

# Chewing lice (Phthiraptera) from wild birds in Senegal, with descriptions of three new species of the genera *Brueelia* and *Phlopteroides*

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## Abstract

A total of 170 wild birds from Senegal, belonging to 48 species and 9 orders, were searched for lice in 2005 and 2007. Chewing lice were found on 58 birds of 18 species and 5 orders (Columbiformes, Cuculiformes, Coraciiformes, Galliformes and Passeriformes). Twenty-two species of chewing lice of 13 genera were determined. Other nine samples of chewing lice that represent a new host-parasite association were determined at generic level only, because only one sex or nymph of these lice were found. Our records represent the first louse records from passerines *Camaroptera brachyura* (Cisticolidae), *Chalcomitra senegalensis* (Nectariniidae), *Corvinella corvina* (Laniidae), *Laniarius barbarus* (Malaconotidae), *Prinia erythroptera* (Cisticolidae) and *Turdus pelios* (Turdidae). Descriptions and illustrations are given for *Brueelia chalcomitrae* Najer et Sychra sp. nov. ex *Chalcomitra senegalensis* (Nectariniidae), *Brueelia priniae* Najer et Sychra sp. nov. ex *Prinia subflava* (Cisticolidae), and *Phlopteroides terpsiphoni* Najer et Sychra sp. nov. ex *Terpsiphone viridis* (Monarchidae).

## Keywords

*Rallicola*, *Emersoniella*, *Rallicola centropus*, Sunbird, Coucal, new host records

## Introduction

There are 670 species of birds in Senegal (Fry and Keith 2004, Lepage 2010, according to taxonomy in Clements 2007) and 399 of them (60%) are known to be hosts for 779 species of chewing lice (Price *et al.* 2003). The chewing lice from non-passerine birds are in general better known than are those from passerines. Three hundred and eighteen (80%) of the 397 non-passerine bird species from Senegal are known as hosts of chewing lice. Despite that high proportion of non-passerines, knowledge of chewing lice from some bird orders, e.g. cuckoos (Cuculiformes), is still very scarce and incomplete. While passerines comprise more than 40% of all bird species in Senegal, only 20% of chewing lice known from Senegal are from passerines. Following up on our previous work (Sychra *et al.* 2010a, b) we present new data on the species composition and distribution of chewing lice found on wild birds in Senegal, including the description of three new species of the genera *Brueelia* and *Phlopteroides*.

## Materials and methods

We collected chewing lice during the dry season, from 30 January to 28 February 2005, and during the rainy season, from 7 to 18 September 2007, at various locations in Senegal, but mostly in Lengué Kountou (13°04'N, 13°01'W), Simenti (13°02'N, 13°18'W), and Dar Salam (13°15'N, 13°12'W) (all three locations within Niokolo Koba National Park), as well as in Kaolack (14°09'N, 16°06'W). Seven birds – one *Psittacula krameri* (Scopoli, 1769) and six *Streptopelia senegalensis* (Linnaeus, 1766) – were captured by local people at unknown localities in the regions of Casamance and Tambacounda.

Birds were examined and chewing lice collected as described by Sychra *et al.* (2010b). Identification of the chewing lice was based on papers written by Clay (1940), Tendeiro (1958, 1960, 1969, 1973), Elbel (1967, 1977), Price (1977), Scharf and Price (1983), Price *et al.* (2003), Adams *et al.* (2005), as well as on samples from the Natural History Museum in London. The nomenclature of the lice follows Price

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**Table I.** List of wild non-passerine birds as hosts of chewing lice found in Senegal

Bird species	P <sup>1</sup>	E <sup>2</sup>	Chewing lice	♂	♀	Nymphs	Location
Order Galliformes							
Family Phasianidae							
Double-spurred Francolin							
<i>Francolinus bicalcaratus</i> (Linnaeus, 1766)	1	1	A/ <i>Amyrsidea powelli</i> (Bedford, 1920)	9	7	9	Dar Salam
„	1 <sup>3</sup>	1	I/ <i>Cuclotogaster bicalcaratus</i> Tendeiro, 1958	6	12	11	Dar Salam
„	1 <sup>3</sup>	1	I/ <i>Goniodes assimilis</i> Piaget, 1880	15	13	42	Dar Salam
„	0	2		–	–	–	Simenti
Order Columbiformes							
Family Columbidae							
Laughing Dove							
<i>Streptopelia senegalensis</i> (Linnaeus, 1766)	6	6	I/ <i>Coloceras hilli</i> (Bedford, 1920)	70	64	48	Dakar
„	6 <sup>3</sup>	6	I/ <i>Columbicola theresae</i> Ansari, 1955	30	25	26	Dakar
„	2 <sup>3</sup>	6	I/ <i>Columbicola senegalensis</i> Tendeiro, 1965	2	1	1	Dakar
Vinaceous Dove							
<i>Streptopelia vinacea</i> (Gmelin, 1789)	1	5	I/ <i>Columbicola streptopeliae</i> (Clay et Meinertzgarten, 1937)	1	0	0	Simenti
Black-billed Wood-dove							
<i>Turtur abyssinicus</i> (Sharpe, 1902)	2	6	I/ <i>Columbicola carrikeri</i> Tendeiro, 1965	0	5	0	Lengué
„	2 <sup>4</sup>	6	I/ <i>Coloceras chinense</i> (Kellogg et Chapman, 1902)	0	1	4	Lengué
„	8	14	I/ <i>Columbicola carrikeri</i> Tendeiro, 1965	33	49	26	Kountou
„	7 <sup>3</sup>	14	I/ <i>Coloceras castroi</i> (Tendeiro, 1969)	1	12	18	Simenti
„	4 <sup>3</sup>	14	I/ <i>Coloceras chinense</i> (Kellogg et Chapman, 1902)	0	5	0	Simenti
„	12	12	I/ <i>Columbicola carrikeri</i> Tendeiro, 1965	66	69	60	Dar Salam
„	8 <sup>3</sup>	12	I/ <i>Coloceras chinense</i> (Kellogg Chapman, 1902)	3	11	16	Dar Salam
„	3 <sup>3</sup>	12	I/ <i>Coloceras castroi</i> (Tendeiro, 1969)	4	4	15	Dar Salam
Order Cuculiformes							
Family Cuculidae							
Senegal Coucal							
<i>Centropus senegalensis</i> (Linnaeus, 1766)	1	2	I/* <i>Rallicola centropus</i> Tendeiro, 1960	17	20	9	Simenti
Order Coraciiformes							
Family Alcedinidae							
Grey-headed Kingfisher							
<i>Halcyon leucocephala</i> (Statius Müller, 1776)	1	1	I/* <i>Emersoniella</i> sp.	1	0	0	Simenti
Family Meropidae							
Red-throated Bee-eater							
<i>Merops bulocki</i> Vieillot, 1817	2	5	I/ <i>Meropoeus emersoni</i> Tendeiro, 1961	1	2	0	Simenti
„	1 <sup>3</sup>	5	I/ <i>Brueelia erythropteri</i> (Piaget, 1885)	1	1	0	Simenti
Family Bucerotidae							
Red-billed Hornbill							
<i>Tockus erythrorhynchus</i> (Temminck, 1823)	1	1	I/ <i>Buceroemersonia brelihi</i> Elbel, 1977	9	17	22	Dar Salam
„	1 <sup>3</sup>	1	A/ <i>Chapinia lophocerus</i> (Bedford, 1920)	4	4	13	Dar Salam

