



Morphological variation in *Guimaraesiella* Eichler, 1949 (Phthiraptera: Ischnocera: Philopteridae: *Brueelia*-complex)

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Guimaraesiella Eichler, 1949, is the most morphologically heterogeneous genus in the *Brueelia*-complex. Interspecific differences in genitalia, head shape, extent of dorsal preantennal suture, and abdominal chaetotaxy can be extensive. Moreover, the genus *Guimaraesiella* is known from a vast range of host families, and are likely to occur on most passeriform families across the world [1, 2]. In many cases, lice that are genetically and morphologically indistinguishable are known to parasitize multiple host species, including hosts from different host families [1].

Many of the known *Guimaraesiella*, and most of the roughly 150 undescribed species we have examined, are morphologically similar to the type species. However, some morphologically distinct species, such as *Guimaraesiella menuraelyrae* (Coinde, 1859), are phylogenetically nested inside this group of *Guimaraesiella* [1]. Delimitation of groups within this genus is therefore problematic, especially as the undescribed diversity is larger than the described diversity. Several genera have previously been proposed for smaller groups within this genus, but these have not been based on an extensive survey of character variation within *Guimaraesiella* or the *Brueelia*-complex. The recently erected genera *Callaenirmis* Mey, 2017, *Mohoaticus* Mey, 2017, and *Philemonellus* Mey, 2017, are all synonymous with *Guimaraesiella*.

We here outline 14 species groups within *Guimaraesiella*, and place known species into these groups as far as possible, based on original descriptions and examinations of type specimens and other material. Some known species are too poorly described to be placed in any group, and are here considered *incerta sedis* within *Guimaraesiella*. Several of the species groups suggested here (marked with *) may warrant recognition as subgenera in the future. This includes the *G. diaprepes* species group, for which the subgeneric name *Mohoaticus* Mey, 2017, is available. We have seen additional undescribed species from almost all these groups.

The primary character sets used for species group delimitations are: structure of the male mesosome; structure of the female subgenital plate; structure of the preantennal area; presence/absence of accessory post-spiracular setae (*aps*) on male tergopleurites (absent in females unless otherwise indicated).

This poster is not issued for permanent scientific record or purposes of zoological nomenclature, and is not regarded as published within the meaning of the International Code for Zoological Nomenclature (ICZN), Ed. 4, Article 8.2 and 8.3. Detailed accounts, with more thorough illustrations, redescrptions of all new species mentioned here, are under preparation. New species are therefore given here in citation marks and non-italicized.

"*Guimaraesiella barbata*" species group

- Head rounded pentagonal
- Ventral sclerite of male genitalia with single anterior extension
- Distal mesosome smooth
- Gonopore terminal, with smooth anterior margin
- Dorsal anterior plate not separate
- Female subgenital plate with lateral submarginal extensions
- *aps*: IV-VII (also in female)

Hosts: Malaconotidae
Range: Afrotropical

***Guimaraesiella cicchini* species group**

- Head dome-shaped
- Dorsal anterior plate not separate, preantennal area unique
- Ventral sclerite of male genitalia with paired anterior extensions
- Distal mesosome smooth
- Gonopore terminal, anterior margin slightly rugose
- Female subgenital plate with medianly displaced cross-piece
- *aps*: V-VII

Hosts: Trogoniformes
Range: Neotropical
Note: Head and female genitalia redrawn from [4]; male genitalia redrawn from [2].

Guimaraesiella galapagensis* species group

- Head pentagonal
- Ventral sclerite absent or diffuse
- Distal mesosome rugose centrally or laterally
- Gonopore ventral, with smooth anterior margin
- Dorsal anterior plate separate (except *G. brunneinucha*)
- Female subgenital plate with lateral submarginal bulges
- *aps*: IV-VII or V-VII

Hosts: Cardinalidae, Mimidae, Turdidae, Passerellidae, Thraupidae, Tyrannidae
Range: Neotropical
Note: Head and female genitalia redrawn from [5] (head *G. saltator*, female genitalia *G. brunneinucha*; no scales in original); male genitalia redrawn from [2].

