The Chewing Lice (Phthiraptera) of Red-Billed Quelea (*Quelea quelea*) in Senegal, with a Description of a New Species

Author(s): O. Sychra, E. Barlev, I. Literák, M. Čapek, P. Koubek & P. Procházka
Source: African Entomology, 18(1):17-22.
Published By: Entomological Society of Southern Africa
DOI: http://dx.doi.org/10.4001/003.018.0103
URL: http://www.bioone.org/doi/full/10.4001/003.018.0103

The chewing lice (Phthiraptera) of red-billed quelea (*Quelea quelea*) in Senegal, with a description of a new species

O. Sychra[1*], E. Barlev[1], I. Literák[1], M. Čapek[2], P. Koubek[2] & P. Procházka[2]

[1]*Department of Biology and Wildlife Diseases, Faculty of Veterinary Hygiene and Ecology, University of Veterinary and Pharmaceutical Sciences, Palackeho 1–3, 612 42 Brno, Czech Republic*

[2]*Institute of Vertebrate Biology, Academy of Science of the Czech Republic, v.v.i., Kvetna 8, 603 65 Brno, Czech Republic*

One hundred and six individuals of red-billed quelea (*Quelea quelea*) were examined for chewing lice (Phthiraptera: Amblycera, Ischnocera) in Senegal. Chewing lice were found on 91 (86 %) birds examined. Three species of chewing lice were identified; they had the following prevalences and mean intensities: *Brueelia queleae* n. sp. (81 %; 5.3 lice), *Myrsidea queleae* (37 %; 1.7) and *Machaerilaemus plocei* (9 %; 1.7). These are the first records of chewing lice from red-billed quelea from Senegal. A new species of *Brueelia* is described and illustrated. This is the first ischnoceran louse described from this host.

Key words: *Brueelia, Myrsidea, Machaerilaemus,* Ploceidae, sex ratio, Mallophaga.

INTRODUCTION

The red-billed quelea, *Quelea quelea* (Linnaeus) (Passeriformes: Ploceidae), might be the world's most abundant bird species. It occurs at very high populations, up to 1500 million birds in sub-Saharan Africa (Elliott 1989; Craig 2004). There are two valid species of chewing lice from suborder Amblycera recognized from this host (Price *et al.* 2003): *Myrsidea queleae* Tendeiro, 1964 and *Machaerilaemus plocei* Bedford, 1920.

The aim of this study was to examine the occurrence of chewing lice on red-billed quelea in Senegal, and to determine the prevalence, intensity of infestation and abundance of individual lice species.

MATERIAL AND METHODS

A total of 106 red-billed queleas were examined for lice during the breeding season in September 2007. Birds were captured by local people near the city of Matam in northern Senegal (15°37'N 13°20'W). Chewing lice were collected using the fumigation chamber method with visual search of the head (Clayton & Drown 2001). Chewing lice were fixed in 70 % ethanol and subsequently slide-mounted in Canada balsam as permanent slides. Identification of the lice was based on Klockenhoff (1984), Lakshminarayana (1968), Price *et al.* (2002) and a sample of lice from the collection of the Natural History Museum in London (BNHM). The prevalence, mean intensity and mean abundance were determined *sensu* Bush *et al.* (1997).

In the following description, all measurements are in millimetres. Abbreviations for dimensions are TW, temple width; HL, head length at midline; PW, prothorax width; MW, metathorax width; AWV, abdomen width at level of segment V; TL, total length; GL, male genitalia length; GW, male genitalia width. The description of the new species is attributed to the first two authors. The types of new species are deposited at the Moravian Museum Brno, Czech Republic (MZM) and the Natural History Museum in London (BNHM).

RESULTS

The birds examined were infested with three species of chewing lice: two amblyceran species, *Machaerilaemus plocei* and *Myrsidea queleae,* and one ischnoceran species representing a new species of *Brueelia.* Although we searched the head of each bird carefully we found no head lice (*Philopterus*). Chewing lice were found on 91 (86 %) birds examined, with individual birds hosting 1–3 species. A total of 542 lice were collected. The dominant species was *Brueelia queleae* n. sp. with a dominance of 85 %. The two other species were less frequent: *M. queleae* (12 %) and *M. plocei* (3 %). A total of 43 % of individuals were infested with only one species of louse (mostly *B. queleae,* 46 birds). Two species of lice were found on 36 % of birds.