<sup>1</sup>Number of birds parasitized; <sup>2</sup>number of birds examined; <sup>3</sup> aforementioned species of chewing louse was also found on this bird; <sup>4</sup> only this species of chewing louse was found on one of these birds; A = *Amblycera*: Menoponidae; I = *Ischnocera*: Philopteridae; \*new parasite-host association.

et al. (2003), while the taxonomy of birds follows Clements et al. (2011).

In the following louse descriptions, all measurements are in millimeters. Abbreviations for dimensions are PAW, preantennal width; PAL, preantennal length; TW, temple width; POL, postantennal length; HL, head length; DHPW, dorsal head plate width; DHPL, dorsal head plate length; PCW, preconal width; PCL, preconal length; POCL, postconal length; CL, conus length; PW, prothorax width; MW, metathorax width; ML, metathorax length; AWV, abdomen width at level of segment V; AL, abdomen length; TL, total length; GW, male genitalia width at level of base of parameres. The naming of the new species is attributed to the two senior authors. The types of the new species described in this paper are deposited in the Moravian Museum Brno, Czech Republic, and in the Natural History Museum, London, United Kingdom.

## Results

A total of 88 individuals of 22 non-passerine bird species belonging to the orders Galliformes, Pelecaniformes, Accipitriformes, Charadriiformes, Columbiformes, Psittaciformes, Cuculiformes, Coraciiformes and Piciformes were examined. Thirty-six birds (40%,  $n = 89$ ) of 8 species were parasitized with 16 species of chewing lice of 11 genera (Table I). One species of *Emersoniella* represents a possible new species, and the finding of *Rallicola centropus* Tendeiro, 1960 on *Centropus senegalensis* (Linnaeus, 1766) represents a new host-parasite association. No chewing lice were recorded on the following birds from the following orders: Pelecaniformes: *Butorides striata* (Linnaeus, 1758) (1 specimen examined), *Scopus umbretta* Gmelin, 1789 (1); Accipitriformes: *Accipiter badius* (Gmelin, 1788) (1); Charadriiformes: *Vanellus senegallus* (Linnaeus, 1766) (1), Coraciiformes: *Ispidina picta* (Boddaert, 1783) (1), *Halcyon malimbica* (Shaw, 1811) (4), *Megaceryle maximus* (Pallas, 1769) (1), *Phoeniculus purpureus* (Miller, 1784) (7); Psittaciformes: *Psittacula krameri* (2); and Piciformes: *Lybius dubius* (Gmelin, 1788) (1), *Pogoniulus chrysoconus* (Temminck, 1832) (1), *Indicator indicator* (Sparrman, 1777) (6), *I. minor* Stephens, 1815 (1), *Campethera punctuligera* (Wagler, 1827) (5).

A total of 82 individuals of 26 passerine bird species belonging to 13 families were also examined. Twenty-two birds (27%,  $n = 82$ ) of 10 species were parasitized with 5 genera of chewing lice (Table II). Seven species of chewing lice were determined. Other eight samples of chewing lice were determined at the generic level only, because they are represented only by one sex or nymph. Four species of chewing lice – *Brueelia turdimulae* Ansari, 1956 from *Turdus pelios* Bonaparte, 1850, *Mencanthus camelinus* (Nitzsch, 1874) from *Corvinella corvina* (Shaw, 1809), *M. curuccae* (Schrank, 1776) from *Camaroptera brachyura* (Vieillot, 1820) and *M. eurysternus* (Burmeister, 1838) from *Prinia subflava* (Gmelin, 1789) – were known from these passerines according to the literature (Price 1977, Price et

al. 2003). All others represent possible new species and three of them are described below as new species. No chewing lice were recorded on the following birds from the following families: Fringillidae: *Serinus mozambicus* (Statius Müller, 1776) (4 specimens examined); Motacillidae: *Anthus trivialis* (Linnaeus, 1758) (1), *Motacilla flava* Linnaeus, 1758 (1); Muscipapidae: *Ficedula hypoleuca* (Pallas, 1764) (4), *Luscinia megarhynchos* (Brehm, 1831) (1), *Melaenornis edolioides* (Swainson, 1837) (1), *Muscicapa aquatica* Heuglin, 1864 (1), *Phoenicurus phoenicurus* (Linnaeus, 1758) (1); Nectariniidae: *Cinnyris pulchellus* (Linnaeus, 1766) (3); Pycnonotidae: *Pycnonotus barbatus* (Desfontaines, 1789) (3); Acrocephalidae: *Acrocephalus scirpaceus* (Hermann, 1804) (1), *Hippolais opaca* (Cabanis, 1850) (2); Cisticolidae: *Eremomela pusilla* Hartlaub, 1857 (1); Sylviidae: *Sylvia borin* (Boddaert, 1783) (2), *S. cantillans* (Pallas, 1764) (1); and Zosteropidae: *Zosterops senegalensis* Bonaparte, 1850) (2).

