



## New quill mites (Cheyletoidea: Syringophilidae) parasitizing the black-headed paradise-flycatcher *Terpsiphone rufiventer* (Passeriformes: Monarchidae) in Gabon

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### Abstract

A new genus of quill mites (Cheyletoidea: Syringophilidae) and two new species *Pipicobia terpsiphoni* **gen. nov.** and **sp. nov.** and *Syringophiloidus furthi* **sp. nov.** parasitizing the black-headed paradise-flycatcher *Terpsiphone rufiventer* (Swainson) (Passeriformes: Monarchidae) in Gabon are described. Three species of the *Neopicobia* Skoracki, 2011 are moved to the newly established genus: *Pipicobia locustella* (Skoracki, Bochkov and Wauthy, 2004) **comb. nov.**, *Pipicobia pyrrholaemus* (Skoracki and Glowska, 2008) **comb. nov.**, and *Pipicobia glossopsitta* (Skoracki, Glowska and Sikora, 2008) **comb. nov.** Syringophilids are recorded on hosts of the family Monarchidae and in Gabon for the first time. A key to the genera of the subfamily Picobiinae is proposed.

**Key words:** Quill mites, Syringophilidae, *Pipicobia*, *Syringophiloidus*, monarchid birds, systematics

### Introduction

Quill mites of the family Syringophilidae (Prostigmata: Cheyletoidea) are a group of bird permanent parasites including 59 genera and 314 species known from 438 bird species belonging to 92 families and 23 orders. The family is divided into two subfamilies: Syringophilinae Lavoipierre with 255 species grouped in 50 genera and Picobiinae Johnston and Kethley with 59 species belonging to nine genera. Under that biodiversity of mites known from almost all biogeographical regions, the Ethiopian region seems to be deeply neglected. Only 55 mite species from 70 host species have been recorded so far from this area (Fain *et al.* 2000; Skoracki & Hromada 2013; Skoracki *et al.* 2011, 2012, 2013*a,b,c*, 2014).

The monarch flycatchers (Passeriformes: Monarchidae) are a family of birds represented by 94 species distributed throughout the south-east Asia, Australasia, many of Pacific islands and sub-Saharan Africa, whilst occurrence of the black-headed paradise-flycatcher *Terpsiphone rufiventer* (Swainson) is restricted to the West and Central Africa. Syringophilids have never been recorded from species belonging to this family.

In this paper we propose a new genus of quill mites (Cheyletoidea: Syringophilidae) *Pipicobia* **gen. nov.** and describe two new species *Pipicobia terpsiphoni* **sp. nov.** and *Syringophiloidus furthi* **sp. nov.** parasitizing the black-headed paradise-flycatcher *Terpsiphone rufiventer* (Swainson) (Passeriformes: Monarchidae) in Gabon. Three species of the *Neopicobia* Skoracki, 2011 are moved to the newly established genus, *Pipicobia locustella* (Skoracki, Bochkov and Wauthy, 2004) **comb. nov.**, *Pipicobia pyrrholaemus* (Skoracki and Glowska, 2008) **comb. nov.** and *Pipicobia glossopsitta* (Skoracki, Glowska and Sikora, 2008) **comb. nov.** We expand a host range of this mite group on a new avian family Monarchidae and give the first records of syringophilids in Gabon. Additionally, we propose a key to the genera of subfamily Picobiinae.

## Material and methods

Material used in the study was acquired from the collection of feathers deposited in Smithsonian Institution, National Museum of Natural History, Department of Vertebrate Zoology, Division of Birds, Washington, DC, US (USNM). Mites were collected by Eliza Glowska from coverts and body feathers of the black-headed paradise-flycatcher *Terpsiphone rufiventer*. Bird specimen was trapped by B. K. Schmidt during the expedition to Gabon, Ogooue Maritime Province (Moukalaba-Doudou National Park, NW corner of N'dogo Lagoon). Drawings were made with an Olympus BH2 microscope with differential interference contrast (DIC) optics and a camera lucida. All measurements are given in micrometres ( $\mu\text{m}$ ). The idiosomal setation follows Grandjean (1939) with modifications adapted for Prostigmata by Kethley (1990). The system of nomenclature for leg chaetotaxy follows that proposed by Grandjean (1944). The application of these chaetotaxic schemes to Syringophilidae was recently provided by Bochkov *et al.* (2008) with changes by Skoracki (2011). The Latin and common names of the birds follow Clements (2012).