*To whom correspondence should be addressed.
E-mail: sychrao@vfu.cz

Table 1. Parasitological characteristics, sex ratio and age ratio of chewing lice on red-billed quelea from Senegal.

n = 106	Prevalence (%)	Mean intensity ± S.E.	Intensity range	Mean abundance ± S.E.	Male:female	Adult:nymph
Brueelia queleae	81	5.3 ± 0.5	1–30	4.3 ± 0.5	1:1.58	1:0.22
Myrsidea queleae	37	1.7 ± 0.1	1–8	0.6 ± 0.3	1:1.60	1:4.15
Machaerilaemus plocei	9	1.7 ± 0.1	1–8	0.2 ± 0.2	1:3	1:3.25
Total	86	6.0 ± 0.5	1–30	5.1 ± 0.6	–	–

Infestation by both *B. queleae* and *M. queleae* was more common (33 birds) than infestation by both *B. queleae* and *M. plocei* (five birds). Four birds were infestated by all three species of chewing lice. Total prevalences, mean intensities, mean abundances, sex ratio and adult nymph ratio are given in Table 1. In 72 % of birds the rate of infestation was very light (1–10 lice per bird). Infestation by 11–20 and 21–30 lice was found in 10 % and 4 % of birds, respectively. There were no significant differences in prevalence between males and females (Fisher's exact test, $P = 0.179$) or adults and fledged juveniles of red-billed quelea (Fisher's exact test, $P = 0.686$). Total prevalence, mean intensities, mean abundances, sex ratio and adult: nymph ratio in dominant species of lice, *B. queleae,* on male, female and fledged juvenile of red-billed quelea are presented in Table 2.

DESCRIPTION

Brueelia queleae Sychra & Barlev, **sp. n.**, Figs 1–5

Type host. *Quelea quelea* (Linnaeus).

Male (Fig. 1). Conspicuous pattern of sclerotization and pigmentation involving head, gular and ventral thoracic plates, sternites and pleurites makes the louse striped. Preantennal region as long as postantennal, with convex anterior margin. The entire marginal carina uninterrupted.

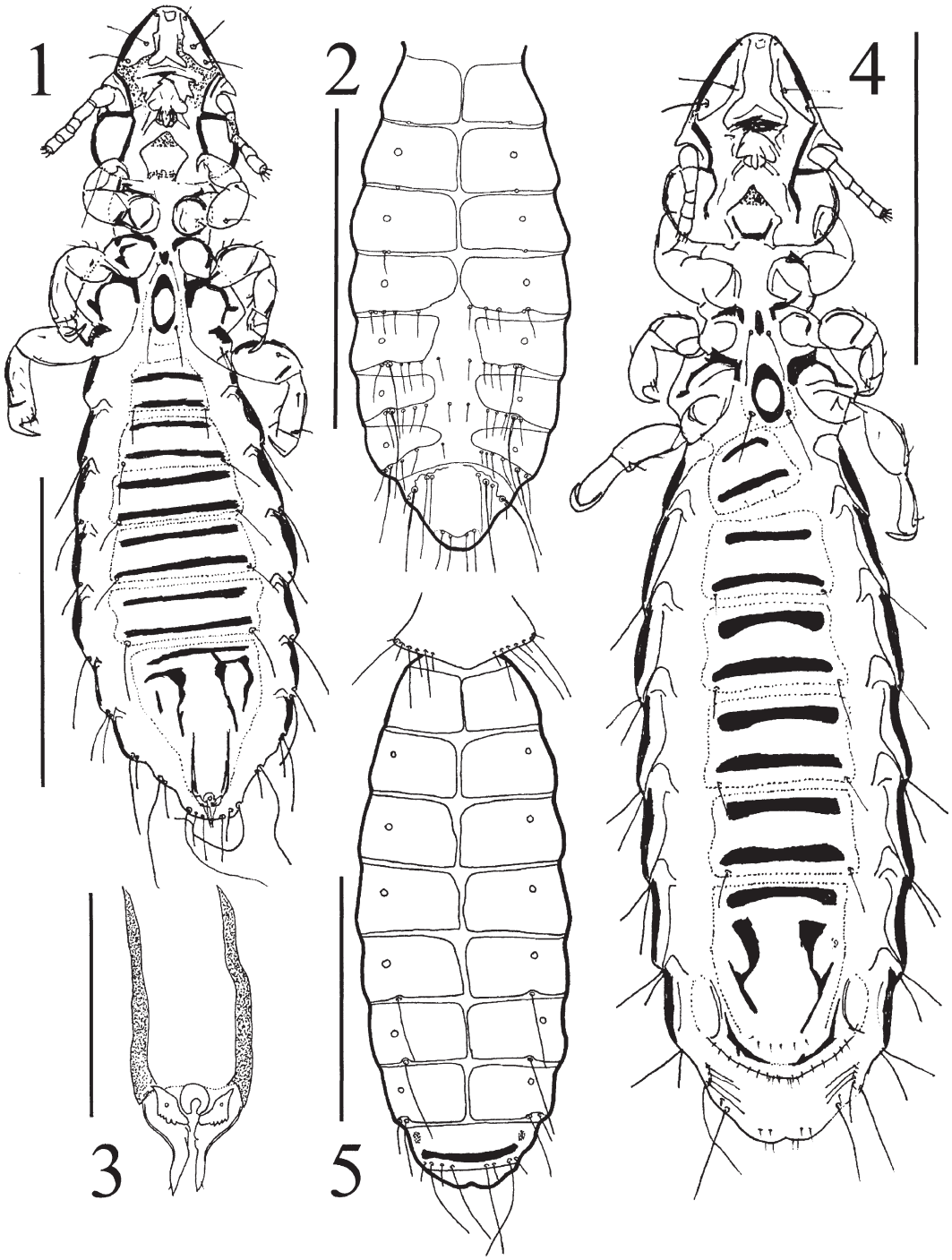
Pronotum with one medium length seta on each posterolateral corner; metanotum with seven setae (three long and four of medium length) on each posterolateral margin. Metasternal plate pigmented, with large central unpigmented 'hole'. All abdominal tergites divided centrally, tergites VI–VII of characteristic shape (Fig. 2). Tergal setae: II(first apparent tergite)–IV, nil (only one male with single seta on one side); V, 2–5 ; VI–VIII, 5–6 on each side; IX much narrowed with a marginal row of 8–10 setae, with lengths as shown (Fig. 2), terminally with four short setae. Post-spiracular sensillus present on tergites II–VII. Abdominal sterna with a pair of medium length lateral setae. Male genitalia as in Fig. 3. Parameres narrow and quite long, each with a very short subapical seta on the lateral margin. Endomeral complex contains a pair of sacs of triangular shape, with a conspicuous medial circular spot and serrated posterior margin.