### *Brueelia chalconitiae* Najer et Sychra sp. nov. (Figs 1–3, 13)

Male ( $n = 6$ ): Head of unique triangular shape (Figs 1, 2). Preantennal region much narrowed with very pointed apical part, longer than the postantennal, with concave anterior margin. The entire marginal carina uninterrupted. Without small dorsal anterior head plate.

Metanotum with 6–7 setae including 2–3 metapleural setae on each postero-lateral margin. All abdominal tergites divided centrally. Tergal setae (setae are named and characterized according to Cicchino and Castro (1996): *postspiracular setae* present on tergites VI–VII; *postspiracular accessory setae* absent; *sutural setae* absent; *tergoposterior setae*: II–V, 0; VI, 1–2; VII, 2–3 on each side. Tergite VIII with one medium long seta in each postero-lateral corner and 2–3 short tergoposterior setae; tergite IX with one long and 1–2 short setae on each side. Abdominal sternites with a pair of lateral setae. A pair of small oval-shaped plates placed between sternal and pleural plates on sternites III–VII (Fig. 4). Paratergal setae: II–III, 0; IV–VII, 1; VIII, 2. Male genitalia as in Figure 13.

Dimensions (in mm): PAW, 0.23–0.24; PAL, 0.24–0.27; TW, 0.28–0.29; POL, 0.14–0.16; HL, 0.41–0.44; PW, 0.18–0.21; ML, 0.16–0.17; MW, 0.25–0.28; AWV, 0.30–0.35; AL, 0.70–0.81; TL, 1.38–1.46; GW, 0.06–0.08.

Female ( $n = 6$ ): Generally as for male. Tergal setae: *postspiracular setae* as for male, only one female also with one seta on right side of tergite V; *postspiracular accessory setae* absent; *sutural setae* absent; *tergoposterior setae*: II–VI, 0; VII, 0–1 on each side. Tergite VIII with one medium long seta in each postero-lateral corner; tergite IX with 2 long and 2 short setae on each side. Paratergal setae: II–III, 0; IV, 1; V, 2; VI–VIII, 3. Ventral terminalia as in Fig. 3; subgenital plate wide slightly convex posteriorly, with 9–16 spine-like and 9–13 spine-like and 9–fine minute setae.

Dimensions (in mm): PAW, 0.27–0.29; PAL, 0.25–0.31; TW, 0.33; POL, 0.14–0.16; HL, 0.45–0.48; PW, 0.22–0.23;

**Table II.** List of wild passerine birds as hosts of chewing lice found in Senegal

Bird species	P <sup>1</sup>	E <sup>2</sup>	Chewing lice	♂	♀	Nymphs	Location
Order Passeriformes							
Family Malaconotidae							
Common Gonolek							
<i>Laniarius barbarus</i> (Linnaeus, 1766)	1	1	I/* <i>Brueelia</i> sp.	0	0	1	Lengué Kountou
White Helmetshrike							
<i>Prionops plumatus</i> (Shaw, 1809)	1	4	I/* <i>Brueelia</i> sp.	0	1	1	Dar Salam
Family Laniidae							
Yellow-billed Shrike							
<i>Corvinella corvina</i> (Shaw, 1809)	3	7	A/* <i>Menacanthus camelinus</i> (Nitzsch, 1874)	8	3	20	Dar Salam
Family Dicuridae							
Fork-tailed Drongo							
<i>Dicrurus adsimilis</i> (Bechstein, 1794)	1	3	I/* <i>Brueelia</i> sp.	0	1	0	Dar Salam
Family Monarchidae							
African Paradise-Flycatcher							
<i>Terpsiphone viridis</i> (Stadius Müller, 1776)	1	2	I/* <i>Brueelia</i> sp.	1	0	0	Dar Salam
„	1 <sup>4</sup>	2	I/* <i>Philopteroides terpsiphoni</i> Najer et Sychra sp. nov.	3	3	1	Dar Salam
Family Cisticolidae							
Green-backed Camaroptera							
<i>Camaroptera brachyura</i> (Vieillot, 1820)	1	6	A/* <i>Menacanthus curuccae</i> (Schrank, 1776)	0	0	1	Dar Salam
„	1	3	A/* <i>Menacanthus curuccae</i> (Schrank, 1776)	0	2	0	Lengué Kountou
„	2	2	A/* <i>Menacanthus curuccae</i> (Schrank, 1776)	4	2	16	Simenti
„	1 <sup>3</sup>	2	I/* <i>Sturnidoecus</i> sp.	0	1	0	Simenti
Red-winged Warbler							
<i>Prinia erythroptera</i> (Jardine, 1849)	1	2	I/* <i>Sturnidoecus</i> sp.	1	0	0	Dar Salam
Tawny-flanked Prinia							
<i>Prinia subflava</i> (Gmelin, 1789)	2	5	I/* <i>Brueelia priniae</i> Najer et Sychra sp. nov.	1	3	1	Dar Salam
„	1	6	I/* <i>Brueelia priniae</i> Najer et Sychra sp. nov.	0	3	5	Lengué Kountou
„	1 <sup>3</sup>	6	A/* <i>Menacanthus eurysternus</i> (Burmeister, 1838)	3	0	10	Lengué Kountou
Family Turdidae							
African Thrush							
<i>Turdus pelios</i> Bonaparte, 1850	2	5	I/* <i>Brueelia turdinulae</i> Ansari, 1956	3	8	3	Dar Salam
„	1 <sup>3</sup>	5	A/* <i>Myrsidea</i> sp.	1	0	0	Dar Salam
„	0	1		-	-	-	Simenti
Family Nectariniidae							
Scarlet-chested Sunbird							
<i>Chalcomitra senegalensis</i> (Linnaeus, 1766)	1	1	I/* <i>Brueelia chalcomitrae</i> Najer et Sychra sp. nov.	0	2	0	Lengué Kountou
„	2	5	I/* <i>Brueelia chalcomitrae</i> Najer et Sychra sp. nov.	6	9	5	Dar Salam
„	1 <sup>3</sup>	5	I/* <i>Philopteroides</i> sp.	0	1	0	Dar Salam

