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Three new species of ischnoceran lice (Psocodea: Phthiraptera) from birds in China, with a key to the *Lagopoecus*-group of genera

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Abstract. Three new species of chewing lice (Psocoptera: Phthiraptera: Ischnocera) are described from hosts in China based on specimens deposited at the Natural History Museum of China. *Galliphilopterus latifrons* sp. nov. is described from *Arborophila gingica* (Gmelin, 1789) as the second known species of this genus. The relationships of the genus *Galliphilopterus* are discussed, and it is suggested this genus is close to *Mulcticola* Clay & Meinertzhagen, 1939. *Lagopoecus liui* sp. nov. is described from *Lophura nycthemera* (Linnaeus, 1758). Species groups within *Lagopoecus* Waterston, 1922 are suggested, based on a partial morphological review of the genu. A key to the species groups of *Lagopoecus* and presumed

closely related genera is provided. *Turdinirmus calleipus* sp. nov. is described from specimens that likely constitute stragglers, and the natural host of this species is here considered unknown.

Keywords. *Galliphilopterus*, *Lagopoecus*, *Turdinirmus*.

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Introduction

China is home to one of the most diverse bird faunas of the world, with over 1400 species recorded to date (Zhang 2017). However, the chewing louse fauna of Chinese birds has been neglected historically, with only ~260 species of Ischnocera recorded to date (Gustafsson *et al.* 2024a, 2024b, 2024c, 2024d; Ren *et al.* 2024; Cao *et al.* 2024). As each species of bird may be parasitized by 3–5 species of lice, and many more in some host groups (Price *et al.* 2003), this suggests that the vast majority of species of lice occurring in China are unrecorded. Moreover, many of these unrecorded species of lice likely represent new species.

Here, we describe three new species from three poorly known genera of lice, illustrating that the unknown diversity of China spans many different genera. One of these new species, *Galliphilopterus latifrons* sp. nov., constitutes the second record of this genus worldwide. Another species, *Turdinirmus calleipus* sp. nov., shows characters that are previously unknown for the genus, allowing us to describe it even if the stated host on the slides is vague and presumably wrong. Finally, the third species described here, *Lagopoecus liui* sp. nov., gives us an opportunity to examine the within-genus relationships of *Lagopoecus* Waterston, 1922, and the relationships among this genus and several presumably closely related genera.

Material and methods

Previously slide-mounted specimens deposited at the Natural History Museum of China, Beijing, China (NHMC) were examined with a Nikon Eclipse N*i* (Nikon Corporation, Tokyo, Japan), with a drawing tube attached for making illustrations. Drawings were scanned, then compiled and edited in GIMP (https://www.gimp.org). Measurements (in mm) were taken from live images of the specimens, for the following dimensions: measurements for all species are in Table 1. Host taxonomy follows Clements *et al.* (2023).

Abbreviations of measurements (in mm)

AW = abdominal width (at segment V)
HL = head length (at midline)
HW = head width (at widest point of temples)
PRW = prothoracic width
PTW = pterothoracic width
TL = total length (at midline)

Abbreviations for morphological terms (following Gustafsson *et al.* 2024a)

ames = anterior mesosomal seta
aps = accessory post-spiracular seta
gpmes = gonoporal posterior mesosomal seta
lpmes = lateral posterior mesosomal seta

mts1,3 = marginal temporal setae 1,3
os = ocular seta
pas = preantennal seta
pos = preocular seta
ppss = pronotal post-spiracular seta
ps = paratergal seta
psps = principal post-spiracular seta
pst1–2 = parameral setae 1–2
s1–5 = sensilla 1–5 of the postantennal head
sts = sternal seta
tps = tergal posterior seta
vms = vulval marginal seta
vos = vulval oblique seta
vss = vulval submarginal seta

Results

Taxonomy

Class Insecta Linnaeus, 1758
Order Psocodea Hennig, 1966
Suborder Troctomorpha Roesler, 1944.
Infraorder Phthiraptera Haeckel, 1896
Parvorder Ischnocera Kellogg, 1896.
Philopteridae Burmeister, 1838.

Genus ***Galliphilopterus*** Emerson & Elbel, 1957

Galliphilopterus Emerson & Elbel, 1957a: 147.

Type species

Galliphilopterus brunneopectus Emerson & Elbel, 1957a: 147, by original designation.

Host distribution

Galliformes: Phasianidae. Both described species are known from hosts in the genus *Arborophila* Valenciennes, 1825, but we have seen specimens of another undescribed species of *Galliphilopterus* from *Bambusicola fytchii* Anderson, 1871, from Yunnan, China (Gustafsson, pers. obs.). Unfortunately, these specimens are too poorly preserved to be adequately described, and additional specimens are needed. The genera *Bambusicola* and *Arborophila* are not closely related (e.g., Kimball *et al.* 2021), but the birds in these genera share a similar habitat (Madge & McGowan 2002). More extensive investigations of other galliform birds in Southeast Asia may reveal that the genus *Galliphilopterus* is more diverse and widely distributed than presently known.

Geographical range

Southeast Asia.

Remarks

Emerson & Elbel (1957a) described the only previously known species of *Galliphilopterus*, and noted that no similar genera were known from any other galliform hosts. Kettle (1981) noted that the

relationships of *Galliphilopterus* are obscure, but Mey (2009) placed it in the *Philopterus*-complex, without comment. No further reports of *Galliphilopterus* have been published since 1957.

Emerson & Elbel (1957a) noted that elongated *pas* had previously been found only in *Mulcticola* Clay & Meinertzhagen, 1938a, and Valim & Kuabara (2015) stated that the elongated *pas* was unique to *Mulcticola* (excepting genera in the Goniodidae and Heptapsogastridae). However, the distribution of elongated *pas* within Ischnocera is wider than appreciated by these authors, being found in, e.g., *Lerwoecus meinertzhageni* Clay, 1938, *Pelmatocerandra setosa* Giebel, 1876, and some species of *Philopterus* Nitzsch, 1818 (see Price & Hellenthal 1998). As most of these species are not closely related, it seems the elongation of *pas* has evolved convergently numerous times within Ischnocera, and does not alone indicate a close relationship between *Mulcticola* and *Galliphilopterus*.

Nevertheless, other characters indicate that these two genera may be closely related, although not all these characters were illustrated by Emerson & Elbel (1957a), and are here assumed to be present in the type species of *Galliphilopterus* based on the species from China we have seen. These characters include (for illustrations of *Mulcticola* spp., see, e.g., Emerson & Elbel 1957b; Valim & Kuabara 2015; Kuabara *et al.* 2020): pterothorax medianly divided; *os, mts1* and *mts3* macrosetae or at least elongated compared to other temporal setae; postantennal head sensilla *s1–5* all present; *ppss* located median to spiracle opening on posterior margin of pronotum. Above all, the structure of the male genitalia is similar: mesosome simple with arched thickening distally, and two minute sensilla on ventral side; parameres simple, with notably broadened anterior ends; gonopore terminal. In at least some species of *Mulcticola* we have examined, the median section of the vulval margin bulges narrowly, and this bulge is associated with a set of short setae (*vss*?), similar to the submarginal bulge of the vulval margin seen in *Galliphilopterus* (Fig. 7).

Some of the morphological differences between *Galliphilopterus* and *Mulcticola* may be due to differences in microhabitat adaptations; lice in this genus appear to be of the head louse ecomorph (Johnson *et al.* 2012), but this has never been established and requires confirmation. Ultimately, genetic data may be needed to evaluate the relationships between *Galliphilopterus* and *Mulcticola*.

Included species

Galliphilopterus brunneopectus Emerson & Elbel, 1957a: 147.
Galliphilopterus latifrons sp. nov.

