall (Motacillidae); *P. cyanodermae* **sp. nov.** from *Cyanoderma ruficeps* Blyth (Timaliidae); *P. periparus* **sp. nov.** from *Periparus ater* (Linnaeus) (Paridae); *P. aegithalos* **sp. nov.** from *Aegithalos iouschistos bonvaloti* (Oustalet) (Aegithalidae).

Key words: new species, avian parasites, Astigmata, taxonomy

Introduction

Mites of the family Dermationidae Fain, 1965 (Acariformes: Analgoidea) are permanent parasites living on the skin of birds (Bochkov & Mironov 2012). Initially, this family was established as a subfamily of the Epidermoptidae (Fain 1965). Later Gaud and Atyeo (1996) elevated its status to the family level. To present, the family Dermationidae consists of three subfamilies: Apocnemidocoptinae, Dermationinae, and Otocoptoidinae, and includes more than 50 species in 13 genera (Mironov *et al*. 2005; Hernandes *et al*. 2015).

The genus *Passeroptes* Fain, 1964, with 24 species, is the largest genus in the family Dermationidae (Fain 1965; Fain & Bochkov 2003; Bochkov & Mironov 2012; Wang *et al*. 2014). To date, five species of *Passeroptes* have been reported in China (Wang & Wang 2012; Wang *et al*. 2014). In the present paper, we add descriptions of five new species from Chinese passerines. Hosts and distributions of all species of the genus *Passeroptes* are provided in Table 1.

Material and methods

Birds were captured with mist-nets in Sichuan and Yunnan by a study group from the Ornithology Research Center (University of Chinese Academy of Sciences). Birds were restrained while feather mites were collected with a needle under a stereoscopic microscope and preserved in 96% ethanol. Mites were slide-mounted with Hoyer's solution and cured on a Flatting table (Leica HI1220, Germany) at 50°C for 4–5 days. Mounted mites were observed with an Olympus BX51 (Japan) equipped with differential interference contrast. The idiosomal setation follows Griffiths *et al*. (1990) with modifications of Norton (1998) concerning coxal setae. The leg setation follows Grandjean (1939). In species descriptions, all measurements are given in micrometres (μm). Idiosomal length was measured from the anterior margin of propodonotum to posterior end of the opisthosomal lobes. Widths of the idiosoma and hysteronotal shield were measured at the level of setae *cp*. The length of the propodonotal shield was measured along the median line of the shield, its width at the level of setal bases *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.

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TABLE 1. Hosts and distribution of *Passeroptes* spp.

Mite species	Type host	Host family	Distribution	References
P. aegithalos **sp. nov.**	*Aegithalos iouschistos bonvaloti* (Oustalet)	Leiothrichidae	Sichuan, China	
P. ampeliceps	*Ampeliceps coronatus* Blyth	Sturnidae	Thailand; China	Fain & Bochkov 2003
P. armatus	*Leiothrix lutea* (Scopoli)	Leiothrichidae	Antwerp, Belgium	Fain 1965
P. cecropis	*Cecropis abyssinica unitatis* (Sclater & Mackworth–Praed)	Hirundinidae	Rwanda	Fain 1965
P. cyanerpis	*Cyanerpes cyaneus* (Linnaeus)	Thraupidae	Brazil	Fain & Bochkov 2003
P. cyanodermae **sp. nov.**	*Cyanoderma ruficeps* Blyth	Timaliidae	Sichuan, China	
P. dermicola	*Passer domesticus* (Linnaeus)	Passeridae	Europe; France	Fain 1965
P. eulabis	*Gracula religiosa* Linnaeus	Sturnidae	Indonesia	Fain 1965
P. formosus	*Trochalopteron formosum formosum* (Verreaux)	Leiothrichidae	Guizhou, China	Wang *et al.* 2014
P. garrulax	*Garrulax bicolor* Hartlaub	Leiothrichidae	Indonesia	Fain 1965
P. gaudi	*Sturnus vulgaris* Linnaeus, 1758	Sturnidae	Russia; Armenia; Bulgaria	Vassilev & Kolebinova 1965; Bochkov & Mironov 2012
P. geopeliae	*Geopelia striata* (Linnaeus)	Columbidae	Indonesia	Fain 1965
P. hippolais	*Hippolais icterina* (Vieillot)	Acrocephalidae	Kaliningrad, Russia	Bochkov & Mironov 2012
P. hirundiphilus	*Hirundo nigrita* Gray, *Riparia cincta* (Boddaert)	Hirundinidae	Rwanda	Fain & Bochkov 2003
P. inermis	*Calocitta formosa* (Swainson)	Corvidae	Antwerp, Belgium	Fain 1965
P. lamprocolii	*Lamprotornis chloropterus* Swainson	Sturnidae	Africa	Fain & Bochkov 2003
P. lamprotornis	*Lamprotornis purpuroptera* Rüppell	Sturnidae	Africa	Fain & Bochkov 2003
P. lioparis **sp. nov.**	*Lioparus chrysotis* (Blyth)	Paradoxornithidae	Yunnan, China	
P. lophophaps	*Geophaps plumifera* Gould	Columbidae	Australia	Fain 1965
P. motacillae **sp. nov.**	*Motacilla cinerea* Tunstall	Motacillidae	Sichuan, China	
P. myrmecocichlae	*Myrmecocichla formicivora* (Vieillot)	Muscicapidae	Transvaal, South Africa	Fain 1965
P. oenanthe	*Oenanthe oenanthe* (Linnaeus)	Muscicapidae	Netherlands	Fain & Bochkov 2003
P. periparus **sp. nov.**	*Periparus ater* (Linnaeus)	Paridae	Sichuan, China	
P. picae	*Pica pica sericea* Gould	Corvidae	Henan, China	Wang *et al.* 2014
P. poecilorhynchus	*Ianthocincla berthemyi* (Oustalet)	Leiothrichidae	Guizhou, China	Wang *et al.* 2014
P. sylviae	*Curruca communis* Latham	Sylvidae	Kaliningrad, Russia	Bochkov & Mironov 2012
P. temenuchi	*Temenuchus pagodarum* (Gmelin)	Sturnidae	India	Fain 1965
P. turdoides	*Turdoides jardineii* (Smith)	Leiothrichidae	South Africa	Fain & Bochkov 2003
P. viduicola	*Vidua chalybeata* (Statius Müller)	Viduidae	Central Africa	Fain 1965

Holotypes (male) and at least one male and female paratype for both species described here are deposited in the Institute of Zoology, Chinese Academy of Sciences, Beijing, China (IOZ). Paratypes are deposited at the Institute of Entomology, Southwest University, Chongqing, China (IESWU). Host systematics follows Clements *et al*. (2014).

Systematics

Family Dermationidae Fain, 1965

Subfamily Dermationinae Fain, 1965

Genus *Passeroptes* Fain, 1964

***Passeroptes lioparis* sp. nov.**
(Figs. 1, 2, 9F, 12A–D)

Description. MALE (holotype). Body 165 long (150–165 in 6 paratypes) and 115 wide (110–115). Idiosomal shields devoid of ornamentation, soft idiosomal cuticle striated, without scales or tubercles. *Dorsum*. Distance between propodonotal and hysteronotal shields 18 (14–20). Propodonotal shield 36 long (26–36) and 45 wide (42–45), its posterolateral extensions encompassing bases of setae *se*. Posterior margin of propodonotal shield straight. Setae *se* 60 long (52–62), *se–se* 40 long (38–41). Hysteronotal shield transversely separated at level of femora IV; its anterior part 45 long (42–50) and 87 (75–79) wide, its posterior part paired, 64 long (61–67) and 20 wide (22–23). Maximal distance between posterior hysteronotal shields 27. Setae *d2* present, 16 long, *d2–d2* 48. Humeral shields with bent extension, forming acute angle. Terminal cleft longer than its greatest width, 55 long (45–57). Opisthosomal lobes 47 long (40–54), and about 19 wide, posterior interlobar membranes entire, widely separated from each other; distance between lobes 14 (12–14). *Venter*. Coxal apodemes II to IV free. Genital arch as an inverted V with tips strongly curved laterally, 9 length and 15 width. Aedeagus 16 long (16–28). Adanal shields 23 long (28–30) and about 4 wide, forming "L" shape, subparallel to each other. Coxal apodeme IVa about 18 long and 3 wide. Diameter of adanal suckers about 8. Cupules *ih* situated posterior to adanal suckers, *ih–ih* 38. *Legs*. Legs III and IV subequal, 100 long (92–110). Femora III 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. Tarsi IV slightly curved, 16 long, with 2 apices. Lengths of setae: *cp* 10 (84–94), *c3* 20 (22–32), *h2* 135 (125–135), *h3* 39 (40–45), *ps1* 10 (11–15), *ps2* 32 (29–33), *d*II 57 (53–58), *d*III 44 (47–61), *ω3*I 17 (15–16), *ω1*II 25 (21–23), *φ*I 32 (28–34), *φ*II 41 (44–48), *φ*III about 5, *φ*IV 24 (20–22), *σ1*I 28 (25–29), *σ*II about 5. Distances between setae: *g–g* 3, *ps3–ps3* 24 (26–27), *g–ps3* 34 (34–36), *ps1–ps1* 18 (13–19), *h3–h3* 26 (22–25), *ps2–ps2* 44 (42–46), *h2–h2* 40 (33–40), *4a–4a* 63 (62–65), *4b–4b* 48 (46–58), *d2–d2* 47.

FEMALE (10 paratypes). Body 157–170 long and 120–130 wide. Idiosomal shields devoid of ornamentation, soft idiosomal cuticle without scales or tubercles. *Dorsum*. Distance between propodonotal and hysteronotal shields 21–25. Propodonotal shield 29–41 long and 45–52 wide. Posterolateral extensions encompassing bases of setae *se*. Posterior margin of propodonotal shield not straight. Setae *se* 42–52 long, *se–se* 47. Hysteronotal shield 69–73 long and 59–64 wide. Posterior angles of hysteronotal shield with oval-shaped extensions. Setae *d2* present, 15 long, *d2–d2* 41–46. Humeral shields well developed, with bent extensions, forming acute angle. *Venter*. Coxal fields III closed. Adanal shields well developed, separated from each other. Setal bases *ps3* situated on adanal shields. Tarsus IV about 44. *Legs*. Legs III and IV subequal, 105–120 long. Femora III and IV each with 1 dorsal and 1 ventral moderately developed retrorse processes. Other processes on legs III and IV absent. Setae *ba* I, II absent. Lengths of setae: *cp* 73–89, *c3* 30–40, *h2* 140–165, *h3* 39–57, *ps1* 7, *ps2* 27–41, *d*II 52–71, *d*III 52–65, *ω3*I 13–17, *ω1*II 19–21, *φ*I 33–40, *φ*II 36–39, *φ*III 2, *φ*IV 6, *σ1*I 21–27, *σ*II 7. Distance between setae: *g–g* 64, *ps3–ps3* 12, *g–ps3* 66, *ps1–ps1* 12, *h3–h3* 22–34, *ps2–ps2* 32–34, *h2–h2* 37, *4a–4a* 21–24, *4b–4b* 32–36, *d2–d2* 40–50.

