Zootaxa 1762: 63–68 (2008)
www.mapress.com/zootaxa/

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

A new species of *Picicola* Clay and Meinertzhagen, 1938 (Phthiraptera: Ischnocera) parasitic on the Rufous-sided Broadbill (Passeriformes: Eurylaimidae) in Ghana

MATHYS J. MEYER[1*], ROGER D. PRICE[2], & KEVIN P. JOHNSON[1]

[1]*Illinois Natural History Survey, 1816 South Oak Street, Champaign, IL 61820, USA. E-mail: mathysm@inhs.uiuc.edu, kjohnson@inhs.uiuc.edu*
[2]*1409 Burnham Court, Fort Smith, AR 72903, USA. E-mail: rpricelice2@aol.com*
[*] *Corresponding author*

Abstract

Picicola donwebbi, a new species of chewing louse from the Rufous-sided Broadbill (*Smithornis rufolateralis* Gray, 1864) collected in Ghana, is herewith described and illustrated. This is the first species of Ischnocera recorded from the broadbills (Passeriformes: Eurylaimidae) and, based on morphology, is placed in the *Picicola quadripustulosus* species group recorded from the Pittidae (Passeriformes). To evaluate its genetic distinctiveness and phylogenetic position in the *Degeeriella* complex, sequences of nuclear (elongation factor-1α) and mitochondrial (cytochrome oxidase I) genes for *Picicola donwebbi* are compared to various other species. Although this new species is genetically distinct, its phylogenetic position within the larger complex is unclear.

Key words: Africa, chewing lice, *Picicola donwebbi*, *Smithornis rufolateralis*, *Degeeriella* complex, elongation factor-1α, cytochrome oxidase I, maximum-likelihood

Introduction

No species of chewing louse (Insecta: Phthiraptera) of the suborder Ischnocera has been described from the broadbills (Aves: Eurylaimidae). This family of birds is an Old World group of suboscine songbirds (Passeriformes). The other major family of suboscines in the Old World is the Pittidae, which has 10 valid species of *Picicola* (Ischnocera) recorded from 10 host species (Somadder & Tandan 1977; Price *et al*. 2003). Here we describe the first ischnoceran louse collected from the Eurylaimidae and place it in the genus *Picicola* Clay and Meinertzhagen, 1938.

Picicola was originally erected for three species of Ischnocera found on the Picidae (Piciformes) by Clay and Meinertzhagen (1938). Price *et al*. (2003) considered 29 of the 39 named species in the genus valid. Subsequent to Price *et al*. (2003), an additional seven species have been described (Price & Weckstein 2006; Valim & Linardi 2006). Of these 36 species, 18 have been recorded from the avian order Piciformes (Picidae, Bucconidae, and Galbulidae) and 18 from the Passeriformes (Pittidae, Tyrannidae, Furnariidae, Mimidae, Parulidae, Cracticidae, Dicruridae, and Ptilonorhynchidae). Dalgleish (1969) revised species of *Picicola* from the Picidae, Somadder and Tandan (1977) those from the Pittidae, and Williams (1979) and Cicchino (1981) those of the Passeriformes excluding those from the Pittidae. Most recently, Price and Weckstein (2006) reviewed the species from the Bucconidae and Galbulidae.

Picicola falls within the larger *Degeeriella* complex and although the monophyly of this historically recognized taxonomic complex (Clay 1958; Eichler 1963) is strongly supported by morphological (Smith 2001)

Accepted by R. Dalgleish: 27 Mar. 2008; published: 5 May 2008

and molecular data (Cruickshank *et al*. 2001), the same cannot be said for the generic classification within the complex. Johnson *et al*. (2002) showed that current definitions of genera in the *Degeeriella* complex do not represent monophyletic groups; instead, most genera, including *Picicola*, are paraphyletic with respect to other genera. In order to evaluate the genetic distinctiveness and phylogenetic position of the species of *Picicola* from broadbills within the larger *Degeeriella* complex, we sequenced its nuclear (elongation factor-1α) and mitochondrial (cytochrome oxidase I) genes and analyzed these sequences in relation to those published by Johnson *et al*. (2002).