## Results

### Family Syringophilidae Lavoipierre

#### Subfamily Picobiinae Johnston and Kethley

#### Genus *Pipicobia* gen. nov.

Type species: *Picobia locustella* Skoracki, Bochkov and Wauthy, 2004

**Diagnosis.** FEMALE. *Gnathosoma*. Hypostomal apex tapering. Peritremes M-shaped. Movable cheliceral digits edentate on distal tip. Stylophore rounded posteriorly. *Idiosoma*. Propodonal shield long sleeve shirt-like or divided into three sclerites, 1 central and 2 narrow lateral. Six pairs of propodonal setae present arranged 2-1-1-2. Setae *vi* situated anterior to level of setae *ve*. One pair of genital and pseudanal setae present, respectively. Aggenital series with 3 pairs of setae. Opistosomal lobes absent. *Legs*. Legs I and II thicker than III and IV. Apodemes with small thorn-like protuberances. Solenidiotaxy without solenidia *phi* on tibiae I. Antaxial and paraxial members of claw pairs III-IV subequal in size and shape.

MALE. Unknown.

**Etymology.** The generic epithet derives from the mathematical constant, irrational number pi ( $\pi$ ), approximately equal to 3.14159.

**Differential diagnosis.** This new genus is most similar to *Neopicobia* Skoracki, 2011. Females of both genera have the tapering hypostomal apex, setae *vi* bases situated anterior to the level of *ve* and are devoid of solenidion *phi* on legs I. Females of *Pipicobia* gen. nov. are distinguishable from *Neopicobia* by the presence of thorn-like protuberances on apodemes I and a single pair of setae in each pseudanal and genital series. In females of *Neopicobia*, thorn-like protuberances on apodemes I are absent, two pairs of pseudanal setae are present and genital setae are absent.

**Habitat, host range and distribution.** Species of this genus live inside the quills of body feathers of birds from two orders Passeriformes (Acanthizidae, Sylviidae and Monarchidae) and Psittaciformes (Psittacidae).

**Species included.** Four species included in this genus: *Pipicobia terpsiphoni* sp. nov., *Pipicobia locustella* (Skoracki, Bochkov and Wauthy, 2004) comb. nov., *Pipicobia pyrrholaemus* (Skoracki and Glowska, 2008) comb. nov. and *Pipicobia glossopsitta* (Skoracki, Glowska and Sikora, 2008) comb. nov.

#### *Pipicobia locustella* (Skoracki, Bochkov and Wauthy, 2004) comb. nov.

*Picobia locustella* Skoracki, Bochkov and Wauthy, 2004: 164, figs. 21–27.

*Neopicobia locustella*, Skoracki 2011:389, figs. 291–292.

This species was originally described in the genus *Picobia* based on material found on the common grasshopper-warbler *Locustella naevia* (Boddaert) (Passeriformes: Locustellidae) in Poland (Skoracki *et al.* 2004). Later on, Skoracki (2011) redescribed this species, moved it to the genus *Neopicobia* and provided a record from an additional host species, Savi's warbler *Locustella luscinioides* (Savi) from Poland.

***Pipicobia pyrrholaemus* (Skoracki and Glowska, 2008) comb. nov.**

*Picobia pyrrholaemus* Skoracki and Glowska, 2008: 284, figs. 14–19.

*Neopicobia pyrrholaemus* Skoracki, 2011: 384.