<sup>1</sup>Number of birds parasitized; <sup>2</sup>number of birds examined; <sup>3</sup> aforementioned species of chewing louse was also found on this bird; <sup>4</sup> only this species of chewing louse was found on this bird; A = *Amblycera*: Menoponidae; I = *Ischnocera*: Philopteridae. \*New parasite-host association.

ML, 0.20–0.22; MW, 0.30–0.33; AWV, 0.29–0.40; AL, 1.07–1.18; TL, 1.84–1.96.

Type material: Holotype male ex *Chalcomitra senegalensis* (Linnaeus, 1766), Senegal: Dar Salam, Region of Kolda, 18 September 2007, coll. Literák and Čapek. Deposited at the Moravian Museum, Brno, Czech Republic. Paratypes: 6 females, 5 males, with the same data as holotype.

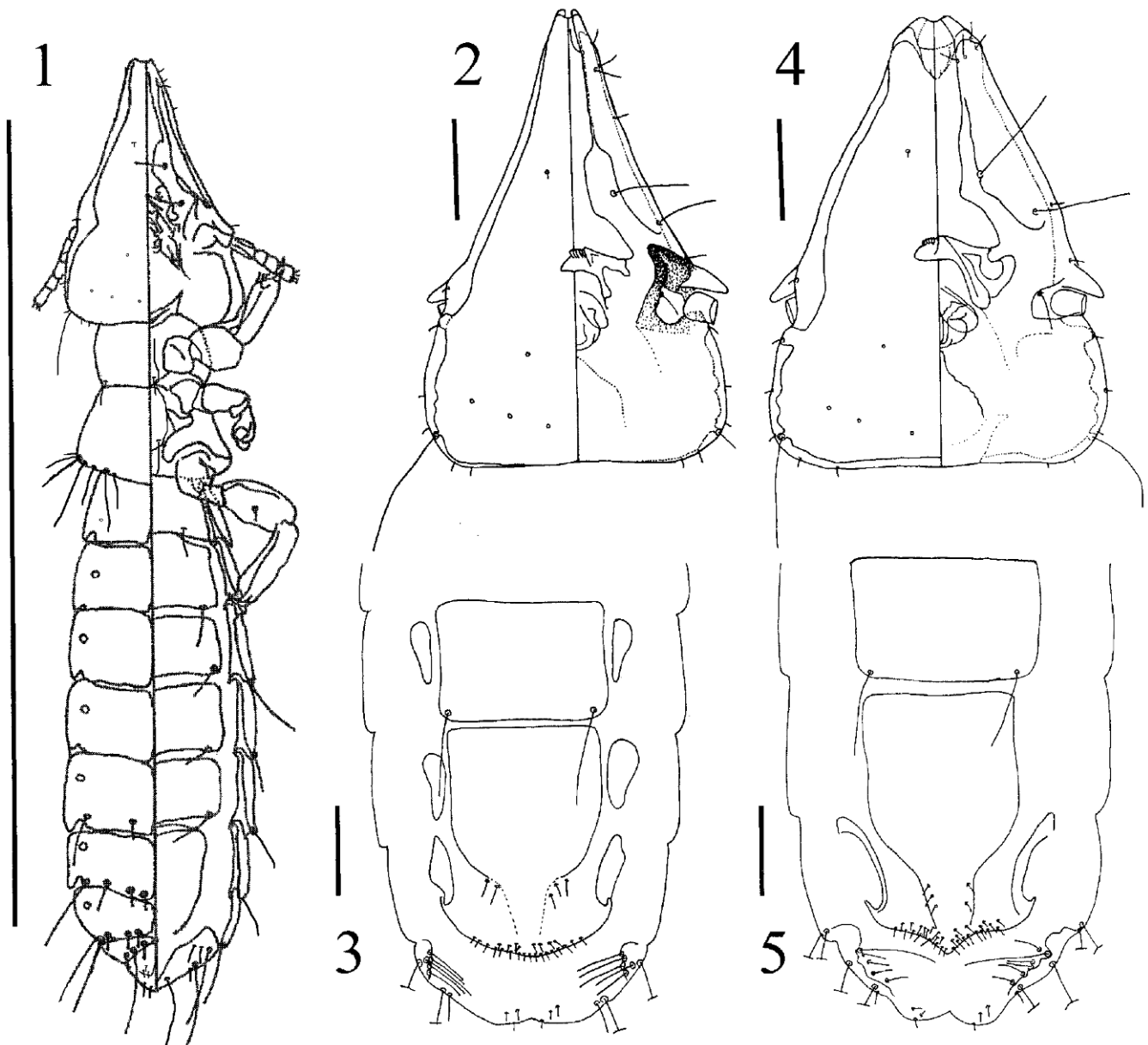
Remarks: *Brueelia chalcomitrae* is the first species of *Brueelia* known from the passerine family Nectariniidae. It can be morphologically separated from other species of *Brueelia* occurring in the Afrotropical Region (see Ledger

1980) by the unique triangular shape of head with very pointed apical part.