Material and Methods

We collected lice, using ethyl acetate fumigation as described by Clayton and Drown (2001), from a specimen of Rufous-sided Broadbill (*Smithornis rufolateralis* Gray, 1864) collected during an expedition to Ghana. Specimens were mounted on slides in Canada balsam following the procedure given in Price *et al*. (2003) and the DNA voucher specimen was prepared following the procedure in Johnson *et al*. (2002).

Classification follows Howard and Moore (1991) for hosts and Price *et al*. (2003) for lice. Morphological terminology follows Dalgleish (1969), Somadder and Tandan (1977), Williams (1979), and Price and Weckstein (2006) to simplify placement of the new species in existing keys.

All measurements (in millimeters) are given as a range followed by the mean in parentheses. Abbreviations for measured characters are: TW, temporal width; HL, head length; CI, cephalic index (HL/TW); PW, prothorax width; MW, metathorax width; AWV, abdomen width at segment V; GL, male genitalia length; PL, male penis length; and TL, total length. Specimens are deposited in the following collections (acronyms follow Evenhuis and Samuelson 2007): BMNH—The Natural History Museum, London, United Kingdom; FMNH—Field Museum of Natural History, Chicago, Illinois, USA; INHS—Illinois Natural History Survey, Champaign, Illinois, USA; OSEC—K. C. Emerson Museum, Oklahoma State University, Stillwater, Oklahoma, USA.

Extraction and sequencing of the nuclear (elongation factor-1α) and the mitochondrial (cytochrome oxidase I) genes follow the laboratory protocols in Johnson *et al*. (2002). We evaluated the phylogenetic position of the broadbill *Picicola* by maximum likelihood analysis of the new sequences together with previously published data of Johnson *et al*. (2002), using the same model parameters. DNA sequences analyzed for *P. donwebbi* are deposited in GenBank (Accession numbers EU520585-6).

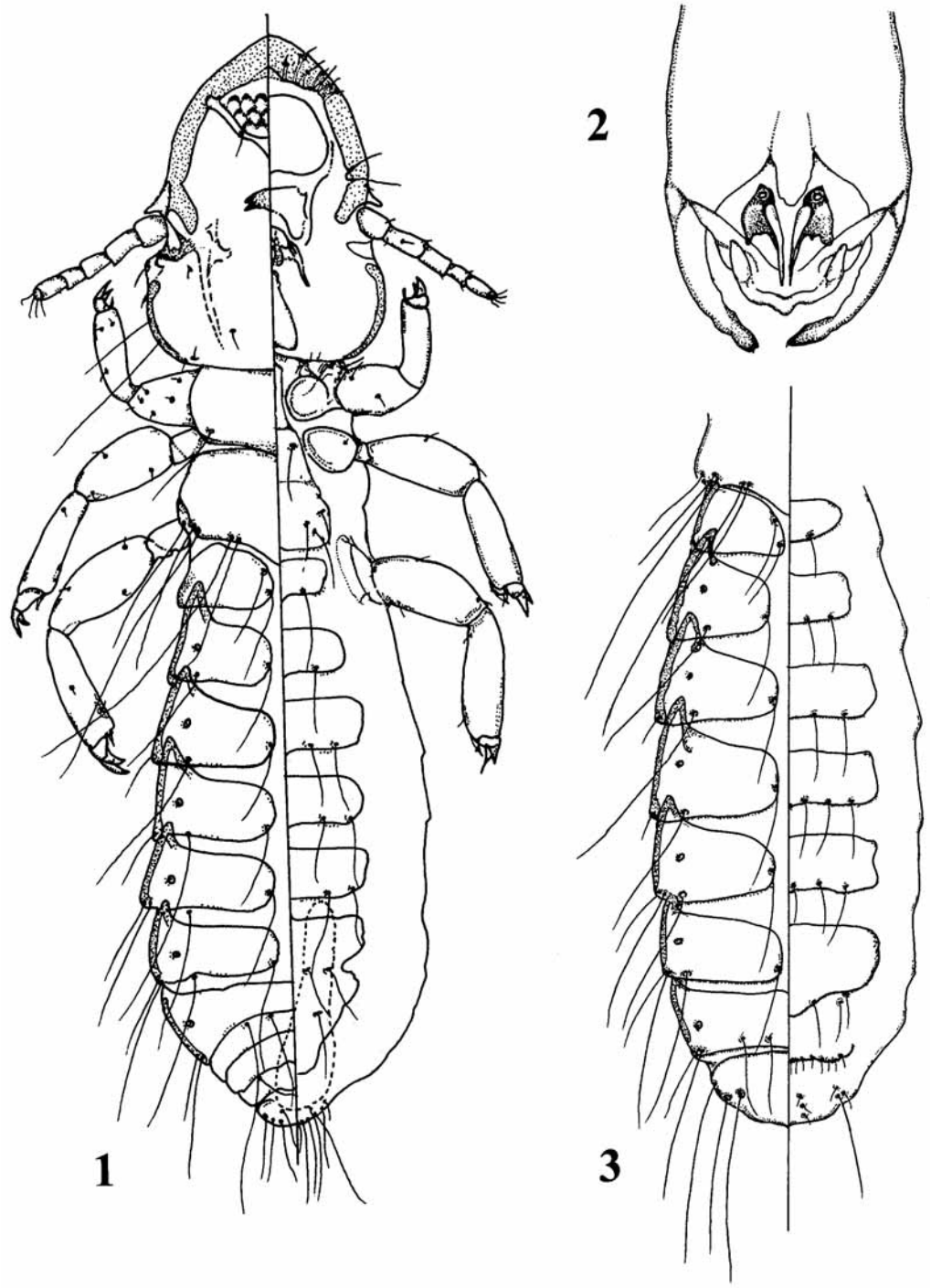
Picicola donwebbi Meyer, Price, and Johnson, new species (Figs. 1–3)