Type material. Holotype male [IOZ(E) 227739], 6 male and 10 female paratypes ex *Lioparus chrysotis* (Blyth) (Passeriformes: Paradoxornithidae), **CHINA**: Yunnan, 24°52'48" N, 102°49'51" E, 5 May 2013, coll. X.-H. Su.

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

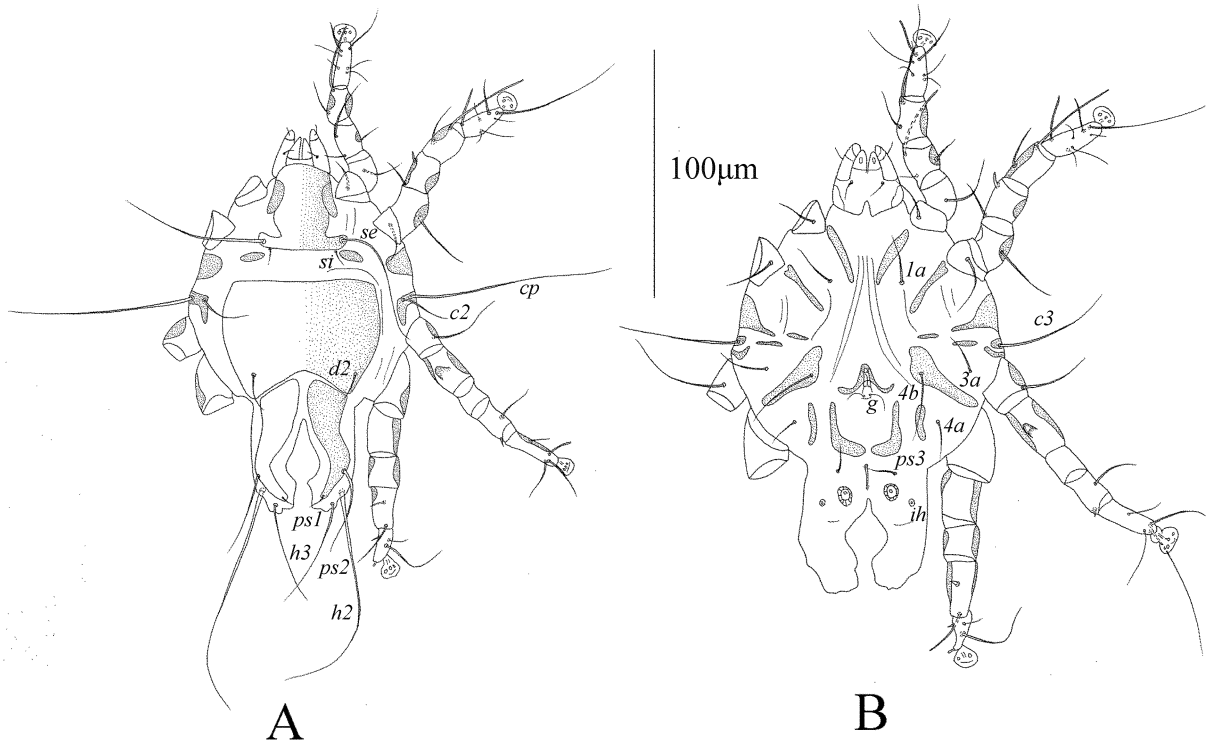

FIGURE 1. *Passeroptes lioparis* **sp. nov.**, male. A—dorsal view, B—ventral view.

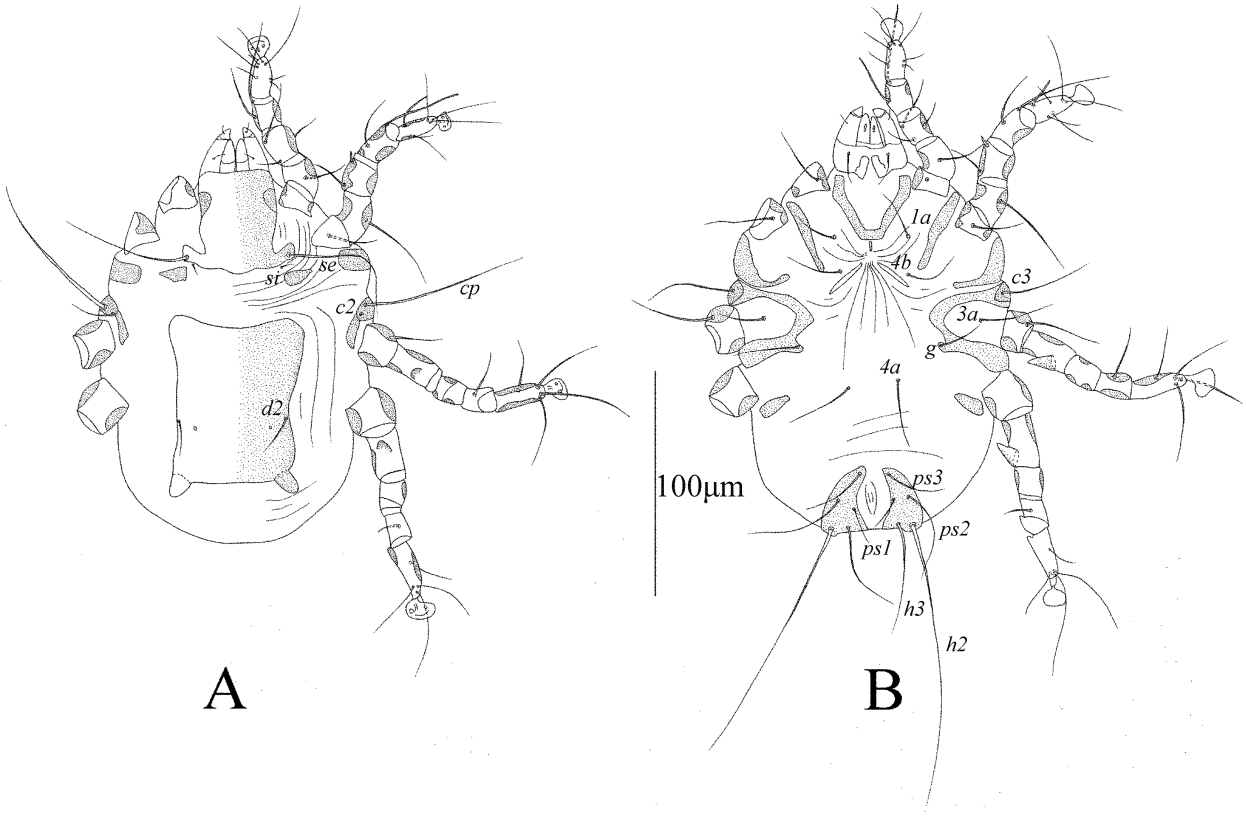

FIGURE 2. *Passeroptes lioparis* **sp. nov.**, female. A—dorsal view, B—ventral view.

Differential diagnosis. The new species is closest to *Passeroptes formosus* Wang and Mu, 2014 from *Trochalopteron formosum formosum* (Verreaux) (Passeriformes: Leiothrichidae) and *Passeroptes viduicola* Fain,

1965 from *Vidua chalybeata* (Statius Müller) (Passeriformes: Viduidae) (Wang *et al*. 2014; Fain 1965). In these species, setae *d2* are present, and the humeral shields have a bent extension; in males, the hysteronotal shield is transversely separated and only femora III have retrorse processes; in females, setal bases *ps3* are situated on adanal shields, coxal fields III are closed, femora III and IV each bear one dorsal and one ventral moderately developed retrorse process, and tarsi IV are slightly curved, 16 long, with two apices.

The new species differs from *P. formosus* in the following features. In both sexes of *P. lioparis* **sp. nov.**, setae *se* are long, about six times longer than *si*, and setae *c2* and *d2* are long, about 16; in males, coxal apodemes II to IV are free, the opisthosomal lobes, including the interlobar membrane, are not overlapping, and adanal shields are 23 (28-30) long, longer than coxal apodeme IVa; in females, setae *si* are situated off the propodonotal shields. The new species differs from *P. viduicola* in following features: setae *se* are long, about six times longer than *si*, the aedeagus is about 16 long, the adanal shields are 23 long (28–30) and about 4 wide, forming an "L" shape.

In both sexes of *P. formosus*, setae *se* are short, about twice longer than *si*, setae *c2* and *d2* are short, only 5 long; in males, the adanal shields are equal to coxal apodeme IVa, coxal fields III are opened in their anterior third and the interlobar membranes are overlapping; in females, setae *si* are situated on propodonotal shields. In both sexes of *P. viduicola*, setae *se* are about three times than *si*; in males, the aedeagus is very long, the extruded part is 66 long, the adanal shields are U-shaped with a broad base.