"*Guimaraesiella limpopoensis*" species group

- Head dome-shaped
- Dorsal anterior plate not separate
- Ventral sclerite of male genitalia with paired anterior extensions
- Distal mesosome smooth, elongated
- Gonopore ventral, with smooth anterior margin
- Female subgenital plate with lateral submarginal bulges
- *aps* absent on all tergopleurites

Hosts: Malaconotidae
Range: Afrotropical

***Guimaraesiella myiophoneae* species group**

- Head rounded triangular-pentagonal
- Dorsal anterior plate separate
- Ventral sclerite of male genitalia without anterior extension, but with lateral diffuse ridges
- Distal mesosome rugose near gonopore
- Gonopore ventral, with smooth anterior margin
- Female subgenital plate with lateral submarginal bulges
- *aps*: IV-VII

Hosts: Turdidae
Range: Indo-Malayan
Note: Very large species.

***Guimaraesiella papuana* species group**

- Head variable
- Dorsal anterior plate not separate
- Ventral sclerite of male genitalia with single anterior extension
- Distal mesosome smooth
- Gonopore terminal
- Female subgenital plate with or without lateral submarginal bulges
- *aps*: IV-VII, V-VII, or VI-VII

Hosts: Over 60 families
Range: Global
Species shown: *G. papuana* redrawn from [2]; *G. nouankensis*

***Guimaraesiella sexmaculata* species group**

- Head rounded trapezoidal
- Dorsal anterior plate not separate
- Ventral sclerite of male genitalia with single anterior extension
- Distal mesosome with paired rugose nodi
- Gonopore ventral, with smooth anterior margin
- Female subgenital plate with lateral submarginal bulges
- *aps*: V-VII

Hosts: Dicuridae, Oriolidae, Vangidae
Range: Afrotropical, Indo-Malayan

Guimaraesiella Eichler, 1949

- Dacophorus* Nitzsch, 1818: 289 (in partim).
- Nirmus* Nitzsch, 1818: 293 (in partim).
- Degeriella* Neumann, 1906: 60 (in partim).
- Brueelia* Kéler, 1936: 257 (in partim).
- Guimaraesiella* Eichler, 1949: 11.
- Xobagradus* Eichler, 1949: 13.
- Allobrueelia* Eichler, 1949: 36.
- Allobrueelia* Eichler, 1952: 74.
- Maculinirmus* Zlotorzkyca, 1964: 247 (in partim).
- Olivinirmus* Zlotorzkyca, 1964: 246 (in partim).
- Alteinirmus* Zlotorzkyca, 1964: 263.
- Nitzschinirmus* Mey & Barker, 2014: 101.
- Callaenirmis* Mey, 2017: 92 new synonymy [3]
- Philemonellus* Mey, 2017: 145 new synonymy [3]
- Mohoaticus* Mey, 2017: 173 new synonymy [3]

Type species: *Dacophorus subalbicans* Piaget, 1885:6
[= *Dacophorus papuanus* Giebel, 1879: 475] ex *Paradisaea minor* Shaw, 1809, by original designation.

- Included species (arranged by species group):**
- "*Guimaraesiella barbata*" species group**
 - "*Guimaraesiella barbata*" n. sp.
 - "*Guimaraesiella capensis*" species group**
 - "*Guimaraesiella capensis*" n. sp.
 - Guimaraesiella cicchini* species group**
 - Guimaraesiella cicchini* (Valim & Weckstein, 2011)
 - Guimaraesiella insolita* (Cicchino, 1983)
 - Guimaraesiella sueta* (Valim & Weckstein, 2011)
 - Guimaraesiella diaprepes* species group**
 - Guimaraesiella diaprepes* (Kelllogg & Chapman, 1902)
 - Guimaraesiella busharae* (Ansari, 1955)
 - Guimaraesiella aoolis* (Mey, 2017) n. comb. [3]
 - Guimaraesiella pterocarphagus* (Mey, 2017) n. comb. [3]

- Guimaraesiella galapagensis* species group**
 - Guimaraesiella antiqua* (Ansari, 1956)
 - Guimaraesiella brunneinucha* (Cicchino, 1983)
 - Guimaraesiella cubana* (Cicchino, 1983)
 - Guimaraesiella erythrophthalma* (Cicchino, 1983)
 - Guimaraesiella galapagensis* (Kelllogg & Kuwana, 1902)
 - Guimaraesiella incerta* (Cicchino, 1983)
 - Guimaraesiella pallidula* (Garrison, 1916)
 - Guimaraesiella polyglotta* (Williams, 1983)
 - Guimaraesiella saltatoria* (Carriker, 1956)

- "*Guimaraesiella ghanae*" species group**
 - "*Guimaraesiella ghanae*" n. sp.

- "*Guimaraesiella limpopoensis*" species group**
 - "*Guimaraesiella limpopoensis*" n. sp.