Type host. *Smithornis rufolateralis* Gray, 1864, Rufous-sided Broadbill.

Description. Both sexes similar except for terminalia and dimensions. General aspects of body and chaetotaxy as in Fig. 1 for male and Fig. 3 for female. Head with marginal carina well developed, with outer edge and inner border medially pointed; lateral notch present and interrupting, but not breaking, marginal carina at point of curvature around frons. Preantennal suture distinct. Frontal plate located anterior to preantennal suture, distinct and sculptured, but without thickened posterior edge. Tip of conus usually not reaching distal end of first antennal segment (scape). Abdominal tergites II–VII divided with 2 central setae, tergite VIII entire and with 4 central setae. Abdominal segments with prominent pleural thickening and reentrant heads. Margin of male tergite IX with long seta posteriolateral to shorter one on either side. Female subgenital plate vulval margin with 16 short setae and row of 6 very short setae lateromedial to this marginal row, with 4 additional short setae displaced latero-anteriorly. Male genitalia (Fig. 2) with one sensillum on each endomeral arm. Dimensions (in millimeters): Male (n=5): TW, 0.32–0.33 (0.33); HL, 0.43–0.48 (0.45); CI, 1.33–1.49

(1.38); PW, 0.21–0.22 (0.21); MW, 0.27–0.28 (0.27); AWV, 0.38–0.46 (0.40); GL, 0.24–0.28 (0.27); PL, 0.03–0.04 (0.04); TL, 1.43–1.55 (1.48). Female (n=5): TW, 0.34–0.37 (0.35); HL, 0.45–0.48 (0.47); CI, 1.31–1.33 (1.32); PW, 0.22–0.25 (0.23); MW, 0.29–0.30 (0.30); AWV, 0.40–0.44 (0.42); TL, 1.61–1.78 (1.72).

Type material. Holotype male is labeled "ex *Smithornis rufolateralis*, GHANA: Goaso, K. P. Johnson, 28 Mar 2003, BDM 851" and is deposited in INHS. Paratypes: 4 males, 5 females with same data as holotype and deposited as follows: 1 male, 1 female (BMNH); 1 male, 1 female (FMNH); 1 male, 2 females and a female DNA voucher specimen (INHS); 1 male, 1 female (OSEC).