Dimensions. TW, 0.24–0.25; HL, 0.27–0.28; PW, 0.16–0.19; MW, 0.27–0.29; AWV, 0.35–0.38; TL, 1.28–1.37; GL, 0.16–0.20; GW, 0.07.

Female (Fig. 4). Mostly as for male. Tergal setae on each side of abdominal segments: II–V, nil; VI–VII, one; VIII, two; IX, four (two long and two short). Tergite IX not narrowed, with a conspicuous pigmented stripe near the posterior margin (Fig. 5). Ventral terminalia as in Fig. 4; subgenital plate wide slightly convex posteriorly, with characteristic pigmentation and chaetotaxy as shown.

Table 2. Parasitological characteristics, sex ratio and age ratio of *Brueelia queleae* on male, female and fledged juvenile of red-billed quelea from Senegal.

	Prevalence (%)	Mean intensity ± S.E.	Intensity range	Mean abundance ± S.E.	Male:female	Adult:nymph
Male (*n* = 76)	79	5.3 ± 0.6	1–19	4.2. ± 0.5	1:1.64	1:0.22
Female (*n* = 18)	94	4.1 ± 0.7	1–11	3.9 ± 0.7	1:1.48	1:0.13
Fledged juvenile (*n* = 12)	92	7.0 ± 2.4	2–30	6.4 ± 2.2	1:1.41	1:0.32



Figs 1–5. *Brueelia queleae*. **1**, Male in ventral view. **2**, Male abdomen in dorsal view; **3**, male genitalia; **4**, female in ventral view; **5**, female metathorax and abdomen in dorsal view. Scale bars: Figs 1–2, 4–5 = 0.5 mm, Fig. 3 = 0.125 mm.

Dimensions. TW, 0.27–0.29; HL, 0.30–0.33; PW, 0.17–0.20; MW, 0.27–0.30; AWV, 0.42–0.46; TL, 1.61–1.73.

Type material. Holotype male ex *Quelea quelea,* SENEGAL, Matam, 15°37′N 13°20′W, 2007, Literák & Čapek leg. Paratypes: 3♂, 4♀, same data as holotype; all deposited in the Moravian Museum, Brno (MZM) (O. Sychra-SE01–SE04). Paratypes: 2♂, 2♀, same data as holotype, all deposited in the Natural History Museum, London (BNHM) (O. Sychra-SE05–SE06).