Passeroptes motacillae **sp. nov.**
(Figs. 3, 4, 9G, 12E–H)

MALE (holotype). Body 145 long (140–155 in 9 paratypes) and 97 wide (95–105). Idiosomal shields without ornamentation, soft idiosomal cuticle striated, without scales or tubercles. *Dorsum*. Distance between propodonotal and hysteronotal shields 19 (15–23). Propodonotal shield 32 long (27–39) and 33 wide (40–45), its posterolateral extensions encompassing bases of setae *se* and *si*. Posterior margin of propodonotal shield straight. Setae *se* long, 32 long (32–41), *se–se* 39 (38–41). Hysteronotal shield about 93 long, its length along midline 56, with deep lateral incisions at level of femora IV; its anterior part 44 long (40–47) and 45 wide, anterior part of hysteronotal shield wider than or subequal in width to posterior part of hysteronotal shield. Setae *d2* absent. Humeral shields not developed, without bent extensions. Opisthosomal lobes 30 long (36–41), widely separated from each other. Terminal cleft slightly longer than its greatest width. Interlobar membranes wide, entire, about 38 long and 16 wide, widely separated from each other. Maximum distance between lobes about 13. *Venter*. Coxal apodemes IIa to IV free. Genital arch as an inverted V with tips strongly curved laterally, 10 length and 18 width. Aedeagus about 20 long, beyond genital arch. Adanal shields about 27 long and 7 wide, subparallel to each other. Diameter of adanal suckers about 7. Cupules *ih* situated posterolateral adanal suckers, *ih–ih* 37. *Legs*. Legs III and IV subequal, 80 long (76–88). Femora III and IV 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. Tarsi IV straight, without apices, 17 long. Lengths of setae: *cp* 99 (98–105), *c3* 23 (24–26), *h2* 155 (150–170), *h3* 32 (28–32), *ps1* 8, *ps2* 25 (18–27), *d*II 68 (66–70), *d*III 80 (61–76), *ω3* about 14, *ω1*II 26 (19–23), *φ*I about 18, *φ*II about 35, *φ*III about 1, *φ*IV about 18, *σ1*I about 18, *σ*II about 2. Distances between setae: *g–g* 3, *ps3–ps3* 30, *g–ps3* 38, *ps1–ps1* 13, *h3–h3* 26 (25–30), *ps2–ps2* 47 (45–50), *h2–h2* 39 (38–43), *4a–4a* 43, *4b–4b* 43 (51–53).

FEMALE (5 paratypes). Body 160–175 long and 110–125 wide. Idiosomal shields without ornamentation, soft idiosomal cuticle without scales or tubercles. *Dorsum*. Distance between propodonotal and hysteronotal shields about 18. Propodonotal shield 37–40 long and 45–53 wide, posterolateral extensions encompassing bases of setae *se* and *si*. Posterior margin of propodonotal shield straight. Setae *se* about 35 long. Hysteronotal shield 70–81 long and 54–65 wide. Posterior margin of hysteronotal shield straight, entire. Setae *d2* absent. Humeral shields without bent extensions. *Venter*. Coxal fields II to IV opened. Adanal shields well developed, separated from each other. Setae *ps3* situated on these shields. *Legs*. Legs III and IV subequal, 90 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* 87–98, *c3* 27–31, *h2* 150–165, *h3* 23–30, *ps2* 25, *d*II 61–68, *d*III 72–76, *ω3*I about 13, *ω1*II 32–38, *φ*I 26–29, *φ* II 32–37, *σ1*I 11–17, and *σ*II 3. Distances between setae: *se–se* 45–48, *g–g* 50, *ps3–ps3* 16, *g–ps3* 47–68, *ps1–ps1* 14–18, *h3–h3* 16, *ps2–ps2* 29–33, *h2–h2* 24–30, *4a–4a* 16–22, *4b–4b* 24–30.

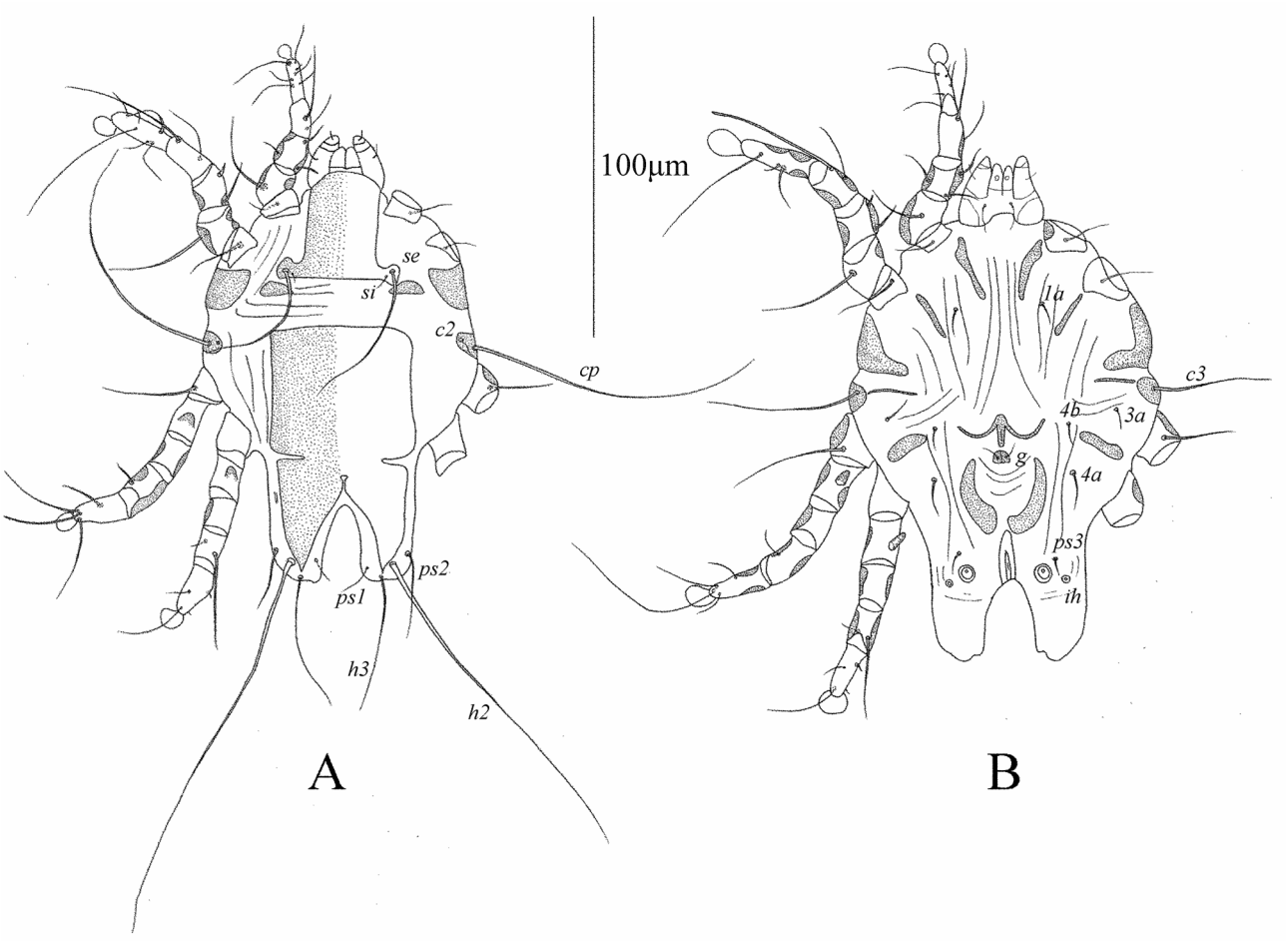

FIGURE 3. *Passeroptes motacillae* **sp. nov.**, male. A—dorsal view, B—ventral view.

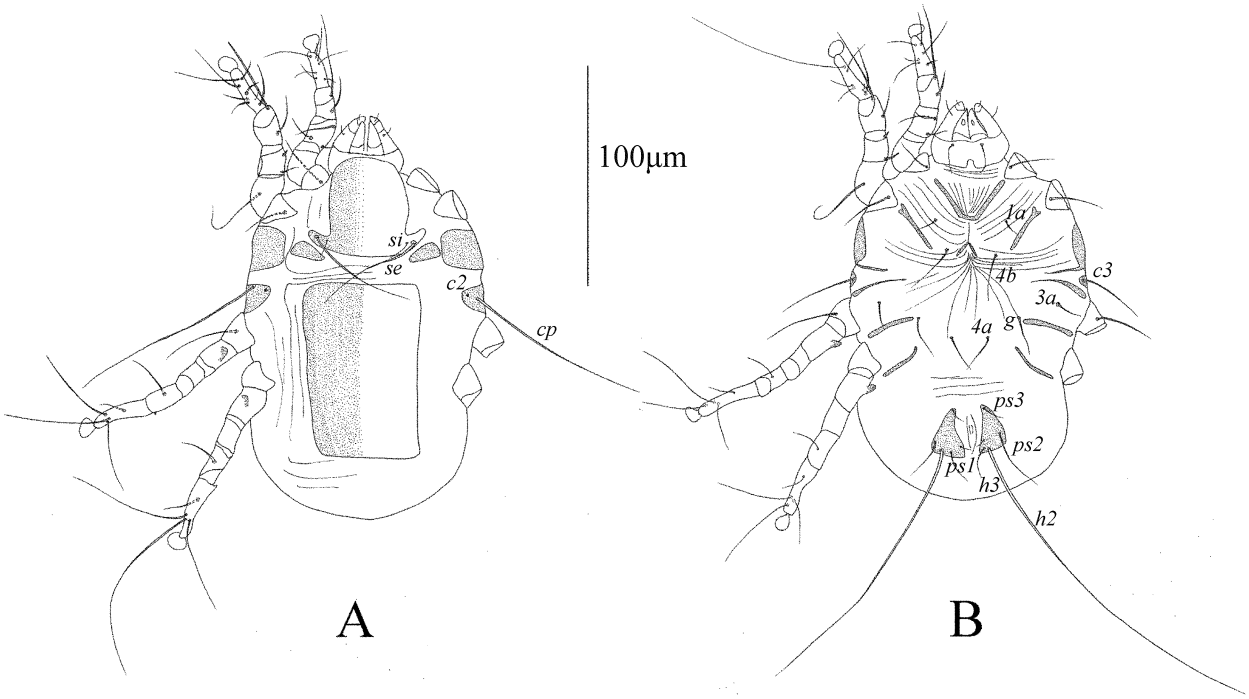

FIGURE 4. *Passeroptes motacillae* **sp. nov.**, female. A—dorsal view, B—ventral view.

Type material. Holotype male [IOZ(E) 227740], 9 male and 5 female paratypes ex *Motacilla cinerea* Tunstall (Passeriformes: Motacillidae), **CHINA**: Sichuan, 31°03'38.35" N, 103°33'21.84" E, 23 April 2014, coll. N. Mu.

Etymology. The specific epithet is derived from the generic name of the host.

Differential diagnosis. The new species is closest to *Passeroptes hippolais* Bochkov and Mironov, 2012 from *Hippolais icterina* (Vieillot) (Passeriformes: Acrocephalidae) (Bochkov & Mironov 2012). In both sexes of these two species, setae *d2* are absent and the humeral shields lack bent extensions, setae *se* are long, extending beyond the anterior margin of hysteronotal shield, at least five times longer than *si*, and tarsi IV are straight, without apices; in males, the hysteronotal shield is not transversely separated, but has a pair of deep lateral incisions at level of femora IV, femur IV has one ventral and one dorsal retrorse processes (an unique feature shared by both these species), the shape of the lateral incisions of the hysteronotal shield is simple, the opisthosomal lobes, including the interlobar membrane, are not overlapping; in females, femora III and IV each bear one dorsal and one ventral moderately developed retrorse process.