Galliphilopterus latifrons sp. nov.
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Figs 1–7; Tables 1–2

Differential diagnosis

Galliphilopterus latifrons sp. nov. can be separated from *G. brunneopectus* by the following characters: frons broader and hyaline margin more extensive in *G. latifrons* (Fig. 3) than in *G, brunneopectus*; dorsal anterior plate with more rounded, narrower anterior end in *G. brunneopectus* than in *G. latifrons* (Fig. 3); mesosome with prominent antero-lateral lobes and broad distal end with lateral extensions in *G. latifrons* (Figs 4–5), but without anterior lobes and with a narrower distal end without lateral extensions in *G. brunneopectus*; basal apodeme strongly constricted anteriorly in *G. brunneopectus*, but of more or less even width throughout in *G. latifrons* (Figs 4–5); both sexes of *G. brunneopectus* have a total of 8 sternal setae on the pterothorax, whereas both sexes of *G. latifrons* have 2–4 setae (Figs 1–2).

The female subgenital plate present but poorly sclerotised in *G. latifrons* (Fig. 7), but not illustrated for *G. brunneopectus*; a reexamination of the type series of *G. brunneopectus* is necessary to confirm whether this plate is present in *G. brunneopectus*, and if so if the shape differs between species.

Etymology

The specific epithet is derived from '*latus*', Latin for 'broad', and '*frons*', Latin for 'forehead', referring to the wider and flatter frons of this species compared to *G. brunneopectus*.

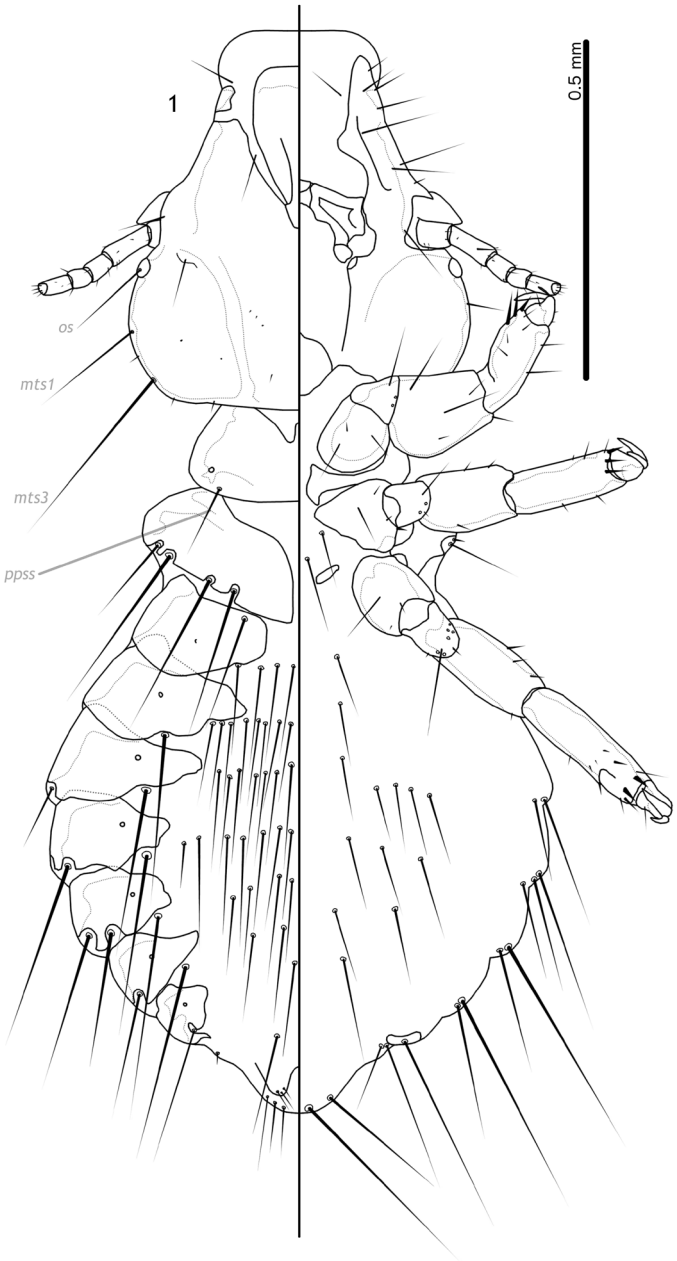


Fig. 1. *Galliphilopterus latifrons* sp. nov., holotype, ♂ (NHMC, box E0026198, slide 86), habitus, dorsal and ventral views. Abbreviations: see Material and methods.

Type material

Holotype (ex *Arborophila gingica*)
CHINA • ♂; Fujian Province; 8 Apr. 1980; collector unknown; box E0026198, slide 86; NHMC.

Paratypes (ex *Arborophila gingica*)
CHINA • 1 ♂, 3 ♀♀; Fujian Province; 8 Apr. 1980; collector unknown; box E0026198, slide 77; NHMC • 3 ♀♀; same data as for preceding; box E0026198, slide 86; NHMC.

Type host

Arborophila gingica (Gmelin, 1789) – White-necklaced Partridge (Galliformes: Phasianidae).

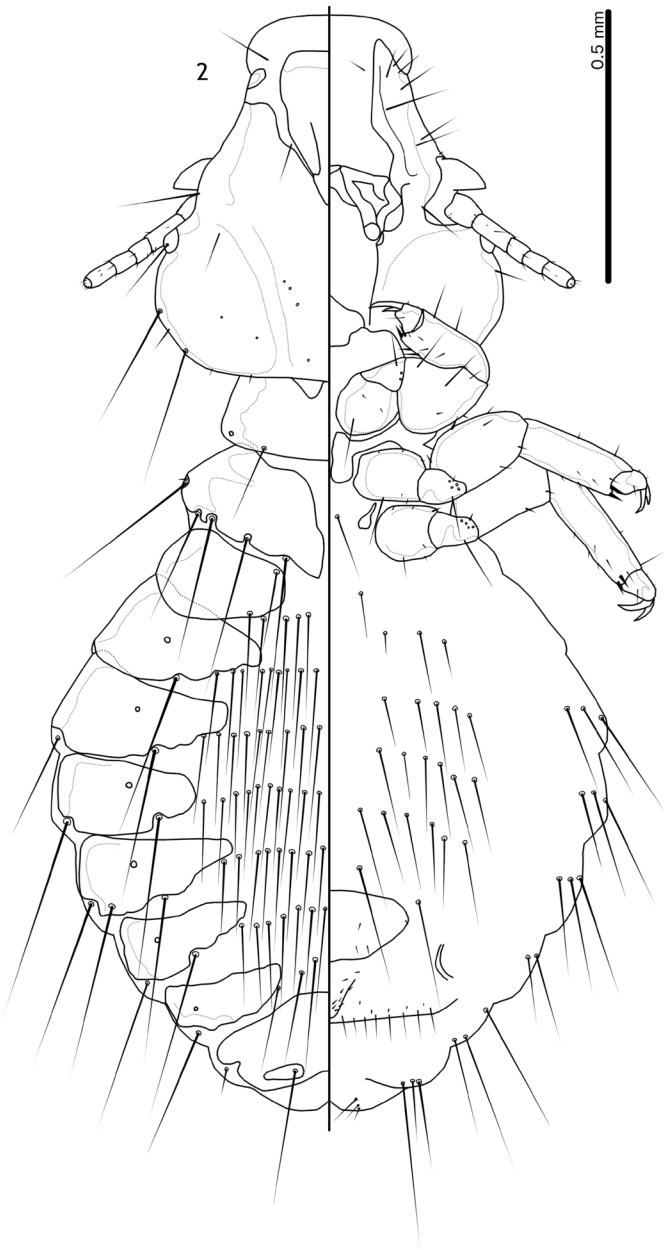


Fig. 2. *Galliphilopterus latifrons* sp. nov., ♀, habitus, dorsal and ventral views.