Remarks. Brueelia queleae is morphologically similar to *B. plocea* originally described by Lakshminarayana (1968) whose description was based on three males from the Baya weaver, *Ploceus philippinus burmanicus* Ticehurst, from India. However, *B. queleae* can be separated from *B. plocea* by a combination of features, involving details of the male genitalia (the denticulation and shape of the endomeral complex), the pigmentation of subgenital and metasternal plates (with large central unpigmented 'hole') and higher number of setae on tergites VI–VIII. Lakshminarayana (1968) mentioned only the number of sternal setae, but according to his figure 1, he had added up sternal and tergal setae.

Since weavers (Ploceidae) are closely related to estrildid finches (Estrildidae), indigobirds (Viduidae) and sparrows (Passeridae) (Ericson & Johansson 2003), we compared our new species with *Brueelia* known from hosts of these bird families. *Brueelia queleae* is distinguished from all of those from estrildid and passerid hosts by its head shape, conspicuous pattern of sclerotization and pigmentation involving ventral thoracic plates and sternites or male genitalia. A typical feature of *Brueelia* from the estrildid hosts is its triangular-shaped head (Rékási & Saxena 2005). Similar shape of head is also characteristic of *B. bicurvata* (Piaget, 1880) from *Vidua paradisaea* (Linnaeus, 1758) and *B. xanthocollis* Ansari, 1955 from *Gymnoris pyrgita* (Heuglin, 1862) belonging to Viduidae and Passeridae, respectively. In contrast to these species *B. queleae* has an oval head. *Brueelia queleae* is similar in this character to other *Brueelia* from passerid hosts (*B. cyclothorax* (Burmeister, 1838), *B. subtilis* (Nitzsch, 1874) and *B. alexandrii* Eichler, 1953). *Brueelia queleae* differs from these species by the conspicuous pattern of sclerotization and pigmentation. *Brueelia* from sparrows are pale or almost pellucide (Zlotorzycka 1997). *Brueelia queleae* is morphologically similar to *B. altaica* Mey, 1982 from *Montifringilla nivalis* (Linnaeus). However, *B. queleae* can be separated from *B. altaica* by the quite different male genitalia (the denticulation and shape of the endomeral complex) and smaller dimensions.

DISCUSSION

In the course of this study, species of three louse genera, *Myrsidea, Machaerilaemus* and *Brueelia*, were identified from red-billed quelea.

Myrsidea queleae was originally described by Tendeiro (1964) from *Q. quelea lathami* (Smith) from 'Transvaal' (South Africa). Subsequently this species was recorded from the type subspecies from Rhodesia (now Zimbabwe) and Katanga (Democratic Republic of Congo), from *Q. quelea aethiopica* (Sundevall) from Kenya and Sudan and from *Q. cardinalis* (Hartlaub) from Bechuanaland (now Botswana) (Klockenhoff 1984; Tendeiro 1964). We found another slide of this species from the type host from Cameroon deposited in the Natural History Museum, London. Our record is the first not only from Senegal, but also from western Africa.

Machaerilaemus plocei was originally described by Bedford (1920) from *Q. quelea* from Onderstepoort, Pretoria, South Africa. This is the second record of this louse and the first one from Senegal as well as Western Africa.

The chewing louse genus *Brueelia* Kéler is one of the largest genera of ischnoceran lice with 280 described species. This genus appears to be highly host-specific. All currently recognized species of *Brueelia sensu strico* are restricted to one (*c.* 90 % species) or, much less often, more host species (Price *et al.* 2003). Balakrishnan & Sorenson (2007) reconstructed a phylogeny of lice from parasitic finches (Viduidae) and its estrildid hosts and their results provided evidence of host-specificity of *Brueelia,* at least at the level of avian families. On the other hand their results suggested a lack of host specificity in five genetically similar lice of genus *Sturnidoecus* that seems to be only 'subgroup' of *Brueelia.* So it appears that species of *Brueelia sensu lato* are not as host-specific as previously suspected.

According to Dickinson (2003) there are 116 species in the family Ploceidae. Despite a relatively high number of potential hosts, only one species of *Brueelia,* namely *B. plocea,* has been described from birds in this family (Price *et al.* 2003).