- "*Guimaraesiella mcgrewi*" species group**
 - "*Guimaraesiella mcgrewi*" n. sp.

- Guimaraesiella myiophoneae* species group**
 - Guimaraesiella myiophoneae* (Clay, 1936)
 - Guimaraesiella neodumaee* (Najser & Sychra [in Najser et al.], 2012) ??

- Guimaraesiella pandolura* species group**
 - Guimaraesiella pandolura* Gustafsson & Bush, 2017

- Guimaraesiella papuana* species group**
 - Guimaraesiella addolorati* (Cicchino, 1986)
 - Guimaraesiella amsel* (Eichler, 1951)
 - Guimaraesiella callaencola* (Valim & Palma, 2015)
 - Guimaraesiella capitus* (Ansari, 1955)
 - Guimaraesiella chiquena* (Cicchino, 1986)
 - Guimaraesiella cucphuongensis* (Najser & Sychra [in Najser et al.], 2012)
 - Guimaraesiella flavola* (Najser & Sychra [in Najser et al.], 2012)
 - Guimaraesiella ilmasae* (Ansari, 1956)
 - Guimaraesiella kokakophilus* (Mey, 2017) n. comb. [3]
 - Guimaraesiella magellanica* (Cicchino, 1986)
 - Guimaraesiella marginata* (Burmeister, 1838)
 - Guimaraesiella menuraelyrae* (Coinde, 1859)
 - Guimaraesiella nitzschii* (Ponton, 1871)
 - "*Guimaraesiella nouankensis*" n. sp.
 - Guimaraesiella ouestensis* (Ansari, 1955)
 - Guimaraesiella pallida* (Piaget, 1880)
 - Guimaraesiella papuana* (Giebel, 1879)
 - Guimaraesiella pentlandensis* (Mey, 2017) n. comb. [3]
 - Guimaraesiella persimilis* (Cicchino, 1987)
 - Guimaraesiella setifer* (Ansari, 1955)
 - Guimaraesiella rhampocellii* (Cicchino, 1983) ??
 - Guimaraesiella saghariae* (Ansari, 1955)
 - Guimaraesiella samoensis* (Mey, 2017) n. comb. [3]
 - Guimaraesiella satelles* (Nitzsch [in Giebel], 1866)
 - Guimaraesiella setifer* (Piaget, 1885)
 - Guimaraesiella similis* (Cicchino, 1986)
 - Guimaraesiella timorensis* (Mey, 2017) n. comb. [3]
 - Guimaraesiella tristis* (Giebel, 1874)
 - Guimaraesiella turdinusae* (Ansari, 1956)
 - Guimaraesiella viscovis* (Denny, 1842)
 - Guimaraesiella wallacei* (Mey & Barker, 2014)

- Guimaraesiella sehri* species group**
 - Guimaraesiella avinus* (Ansari, 1956)
 - Guimaraesiella sehri* (Ansari, 1955)

- Guimaraesiella sexmaculata* species group**
 - Guimaraesiella dicruri* (Ansari, 1955)
 - Guimaraesiella sexmaculata* (Piaget, 1880)

- "*Guimaraesiella tenella*" species group**
 - "*Guimaraesiella tenella*" n. sp.

- Guimaraesiella incerta sedis***
 - Guimaraesiella abbasii* (Carriker, 1956)
 - Guimaraesiella atricapilla* (Cicchino, 1983)
 - Guimaraesiella bisetacea* (Piaget, 1885)
 - Guimaraesiella borneensis* (Mey, 2017) n. comb. [3]
 - Guimaraesiella concava* (Eichler [in Niehammer], 1956)
 - Guimaraesiella grammaticea* (Solier-Cruz et al. 1987)
 - Guimaraesiella haftorni* (Balát, 1981)
 - Guimaraesiella interposita* (Kelllogg, 1899)
 - Guimaraesiella lais* (Giebel, 1874)
 - Guimaraesiella melanococca* (Carriker, 1903)
 - Guimaraesiella nigrosignata* (Piaget, 1880)
 - Guimaraesiella niquitai* (Carriker, 1903)
 - Guimaraesiella ptiliagonis* (Carriker, 1903)
 - Guimaraesiella schistacea* (Cicchino, 1983)
 - Guimaraesiella subocata* (Piaget, 1880)
 - Guimaraesiella tauilis* (Eichler [in Niehammer], 1956)
 - Guimaraesiella tovarnikae* (Balát, 1981)