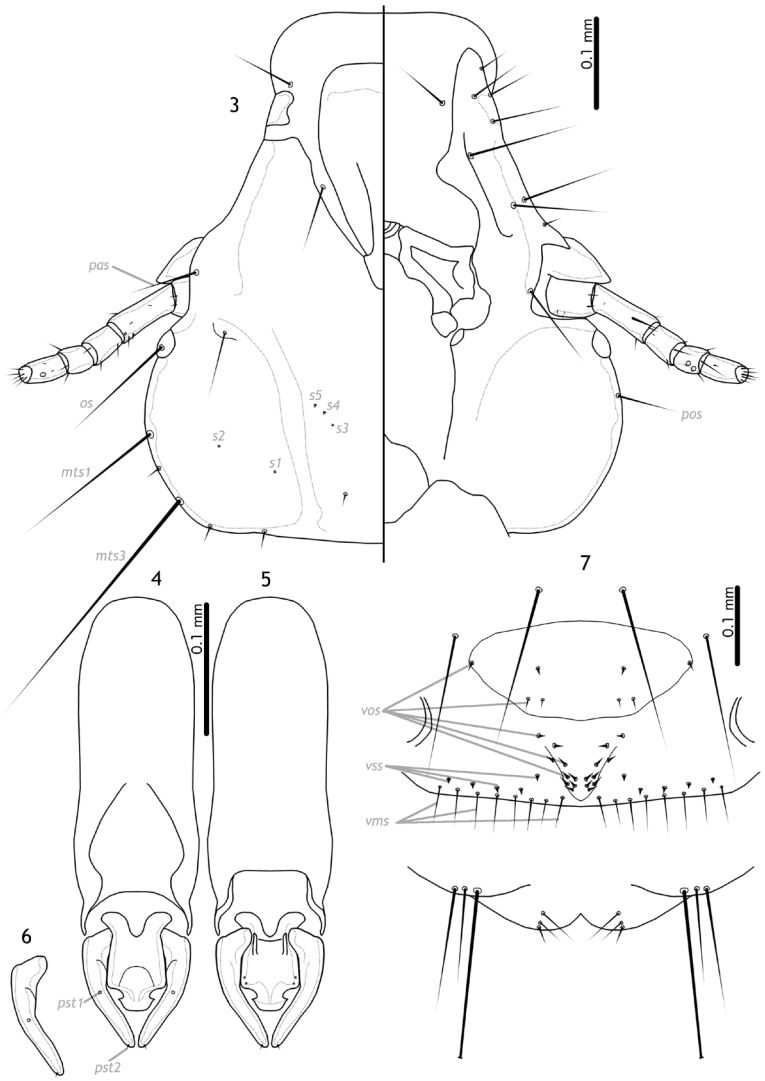
Type locality

Fujian Province, China.

Description

Both sexes

Frons broadly flattened, hyaline margin extensive, bulging laterally and extended lateral to marginal carina (Fig. 3). Marginal carina interrupted medianly and laterally, postmarginal carina slender. Dorsal preantennal suture continuous with hyaline margin and reaching lateral margin of head; suture probably also completely separating dorsal anterior plate, but plate with medio-posterior extension overlapping and obscuring median section of suture above mandibles. Preantennal nodi broad, but ill-defined laterally and posteriorly. Head chaetotaxy as in Fig. 3; *s1–5* present; *pos* clearly ventral in examined males, but more lateral in females; illustrated on ventral side for both sexes. Coni longer than scape. Antennae



Figs 3–7. *Galliphilopterus latifrons* sp. nov. **3–6**. Holotype, ♂ (NHMC, box E0026198, slide 86). **7**. Paratype, ♀ (NHMC, box E0026198, slides 86). **3**. Head, dorsal and ventral views. **4**. Genitalia, dorsal view. **5**. Genitalia, ventral view. **6**. Paramere, dorsal view. **7**. Subgenital plate, vulval margin, and post-vulval area, ventral view. Abbreviations: see Material and methods.

Table 1. Measurements (in mm) of the species described as new here for the following dimensions: AW = abdominal width (at segment V); HL = head length (at midline); HW = head width (at widest point of temples); PRW = prothoracic width; PTW = pterothoracic width; TL = total length (at midline). [1]For TL and AW, N = 1. [2]For TL, N = 5; for AW, N = 4. [3]For TL and PTW, N = 38; for AW, N = 37. [4]For HW, N = 56; for TL, N = 55; for AW, N = 54.

Species	Sex	#	TL	HL	HW	PRW	PTW	AW
Galliphilopterus latifrons sp. nov.	M	2[1]	1.61	0.58–0.62	0.53	0.33–0.40	0.46–0.48	0.75
	F	6[2]	1.88–2.03	0.63–0.67	0.56–0.61	0.33–0.42	0.46–0.55	0.96–1.02
Lagopoecus liui sp. nov.	M	39[3]	1.61–1.78 (1.69)	0.54–0.61 (0.57)	0.45–0.57 (0.50)	0.28–0.41 (0.32)	0.35–0.47 (0.42)	0.64–0.79 (0.72)
	F	57[4]	1.87–2.17 (2.03)	0.56–0.66 (0.62)	0.50–0.60 (0.55)	0.30–0.37 (0.34)	0.40–0.50 (0.46)	0.63–0.86 (0. 78)
Turdinirmus calleipus sp. nov.	M	1	2.09	0.54	0.56	0.34	0.46	0.61
	F	3	2.21–2.37	0.52–0.58	0.57–0.61	0.34–0.36	0.47–0.50	0.64–0.71

Table 2. Variation in abdominal chaetotaxy within *Galliphilopterus latifrons* sp. nov. Each number refers to the setae on one side of the body; the total number of setae on one segment is thus roughly twice the numbers given here. The following setae are constant and not included below: 1) anterior seta on tergopleurite II; 2) trichobothrium of tergopleurite VIII. Setae associated with the female subgenital plate and the vulval margin are not listed here, but are found in the text.

	Male				Female			
Segment	***psps***	***tps***	***sts***	***ps***	***psps***	***tps***	***sts***	***ps***
II	0	4	1	0	0	4–5	1	0
III	1	7–9	1	0	1	10–11	2–3	0
IV	1	6–7	1	3	1	9–11	4–5	4
V	1	7–8	3–4	4	1	7–10	3–6	4
VI	1	3–4	3	4	1	7–8	4–6	5
VII	1	2–3	1	3	1	6–7	2	3
VIII	0	1–2	1–2	2	0	2–4	–	1
IX+X	0	1	0	1	0	1	–	3

sexually monomorphic. Marginal temporal carina and pre- and postocular nodi slender. Temporal carina extends anteriorly to near antennal socket. Gular plate with convex lateral margins. Thoracic and abdominal segments and chaetotaxy as in Figs 1–2. Pterothorax and tergopleurites II–VIII divided medianly. Leg chaetotaxy as in Figs 1–2; that of male based partially on paratype specimens as holotype has distorted legs. Sternites and ventral sections of tergopleurites absent. Abdominal chaetotaxy variable among specimens and between sides of specimens (Table 2). Genital opening dorsal.

Male

Subgenital plate and tergopleurites IX–XI absent or too poorly sclerotised to be visible (Fig. 1). Basal apodeme of roughly even width throughout (Figs 4–5), distally with prominently concave margin. Proximal mesosome with antero-lateral extensions. Mesosome widens slightly distally, with distal end shaped as in Figs 4–5. Gonopore not visible; *ames* and *pmes* not clearly visible in examined specimens, but lighter spots that appear to be apertures of sensilla present on ventral side as in Fig. 5. Ventral mesosome with narrow, sclerotised ridge in anterior part, seemingly articulating with parameral heads. Parameres slender, with bulging parameral heads (Fig. 6); *pst1* dorsal sensilla situated at about half-

length of paramere; *pst2* microseta situated on lateral margin of paramere near distal tips. Measurements as in Table 1.