Red-billed quelea is known to be highly gregarious

species breeding in vast colonies, with 600 nests practically touching in a small tree 5 m tall and up to 6000 nests in a large tree; a 200 ha site may hold 10 million nests (Craig 2004). This fact may explain a very high prevalence of lice on red-billed quelea. Rózsa *et al.* (1996) and Rékasi *et al.* (1997) showed that prevalence of lice is increased on colonial birds, presumably because of an increase in opportunities for horizontal transmission. On the other hand, louse abundance is apparently not affected by avian sociality (Rózsa 1997a). The relatively low abundance of lice on red-billed quelea corroborates that opinion.

In contrast to Ash (1960) and Potti & Merino (1995), we found no difference between the sexes of red-billed quelea in terms of the prevalence and intensity of louse infestation.

Although an even sex ratio is predominant in most ectoparasites, in some species of chewing lice a skewed ratio, usually with a female bias, can be observed (Clayton *et al.* 1992; Price *et al.* 2003). Rózsa *et al.* (1996) found that among social birds living in colonies, sufficiently large subpopulations of chewing lice with an even sex ratio occur thanks to greater opportunities for chewing lice migrations. The ascertained female predominance in chewing lice of red-billed quelea may be associated either with the existence of small subpopulations of lice on individual birds (*Myrsidea* and *Machaerilaemus*) or with transfer of chewing lice during the birds' mating season (seasonal variation in sex ratio of *Brueelia*) (Marshall 1981a; Rózsa *et al.* 1996). Similar results in *Brueelia* on *Delichon urbica* (Linnaeus) or *Lanius excubitor* Linnaeus have been obtained by Clark *et al.* (1994) and Szczykutowicz *et al.* (2006), respectively. The data support the hypothesis that colonizing individuals of lice are mostly females (Rózsa 1997b; Janiga & Kubašková 2000). The skewed age ratios are similar to those mentioned by Clayton *et al.* (1992) and Clark *et al.* (1994), and suggest the existence of stable chewing lice populations (Mashall 1981b).

The intensity of infestation of passerine birds with chewing lice of the genus *Brueelia* is usually low and varies with host body size (Balát 1955; Clark *et al.* 1994; Rózsa 1997a). The highest number of *Brueelia* on a particular host usually varies between 10 and 20 lice, with extreme numbers of 143 and 151 *Brueelia* on one bird reported by Rékasi *et al.* (1997) and Szczykutowicz *et al.* (2006), respectively. The low intensity of infestation with *Brueelia* lice may explain the lack of records of *Brueelia* from ploceid hosts. Since *B. queleae* was found with very high prevalence, it is probable that other ploceid finches harbour a number of *Brueelia* species still unknown to science.

ACKNOWLEDGEMENTS

This study was funded by grants of the Grant Agency of the Academy of Sciences of the Czech Republic No. IAA6093404 and IAA601690901.

REFERENCES

ASH, J. 1960. A study of the Mallophaga of birds with particular reference to their ecology. *Ibis* **102**: 93–110.

BALAKRISHNAN, C.N. & SORENSON, M.D. 2007. Dispersal ecology *versus* host specialization as determinants of ectoparasite distribution in brood parasitic indigobirds and their estrildid finch hosts. *Molecular Ecology* **16**: 217–229.

BALÁT, F. 1955. Contribution to knowledge of the chewing lice of the genus *Brüelia* I. (In Czech.) *Prace Brnenske Zakladny Ceskoslovenske Akademie Ved* **27**(10): 499–524.

BEDFORD, G.A.H. 1920. Mallophaga from South African birds. Descriptions of a new genus (*Neomenopon*) and two new species (*Machaerilaemus plocei, Neomenopon pteroclurus*). *Parasitology* **12**: 167–172.

BUSH, A.O., LAFFERTY, K.D., LOTZ, J.M. & SHOSTAK, A.W. 1997. Parasitology meets ecology on its own terms: Margolis *et al.* revisited. *Journal of Parasitology* **83**: 575–583.

CLARK, F., FARREL, J. & HILL, L.A. 1994. A study of a population of the house martin (*Delichon urbica* (L.)) feather louse *Brüelia gracilis* (Mallophaga: Ischnocera) in Lincolnshire, U.K. *The Entomologist* **113**: 198–204.

CLAYTON, D.H. & DROWN, D.M. 2001. Critical evaluation of five methods for quantifying chewing lice (Insecta: Phthiraptera). *Journal of Parasitology* **87**: 1291–1300.