FIGURES 1–3. *Picicola donwebbi*. 1, entire dorsoventral male. 2, male genitalia. 3, female metanotum and dorsoventral abdomen.

Diagnosis. *Picicola donwebbi* differs from *Picicola* collected from the Picidae by the anterior shape of the head being medially pointed rather than smoothly rounded (as in *P. candidus* and *P. snodgrassi* species groups), or with an apical depression or truncate (as in *P. thripias* species group); by the marginal carina being well developed and complete rather than well developed but thinner where it curves around the frons; and by the lateral notch being present rather than absent. It differs from the *Picicola* found on the passeriform families Tyrannidae, Furnariidae, Mimidae, Parulidae, Cracticidae, Dicruridae, and Ptilonorhynchidae by having the preantennal suture distinct rather than indistinct; by the frontal plate lacking a thickened posterior edge; and by the marginal carina thin but not interrupted where it curves around the frons rather than nearly broken where it curves around the frons. *Picicola donwebbi* is morphologically most similar to the *Picicola* found on the Pittidae as defined by Somadder and Tandan (1977) and is, therefore, placed in their *P. quadripustulosus* species group. In this species group, it is most closely allied with *P. angolensis* Somadder and Tandan, 1977, by the males having only two sensilla associated with the endomeral arms; by the number of setae on abdominal tergites III–VI equaling 2 central (< 11 total); and by the size of the conus which does not reach the base of the first antennal segment (scape). However, overall *P. donwebbi* is slightly smaller than *P. angolensis* in TW, HL, PW, MW, AWV, and TL, but has a significantly higher CI in both sexes. Further differences include the posterior margin of segment IX–XI not being emarginate in females of *P. donwebbi* and the number of preantennal setae (7 vs. 6). In "Degeerielline Ischnocera (Insecta: Phthiraptera) of the Pittidae (Aves)" (Somadder & Tandan 1977), *P. donwebbi* keys out to couplet 6.

The following is a modification of that couplet:

6. Ocular seta and marginal temporal seta 2 very long; pigmentation pattern of abdominal dorsum characteristic (Figs. 4, 15):
- with posterior margin of segment IX–XI in female emarginate; male and female with CI < 1.0 ....*angolensis* Somadder and Tandan
- with posterior margin of segment IX–XI in female not emarginate; male and female with CI > 1.0 ....*donwebbi*, sp. nov.

Etymology. This species is named in honor of Dr. Donald Webb on occasion of his retirement after 40 years of service to the Illinois Natural History Survey and generations of entomology graduate students at the University of Illinois, Champaign-Urbana.

Discussion

Sequences of nuclear (elongation factor-1α) and mitochondrial (cytochrome oxidase I) genes from *P. donwebbi* confirm the genetic distinctiveness of this new species. However, these data do not currently fully support the taxonomic placement of *P. donwebbi* within the genus *Picicola* (Fig. 4). Based on the maximum likelihood analyses of these sequences *P. donwebbi* is excluded from a large clade containing all species of *Austrophilopterus* Ewing and *Picicola* as well as *Degeeriella carruthi* Emerson. Instead it falls in a group among which relationships are less clear. In the current analyses it is the sister taxon to *Capraiella* sp. ex *Eurystomus* (an African roller) plus *D. fulva* (Giebel) (from a North American hawk). Sister to this less well-supported grouping of ((*Capraiella* + *D. fulva)* + (*P. donwebbi*)) are lice of the genus *Cotingacola*, also from New World suboscine passerines. *Smithornis rufolateralis*, the host of *P. donwebbi*, is in one of the two Old World suboscine families (Eurylaimidae). No *Picicola* from the Pittidae, the second Old World family of suboscines, were available for this analysis. However, the close placement of *P. donwebbi* to *Cotingacola* might indicate some influence of host relationship on phylogenetic relationships among the species of lice in this group.