Female

Subgenital plate vaguely visible as slightly darker area as in Fig. 7, but ill-defined in examined specimens; it is unclear whether this character would be more visible in fresh material. Vulval margin almost flat, with distinct cone-shaped fold present medianly; 6–9 short, slender *vms* and 2–6 stout, short *vss* on each side; in one female one *vms* is a macroseta; *vss* not clearly visible in all specimens; subgenital plate and cone-shaped fold with 11–14 thorn-like *vos* on each side, most of which are associated with fold, and there directed anteriorly. Measurements as in Table 1.

Degeeriella-complex s. lat.

Genus ***Lagopoecus*** Waterston, 1922

Philopterus Nitzsch, 1818: 288 (in partim).
Nirmus Nitzsch, 1818: 291 (in partim).
Lipeurus Nitzsch, 1818: 292 (in partim).
Goniocotes Burmeister, 1838: 431 (in partim).
Degeeriella Neumann, 1906: 60 (in partim).
Lagopoecus Waterston, 1922: 159.

Type species

Lagopoecus lyrurus Clay, 1938: 188, nomen novum for *Nirmus cameratus* Burmeister, 1838: 430, nec *Nirmus cameratus* Lyonet [in de Haan], 1829: 267 [= *Cuclotogaster cameratus* (Lyonet [in de Haan], 1829)].

Host distribution

Galliformes.

Geographical range

Mainly Holarctic, but one species is known from Africa.

Included species

Lagopoecus affinis (Children, 1836: 537) [in *Nirmus*]
Lagopoecus californicus (Kellogg & Chapman, 1899: 103) [in *Lipeurus*]
Lagopoecus choui Liu, 1989: 266
Lagopoecus colchicus Emerson, 1949: 78
Lagopoecus crossoptiloni Liu, 1989: 263
Lagopoecus gambellii Emerson, 1949: 75
Lagopoecus gibsoni Hopkins, 1947: 172
Lagopoecus heterytypus (Mégnin, 1880: 87) [in *Nirmus*]
Lagopoecus irinae Eichler & Vasjukova, 1981: 233
Lagopoecus kozuii (Sugimoto, 1934: 456) [in *Philopterus*]
Lagopoecus liui sp. nov.
Lagopoecus lophophori Liu, 1989: 261
Lagopoecus lyrurus Clay, 1938: 188
Lagopoecus obscurus Emerson, 1948: 137
Lagopoecus ovatus (Uchida, 1917: 137) [in *Nirmus*]
Lagopoecus pallidovittatus (Grube, 1851: 474)

Lagopoecus perplexus (Kellogg & Chapman, 1899: 103)
Lagopoecus sinensis (Sugimoto, 1930: 130) [in *Degeeriella*]
Lagopoecus tetrastei Bechet, 1963: 259
Lagopoecus tragopani Liu, 1989: 264
Lagopoecus umbellus Emerson, 1950: 101
Lagopoecus waterstoni (Bedford, 1930: 165) [in *Lipeurus*]

Species groups of *Lagopoecus* Waterston, 1922

The last extensive revision of *Lagopoecus* was published by Clay (1938), although Emerson (1950) briefly revised and partially illustrated the North American species. Arnold (2008) provided comments on a few species. Carriker (1946) separated the genus *Colinicola* Carriker, 1946, from New World hosts; this genus was synonymized with *Lagopoecus* by Hopkins & Clay (1952), but accepted as valid by Price *et al.* (2003) and Mey (2006). Mey (2006) reassigned *Lagopoecus meinertzhageni* Clay, 1938, to the genus *Lerwoecus* Mey, 2006.

Arnold (2008) informally divided the genus into the 'pheasant, grouse, quail, and partridge groups'; however, apart from the 'pheasant group' no morphological characters purporting to separate these groups, nor any list of which species belong to which group, was published by Arnold (2008). This group terminology has not, to our knowledge, been used elsewhere. Moreover, most species of *Lagopoecus* are poorly illustrated and described, making groupings difficult.

Based on published accounts and the few species we have examined, we consider only three groups recognizable until a comprehensive revision of the genus has been performed. These groups are:

Lagopoecus affinis species group [= *Lagopoecus* s. str.] – abdomen relatively slender; head clearly narrower than long; dorsal preantennal suture present; no sclerite present anterior to male genital opening; lateral accessory sternal plates absent in female; sclerotised plates without reticulation pattern or with reticulation very faint; parameres triangular without appendages. This group includes almost all species of *Lagopoecus*, including that illustrated here (Figs 8–13), except those explicitly listed under the two other species groups. Note that the structure of the male genitalia of some of the members of the *L. affinis* species group suggest that this group may be further divided, perhaps along the lines suggested by Arnold (2008). For instance, the endomere and the penile sclerite are both much elongated in species such as *Lagopoecus sinensis* (Sugimoto, 1930), but much shorter in *L. lyrurus*. The lateral thickenings of the endomere are also more elaborate in *L. sinensis* and some other species than in the type species of *Lagopoecus* (see Gustafsson *et al.* 2024a). In species such as *Lagopoecus crossoptiloni* Liu, 1989, the parameres are very slender and positioned entirely distal to the endomere (Gustafsson *et al.* 2024a). Whether these characters are useful taxonomically is still too early to say, until more species have been described and redescribed.

Lagopoecus heterotypus species group – abdomen broad; head about as long as wide; dorsal anterior suture absent; sclerite present anterior to male genital opening; female with lateral accessory sternal plates on segments VI–VII; most sclerotised plates with clear, dense reticulation patterns; parameres triangular without appendages. This group presently includes only *Lagopoecus heterotypus* (Mégnin, 1880) and *Lagopoecus lophophori* Liu, 1989.

Lagopoecus californicus species group – abdomen and head relatively slender; dorsal preantennal suture present; no sclerite present anterior to male genital opening; lateral accessory sternal plates absent in female; sclerotised plates without reticulation pattern or with reticulation very faint; parameres bulkily ovoid with distal appendage. This group presently includes only *Lagopoecus californicus* (Kellogg & Chapman, 1899) and *Lagopoecus gambelii* Emerson, 1949.

These species of the *L. californicus* species group were placed in *Colinicola* by Mey (2006), who suggested that their inclusion in *Lagopoecus* is likely based only on the lack of sexual dimorphism in the antennae, as other characters (thoracic and abdominal chaetotaxy, male genitalia) suggest that these species belong to *Colinicola*. While we agree that these species likely do not belong to *Lagopoecus*, we also consider the structure of the male genitalia between the two groups too dissimilar to support an inclusion of the *L. californicus* group in *Colinicola*. Moreover, *Colinicola* lacks a dorsal preantennal suture, which is present in the *L. californicus* group, a character that is normally constant throughout a genus (although exceptions are known, e.g., Gustafsson & Bush 2017). The picture is complicated further by *Colinicola philortyx* Carriker, 1967, which has sexually dimorphic antennae but genitalia that appear to be similar to those of the *L. californicus* species group.

A revision of the *Lagopoecus*-*Colinicola* group is sorely needed to establish the boundaries between these genera. The genera *Lerwoecus* and *Syrrhaptoecus* Waterston, 1928, are also likely related to this group, and the distribution of many morphological characters is mosaiced when all these genera are considered together. For instance, in both *Lerwoecus* and *Colinicola* the antennae are sexually dimorphic and lateral accessory sternal plates are present, but the male genitalia of *Lerwoecus* are more similar to those of *Syrrhaptoecus*, which has sexually dimorphic antennae but only central sternal plates. Lateral accessory sternal plates are also present in at least females of the *L. heterotypus* species group. Moreover, head sensillum *s6* is present in *Lerwoecus* and at least some *Syrrhaptoecus*, but absent in all *Lagopoecus* we have seen and never illustrated for any *Colinicola*. In females of *Lerwoecus*, *Lagopoecus,* and *Syrrhaptoecus* the *vss* may be supplemented medianly by small sensilla, which may be situated on a median bulge (marginal or submarginal) of the vulval margin, but to our knowledge this has never been illustrated for any *Colinicola*.