CLAYTON, D.H., GREGORY, R.D. & PRICE, R.D. 1992. Comparative ecology of neotropical bird lice (Insecta, Phthiraptera). *Journal of Animal Ecology* **61**: 781–795.

CRAIG, A.J.F.K. 2004. *Quelea quelea.* In: Fry, C.H. & Keith, S. (Eds) *The Birds of Africa. Vol. VII.* Christopher Helm, London.

DICKINSON, E.C. (Ed.) 2003. *The Howard and Moore Complete Checklist of the Birds of the World.* 3rd Edition. Christopher Helm, London.

ELLIOTT, C.C.H. 1989. The pest status of the quelea. In: Bruggers, R.L. & Elliott, C.C.H. (Eds) *Quelea quelea: Africa's Bird Pest.* Oxford University Press, Oxford.

ERICSON, P.G.P. & JOHANSSON, U.S. 2003. Phylogeny of Passerida (Aves: Passeriformes) based on nuclear and mitochondrial sequence data. *Molecular Phylogenetics and Evolution* **29**: 126–138.

JANIGA, M. & KUBAŠKOVÁ, Ľ. 2000. The biology of the Alpine accentor *Prunella collaris.* III. The coevolution of Alpine accentors and lice (Phthiraptera). *Oecologia Montana* **9**(1-2): 24–28.

KLOCKENHOFF, H.F. 1984. Mallophagen der Gattung *Myrsidea* Waterston, 1915 von afrikanischen Webervögeln (Ploceidae) – II. *Bonner Zoologische Beiträge* **35**(1-3): 269–284.

LAKSHMINARAYANA, K.V. 1968. Mallophaga Indica II. A new species of Philopteridae on *Ploceus philippinus burmanicus* Ticehurst from India. *Oriental Insects* **2**(1): 97–102.

MARSHALL, A.G. 1981a. The sex ratio of ectoparasitic insects. *Ecological Entomology* **6**: 155–174.

MARSHALL, A.G. 1981b. *The Ecology of Ectoparasitic Insects.* Academic Press, London.

POTTI, J. & MERINO, S. 1995. Louse loads of pied flycatchers – effects of hosts sex, age, condition and relatedness. *Journal of Avian Biology* **26**: 203–208.

PRICE, R.D., HELLENTHAL, R.A. & DALGLEISH, R.C. 2002. A review of *Machaerilaemus* (Phthiraptera: Amblycera: Menoponidae) from the Passeriformes (Aves), with the description of five new species. *American Midland Naturalist* **148**: 61–74.

PRICE, R.D., HELLENTHAL, R.A., PALMA, R.L., JOHNSON, K.P. & CLAYTON, D.H. 2003. *The Chewing Lice: World Checklist and Biological Overview.* Illinois Natural History Survey Special Publication 24.

RÉKÁSI, J., RÓZSA, L. & KISS, J.B. 1997. Patterns in the distribution of avian lice (Phthiraptera: Amblycera, Ischnocera). *Journal of Avian Biology* **28**: 150–156.

RÉKÁSI, J. & SAXENA, A.K. 2005. A new Phthiraptera species (Philopteridae) from red avadavat (*Amandava amandava*). *Aquila* **112**: 87–93.

RÓZSA, L., RÉKÁSI, J. & REICZIGEL, J. 1996. Relationship of host coloniality to the population ecology of avian lice (Insecta: Phthiraptera). *Journal of Animal Ecology* **65**: 242–248.

RÓZSA, L. 1997a. Patterns in the abundance of avian lice (Phthiraptera: Amblycera, Ischnocera). *Journal of Avian Biology* **28**: 249–254.

RÓZSA, L. 1997b. Adaptive sex ratio manipulation in *Pediculus humanus capitis*: Possible interpretations of Buxton's data. *Journal of Parasitology* **83**: 543–544.

TENDEIRO, J. 1964. Mallophaga. *Annales du Museé Royal de l'Afrique Centrale (Tervuren)* **132**: 161–216.

SZCZYKUTOWICZ, A., ADAMSKI, Z., HROMADA, M. & TRYJANOWSKI, P. 2006. Patterns in the distribution of avian lice (Phthiraptera: Amblycera, Ischnocera) living on the great grey shrike *Lanius excubitor. Parasitology Research* **98**: 507–510.

ZŁOTORZYCKA, J. 1997. *Chewing lice (Mallophaga) – Goniodidae and Philopteridae.* (In Polish.) Wydawnictwo Uniwersytetu Wroclawskiego.

Accepted 7 September 2009