The new species differs from *P. hippolais* by following features. In both sexes of *P. motacillae* **sp. nov.**, setae *ba*I, II are absent, and coxal fields II to IV are completely opened; in males, cupules *ih* are situated posterolateral to adanal suckers, and the aedeagus is about 20 long, extending beyond the genital arch; in females, the posterior margin of the hysteronotal shield is straight.

In both sexes of *P. hippolais*, setae *ba*I, II are present, coxal fields III are nearly closed, being opened only in the anterior third; in males, cupules *ih* are situated at the same level as the adanal suckers, and the aedeagus is about 7 long, not extending beyond nor reaching to the genital arch; in females, the posterior margin of the hysteronotal shield is concave.

***Passeroptes cyanodermae* sp. nov.**
(Figs. 5, 6, 9H, 12I-L)

MALE (holotype). Body 215 long (190–215 in 9 paratypes) and 160 wide (135–155). Idiosomal shields devoid of ornamentation, soft idiosomal cuticle striated, without scales or tubercles. *Dorsum*. Distance between propodonotal and hysteronotal shields 24 (16–23). Propodonotal shield 46 long (43–52) and 59 wide (54–67), its posterolateral extensions encompassing bases of setae *se* and *si*. Posterior margin of propodonotal shield straight. Setae *se* long, beyond anterior margin of hysteronotal shield, 52 long (47–59), *se–se* 51 (47–51). Hysteronotal shield transversely separated at level of femora IV; its anterior part 46 long (50–53) and 83 wide (63–100), its posterior part paired, 92 long (77–96) and 38 wide (31–33). Maximal distance between posterior hysteronotal shields 37. Setae *d2* present, about 37 long. Humeral shields without bent extension. Terminal cleft 66 long (53–66). Opisthosomal lobes about 67 long and 33 wide, interlobar membranes not overlapping, maximum distance about 13 wide. *Venter*. Coxal apodemes I to IV free, apodeme IIIa with two extending of sclerotizations. Genital arch a wide inverted V, 11 long and 18 wide. Aedeagus 17 long (16–18). Adanal shields about 23 long and 3 wide, symmetric to each other; coxal apodeme IVa about 19 long and 2 wide, shorter than adanal shield. Diameter of adanal suckers 7 (6–9). Cupules *ih* situated posterolateral to adanal suckers. *Legs*. Legs III and IV subequal in length, about 140 long, leg IV 1.5–2 times wider than leg III. Femora III with 1 dorsal and 1 ventral moderately developed retrorse processes, genus III with small dorsal process. Other processes on legs III and IV absent. Solenidion *ω1*I absent. Setae *ba*I, II absent. Tarsi IV curved. Lengths of setae: *cp* 145 (125–155), *c3* 50 (39–48), *h2* 170 (155–180), *h3* about 78, *ps1* 22 (29–37), *ps2* 38 (33–45), *d*II 75 (67–82), *d*III 95 (77–89), *ω3* about 17, *ω1*II 21 (19–23), *φ*I 38 (32–36), *φ*II about 50, *φ*III about 4, *φ*IV about 12, *σ1*I about 33, *σ*II about 7. Distance between setae: *g–g* 5, *ps3–ps3* 37, *g–ps3* 46 (40–47), *ps1–ps1* 42, *h3–h3* 60 (44–55), *ps2–ps2* 72 (56–70), *h2–h2* 64 (53–66), *ih–ih* 52, *4a–4a* 59 (57–63), *4b–4b* 87 (74–86).

FEMALE (8 paratypes). Body 190–220 long and 140–155 wide. Idiosomal shields without ornamentation, soft idiosomal cuticle without scales or tubercles. *Dorsum*. Distance between propodonotal and hysteronotal shields 21–28. Propodonotal shield 49–56 long and 59–68 wide, posterolateral extensions encompassing bases of setae *se* and *si*. Posterior margin of propodonotal shield straight. Setae *se* 51–55 long, *se–se* 49–51. Hysteronotal shield 82–95 long and 68–70 wide, its posterior margin concave. Setae *d2* present, about 21 long. Humeral shields well developed, with bent extension. *Venter*. Coxal apodemes II to IV free, apodeme IIIa with some extending of sclerotizations; adanal shields well developed, separated from each other encompassing setae *h2*, *h3*, *ps1*, *ps2*, and

ps3. *Legs*. Legs III and IV subequal, 115–135 long. Femora III and IV each with 1 dorsal and 1 ventral moderately developed retrorse processes. Other processes on legs III and IV absent, tarsi IV curved. Solenidion *ω1*I absent. Setae *ba*I, II absent. Lengths of setae: *cp* 115–130, *c3* 34–47, *h2* 155–170, *h3* 41–56, *ps2* 20–30, *d*II 62–69, *d*III 78–92, *ω3* 13–16, *ω1*II 17–20, *φ*I 32–37, *φ*II about 36, *σ1*I about 32, *σ*II about 5. Distances between setae: *se–se* 52–55, *g–g* 67–72, *ps3–ps3* 13–14, *g–ps3* 66–79, *ps1–ps1* 12–15, *h3–h3* 22–25, *ps2–ps2* 33–42, *h2–h2* 38–41, *4a–4a* 28–30, *4b–4b* 26–35.

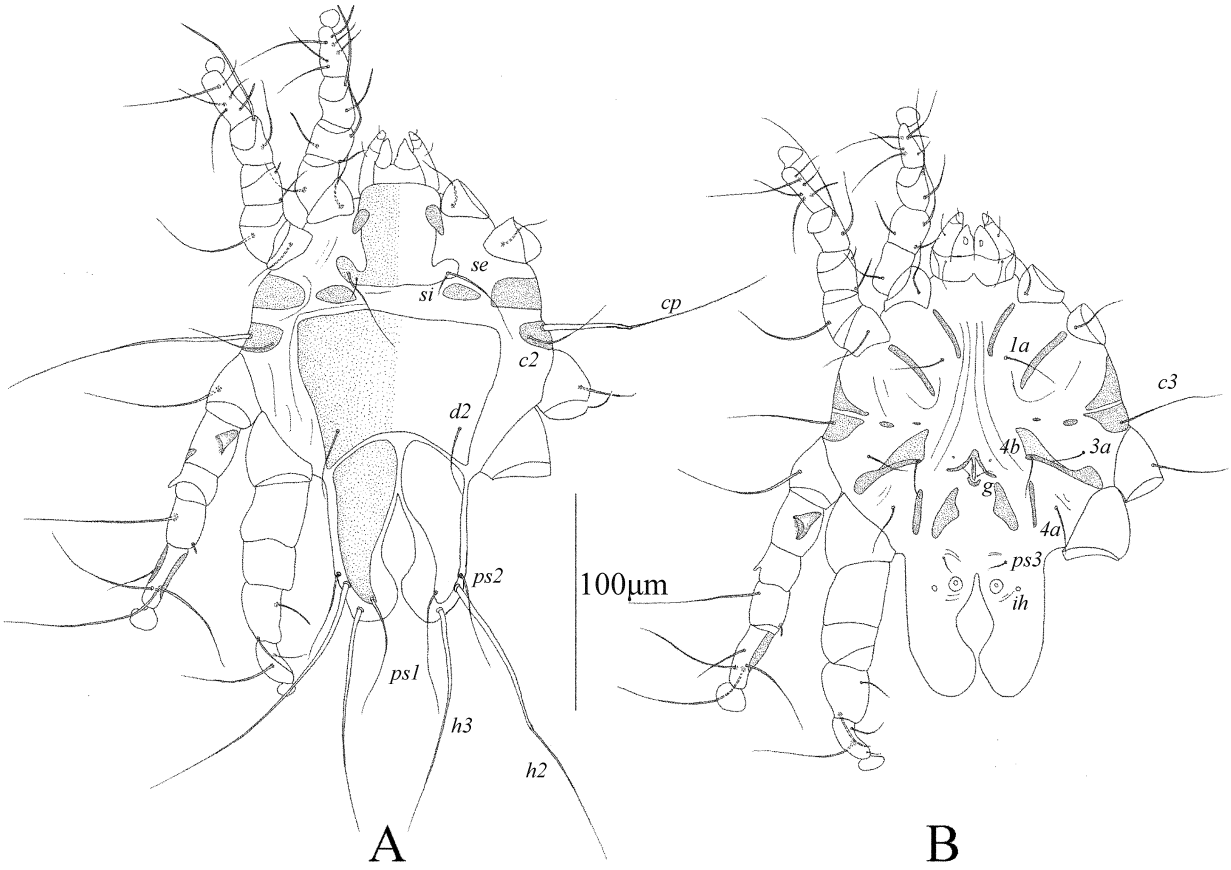

FIGURE 5. *Passeroptes cyanodermae* **sp. nov.**, male. A—dorsal view, B—ventral view.

Type material. Holotype male [IOZ(E) 227741], 9 male and 8 female paratypes ex *Cyanoderma ruficeps* Blyth (Passeriformes: Timaliidae), **CHINA**: Sichuan, Dujiangyan, 31°03'38.35" N, 103°33'21.84" E, 23 April 2014, coll. N. Mu.

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

Differential diagnosis. The new species is closest to *Passeroptes eulabis* Fain, 1965 from *Gracula religiosa* Linnaeus (Passeriformes: Sturnidae) and *P. lamprocolii* Fain, 1965 from *Lamprotornis chloropterus* Swainson (Passeriformes: Sturnidae). In these species, setae *d2* are present and tarsi IV are curved; in males, the hysteronotal shield is transversely separated, the opisthosomal lobes are not overlapping, only femora III have retrorse processes, coxal apodeme IVa are smaller than the adanal shield, the aedeagus is long, extending beyond genital arch, and leg IV is slightly stronger than leg III; in females, femora III and IV each bear one dorsal and one ventral moderately developed retrorse process.

The new species differs from *P. eulabis* and *P. lamprocolii* by the following features. In both sexes of *P. cyanodermae* **sp. nov.**, setae *se* are about five times longer than *si* and setae *d2* are 21–37 long and situated on the hysteronotal shield; in males, the margins of opisthosomal lobes are smooth, without any emarginate, coxal apodemes I to IV are free, coxal fields III are opened and have some small sclerotized patches in the anterior third, genua III have a small process, tarsi IV are curved, without apices, the adanal shields are about 23 long and 3 wide, and coxal apodeme IVa are about 19 long and 2 wide and shorter than the adanal shield; in females, coxal apodemes II to IV are free, apodeme IIIa has some extending of sclerotizations, the humeral shields have a bent extension, and the adanal shields are well developed, separated from each other and encompass setae *ps3*.