Potentially, as many as seven genera are involved, but the group needs thorough revision before any conclusions as to the generic limits can be drawn. We here include a preliminary key to these genera and groups, to aid in their identification based on the placement of species in Price *et al.* (2003), except *Lerwoecus* is recognised, but note that a revision of this group will likely require a new, more detailed key.

Identification key to Lagopoecus Waterston, 1922 and similar genera

Note that it is not clear whether the species included in this key are closely related, but they share some morphological characters that suggest a relationship. In particular, the male genitalia differ from that of other members of the *Degeeriella*-complex in that the penile sclerite appears to be fused to the endomere, forming a mesosome.

1. Dorsal preantennal suture present 2
– Dorsal preantennal suture absent 4

2. Lateral accessory sternal plates present; postero-lateral corner of pronotum with 3 *ppss* on each side .....***Lerwoecus*** Mey, 2006
– Lateral accessory sternal plates absent; poster-lateral corner of pronotum with 1 *ppss* on each side 3

3. Abdominal segments II–VI each with ≥2 *sts* on each side .***Lagopoecus californicus*** species group
– Abdominal segments II–VI each with 1 *sts* on each side ..... ***Lagopoecus affinis*** species group

4. Abdominal segments II–VI each with ≥2 *sts* on each side 5
– Abdominal segments II–VI each with 1 *sts* on each side .....***Lagopoecus heterotypus*** species group

5. Central sternal plates present .....***Syrrhaptoecus*** Waterston, 1928
– Central sternal plates absent (but lateral accessory sternal plates may be present) .... ***Colinicola*** Carriker, 1946

Lagopoecus liui sp. nov.
urn:lsid:zoobank.org:act:131E9717-7874-470B-BA80-37B42B878F78
Figs 8–13; Table 1

Differential diagnosis

Lagopoecus liui sp. nov. belongs in the *Lagopoecus affinis* species group, within which it is most similar to *Lagopoecus sinensis* (Sugimoto, 1930) and *Lagopoecus tragopani* Liu, 1989, with which it shares the following characters: elongated male endomere and penile sclerite (Fig. 12); lateral thickenings of the endomere forming an almost complete transversal arch (Fig. 12); dorsal preantennal suture reaching *dsms* (Fig. 10); other characters listed above for the *L. affinis* species group.

Lagopoecus liui can be separated from *L. sinensis* by the following combination of characters (see Gustafsson *et al.* 2024a for illustrations of *L. sinensis*): head proportionately narrowed and longer in *L. liu* (Fig. 10) than in *L. sinensis*; dorsal preantennal suture more arched in *L. liui* (Fig. 10) than in *L. sinensis*; both sexes of *L. liui* with 1 *tps* on each side of tergopleurites II–VII (Figs 8–9), but these tergopleurites each have 2–3 *tps* on each side in *L. sinensis*; distal male endomere narrower and extended beyond parameres in *L. liui* (Fig. 12), but broader and not extended beyond parameres in *L. sinensis*; lateral thickenings of the endomere (Fig. 12) also differ between species. Female vulval chaetotaxy overlaps between species, but *L. liui* typically has fewer *vss* than *L. sinensis* (2–5 vs 5–6) on each side.

Lagopoecus liui can be separated from *L. tragopani* by the following combination of characters (see Gustafsson *et al.* 2024a for illustrations of *L. tragopani*): preantennal head more similar to postantennal head in width in *L. liu* (Fig. 10) than in *L. tragopani*; both sexes of *L. liui* with 2 tergocentral setae on each side of tergopleurites III–VII (Figs 8–9), but these tergopleurites each have 3–4 tergocentral setae on each side in *L. tragopani*; male endomere narrowed distally and extended distal to parameres in *L. liui* (Fig. 12), but more broadly rounded distally, and not reaching past parameres in *L. tragopani*; lateral thickenings of the endomere (Fig. 12) also differ between species, and in examined specimens of *L. tragopani* the long setae associated with the penile sclerite cannot be seen, although this may be specific to these specimens. Female vulval chaetotaxy partially overlap between species, but *L. tragopani* have more *vms* than *L. liui* (15–18 vs 9–10).

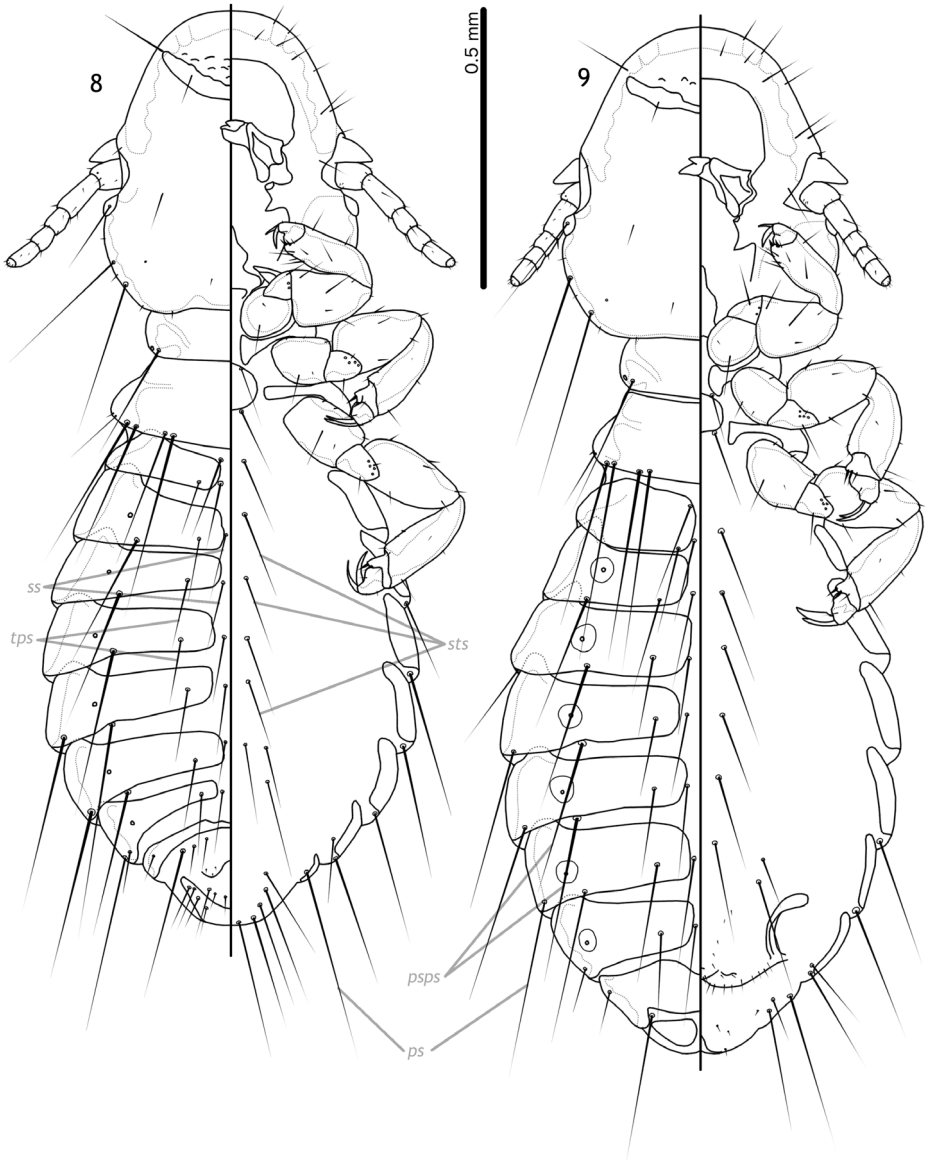
Etymology

Lagopoecus liui is named in honour of the late Liu Sikong, previously at the National Natural History Museum of China, Beijing, who collected and identified many of the specimens currently deposited at this museum, and which formed the basis for much of our recent checklist of the Ischnocera of China (Gustafsson *et al.* 2024a). His publication record on avian Phthiraptera is small, but he remains the most prolific Chinese author of new ischnoceran species to date. Moreover, Liu described many of the species of *Lagopoecus* known from China (Liu 1989). Unfortunately, no other biographical details are known to us.