Etymology: The specific name derives from the generic name of the type host.

***Brueelia prinia* Najer et Sychra sp. nov.** (Figs 4–5, 14)

Male (n = 1): Preantennal region longer than postantennal, with straight anterior margin laterally and slightly convex apically (Fig. 4). The entire marginal carina uninterrupted. Apical part of head hyaline and slightly forceps-like.



**Figs 1–5.** *Brueelia chalcomitrae* sp. nov.: 1 – male; 2 – female head; 3 – female sternite VII and subgenital plate. 4–5. *Brueelia prinia* sp. nov.: 4 – female head; 5 – female sternite VII and subgenital plate. Scales 1 mm (Fig. 1), 0.10 mm (Figs 2–5). For Figs 1, 2, 4, dorsal side on left, ventral side on right



Metanotum with 6–7 setae including 2–3 metapleural setae on each postero-lateral margin. All abdominal tergites divided centrally. Tergal setae (abdomen unfortunately distorted): *postspiracular setae* present on tergites VI–VII; *postspiracular accessory setae* absent; *sutural setae* absent; *tergoposterior setae*: II–VI, 0; VII, 1 on each side. Tergite VIII with one medium long seta in each postero-lateral corner; tergite IX with one long and one short seta on each side. Abdominal sternites with a pair of lateral setae. Paratergal setae: II–VII, 1; VIII, 3. Male genitalia with very pale parameres, as in Figure 14.

Dimensions (in mm): PAW, 0.23; PAL, 0.21; TW, 0.28; POL, 0.13; HL, 0.34; PW, 0.19; ML, 0.16; MW, 0.26; AWV, 0.30; AL, 1.00; TL, 1.57; GW, 0.06.

Female (n = 3): Generally as for male. Tergal setae: *postspiracular setae* as for male; *postspiracular accessory setae*: II–VI, 0; VII, 0–1 on each side; *sutural setae* and *tergoposterior setae* absent. Tergite VIII with one medium long seta in each postero-lateral corner; tergite IX with 2 long and 2 short setae on each side. Paratergal setae: II, 0; III–VII, 1; VIII, 3. Ventral terminalia as in Fig. 5; subgenital pointed posteriorly, with 17–21 spine-like and 13–14 fine minute setae. Both sides of ventral terminalia with group of 6 setae, but not grouped together as in the case of other species of *Brueelia* (see Fig. 5 vs Fig. 3).

Dimensions (in mm): PAW, 0.29; PAL, 0.28; TW, 0.34–0.35; POL, 0.15; HL, 0.45–0.46; PW, 0.22; ML, 0.21–0.22; MW, 0.32–0.33; AWV, 0.45–0.46; AL, 1.40; TL, 2.17.

Type material: Holotype male ex *Prinia subflava* (Gmelin, 1789), Senegal: Dar Salam, Region of Kolda, 17 September 2007, coll. Literák and Čapek. Deposited at the Moravian Museum, Brno, Czech Republic. Paratypes: 3 females with the same data as holotype.

Remarks: *Brueelia priniae* is the first species of *Brueelia* known from the passerine genus *Prinia*. It can be morphologically separated from other species of *Brueelia* occurring on birds from the family Sylviidae *sensu lato* by the following combination of features: (1) shape of the head with straight anterior margin laterally and slightly convex apically (*B. currucae* Bechet, 1961; *B. paratricapillae* Price, Hellenthal et Palma, 2003 and *B. rosickyi* Balát, 1955 have preantennal region of the head rounded); (2) head ratio with preantennal region longer than the postantennal (*B. borini* Lunkaschu, 1970; *B. neoatricapillae* Price, Hellenthal et Palma, 2003 and *B. to-vornikae* (Balát, 1981) have short preantennal region as long as the postantennal); (3) larger dimensions (*B. locustellae* Fedorenko, 1975 and *B. vaneki* Balát, 1981 are small with TL of male < 1.40 and TL of female < 1.80). *Brueelia priniae* is morphologically similar to *B. scotocercae* (Blagoveshtchensky, 1951) from *Scotocerca inquieta platyura* (Severtzov, 1873), a bird species sometimes placed in the genus *Prinia* (del Hoyo *et al.* 2006). However, *B. priniae* can be separated from *B. scotocercae* by (1) a different shape of female subgenital plate with pointed posterior margin; (2) both sides of ventral terminalia with setae not grouped together; and (3) larger dimensions of female (TL 2.17 vs 1.95 and TW 0.34 vs 0.30).

Etymology: The specific name derives from the generic name of the type host.

***Philopteroides terpsiphoni* Najer et Sychra sp. nov.** (Figs 6–12)

Male (n = 3): Dorsal head plate longer than wide, with deep concave anterior margin, as in Figure 7. Preconal region as long as the postconal, with concave anterior margin. The entire marginal carina uninterrupted. Hyaline margin of head narrow with median concavity and central sclerotization in form of thin band (Fig. 8).

Pronotum with 1 seta, metanotum with 5–6 setae on each postero-lateral margin. Tergal setae on each side of abdominal segments: II, 4–6; III–VI, 4 (only 1 male with 5 setae on the left tergite IV); VII–VIII, 3–5; IX, 1. Abdominal sternites entire with 1 short spine-like and 1 long slender lateral seta on each side. Pleural setae: II–III, 0; IV–V, 2 and VI–VIII, 3. Subgenital plate as in Fig. 6 with 2 long central setae. Male genitalia as in Fig. 10 with short stout parameres and rounded endomeral plate. This plate can be easily distorted during preparation to change its shape (Figs 11 and 12).