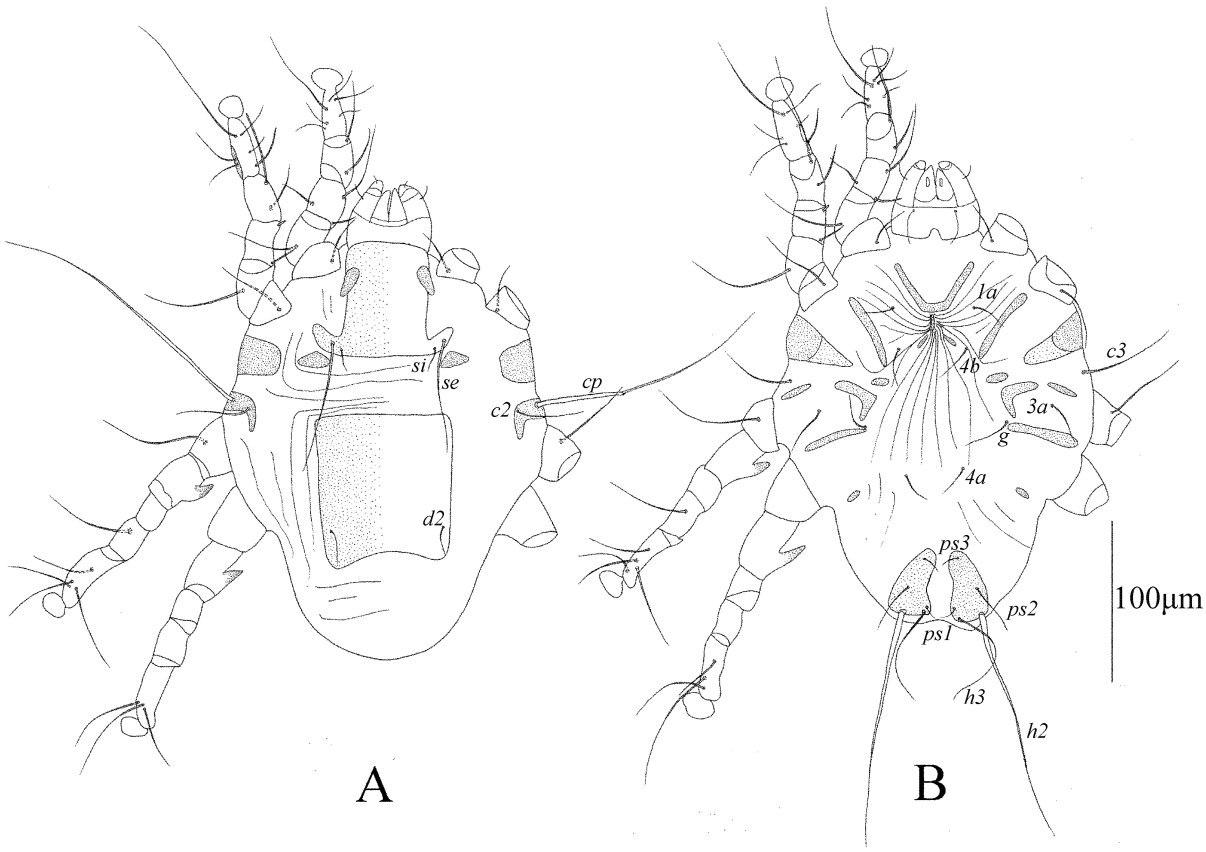

FIGURE 6. *Passeroptes cyanodermae* **sp. nov.**, female. A—dorsal view, B—ventral view.

In both sexes of *P. eulabis*, setae *se* are about twice longer than *si* and setae *d2* are only 10–15 long; in males, the margin of the opisthosomal lobes are not round, emarginate, coxal fields III are opened only in the anterior third, tarsi IV are curved medially and their apex produced, and genua III lack a small process; in females, coxal fields III are closed, the humeral shields lack a bent extension, the adanal shields are developed and connected together, and setae *ps3* are situated off the adanal shields. In both sexes of *P. lamprocolii*, setae *se* are about twice longer than *si* and setae *d2* are situated off the hysteronotal shield, in males, the margins of the opisthosomal lobes are not round, emarginate, genua III lack a small process, tarsi IV are curved, with two apices, and the adanal shields are well developed, about 10 times longer than coxal apodeme IVa; in female, coxal fields III are closed.

***Passeroptes periparus* sp. nov.**
(Figs. 7, 8, 9A–E, 12M–P)

MALE (holotype). Body 165 long and 115 wide. Idiosomal shields without ornamentation, soft idiosomal cuticle striated, without scales or tubercles. *Dorsum*. Distance between propodonotal and hysteronotal shields about 18. Propodonotal shield 39 long and about 64 wide, its posterolateral extensions encompassing bases of setae *se* and *si*. Posterior margin of propodonotal shield not straight. Setae *se* 58 long, about 8 times as long as *si*, *se–se* 45. Hysteronotal shield 105 long, its length along midline 57, with 1 pair of deep lateral incisions at level of femora IV; its anterior part 39 long and 64 wide, anterior part of hysteronotal shield not as wide as its posterior part. Maximal distance between posterior hysteronotal shields 56. Setae *d2* absent. Humeral shields well developed, with bent extensions. Terminal cleft about 43 long. Interlobar membranes not overlapping. Maximum distance about 47 wide. *Venter*. Coxal apodeme I to IV free, coxal fields III opened, coxal apodeme IVa is a small sclerite. Genital arch as an inverted V with tips strongly curved laterally. Genital arch 10 long, and 19 wide. Aedeagus 21 long. Adanal shields about 23 long and 15 wide, subparallel to each other. Diameter of adanal suckers about 8. Cupules *ih* situated posterolateral adanal suckers. *Legs*. Legs III and IV subequal, 100 long. Femora III 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. Tarsi IV curved, with 2 apices. Lengths of setae: *cp* 110, *h2* 150, *h3* 37, *ps1* 16, *ps2* 36, *d*II 55, *d* III 70, *ω3* 12, *ω1*II 15, *φ*I 30, *φ*II 43, *φ*IV 20, *σ1*I 16, *σ*II 12. Distance between setae: *se–se* 5, *g–g* 6, *ps3–ps3* 36, *g–ps3* 42, *ps1–ps1* 30, *h3–h3* 48, *ps2–ps2* 70, *h2–h2* 64, *ih–ih* 50, *4a–4a* 52, *4b–4b* 48.

FEMALE (3 paratypes). Body 165–190 long and 120–130 wide. Idiosomal shields without ornamentation, soft idiosomal cuticle without scales or tubercles. *Dorsum*. Distance between propodonotal and hysteronotal shields 16–25. Propodonotal shield 44–50 long and 55–57 wide, posterolateral extensions encompassing bases of setae *se* and *si*. Posterior margin of propodonotal shield slightly rounded. Setae *se* 45–55 long. Hysteronotal shield 67–74 long and 56–59 wide, with concave anterior and posterior margins. Setae *d2* absent. Humeral shields well developed, with bent round extensions. *Venter*. Coxal apodemes II to IV free, coxal fields III opened only in anterior third. Adanal shields well developed, separated from each other encompassing setae *h2*, *h3*, *ps1*, *ps2* and *ps3*. *Legs*. Legs III and IV subequal, 96–105 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* 100–110, *c3* 22–29, *h2* 140–155, *h3* 30–36, *ps2* 27–31, *d*II 51–57, *d*III 65–74, *ω3* about 12, *ω1*II about 14, *φ*I 25–31, *φ*II 33–35, *σ1*I 14–19, and *σ*II 4–6. Distance between setae: *se–se* 48, *g–g* 62–71, *ps3–ps3* 12, *g–ps3* 68–73, *ps1–ps1* 8–10, *h3–h3* 15, *ps2–ps2* 28–30, *h2–h2* 28–30, *4a–4a* 20–25, *4b–4b* 22–30.

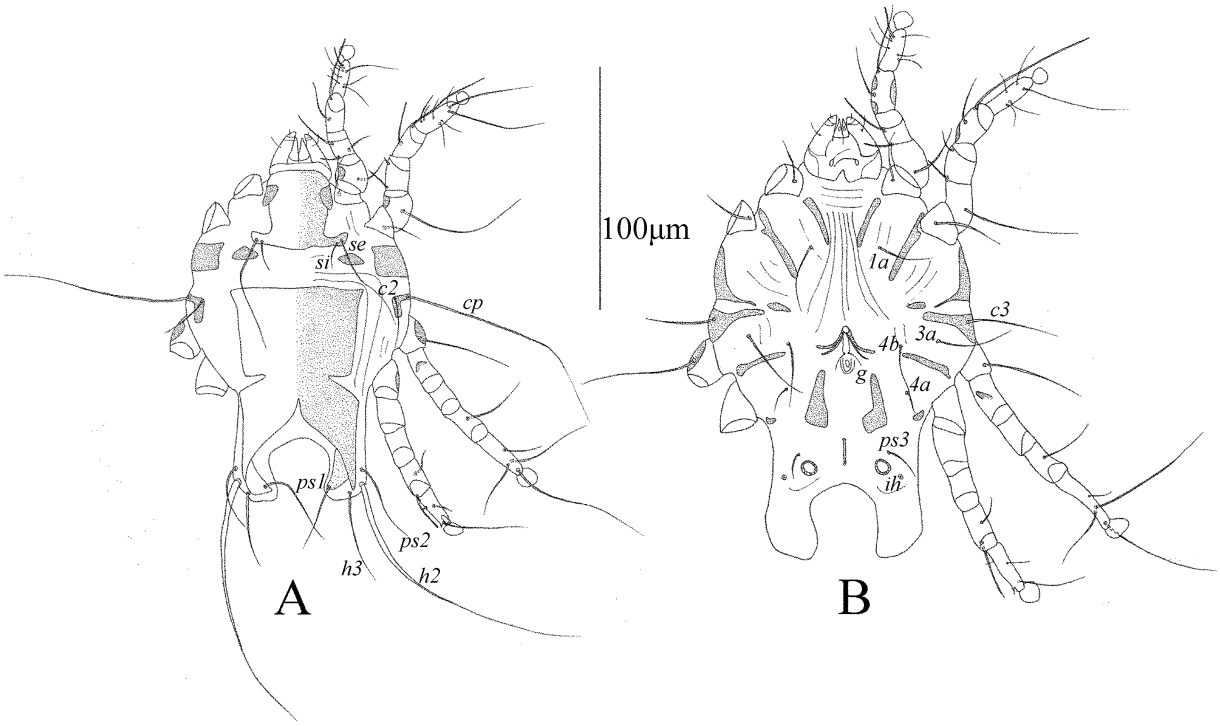

FIGURE 7. *Passeroptes periparus* **sp. nov.**, male. A—dorsal view, B—ventral view.