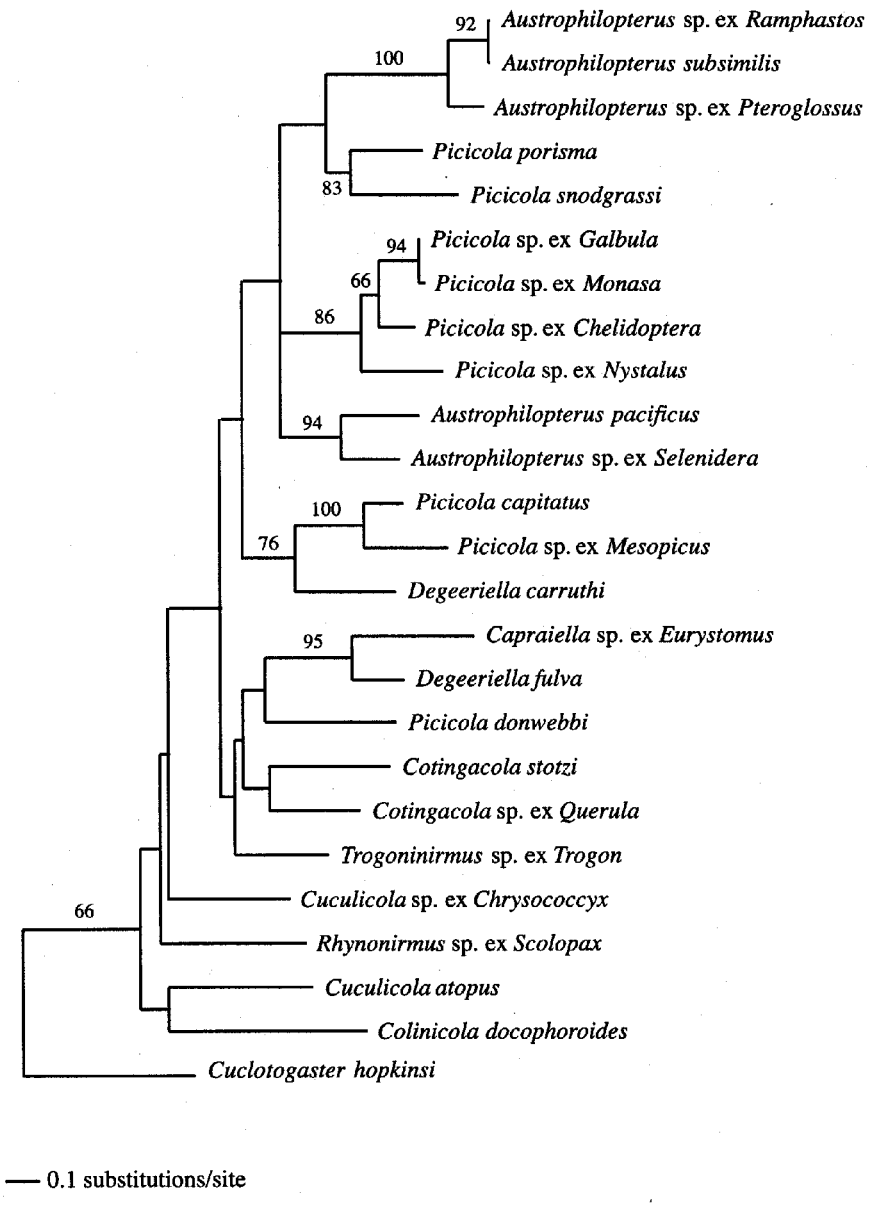


FIGURE 4. Phylogenetic tree derived from maximum-likelihood analysis of combined mitochondrial COI (379 bp) and nuclear EF-1α (348 bp) DNA sequences. Numbers above branches indicate support from 100 maximum-likelihood bootstrap replicates.

In summary, the outcome of this analysis does support the genetic distinctiveness of *P. donwebbi*. However, a better understanding of the phylogenetic relationship between *P. donwebbi* and other species within the larger *Degeeriella* complex remains unclear. These results support the assessment (Johnson *et al*. 2002) that many genera in the complex are not monophyletic and that a taxonomic revision is warranted. We, therefore, consider the placement of this species into the genus *Picicola* as tentative until a revision of the generic level definitions in the *Degeeriella* complex is performed.