This species was originally described in the genus *Picobia* based on material from the speckled warbler *Pyrrholaemus sagittatus* (Latham) (Passeriformes: Acanthizidae) from Australia (Skoracki and Glowska 2008). Skoracki (2011) moved this species to the genus *Neopicobia*.

***Pipicobia glossopsitta* (Skoracki, Glowska and Sikora, 2008) comb. nov.**

*Picobia glossopsitta* Skoracki, Glowska and Sikora, 2008: 67, figs. 28–34.

*Neopicobia glossopsitta* Skoracki 2011: 384.

This species was originally described in the genus *Picobia* based on material from the purple-crowned lorikeet *Glossopsitta porphyrocephala* (Dietrichsen) (Psittaciformes: Psittacidae) from Australia (Skoracki 2008). Later on, Skoracki (2011) moved this species to the genus *Neopicobia*.

***Pipicobia terpsiphoni* sp. nov.**

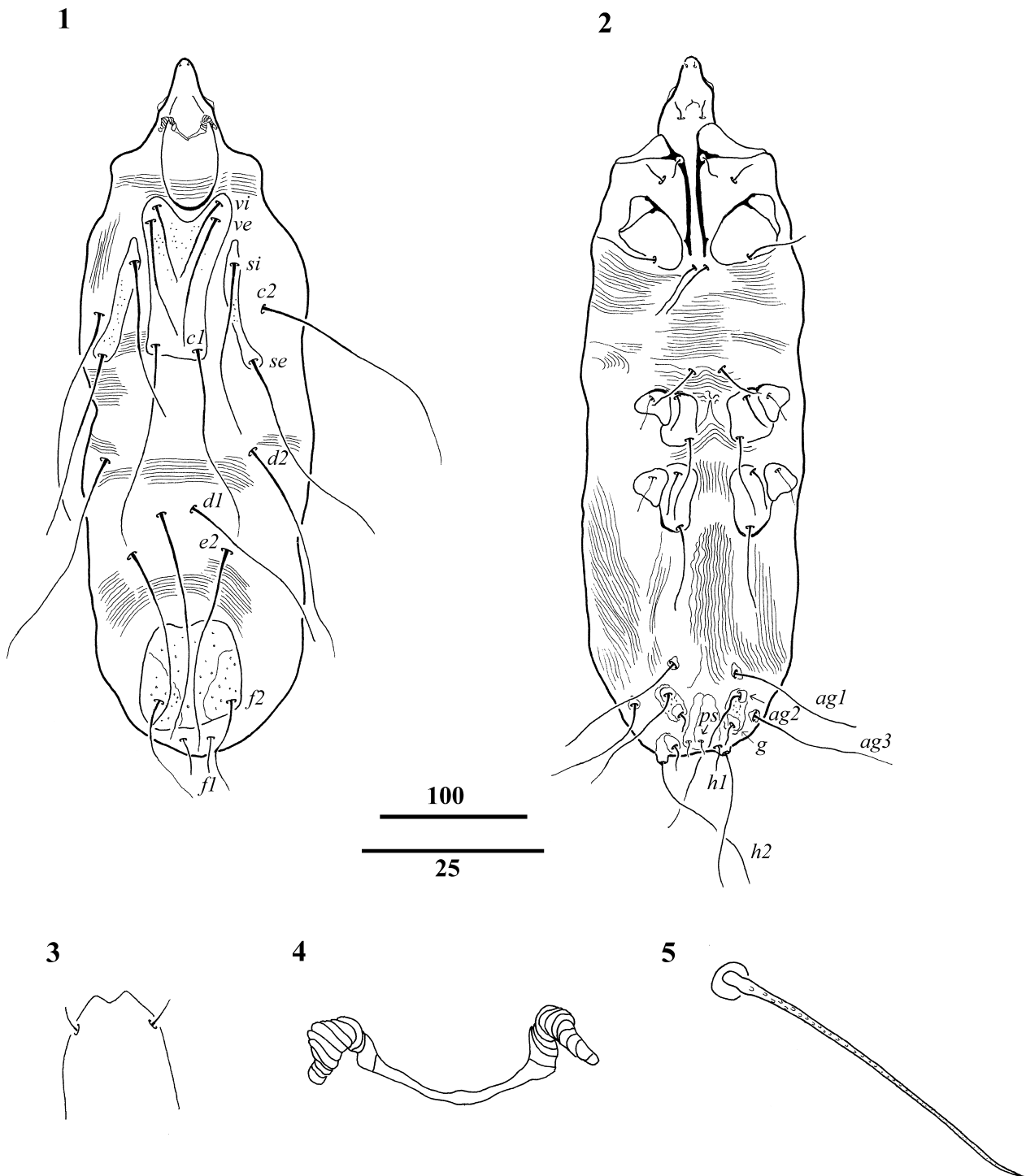
(Figs. 1–5)