Type material. Holotype male [IOZ(E) 227742] and 3 female paratypes ex *Periparus ater* (Linnaeus) (Passeriformes: Paridae), **CHINA**: Sichuan, 31°03'38.35" N, 103°33'21.84" E, 23 April 2014, coll. N. Mu.

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

Differential diagnosis. The new species is closest to *Passeroptes geopeliae* Fain, 1965 from *Geopelia striata* (Linnaeus, 1766) (Columbiformes: Columbidae). In both sexes of these two species, setae *d2* are absent, and setae *se* are long, extending beyond the anterior margin of the hysteronotal shield; in males, the hysteronotal shield is entire but has a pair of deep lateral incisions at the level of femora IV, femora III have retrorse processes, the opisthosomal lobes, including the interlobar membrane, are not overlapping, cupules *ih* are posterolateral to adanal suckers, and tarsi IV are curved, with two apices; in females, femora III and IV each bear one dorsal and one ventral moderately developed retrorse process, and the adanal shields are well developed and separated from each other, encompassing setae *ps3*.

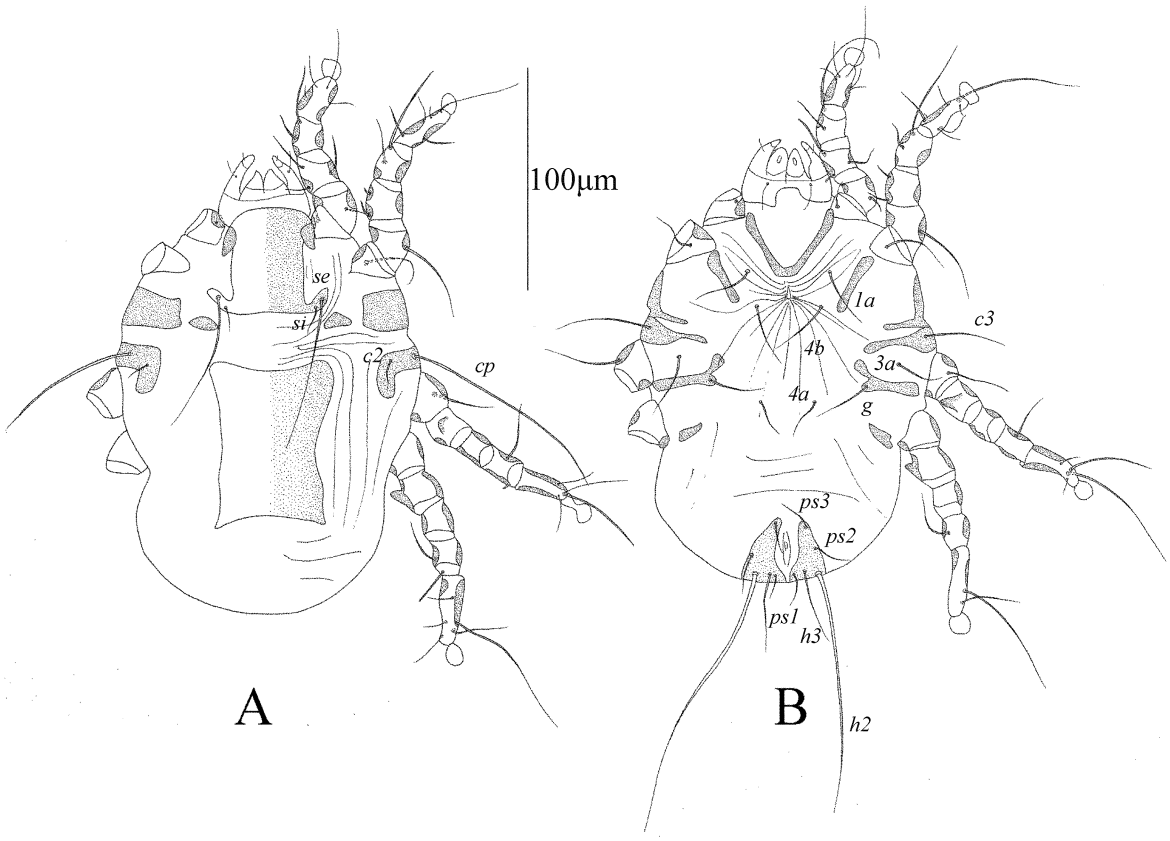

FIGURE 8. *Passeroptes periparus* **sp. nov.**, female. A—dorsal view, B—ventral view.

The new species differs from *P. geopeliae* by the following features. In both sexes of *P. periparus* sp. nov., setae *ba*I, II are absent, and the humeral shields are well developed, with a bent extension; in males, coxal fields III are opened, coxal apodeme IVa is a small sclerite, the opisthosomal lobes, including the interlobar membrane, are separated from each other, and the distance is wider than *P. geopeliae*, about 47 wide. The aedeagus is long, extending beyond genital arch; in females, the margins of hysteronotal shield is curved, and coxal fields III are opened only in the anterior third.

In both sexes of *P. geopeliae*, setae *ba*I, II are presumably present (Fain (1965) only stated that *ω1* was absent), and the humeral shields lack a bent extension; in males, coxal fields III are only opened in the anterior third, coxal apodeme IVa is fused with apodeme IIIa, the interlobar membrane are separated from each other, and minimum distance of interlobar membrane is narrower than *P. periparus*, and the aedeagus is short, not extending to the genital arch; in females, all margins of the hysteronotal shield are straight and coxal fields III are opened.

Passeroptes aegithalos **sp. nov.**
(Figs. 9I, 10, 11, 12Q–T)

MALE (holotype). Body 180 long (160, 180 in 2 paratypes) and 130 wide (115, 120). Idiosomal shields without ornamentation, soft idiosomal cuticle striated, without scales or tubercles. *Dorsum*. Distance between propodonotal and hysteronotal shields 23 (14, 16). Propodonotal shield 38 long (35, 37) and 47 wide (48, 50), its posterolateral extensions encompassing bases of setae *se* and *si*. Posterior margin of propodonotal shield rounded. Setae *se* long, extending trochanter IV, 57 (50, 58), 6 times longer than *si*; *se–se* 43 (43, 45). Hysteronotal shield 125 long, 73 long along midline, with pair of deep lateral incision at level of femora IV; its anterior part 49 long (48, 66) and 68 wide (56, 60), anterior part of hysteronotal shield slightly wider than posterior part of hysteronotal shield. Maximal distance between posterior hysteronotal shields 16. Setae *d2* present. Humeral shields well developed, with bent extensions forming acute angle. Terminal cleft 49 (46, 47) long. Opisthosomal lobes and interlobar membranes

narrow, minimum distance about 2 wide. *Venter*. Coxal apodemes I to IV free, coxal fields III opened, coxal apodeme IVa about 12 long and 2 wide. Genital arch as an inverted V with tips strongly curved laterally, about 10 long and 18 wide. Aedeagus about 16 long, extending beyond genital arch. Adanal shields 27 (28, 29) long and about 6 wide, subparallel to each other, wider than coxal apodeme IVa. Diameter of adanal suckers about 9. Cupules *ih* situated posterior to adanal suckers, *ih–ih* 45. *Legs*. Legs III and IV subequal, 105 (100, 110) long. Femora III and femora IV without retrorse processes. Solenidion *ω1*I absent. Setae *ba*I, II absent. Tarsi IV curved, with 2 apices. Lengths of setae: *cp* 125 (120, 125), *c3* about 32, *h2* 150 (145, 165), *h3* 30 (38, 40), *ps1* about 20, *ps2* 28 (23, 37), *d*II 67 (60, 78), *d*III 87 (84, 89), *ω3* 14 (13, 14), *ω1*II 23 (17, 21), *φ*I about 31, *φ*II 37 (33, 34), *φ*III about 7, *φ*IV about 22, *σ1*I 26 (26, 29), *σ*II 5. Distances between setae: *g–g* about 4, *ps3–ps3* 35 (35, 39), *g–ps3* about 44, *ps1–ps1* about 18, *h3–h3* about 30, *ps2–ps2* 59 (50, 64), *h2–h2* 49 (44, 59), *4a–4a* 57 (58, 59), *4b–4b* about 49.