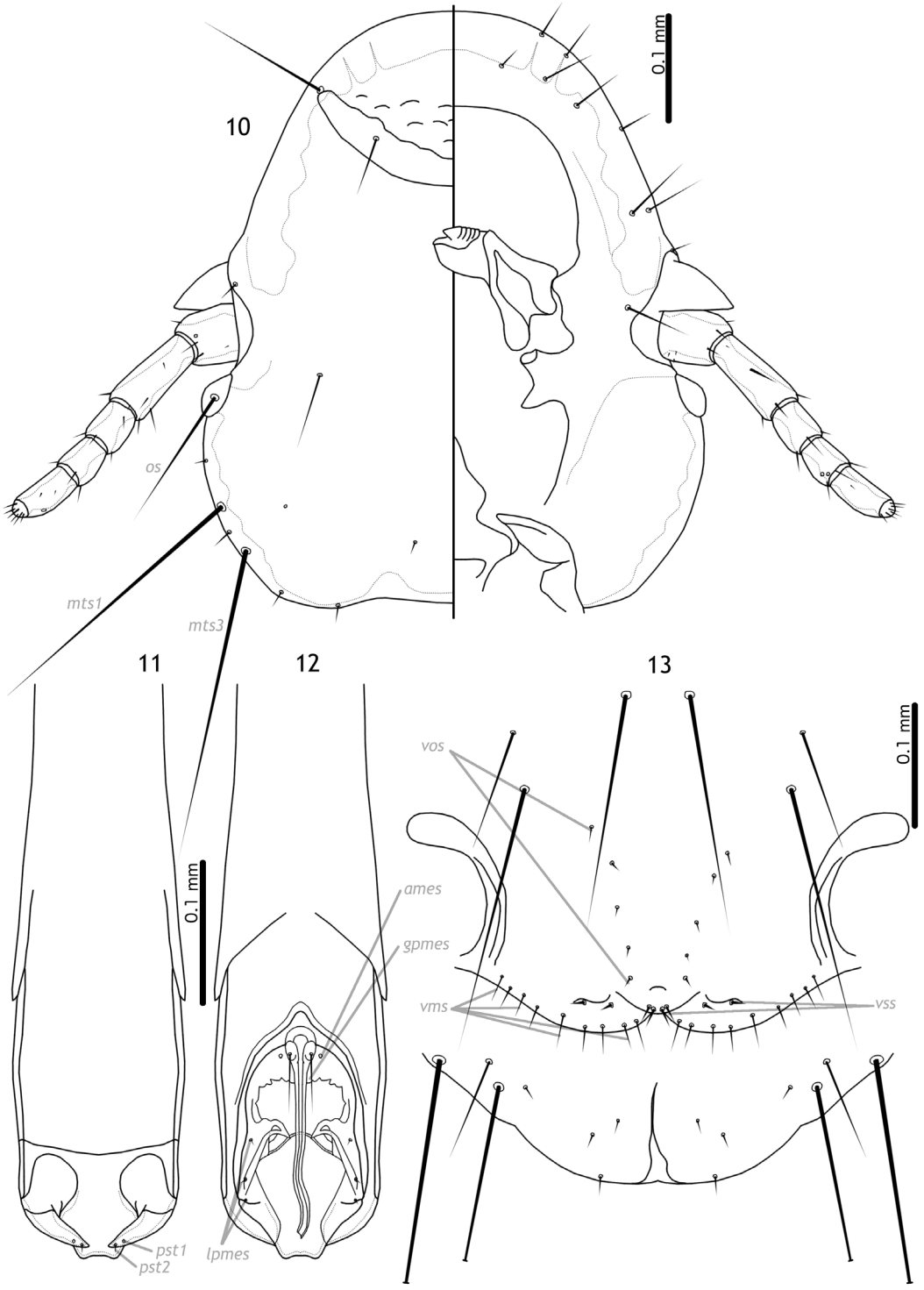
Type material

Holotype (ex *Lophura nycthemera fokiensis*)
CHINA • ♂; Fujian Province, Wuyi Mountain; Jan. 1990; collector unknown; box E0026075, slide 78 [marked with black dot on slide]; NMHC.

Paratypes (ex *Lophura nycthemera fokiensis*)
CHINA • 4 ♂♂, 2 ♀♀; Fujian Province, Wuyi Mountain; Jan. 1990; collector unknown; box E0026075; slide 76; NHMC • 6 ♀♀; Fujian Province, Wuyi Mountain; Jan. 1990; collector unknown; box E0026075; slide 77; NHMC • 6 ♂♂, 3 ♀♀; Fujian Province, Wuyi Mountain; Jan. 1990; collector unknown; box E0026075; slide 78; NHMC • 6 ♀♀; Fujian Province, Wuyi Mountain; Jan. 1990; collector unknown; box E0026075; slide 79; NHMC • 7 ♂♂, 5 ♀♀; Fujian Province, Wuyi Mountain; Jan. 1990; collector unknown; box E0026075; slide 80; NHMC • 2 ♂♂, 7 ♀♀; Fujian Province, Wuyi Mountain; Jan. 1990; collector unknown; box E0026075; slide 82; NHMC • 3 ♂♂, 6 ♀♀; Fujian Province, Wuyi Mountain; Jan. 1990; collector unknown; box E0026075; slide 83; NHMC • 5 ♂♂, 6 ♀♀, 1 nymph; Fujian Province, Wuyi Mountain; Jan. 1990; collector unknown; box E0026075; slide 84; NHMC • 1 ♂♂, 3 nymphs; Fujian Province, Wuyi Mountain; Jan. 1990; collector unknown; box E0026075; slide 85; NHMC • 4 ♂♂, 2 ♀♀; Fujian Province, Wuyi Mountain; Jan. 1990; collector unknown; box E0026075;



Figs 8–9. *Lagopoecus liui* sp. nov. **8**. Holotype, ♂ (NHMC, box E0026075, slide 78), habitus, dorsal and ventral views. **9**. ♀, habitus, dorsal and ventral views. Abbreviations: see Material and methods.



Figs 10–13. *Lagopoecus liui* sp. nov. **10–12**. Holotype, ♂ (NHMC, box E0026075, slide 78). **13**. Paratype, ♀. **10**. Head, dorsal and ventral views. **11**. Genitalia, dorsal view. **12**. Genitalia, ventral view. **13**. Genital area, vulval margin, and post-vulval region, ventral view. Abbreviations: see Material and methods.

slide 86; NHMC • 1 ♂♂, 2 ♀♀; Fujian Province; 2 Mar. 1996; collector unknown; box E0026075; slide 73; NHMC • 6 ♀♀; Fujian Province; 8 Mar. 1996; collector unknown; box E0026075, slide 88; NHMC • 1 ♂♂, 5 ♀♀; Fujian Province; 8 Mar. 1996; collector unknown; box E0026075, slide 89; NHMC • 5 ♂♂; Fujian Province; 8 Mar. 1996; collector unknown; box E0026075, slide 90; NHMC • 3 ♂♂, 5 ♀♀; Fujian Province; 8 Mar. 1996; collector unknown; box E0026075, slide 91; NHMC.

Type host

Lophura nycthemera fokiensis Delacour, 1948 – Silver Pheasant (Galliformes: Phasianidae).