FEMALE (holotype and 5 paratypes). Total body length 475 (465 in 1 paratype, other 4 paratypes broken). *Gnathosoma*. Hypostomal apex tapering. Infracapitulum apunctate. Peritremes M-shaped, borders between chambers poorly visible. Length of stylophore 105 (105). *Idiosoma*. Propodonal shield divided into 3 sclerites, 2 narrow lateral bearing bases of setae *si* and *se* and central bearing bases of setae *vi*, *ve*, and *c1*. Lateral and upper part of central shield punctate. Setae *vi* bases situated anterior to level of *ve*. All dorsal setae slightly beaded. Length ratio of setae *vi:ve:si* 1:1.6–2.6:2.2–3.8. Bases of setae *c1* slightly anterior to *se*. Hysteronotal shield absent. Setae *d1* situated closer to *e2* than *d1*. Length ratio of *d2:d1:e2* 1:1:1. Pygidial shield well developed, punctate, bearing bases of setae *f2* and *f1*. Length ratios of *f2:f1* and *h2:h1* 2.1–2.8:1 and 10:1, respectively. Setae *f1* about 1.2 times longer than *h1*, *h2* about 3 times longer than *f2*. Setae *ag1* situated anterior to *ag2*. Setae *ag1*, *ag2* and *ag3* similar in length. One pair of genital setae *g* situated on hillock at level of setae *ag3* bases. Setae *g* and *ps* subequal in length. Genital plate strongly sclerotized, represented by two narrow, punctate sclerites bearing bases of setae *ag2*, *g*, *h1* and *h2*. *Legs*. Apodemes I with small thorn-like protuberances. Coxal fields well developed, apunctate. Setae *3c* about twice longer than *3b*. Antaxial and paraxial members of claw pairs III and IV subequal in size. Setae *tc''* of legs III–IV ca. 1.2 times longer than *tc'* III–IV. *Lengths of setae*: *vi* 55 (30), *ve* 90 (75–95), *si* 125 (105–120), *se* 145 (115–140), *c1* 155 (140–155), *c2* 145 (120–140), *d2* 155 (120–145), *d1* 145 (120–145), *e2* 145 (120–145), *f1* 25 (25–35), *f2* 70 (70–75), *h1* 20 (20), *h2* 205 (195–215), *ag1* 95 (75–105), *ag2* 90 (75–80), *ag3* 105 (95–105), *g* 12 (12), *ps* 12 (12), *tc'III–IV* 45 (40–45), *tc''III–IV* 55 (50–55), *l'RIII* 25 (25–30), *l'RIV* 30 (30–35), *3b* 30 (30–35), *3c* 60 (60–65), *4b* 35 (30–35), *4c* 65 (75–80).

MALE. Unknown.

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

**Type material.** Female holotype and 5 female paratypes from quill of body feathers of black-headed paradise-flycatcher *Terpsiphone rufiventer* (Swainson) (Passeriformes: Monarchidae), **GABON**: Ogooue Maritime Province (Moukalaba-Doudou National Park, NW corner of N'dogo Lagoon), 14 April 2003, coll. B.K. Schmidt (mites removed by E. Glowska). USNM catalog number of the host: 631583.