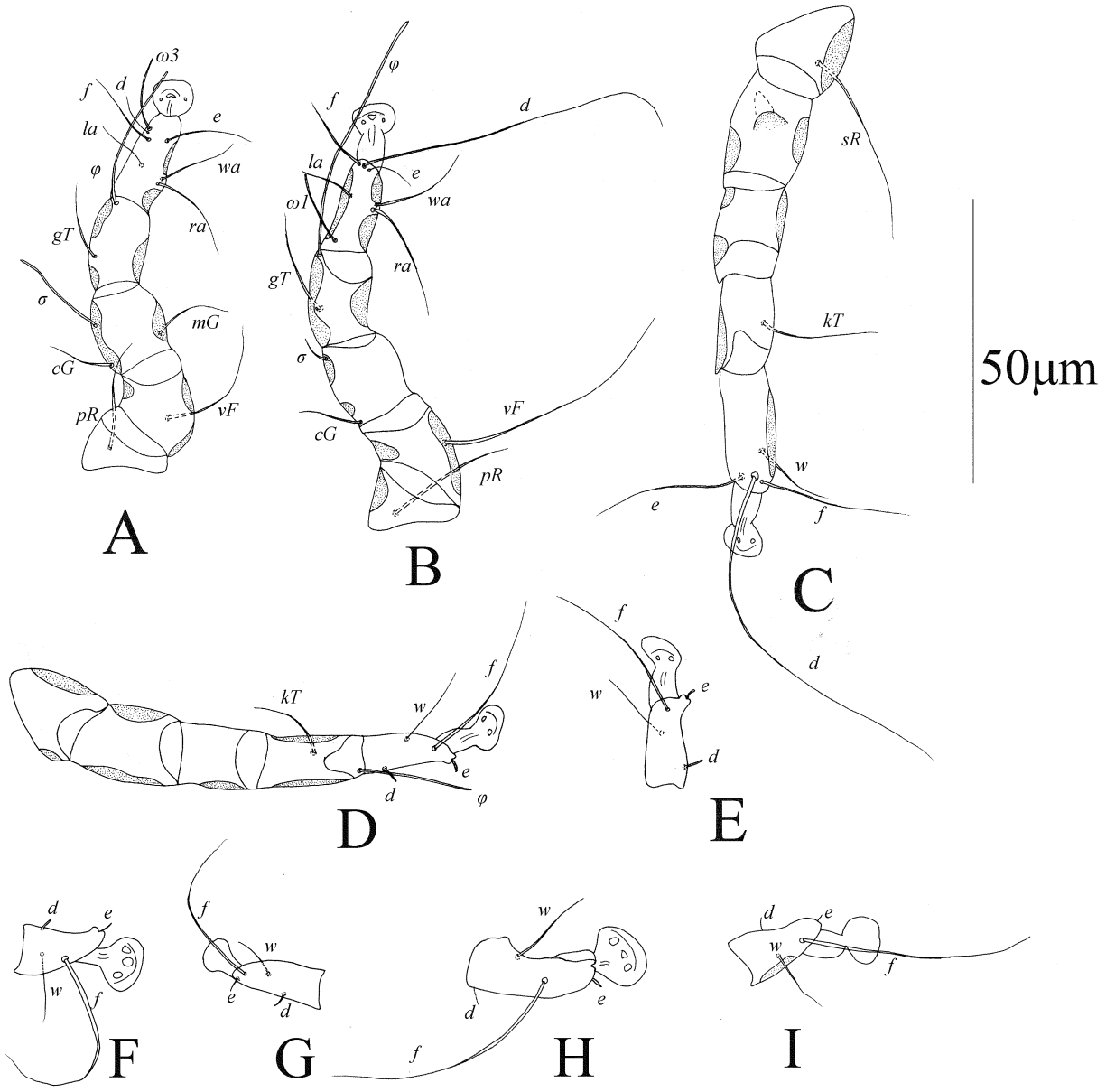

FIGURE 9. *Passeroptes periparus* **sp. nov.**, male. A—leg I in dorsal view, B—leg II in dorsal view, C—leg III in dorsal view, D—leg IV in dorsal view, E—tarsus IV in dorsal view; F— *Passeroptes lioparis*, tarsus IV in dorsal view; G—*Passeroptes motacillae*, tarsus IV in dorsal view; H—*Passeroptes cyanodermae*, tarsus IV in dorsal view; I—*Passeroptes aegithalos*, tarsus IV in dorsal view.

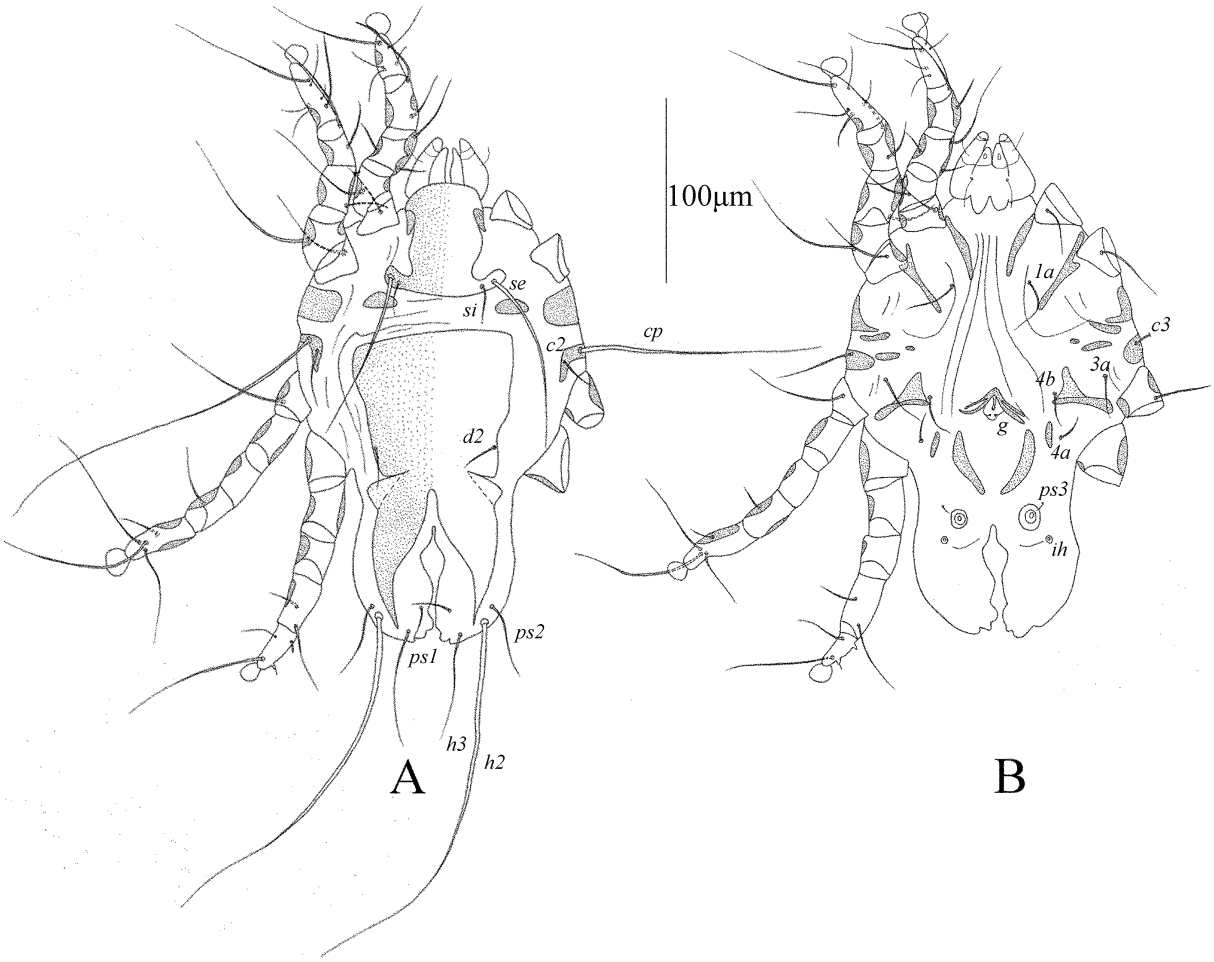

FIGURE 10. *Passeroptes aegithalos* **sp. nov.**, male. A—dorsal view, B—ventral view.

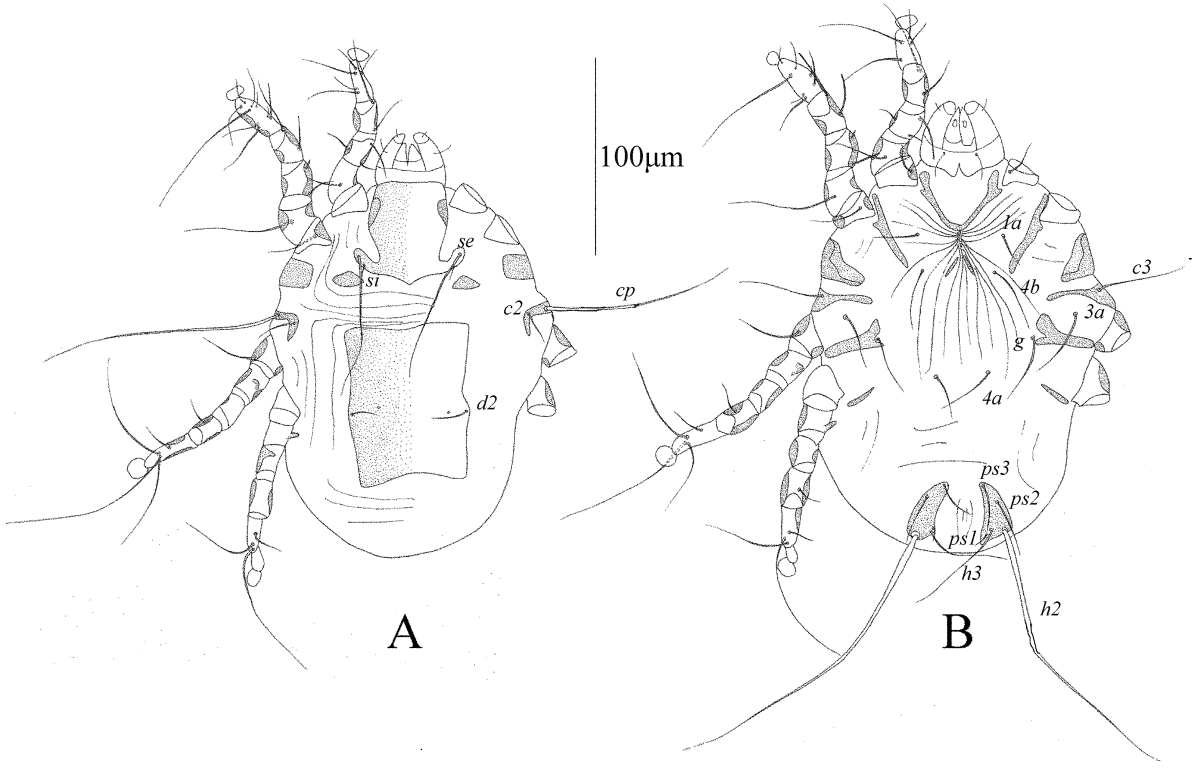

FIGURE 11. *Passeroptes aegithalos* **sp. nov.**, female. A—dorsal view, B—ventral view.