Acknowledgments

We thank James Braimah, Ben Marks, James Oppong, and Jason Weckstein for their assistance and company during our expedition to Ghana. We further acknowledge the personnel of the Ghana Wildlife Department, and in particular the Executive Director of Wildlife Division and Mike Adu-Nsiah, for their support of our research and their help with permits. John Mason and his staff from Nature Conservation Research Centre (NCRC) in Accra, Ghana, and Samuel Agyei provided invaluable logistical support. We also thank Nana Prince Yaw Adomako, Frank Agbeko and the people of Asumura for granting us access to their forest preserves. This work was partially supported by an NSF PEET DEB-0118794 grant to KPJ.

References

Cicchino, A.C. (1981) Contribucion al conocimiento de los Malofagos Argentinos. XI. Dos nuevas especies del subgenero *Picicola* (*Tyrannicola*) Carriker, 1956, parasitas de Furnariidae (Aves: Passeriformes). *Revista de la Sociedad Entomologica Argentina*, 40(1–4), 279–283.

Clay, T. (1958) Revisions of Mallophaga genera. *Degeeriella* from the Falconiformes. *Bulletin of the British Museum (Natural History), Entomology*, 7, 123–207.

Clay, T. & Meinertzhagen, R. (1938) Two new genera of Mallophaga. *The Entomologist*, 71, 73–76.

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

Cruickshank, R.H., Johnson, K.P., Smith, V.S., Adams, R.J., Clayton, D.H. & Page, R.D.M. (2001) Phylogenetic analysis of partial sequences of elongation factor 1 alpha identifies major groups of lice (Insecta: Phthiraptera). *Molecular Phylogenetics and Evolution*, 19, 202–215.

Dalgleish, R.C. (1969) The *Picicola* (Mallophaga: Ischnocera) of the Picidae (Aves: Piciformes). *Proceedings of the Royal Entomological Society of London*, (B), 38(7–8), 101–113.

Eichler, W.D. (1963) Phthiraptera. 1. Mallophaga. *Bronns Klassen und Ordnungen des Tierreichs*, 5. Band III. Abteilung 7. Buch b, Leipzig, 1–291

Evenhuis, N.L. & Samuelson, G.A. (2007) Insect and Spider Collections of the World Website. Available from: http://hbs.bishopmuseum.org/codens/ (accessed 9/11/2007)

Howard, R. & Moore, A. (1991) *A Complete Checklist of the Birds of the World. 2nd edition.* Academic Press, London, 622 pp.

Johnson, K.P., Weckstein, J.D., Witt, C.C., Faucett, R.C. & Moyle, R.G. (2002) The perils of using host relationships in parasite taxonomy: Phylogeny of the *Degeeriella* complex. *Molecular Phylogenetics and Evolution*, 23, 150–157.

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, 501 pp.

Price, R.D. & Weckstein, J.D. (2006) *Picicola* Clay and Meinertzhagen (Phthiraptera: Philopteridae) from jacamars and puffbirds (Piciformes: Galbulidae, Bucconidae), with descriptions of five new species. *Zootaxa*, 1367, 37–50.

Smith, V.S. (2001) Avian louse phylogeny (Phthiraptera: Ischnocera): A cladistic study based on morphology. *Zoological Journal of the Linnean Society*, 132, 81–144.

Somadder, K. & Tandan B.K. (1977) Degeerielline Ischnocera (Insecta: Phthiraptera) of the Pittidae (Aves). *Oriental Insects*, 11(1), 113–138.

Valim, M.P. & Linardi, P.M. (2006) Two new species of *Picicola* Clay and Meinertzhagen, 1938 (Phthiraptera: Philopteridae) from Piciformes (Bucconidae and Galbulidae) in Brazil. *Zootaxa*, 1172, 21–29.

Williams, N.S. (1979) The *Picicola* (Mallophaga: Philopteridae) of the Passeriformes (Aves). *Journal of the Kansas Entomological Society*, 52(4), 633–640.