Type locality

Wuyi Mountain, Fujian Province, China.

Description

Both sexes

Head rounded trapezoidal, frons somewhat flattened (Fig. 10). Marginal carina comparatively broad. Dorsal preantennal suture present. Area anterior to dorsal preantennal suture with internal thickenings. Head structure and chaetotaxy as in Fig. 10. Most post-antennal sensilla not visible in examined specimens. *Ocular setae* relatively short compared to *mts1* and *mts3*. Thoracic and abdominal segments and chaetotaxy as in Figs 8–9. Sclerotised plates of head, thorax and abdomen without noticeable reticulation.

Male

Subgenital plate not visible. Abdominal chaetotaxy: *ss* present on segments II–VIII; single *tps* present on segments II–VIII; *psps* present on segments III–VII; *aps* absent; *ps* present on segments IV–VIII. Basal apodeme slender (Figs 11–12). Endomere elongated, projecting beyond parameres distally; lateral margins of endomere with complicated thickenings (Fig. 12), which arch medianly at about half-length but do not form a complete arch across the endomere; penile sclerite seemingly soft in distal part. Genital chaetotaxy: 1 *apmes* sensillum present on each side of base of penile sclerite; 1 *gpmes* seta present on base of penile sclerite, length ~⅓ of length of sclerite; 2–3 *lpmes* microsetae visible near lateral margins of mesosome on each side. Parameres triangular, convergent; *pst1–2* both subapical. Measurements as in Table 1.

Female

Abdominal chaetotaxy: *ss* present on segments II–VIII; single *tps* present on segments II–VIII; *psps* present on segments III–VII; *aps* absent; *ps* present on segments IV–VIII.

Female subgenital plate absent (Fig. 13). Lateral halves on vulval margin bulging strongly on each side (Fig. 13), and median section with smaller bulge; 9–10 long, slender *vms* and 2–5 short, thorn-like *vss* on each side, with 2–3 additional short, slender setae on each side of median bulge; 5 short, slender *vos* on each side. Measurements as in Table 1.

Brueelia-complex sensu Gustafsson & Bush 2017

Genus ***Turdinirmus*** Eichler, 1951

Nirmus Nitzsch, 1818: 291 (in partim).
Degeeriella Neumann, 1906: 60 (in partim).
Brueelia Kéler, 1936: 257 (in partim).
Turdinirmus Eichler, 1951: 41.
Turdinirmus Eichler, 1952: 78. [described as new a second time]

Type species

Nirmus merulensis Denny, 1842: 51, by original designation.

Included species

Turdinirmus australissimus Gustafsson & Bush, 2017: 123.
Turdinirmus calleipus sp. nov.
Turdinirmus daumae (Clay, 1936: 910) [in *Degeeriella*].
Turdinirmus eichleri Mey, 1982: 179.
Turdinirmus merulensis (Denny, 1842: 51) [in *Nirmus*].
Turdinirmus stresemanni (Clay, 1936: 910) [in *Degeeriella*].
Turdinirmus zootherae (Clay, 1936: 909) [in *Degeeriella*].

Turdinirmus calleipus sp. nov.

urn:lsid:zoobank.org:act:45166825-E353-4455-9050-16CCC59C6DEF

Figs 14–20; Table 1

Differential diagnosis

Turdinirmus calleipus sp. nov. can be separated from all known species of *Turdinirmus* by the narrow and pointed frons, contrasting with the broader, often near flat, frons of congeners.

Etymology

The specific epithet is derived from ‘kalleípō’, ancient Greek for ‘abandoned’, referring to the unknown type host of this species.

Material examined

Holotype (ex “woodpecker” [likely an error])
CHINA • ♂; Jiangxi Province, Geyang; date unknown; Xiongbiao Wang leg.; box E0026020, slide 5; NHMC.

Paratypes (ex “woodpecker” [likely an error])
CHINA • 3 ♀♀; Jiangxi Province, Geyang; date unknown; Xiongbiao Wang; box E0026020, slides 5, 7; NHMC.

Type host

“Woodpecker” [likely an error].

Type locality

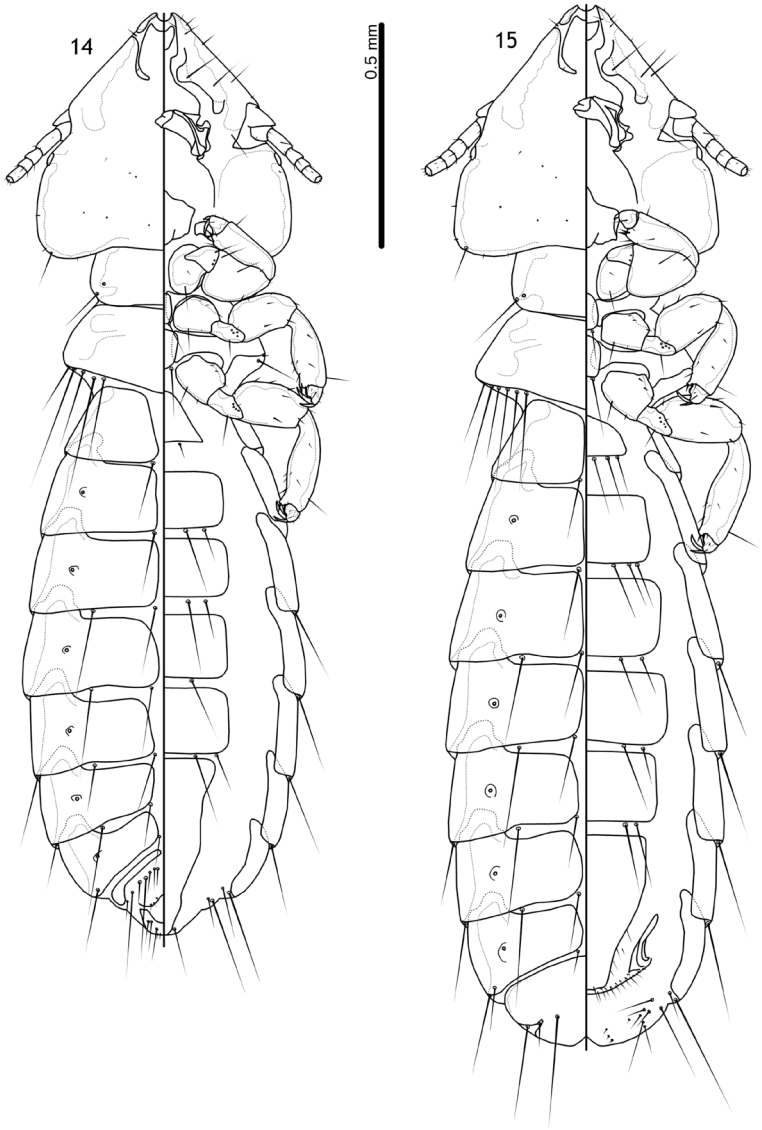
Geyang, Jiangxi Province, China.

Description

Both sexes
Head trapezoidal, preantennal area strongly narrowed anteriorly, lateral margins of preantennal head straight, frons concave (Fig. 16). Marginal carina narrowing conspicuously towards frons. Dorsal anterior plate longer than wide. Head structures and chaetotaxy as in Fig. 16. Thoracic and abdominal segments and chaetotaxy as in Figs 14–15. Sternal plates in both sexes poorly sclerotised and illustrated approximately.