**FIGURES 1–5.** *Pipicobia terpsiphoni* sp. nov., female: 1—dorsal view, 2—ventral view, 3—hypostomal apex, 4—peritremes, 5—propodonal setae *vi*. Scale bars: 1, 2 = 100 µm; 3–5 = 25 µm.

**Type deposition.** Holotype female and 2 female paratypes are deposited in the USNM, 3 female paratypes in the AMU.

**Differential diagnosis.** This new species is similar to *N. locustella* Skoracki *et al.*, 2004 described from the common grasshopper-warbler *Locustella naevia* (Boddaert) (Passeriformes: Locustellidae) from Poland. In females of these species both infracapitulum and coxal fields are apunctate; the propodonotal shield is divided into three punctate sclerites; the genital and pseudanal setae are represented by a single pair each, the genital plate is restricted to the two narrow sclerites bearing bases of setae *ag2*, *g*, *h1*, and *h2*. This new species is distinguishable from *N. locustella* by the absence of the hysteronotal shield, quadratic pygidial shield, setae *fl* ca. 1.2 longer than *h1*, and by setae *ag1–3* subequal in the length. In *N. locustella*, the hysteronotal shield is present, pygidial shield is semicircular, setae *fl* are twice longer than *h1*, length ratio of setae *ag1:ag2:ag3* is 2:1:2.

## Subfamily Syringophilinae Lavoipierre

### Genus *Syringophiloidus* Kethley

#### *Syringophiloidus furthi* sp. nov.

(Figs. 6–11)

**Description.** FEMALE (holotype and 5 paratypes). Total body length 735. *Gnathosoma*. Infracapitulum and stylophore punctate. Each median branch of peritremes with 4 chambers, each lateral branch with 8 chambers. Length of stylophore and movable cheliceral digit 170 (165–170) and about 135, respectively. *Idiosoma*. Propodonotal shield entirely punctate. Ratio of setae *vi:ve:si* 1:1.4–1.6:3.4–4. Dorsal setae (excluding *fl*, *f2*, *h1*, *h2*) beaded. Hysteronotal shield punctate, bearing bases of setae *d2* and *d1*. Pygidial shield punctate. Lengths ratio of setae *d2:d1:e2* 1.1–1.2:1–1.1:1–1.1. Setae *h1* and *fl* similar in length. Length ratio of *ag1:ag2:ag3* 1.2–1.8:1:1.5–2. Genital setae thick, subequal in length. Pseudanal setae subequal in length. Length ratio of setae *g1,2:ps1,2* 1–1.4:1. Genital plate present bearing bases of setae *ag2*, *ag3* and *g1*, *g2*. Length ratio of setae *h1:h2* 1:10–12.8. *Legs*. All coxal fields densely punctate. Setae *3c* ca. 3 times longer than *3b*. Setae *tc'* of legs III–IV ca. twice longer than *tc''*. Fan-like setae *p'* and *p''* of legs III–IV with 6 tines. *Lengths of setae*: *vi* 35 (30–40), *ve* 55 (55), *si* 140 (135–155), *c2* 215 (195–200), *se* 205 (180–210), *c1* 210 (195–215), *d2* 195 (175–180), *d1* 165 (145–180), *e2* 180 (145–165), *fl* 20 (25–35), *f2* 265 (225–245), *h1* 25 (25–35), *h2* (320–335), *ag1* 145 (125–155), *ag2* 80 (80–105), *ag3* 180 (145–175), *g1,2* (25–30), *ps1,2* (15–20), *tc'* (45), *tc''* (90), *l'R3* (35), *l'R4* (30), *3b* (25–30), *3c* (90–95).