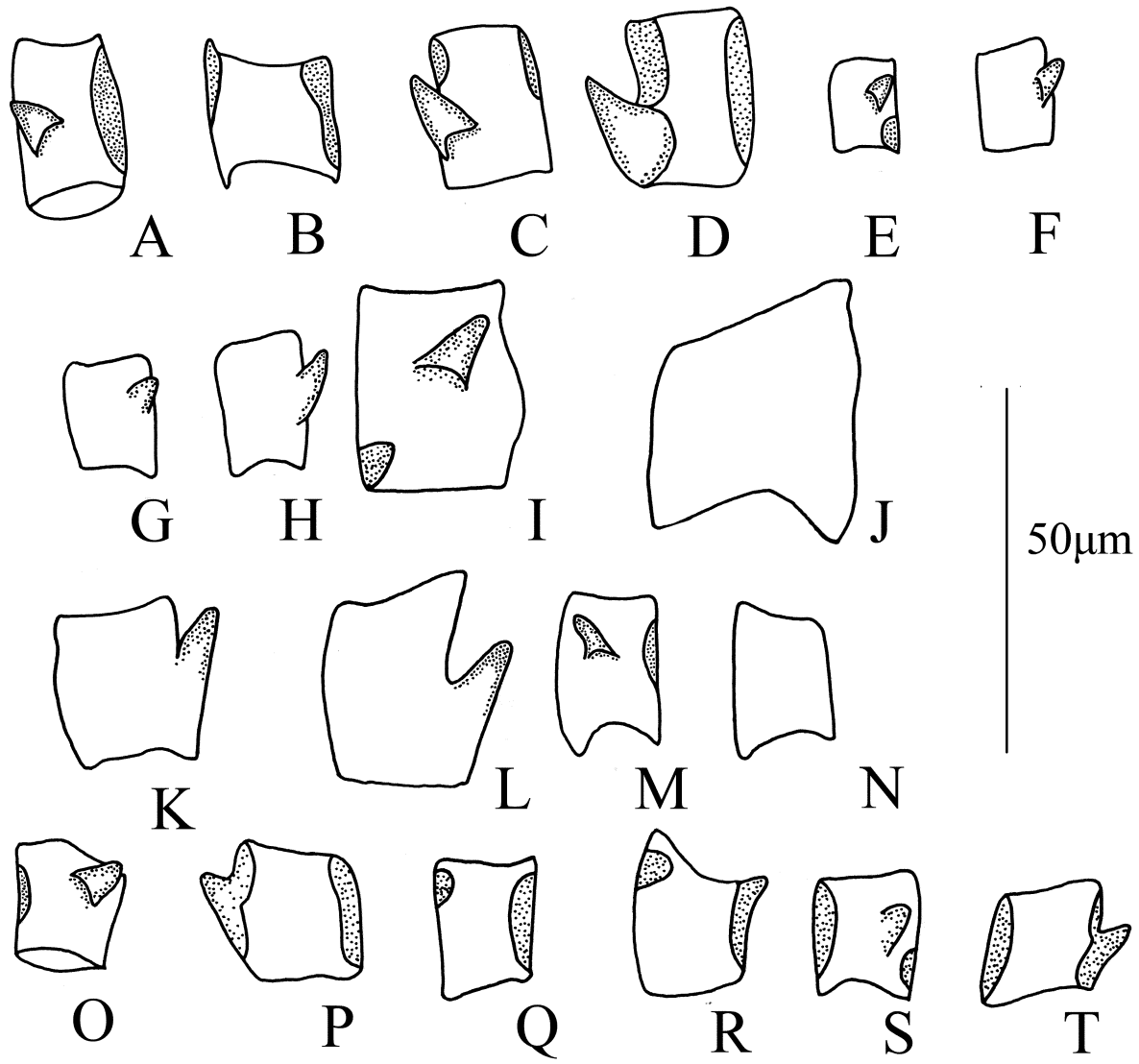

FIGURE 12. *Passeroptes lioparis* **sp. nov.**, male A—femur III in ventral view, B—femur IV in ventral view; female, C—femur III in ventral view, D—femur IV in ventral view; *Passeroptes motacillae* **sp. nov.**, male E—femur III in ventral view, F—femur IV in ventral view; female, G—femur III in ventral view, H—femur IV in ventral view; *Passeroptes cyanodermae* **sp. nov.**, male I—femur III in ventral view, J—femur IV in ventral view; female, K—femur III in ventral view, L—femur IV in ventral view; *Passeroptes periparus* **sp. nov.**, male M—femur III in ventral view, N—femur IV in ventral view; female, O—femur III in ventral view, P—femur IV in ventral view; *Passeroptes aegithalos* **sp. nov.**, male Q—femur III in ventral view, R—femur IV in ventral view; female, S—femur III in ventral view, T—femur IV in ventral view.

FEMALE (2 paratypes). Body 160 long and 120 wide. Idiosomal shields without ornamentation, soft idiosomal cuticle without scales or tubercles. *Dorsum*. Distance between propodonotal and hysteronotal shields 21, 23. Propodonotal shield 44, 46 long and about 55 wide, posterolateral extensions encompassing bases of setae *se* and *si*. Posterior margin of propodonotal shield rounded. Setae *se* 50, 55 long. Hysteronotal shield 75, 77 long and 63, 65 wide. Posterior angles of hysteronotal shield with attenuated extensions. Setae *d2* present, 15, 18 long. Humeral shields well developed, with bent extensions. *Venter*. Coxal fields III opened only in anterior third. Adanal shields well developed, separated from each other. *Legs*. Legs III and IV subequal, 95–100 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* about 116, *c3* about 39, *h2* 140, 145, *h3* 34, 38, *ps2* 22, 25, *d*II 72, 80, *d* III about 78, *ω3* about 15, *ω1*II about 19, *φ*I 26, 28, *φ*II 32, 34, *φ*IV about 24, *σ1*I about 24, *σ*II about 6. Distance between setae: *se–se* 50, *g–g* 57, 58, *ps3–ps3* about 15, *g–ps3* about 60, *h3–h3* about 26, *ps2–ps2* about 28, *h2–h2* 37, 41, *4a–4a* 24, 25, *4b–4b* 32, 35.

Type material. Holotype male [IOZ(E) 227743], 2 male and 2 female paratypes ex *Aegithalos iouschistos bonvaloti* (Oustalet) (Passeriformes: Aegithalidae), **CHINA**: Sichuan, 31°03'38.35" N, 103°33'21.84" E, 23 April 2014, coll. N. Mu.

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

Differential diagnosis. The new species is closest to *Passeroptes garrulax* Fain, 1965 from *Garrulax bicolor* Hartlaub (Passeriformes: Leiothrichidae) (Fain 1965). In both sexes of these two species, setae *d2* are present, and the humeral shields are well developed and have bent extensions; in males, the hysteronotal shield is not transversely separated and has a pair of deep lateral incisions at the level of femora IV, the shape of the lateral incisions of the hysteronotal shield is simple, the processes on femora III, IV are absent, the opisthosomal lobes, including the interlobar membrane, are separated from each other, the margin of the interlobar membrane is emarginate, cupules *ih* are situated posterior to the adanal suckers, the aedeagus is short, and coxal apodeme IVa is smaller than the adanal shields; in females, femora III and IV each bear one dorsal and one ventral moderately developed retrorse process.

The new species differs from *P. garrulax* in the following features. In both sexes of *P. aegithalos* **sp. nov.**, setae *se* are long, being six times longer than *si*, extending beyond the anterior margin of the hysteronotal shield; in males, coxal apodemes II to IV are free, and coxal apodemes IVa are less developed, only about 12 long; in females, coxal fields III are opened only in the anterior third, and setae *d2* are long, being 15, 18 long.

In both sexes of *P. garrulax*, setae *se* are short, only twice as long as setae *si,* not extending beyond the anterior margin of the hysteronotal shield; in males, coxal fields III are almost closed, being opened only in the anterior third, and coxal apodemes IVa are well developed, 20–23 long; in females, coxal fields III are closed, and setae *d2* are 7–8 long.

Acknowledgements

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References

Bochkov, A.V. & Mironov, S.V. (2012) Mites of the genus *Passeroptes* Fain (Acariformes: Dermationidae) from passerines (Aves: Passeriformes) of North–Western Russia. *Zootaxa*, 3563, 43–57.

Clements, J.F., Schulenberg, T.S. & Iliff, M.J. (2014) The Clements checklist of birds of the world. Version 6.9. Available from: http://www.birds.cornell.edu/celments checklist (accessed February 2014)

Fain, A. (1964) Notes sur trois nouveaux Acariens parasites. *Revue de Zoologie et de Botanique africaines*, 70, 297–300.

Fain, A. (1965) A review of the family Epidermoptidae Trouessart parasitic on the skin of birds (Acarina: Sarcoptiformes). *Verhandelingen van de Koninklijke vlaamse academie voor wetenschappen*, *letteren en schone kunsten van België*; *Klasse der wetenschapen*, 27, 1–176 (Pt. I, text), 1–144 (Pt. II, illustrations).

Fain, A. & Bochkov, A.V. (2003) New species of mites parasitic on the skin of birds (Acari Epidermoptidae and Dermationidae). *Bulletin de la Société royale Belge d´Entomologie*, 139, 121–149.

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, 1–193 (Pt. I, text), 1–436 (Pt. II, illustrations).

Grandjean, F. (1939) La chaetotaxie des pattes chez les Acaridiae. *Bulletin de la Societe Zoologique de France*, 64, 50–60.

Griffiths, D.A., Atyeo, W.T., Norton, R.A. & Lynch, C.A. (1990) The idiosomal chaetotaxy of astigmatid mites. *Journal of Zoology (London)*, 220, 1–32.
http://dx.doi.org/10.1111/j.1469-7998.1990.tb04291.x

Hernandes, F.A., Pedroso, L.G.A., Bochkov, A.V. (2015) *Carcinopodacarus polymorphus* gen. n. et sp. n. from *Guira guira* (Cuculiformes; Cuculidae) in Brazil: a first example of male polymorphism in the family Dermationidae (Acariformes: Analgoidea). *Folia Parasitologica*, 62, 1–9.
http://dx.doi.org/10.14411/fp.2015.009

Mironov, S.V., Bochkov, A.V. & Fain, A. (2005) Phylogeny and evolution of parasitism in feather mites of the families Epidermoptidae and Dermationidae (Acari: Analgoidea). *Zoologischer Anzeiger*, 243, 155–179.
http://dx.doi.org/10.1016/j.jcz.2004.10.001

Norton, R.A. (1998) Morphological evidence for the evolutionary origin of Astigmata (Acari: Acariformes). *Experimental and Applied Acarology*, 22, 559–594.
http://dx.doi.org/10.1023/A:1006135509248
Vassilev, I & Kolebinova, M. (1965) Sur une nouvelle espece Analgesoidea – *Rivoltasia gaudi* n.sp. *Comptes rendus de l' Academie bulgare des Sciences*, 18, 161–164.
Wang, Z.Y., Mu, N., Su, X.H. & Liu, H. (2014) Three new species of the genus *Passeroptes* Fain (Astigmata: Dermationidae) from China. *Zootaxa*, 3838 (1), 87–97.
http://dx.doi.org/10.11646/zootaxa.3838.1.4
Wang, Z.Y. & Wang, J.J. (2012) The review of feather mites classification study and one new record family and three new record species in China. *Acta Zootaxonomica Sinica,* 37, 875–884.