

# First description and illustration of the male of *Corcorides biocellatus* Mey 2004 (Phthiraptera: Ischnocera: Philopteridae)

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## Abstract

We describe the male of *Corcorides biocellatus* Mey 2004, for the first time, including illustrations and a comparison with the only other species in the genus, *Corcorides inopinatus* Mey 2004. We discuss the placement of this species within the *Philopterus*-complex.

**Key words:** Phthiraptera, Philopteridae, *Corcorides*, chewing lice.

## Introduction

Mey (2004) described the genus *Corcorides*, in which he placed two species, both of which were described as new in the same publication. The type species of this genus is *Corcorides inopinatus* Mey 2004, which was partially illustrated by Mey (2004). However, only the female of the second species was described, *Corcorides biocellatus* Mey 2004. To complement Mey's description of the female of *C. biocellatus*, we here provide an illustration of the male of the same species, including the male genitalia.

## Materials and methods

All studied material was previously mounted and deposited at the Natural History Museum, London (NHML). All studied material was previously mounted in Canada balsam on microscope slides, which were examined with a Nikon Eclipse E600 microscope (Nikon, Belmont, California, USA) fitted with an Olympus DP25 camera (Olympus, Center Valley, Pennsylvania, USA). Line drawings were made using a drawing tube attached to the same microscope, then edited in GIMP (www.gimp.org).

Measurements were made in ImageJ 1.48v (Wayne Rasband, <https://imagej.nih.gov>) for the following dimensions (with mean values in parentheses): TL = total length (at midline); HL = head length (at midline); HW = head width (at temples); PRW = prothorax width (at widest point); PTW = pterothorax width (at widest point); AW = abdominal width (at posterior margin of fifth segment).

Terminology for chaetotaxy and structural characters follows Gustafsson and Bush (2017) and include: *ads* = anterior dorsal seta; *as1* = anterior seta 1; *dsms* = dorsal submarginal seta; *mts1-5* = marginal temporal setae 1-5; *os* = ocular seta; *pns* = postnodal seta; *pos* = preocular seta; *pts* = posttemporal seta; *s1-4* = head sensilla 1-4; *sts* = sternal seta. Taxonomically important head setae are labelled in figure 1.

Host taxonomy follows Clements *et al.* (2023).

## Results

Phthiraptera Haeckel 1896

Ischnocera Kellogg 1896

Philopteridae Burmeister 1838

*Corcorides* Mey 2004

(Haeckel, 1896: 703; Kellogg, 1896: 63; Burmeister, 1838: 422; Mey, 2004: 158).