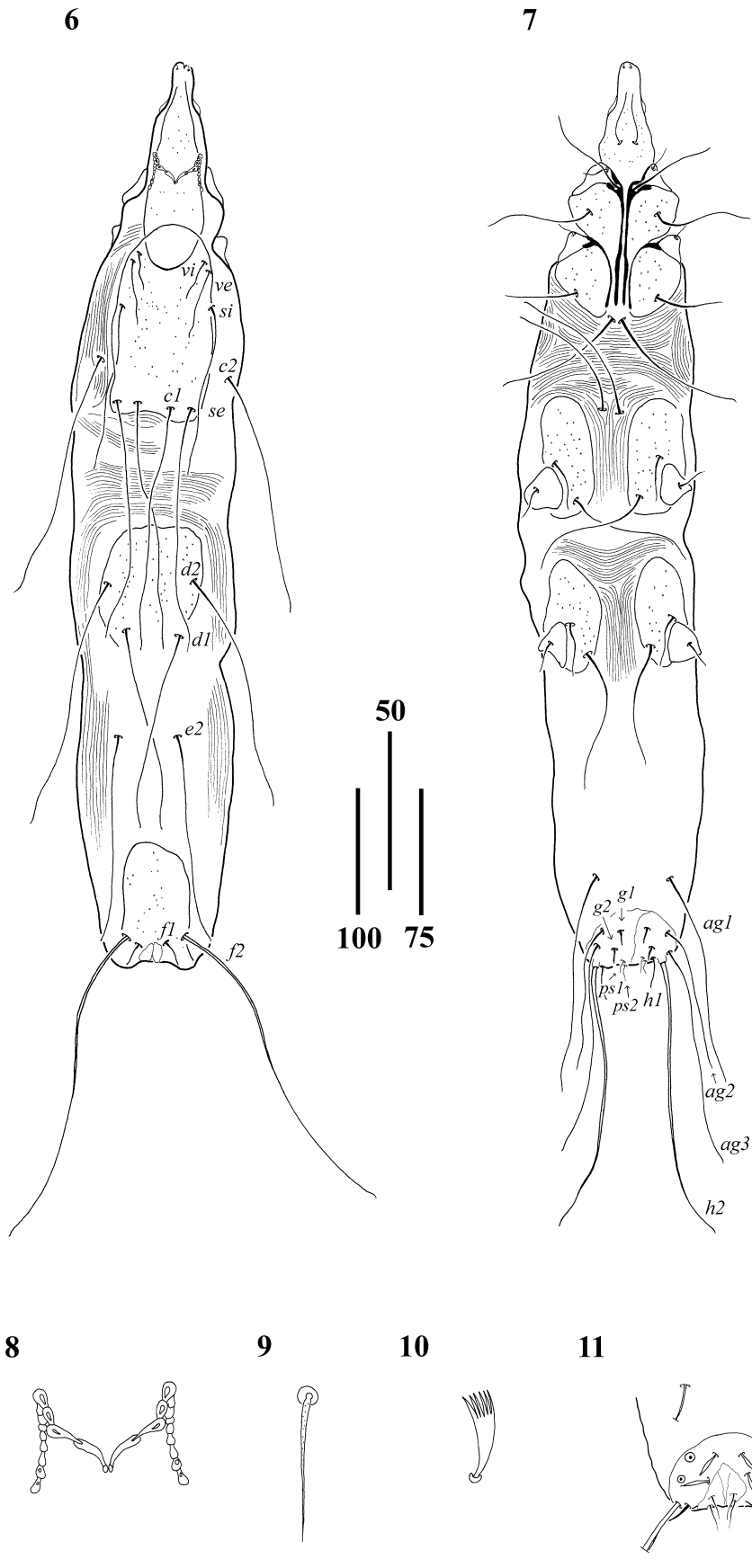
MALE. Unknown.

**Etymology.** This new species is dedicated to Dr. David Furth, prominent American entomologist, expert on Alticinae beetles.