References:
[1] Bush, S.E., Weckstein, J.D., Gustafsson, D.R., Allen, J., Dibbas, E., Shree, S.M., Bold, R., Skewn, H.R., & Johnson, K.P. (2018) Unlocking the black box of feather louse diversity: A molecular phylogeny of the super-clade genus *Brueelia*. *Molecular Phylogenetics and Evolution* 94, 737-751.
[2] Gustafsson, D.R. & Bush, S.E. (2017) Morphological revision of the hyperdiverse *Brueelia*-complex (Insecta: Phthiraptera: Ischnocera: Philopteridae) with new taxa, checklists and generic key. *Zootaxa* 4313, 1-443.
[3] Gustafsson, D.R. & Bush, S.E. (in review) The genus and species of the *Brueelia*-complex (Phthiraptera: Philopteridae) described by Mey (2017).
[4] Valim, M.F. & Weckstein, J.D. (2011) Two new species of *Brueelia* Kéler, 1936 (Ischnocera, Philopteridae) parasitic on Neotropical trogons (Aves, Trogoniformes). *Zootaxa* 128, 1-13.
[5] Cicchino, M.C. (1986) *Especies nuevas o poco conocidas del género Brueelia Kéler, 1936* (Mallophaga: Philopteridae), parásitos de Passeriformes, Piformes y Trogoniformes (Aves) americanas. *Revista del Museo Entomológico Argentino* 42, 283-303.

"*Guimaraesiella capensis*" species group

- Head rounded pentagonal
- Dorsal anterior plate separate
- Ventral sclerite of male genitalia with single anterior extension and broad posterior extension reaching gonopore
- Distal mesosome smooth
- Gonopore terminal, with smooth anterior margin
- Female subgenital plate with lateral submarginal extensions
- *aps*: VII only

Hosts: Platysteriidae
Range: Afrotropical

Guimaraesiella diaprepes* species group

- Head pentagonal
- Dorsal anterior plate separate
- Ventral sclerite of male genitalia with single anterior extension and paired sublateral lobes
- Distal mesosome with prominent paired rugose nodi and sinuous lateral margins ventrally
- Gonopore ventral, with serrated anterior margin and lateral hooks
- Female subgenital plate with lateral submarginal extensions
- *aps*: V-VII

Hosts: Fringillidae, Turdidae
Range: Hawaiian, Neotropical

"*Guimaraesiella ghanae*" species group

- Head rounded pentagonal
- Dorsal anterior plate not separate
- Ventral sclerite of male genitalia with single anterior extension
- Distal mesosome rugose around gonopore
- Gonopore terminal, with smooth anterior margin
- Female subgenital plate with medianly displaced cross-piece
- *aps*: VI-VII

Hosts: Malaconotidae
Range: Afrotropical

"*Guimaraesiella mcgrewi*" species group*

- Head rounded pentagonal
- Dorsal anterior plate separate
- Ventral sclerite of male genitalia absent
- Distal mesosome with prominent paired nodi and lobe-like rugose areas
- Gonopore ventral, with smooth anterior margin, often decorated
- Female subgenital plate with complete cross-piece
- *aps*: IV-VII

Hosts: Leiothrichidae, Pellorinidae
Range: Indo-Malayan

***Guimaraesiella pandolura* species group**

- Head rounded pentagonal
- Dorsal anterior plate separate
- Ventral sclerite of male genitalia with single anterior extension
- Distal mesosome with extensive rugose area
- Gonopore ventral, with smooth anterior margin
- Female subgenital plate without lateral bulges or extensions
- *aps*: VI-VII (also in female)

Hosts: Camphephagidae
Range: Indo-Malayan
Note: Illustrations from [2].

Guimaraesiella sehri* species group

- Head rounded pentagonal
- Dorsal anterior plate not separate
- Ventral sclerite of male genitalia with single anterior extension
- Distal mesosome bilobed, angular, with distinct marginal nodi
- Gonopore ventral, with smooth anterior margin, often decorated
- Female subgenital plate with complete cross-piece
- *aps*: IV-VII

Hosts: Leiothrichidae
Range: Indo-Malayan

"*Guimaraesiella tenella*" species group*

- Head pentagonal
- Dorsal anterior plate separate
- Ventral sclerite of male genitalia with single anterior extension
- Distal mesosome with paired sinuous nodi and lateral rugose areas
- Gonopore ventral, with smooth anterior margin
- Female subgenital plate with complete cross-piece
- *aps*: V-VII

Hosts: Timaliidae
Range: Indo-Malayan