Dimensions (in mm): DHPW, 0.11–0.12; DHPL, 0.19–0.21; PCW, 0.28; PCL, 0.19–0.20; TW, 0.37–0.40; POCL, 0.17–0.22; CL, 0.08–0.09; HL, 0.40–0.44; PW, 0.24–0.28; ML, 0.18–0.27; MW, 0.32–0.34; AWV, 0.46–0.47; AL, 0.52–0.57; TL, 1.22–1.32; GW, 0.08–0.09.

Female (n = 3): Generally as for male. Tergal setae: II, 4–6; III–V, 4–5; VI, 4; VII, 4–5; VIII, 5; IX, 1 (only 1 female with 2 setae on each tergite IX). Abdominal sternites II and VI entire, sternites III–V divided to form a central plate and 2 small lateral plates. Sternal setae as for male. Subgenital plate as in Figure 9 with 4 long slender setae and a few very short setae, vulva with 4–6 short setae.

Dimensions (in mm): DHPW, 0.12–0.13; DHPL, 0.21–0.22; PCW, 0.27–0.29; PCL, 0.20–0.22; TW, 0.38–0.40; POCL, 0.19–0.20; CL, 0.08–0.09; HL, 0.44–0.46; PW, 0.25–0.26; ML, 0.16–0.18; MW, 0.36; AWV, 0.50–0.51; AL, 0.68–0.69; TL, 1.42–1.44.

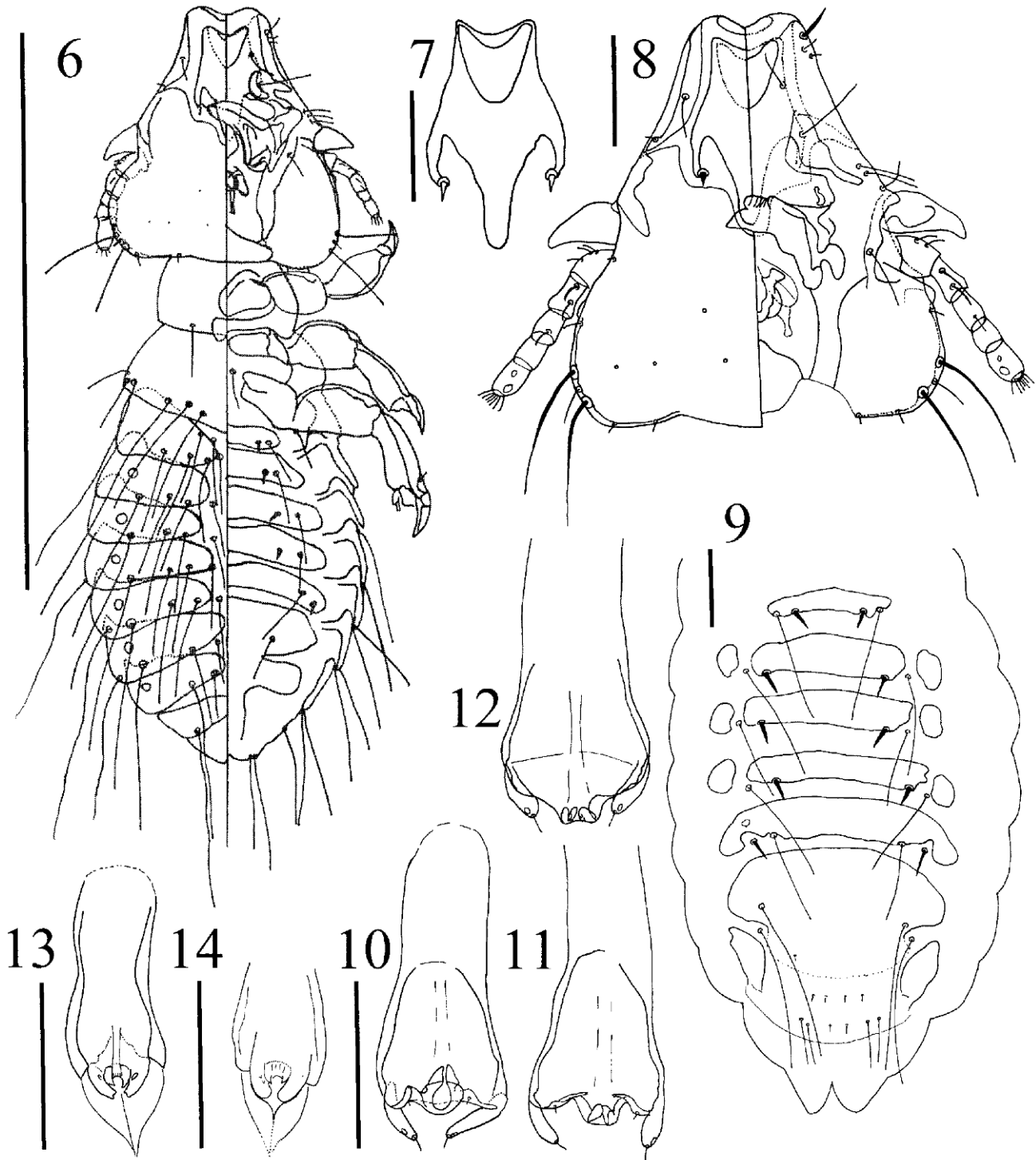
Type material: Holotype male ex *Terpsiphone viridis* (Stattius Müller, 1776), Senegal: Dar Salam, Region of Kolda, 16 September 2007, coll. Literák and Čapek. Deposited at the Moravian Museum, Brno, Czech Republic. Paratypes: 3 females, 2 males, with the same data as holotype.