**Type material.** Female holotype and 5 female paratypes from coverts of black-headed paradise-flycatcher *Terpsiphone rufiventer* (Swainson) (Passeriformes: Monarchidae), **GABON**: Ogooue Maritime Province (Moukalaba-Doudou National Park, NW corner of N'dogo Lagoon), 14 April 2003, coll. B. K. Schmidt (mites removed by E. Glowska). USNM catalog number of the host: 631583.

**Type deposition.** Holotype female and 2 female paratypes are deposited in the USNM, 3 female paratypes in the AMU.

**Differential diagnosis.** This new species is morphologically similar to *S. bombycillae* Skoracki, 2002 described from the bohemian waxwing *Bombycilla garrulus* (L.) (Passeriformes: Bombycillidae) from Slovakia. In females of both species, the infracapitulum, the propodonotal shield and all coxal fields are punctate, dorsal setae are ornamented; number of chambers in the medial branches of the peritremes and the length ratios of setae *vi:ve:si* are similar. Females of *S. furthi* sp. nov. are distinguishable by the lateral branch of the peritremes represented by eight chambers, the punctate hysteronotal and pygidial shields, presence of the genital plate and by the length of setae *ag1* 125–155, *ag2* 80–105, *ag3* 145–180, and *h2* 320–335. In females of *S. bombycillae*, the lateral branch of the peritremes is represented by 10–12 chambers, the hysteronotal and pygidial shields are apunctate and the genital plate is absent. Length of setae *ag1*, *ag2*, *ag3* and *h2* are 165–200, 135–165, 240–250 and 405–450, respectively.



**FIGURES 6–11.** *Syringophiloidus furthi* sp. nov., female: 6—dorsal view, 7—ventral view, 8—peritremes, 9—propodonotal setae *vi*, 10—fan-like setae *p'* of legs III–IV, 11—genito-anal region. Scale bars: 1, 2 = 100  $\mu$ m; 8–10 = 50  $\mu$ m; 11 = 75  $\mu$ m.

## Key to the genera of the subfamily Picobiinae (females)

1. Opistosomal lobes present. . . . . *Calamincola* Casto
- Opistosomal lobes absent . . . . . 2
2. Hypostomal apex tapering, solenidion *phi* on tibia I absent, 1–2 pairs of *ps* setae. . . . . 3
- Hypostomal apex of various shaped, solenidion *phi* on tibia I present, two pairs of *ps* setae . . . . . 6
3. Two pairs of *ps* setae present, thorn-like protuberances on apodemes I absent . . . . . 4
- Single pair of *ps* setae present, thorn-like protuberances on apodemes I present . . . . . 5
4. Genital setae absent. . . . . *Neopicobia* Skoracki
- One pair of genital setae present . . . . . *Rafapicobia* Skoracki
5. Genital setae absent. . . . . *Charadriineopicobia* Skoracki, Spicer and OConnor
- One pair of genital setae present . . . . . ***Pipicobia* gen. nov.**
6. One pair of genital setae present . . . . . 7
- Genital setae absent. . . . . 9
7. Setae *vi* and *ve* situated at same transverse level or *vi* posterior to *ve* . . . . . *Picobia* Haller
- Setae *vi* situated anterior to *ve*. . . . . 8
8. Propodonotal shield entire, pygidial shield present . . . . . *Lawrencipicobia* Skoracki and Hromada
- Propodonotal shield represented by 2 narrow lateral sclerites with or without central part, pygidial shield absent . . . . . *Columbiphilus* Kivganov et Sharafat
9. Setae *vi* situated anterior to *ve*, hypostomal apex with shoulders, thorn-like protuberances on apodemes I absent . . . . . *Gunabopicobia* Skoracki and Hromada
- Setae *vi* situated posterior to *ve*, hypostomal apex rounded, thorn-like protuberance on apodemes I present . . . . . *Pseudopicobia* Skoracki, Scibek and Sikora

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