Male

Abdominal chaetotaxy: *ss* present on segments II–VIII; *tps* and *aps* absent; *psps* present on segments IV–VII; *ps* present on segments IV–VIII; sternite II with 1 *sts* on each side, sternites III, IV (one side only, one *sts* on other side) and VI with 2 *sts* on each side, on sternite V only 1 *sts* on each side in single examined male, but this may be specific to this specimen. Basal apodeme widening distally (Fig. 17). Mesosome slightly distorted in holotype, and illustrated as accurately as possible. Proximal mesosome short, slightly concave (Fig. 18); mesosomal lobes somewhat angular laterally; distal mesosome with fringed lobes. Gonopore wide, with lateral ends splayed anteriorly; 3 *gpmes* on each side of gonopore and 1 *lpmes* on each side on lateral margin of mesosome. Parameres as in Fig. 19; parameres in holotype folded under mesosome, and here rotated in the illustration for clarity. Measurements as in Table 1.



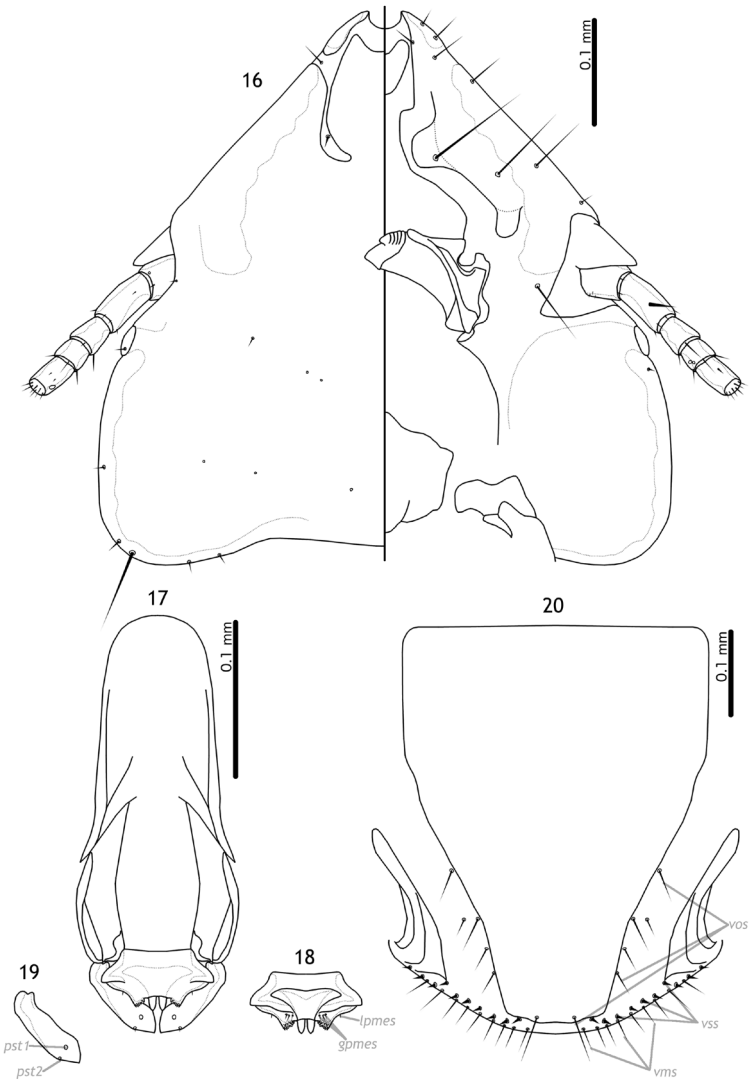
Figs 14–15. *Turdinirmus calleipus* sp. nov. **14**. Holotype, ♂ (NHMC, box E0026020, slide 5). Habitus, dorsal and ventral views. **15**. Paratype, ♀ (NHMC, box E0026020, slide 5). Habitus, dorsal and ventral views. Abbreviations: see Material and methods.

Female

Abdominal chaetotaxy: *ss* present on segments II–VIII; *tps* and *aps* absent; *psps* present on segments IV–VII; *ps* present on segments IV–VIII; sternites II–III with 2–3 *sts* on each side, and sternites IV–VI with 2 *sts* on each side. Female subgenital plate trapezoidal (Fig. 20); vulval margin with 6–9 short, slender *vms*, 10–12 short, thorn-like *vss*, 3–5 short, slender *vos* on each side; distal 1 *vos* median to *vss*. Measurements as in Table 1.

Remarks

The natural host of this species is unknown, but likely some species of thrush. The slide labels on both the holotype and the paratype slides are marked only with the name "woodpecker" in Chinese. There are at least 11 species of woodpeckers in Jiangxi Province (Liu & Chen 2024), but no further clue to the



Figs 16–20. *Turdinirmus calleipus* sp. nov. **16–19**. Holotype, ♂ (NHMC, box E0026020, slide 5). **20**. Paratype, ♀ (NHMC, box E0026020, slide 5). **16**. Head, dorsal and ventral views. **17**. Genitalia, dorsal view. **18**. Mesosome, ventral view. **19**. Paramere, dorsal view. **20**. subgenital plate and vulval margin, ventral view. Abbreviations: see Material and methods.

identity of the host is given on the slide. The slide of the holotype is marked to denote that the host may be wrong, presumably in Sikong Liu's handwriting.

However, lice in the genus *Turdinirmus* are otherwise not known from woodpeckers, but from thrushes (Passeriformes: Turdidae), mainly hosts in the genus *Zoothera* Vigors, 1832, but also on *Geokichla* Latham, 1790, and *Turdus* Linnaeus, 1758. Two nymphs and one female of an unidentified species of *Penenirmus* Clay & Meinertzhagen, 1938b, mounted on a separate slide, are ostensibly from the same host specimen; this genus also occurs on songbirds, and is replaced in woodpeckers by the genus *Picophilopterus* Ansari, 1947, further indicating that the natural host of *T. calleipus* is not a woodpecker. Most likely, the host information on the slides of *T. calleipus* is incorrect, and the natural host of this species is a thrush. At least 12 species of thrush occur in Jiangxi Province (Liu & Chen 2024), and further collections are necessary to establish the natural host of *T. calleipus*.

Few species of lice have been described without a type host, but in principle, host associations are not an innate characteristic of the lice themselves, and thus not necessary for the description of species, given that morphological characters are sufficient to separate the species from all congenerics. In this case, the head shape separates *T. calleipus* from all known species of *Turdinirmus*, and we therefore describe this species as new. As such, *T. calleipus* is illustrative of the principle that the type host and the natural host of a louse are separate concepts, and only the latter one is biologically relevant (Palma 2015; Gustafsson 2023).

Discussion

With the descriptions of these three species, the known ischnoceran fauna of China stands at 269 (Gustafsson *et al.* 2024a, 2024b, 2024c, 2024d; Ren *et al.* 2024; Cao *et al.* 2024). This is likely to be only a fraction of the true fauna, which may be 4335–7225 species (Gustafsson *et al.* 2024a). While no group of birds is well studied for lice in China, there are fewer gaps in our knowledge of the louse fauna of galliform and passeriform hosts than of many other groups; for instance, no ischnoceran lice have so far been recorded in China from any hosts in the orders Otidiformes Wagler, 1830 (bustards), Podicipediformes Fürbringer, 1888 (grebes), and Caprimulgiformes Ridgway, 1881 (nightjars). From many other host orders only a handful of louse species are known. We can only reiterate the call Gustafsson *et al.* (2021) made for more research into the Asian louse fauna, which in most Asian countries is even worse known than for China.

Acknowledgements

Most of the specimens of Phthiraptera in the collection of the Natural History Museum of China were accumulated over the years by the late researcher Liu Sikong, and these specimens provided the type specimens for comparison and additional research materials for this study, for which we would like to express our gratitude. This research was funded by the Introduction of Full-Time High-Level Talent Fund of the Institute of Zoology, Guangdong Academy of Sciences (grant GIABR-GJRC201701), the National Natural Science Foundation of China (grants 31961123003, 32001098), the Foreign Young Talent Plan (QN20200130012), and the Pearl River Talent Recruitment Program of Guangdong Province (Grant 2019QN01N968). These agencies had no influence over the design and execution of this study.

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