Remarks: Mey (2004) erected the genus *Philopteroides* to include his three new species: *P. cucphuongensis*, *P. novaezelandiae* and *P. xenicus*. He mentioned that at least 4 other species previously placed into the genus *Philopterus* – *P. kayanobori* (Uchida, 1948), *P. lineatus* (Giebel, 1874), *P. mitsusui* (Uchida, 1948) and *P. sclerotifrons* Tandan, 1955 – also belonged to *Philopteroides*. Mey (2004) also mentioned the occurrence of an undescribed species of this genus from the family Monarchidae. *Philopteroides terpsiphoni* is the first species of this louse genus from the family Monarchidae, and can be morphologically separated from the species

mentioned above by the following combination of features: (1) the shape of dorsal head plate; (2) a small number of tergal, especially tergo-central, setae; (3) sternites III–V of female divided to form a central plate and 2 small lateral

plates; (4) a small number of sternal setae; (5) vulva of female with only 4–6 setae.

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



**Figs 6–14.** *Philopteroides terpsiphoni* sp. nov.: 6 – male; 7 – dorsal anterior head plate; 8 – female head; 9 – female sternites and subgenital plate; 10 – male genitalia; 11 and 12 – male genitalia distorted. 13 and 14. Male genitalia. 13 – *Brueelia chalconitiae* sp. nov.; 14 – *Brueelia priniae* sp. nov. Scales 1 mm (Fig. 6), 0.10 mm (Figs 7–14). For Figs 6, 8, dorsal side on left, ventral side on right

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## Discussion

All three species of chewing lice found on Double-spurred Francolin have been already reported from this host (Price *et al.* 2003). This was the bird with the highest number of chewing lice of all captured hosts (124 chewing lice of 3 species).

The non-passerines most frequently captured were doves (Columbiformes) and, among all birds examined, these birds had most of chewing lice found. On three species of doves, there were found 654 individuals of 7 species of chewing lice belonging to the genera *Coloceras* and *Columbicola* (Table I). We found 100% prevalence and mean abundance of about 45 lice per bird in the case of *Streptopelia senegalensis*. High abundance and prevalence may be caused by the fact that those birds were not captured, but they were bought on the local market in Dakar together with one *Psittacula krameri*. As there was an extremely high concentration of these birds in cages, chewing lice could easily migrate between birds. The finding of one male of *Columbicola theresae* Ansari, 1955, a typical parasite of *Streptopelia senegalensis*, on *Psittacula krameri* is evidence of that migration. Nevertheless, it is not known how long the birds had been kept in crowded conditions before louse collecting, and how much contact and time are necessary for the migration of a sufficient number of chewing lice to establish a viable population on the new host.

Chewing lice of the genus *Rallicola* are known from a rather wide spectrum of hosts, but mainly from birds of the order Gruiformes (Price *et al.* 2003). Two species of *Rallicola* have been found on 3 species of coucals: *Rallicola centropus* Tendeiro, 1960 from *Centropus superciliosus* Hemprich et Ehrenberg, 1829 occurring in sub-Saharan Africa and Arabian Peninsula, and *Rallicola unguiculatus* (Piaget, 1880) from *Centropus bengalensis* (Gmelin, 1788) and *C. sinensis* (Stephens, 1815) occurring in South-East Asia (Price *et al.* 2003). To identify *Rallicola centropus*, comparison was made against undetermined chewing lice of genus *Rallicola* from *Centropus senegalensis* from the Natural History Museum in London. After comparing those lice from *C. senegalensis* with *Rallicola unguiculatus* from the same collection (from both species of Asian coucals), we believe that they belong to the same species. The clypeal hyaline margins of these lice were bent upward on the slides, and that is why these lice had not been determined. In any case, the two males and two females from the Natural History Museum in London are the first record of *R. unguiculatus* from Africa and represent a new louse-host association. At first sight, *Rallicola* from *C. senegalensis* from our collection is totally unlike *R. unguiculatus*. We compared it with *Rallicola centropus* from *Centropus superciliosus* and they were the same species too. The two species of African coucals (*C. senegalensis* and *C. superciliosus*) differ from one another geographically, but visually and ecologically are very similar. *Centropus superciliosus* lives in Eastern and Central Africa, while *C. senegalensis* occurs in Western Africa, but their chewing lice look exactly alike. It

would be advisable to use DNA analysis in order to clarify the question of possible sibling species in this case.

*Emersoniella* is a genus of lice typical from several genera of kingfishers from South-East Asia and Australia (five species of hosts in the genera *Actenoides*, *Tanysiptera*, *Clytoceyx* and *Dacelo*). The louse found on the grey-headed kingfisher *Halcyon leucocephala* (Statius Müller, 1776) represents the first record of this genus on an African kingfisher, and on a kingfisher of the genus *Halcyon*. Unfortunately, only one *Halcyon leucocephala* was captured, and only one female of *Emersoniella* was found.

In comparison to those of kingfishers, chewing lice of other Coraciiformes birds, bee-eaters and horn-bills, are relatively well known. Two species of chewing lice were found on *Merops bulocki* Vieillot, 1817 – *Brueelia erythropteri* (Piaget, 1885) and *Meropoecus emersoni* Tendeiro, 1961 – and two other on *Tockus erythrorhynchus* (Temminck, 1823) – *Buceroemersonia brelihi* Elbel, 1977 and *Chapinia lophocerus* (Bedford, 1920).

Among the passerines, our records represent 12 new louse-host associations, as well as first louse records from *Cameroptera brachyura*, *Chalcomitra senegalensis*, *Corvinella corvina*, *Laniarius barbarus* (Linnaeus, 1766), *Prinia erythroptera* (Jardine, 1849) and *Turdus pelios*. Most of these chewing lice probably represent new species but, unfortunately, having single male or female specimens is insufficient for adequate descriptions of new species.

*Brueelia* is the most speciose philopterid genus. It includes about 300 recognized species, and most of these parasitize passeriform hosts. There are about 270 *Brueelia* species parasitic on 300 species of passerine birds from 34 families occurring throughout the world (Price *et al.* 2003). The finding of *Brueelia chalcomitreae* from *Chalcomitra senegalensis* as the first record of this louse genus from the family Nectariniidae is an indication of the very scarce and incomplete information available about this family of birds.

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## References

- Adams R.J., Price R.D., Clayton D.H. 2005. Taxonomic revision of Old World members of the feather louse genus *Columbicola* (Phthiraptera: Ischnocera), including descriptions of eight new



- species. *Journal of Natural History*, 39, 3545–3618. DOI: 10.1080/00222930500393368.
- Cicchino A.C., Castro D.d.C. 1996. Revisión preliminar de las especies del género *Brueelia* Kéler, 1936 (Phthiraptera, Philopteridae) parásitas de Icterinae (Aves, Passeriformes, Fringillidae). *Graellsia*, 52, 3–30. DOI: 10.3989/graellsia.1996.v52.i0.373.
- Clay T. 1940. Genera and species of Mallophaga occurring on Gallinaceous hosts. - Part II. *Goniodes*. *Proceedings of the Zoological Society of London*, (Ser. B), 110, 1–120. DOI: 10.1111/j.1469-7998.1940.tb00027.
- Clements J.F. 2007. *The Clements Checklist of Birds of the World. 6th edition*. Cornell University Press, Ithaca, New York, 855 pp.
- Clements J.F., Schulenberg T.S., Iliff M.J., Sullivan B.L., Wood C.L., Roberson D. 2011. *The Clements checklist of birds of the world: Version 6.6*. Available from: <http://www.birds.cornell.edu/clementschecklist/downloadable-clements-checklist>. (Accessed 16 December 2011).
- del Hoyo J., Elliott A., Christie D. (Eds). 2006. *Handbook of the Birds of the World. Volume 11: Old World Flycatchers to Old World Warblers*. Lynx Edicions, Barcelona, Spain, 798 pp.
- Elbel R.E. 1967. Amblyceran Mallophaga found on the Bucerotidae (Hornbills). *Proceedings of the United States National Museum*, 120, 1–76.
- Elbel R.E. 1977. *Buceroemersonia*, a new genus of ischnoceran Mallophaga found on the hornbill genus *Tockus* (Bucerotidae). *Proceedings of the Biological Society of Washington*, 90, 798–807.
- Fry C.H., Keith S. (eds.). 2004. *The Birds of Africa. Vol. VII*. Christopher Helm, London, 666 pp.
- Ledger J.A. 1980. Phthiraptera (Insecta). South African Institute for Medical Research, Johannesburg, 327 pp.
- Lepage D. 2010. Avibase – Bird Checklists of the World: Senegal. In Web page Avibase – the world bird database. URL: <http://avibase.bsc-eoc.org/> [accessed 20 July 2010].
- Mey E. 2004. Zur Taxonomie, Verbreitung und parasitophyletischer Evidenz des *Phlopterus*-Komplexes (Insecta, Phthiraptera, Ischnocera). *Ornithologischer Anzeiger* 43(2): 149–203.
- Price R.D. 1977. The *Menacanthus* (Mallophaga: Menoponidae) of the Passeriformes (Aves). *Journal of Medical Entomology*, 14, 207–220.
- Price R.D., Hellenenthal R.A., Palma R.L. 2003. World checklist of chewing lice with host associations and keys to families and genera. In: (Eds. R.D. Price, R.A. Hellenenthal, R.L. Palma, K.P. Johnson and D.H. Clayton) *The Chewing Lice: World Checklist and Biological Overview*. Illinois Natural History Survey, 1–448.
- Scharf W.C., Price R.D. 1983. Review of the *Amyrsidea* in the subgenus *Argimenopon* (Mallophaga: Menoponidae). *Annals of the Entomological Society of America*, 76, 441–451.
- Sychra O., Barlev E., Literák I., Čapek M., Koubek P., Procházka P. 2010a. The chewing lice (Phthiraptera) of Red-billed Quelea (*Quelea quelea*) in Senegal, with a description of a new species. *African Entomology*, 18, 17–22. DOI: 10.4001/003.018.0103.
- Sychra O., Literák I., Najer T., Čapek M., Koubek P., Procházka P. 2010b. Chewing lice (Insecta: Phthiraptera) from estrildid finches (Aves: Passeriformes: Estrildidae) and louse-flies (Insecta: Diptera: Hippoboscidae) from birds in Senegal, with descriptions of three new species of the genus *Brueelia*. *Zootaxa*, 2714, 59–68.
- Tendeiro J. 1958. Études sur les Mallophages. Observations sur les *Cuclotogaster* (Ischnocera, Philopteridae) parasites des Galiliformes des genres *Francolinus* et *Pternistis*. *Junta de Investigações Científicas do Ultramar. Estudos, Ensaios E Documentos (Portugal)*, 44, 1–126.
- Tendeiro J. 1960. Études sur les Mallophages. Description d'une nouvelle espèce du genre *Rallicola* Johnston et Harrison (Ischnocera, Philopteridae), parasite de *Centropus superciliosus* subsp. *Garcia de Orta*, 8, 553–558.
- Tendeiro J. 1969. Estudos sobre os Goniódideos (Mallophaga, Ischnocera) dos Columbiformes. I - Género *Nitzschiella* Kéler, 1939. *Revista de Ciências Veterinárias, Universidade de Lourenço Marques 2 (Série A)*, 1–124.
- Tendeiro J. 1973. Estudos sobre os Goniódideos (Mallophaga, Ischnocera) dos Columbiformes. XIV - Género *Coloceras* Taschenberg, 1882. *Revista de Ciências Veterinárias, Universidade de Lourenço Marques (Série A)*, 6, 199–524.

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