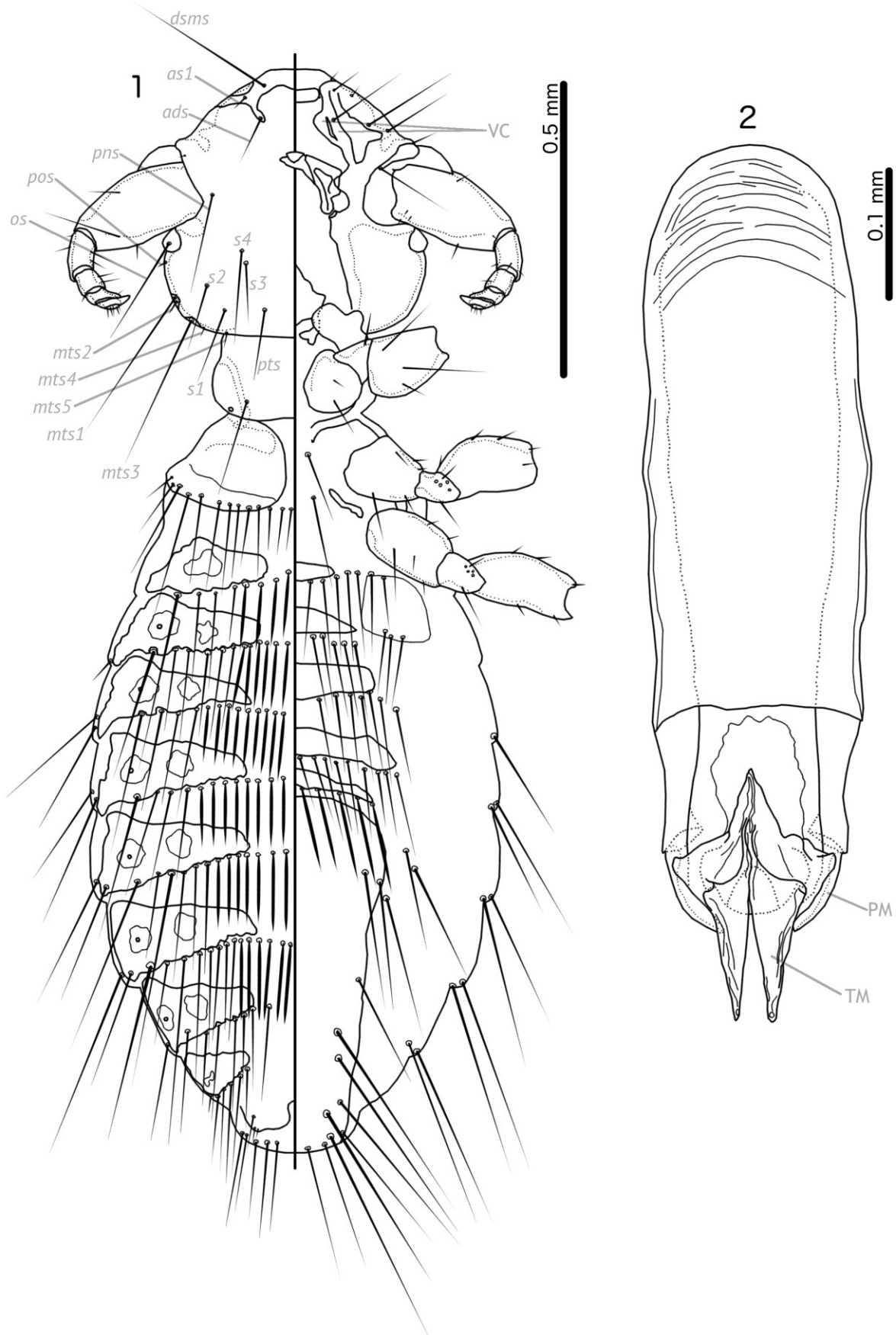
*Corcorides biocellatus* Mey 2004

*Corcorides biocellatus* Mey 2004 (figure 1-2) (Mey, 2004: 162).

Type host: *Struthidea cinerea cinerea* Gould 1837 - apostlebird.

Type locality: Mount Harris Station, Warren, New South Wales, Australia.

Description: head as in figure 1. Preantennal area short, flattened trapezoidal, with more or less flat frons. Hyaline margin wide. Dorsal preantennal suture reaches *ads* and lateral margin of head, but does not surround dorsal anterior plate. Ventral anterior plate present, wider than long. Marginal carina interrupted medianly, narrowed but not interrupted laterally. Ventral carina as two subparallel bars that fuse anterior to pulvinus. Preantennal nodi small, pedunculated. Coni small, rounded. Trabecula long, arched. Antennae sexually dimorphic, with male scape much longer and swollen than female scape (*cf.* with Mey, 2004; fig. 10), pedicel slightly arched, and flagellomeres II–III shortened and extended medianly to form joint hook. Head chaetotaxy as in figure 1; *dsms* macroseta; *as1* dorsal, situated in lateral extension of dorsal preantennal suture; *pns*, *pts*, *s1-4* all macrosetae; *os*, *mts1* and *mts3* macrosetae, but *pos*, *mts2* and *mts4-5* microsetae. Preocular nodi much larger than postocular nodi. Marginal temporal carina slender, with indentations surrounding apertures of *mts1-2* and *mts3*. Temporal carina and dorsal postantennal sutures not present. Gular plate roughly triangular, with irregular antero-lateral margins.



**Figures 1-2.** *Corcorides biocellatus* Mey 2004. **1)** Male habitus, dorsal and ventral views. **2)** Male genitalia, ventral view. Abbreviations used: *ads* = anterior dorsal seta; *as1* = anterior seta 1; *dsms* = dorsal submarginal seta; *mts1-5* = marginal temporal setae 1-5; *os* = ocular seta; *PM* = paramere; *pns* = postnodal seta; *pos* = preocular seta; *pts* = posttemporal seta; *s1-4* = head sensilla 1-4; *TM* = triangular extensions of mesosome; *VC* = ventral carina.

Thoracic segments as in figure 1. *Pronotal post-spiracular setae* situated median to spiracle opening. Mesometathorax divided medianly. Pro-, meso-, and metasterna absent. Proepimeron slender, continuous laterally, but with diffuse median ends. Metepisternum not continuous laterally, and isolated sclerite present antero-median to coxa III on each side.

Abdominal segments as in figure 1. Tergopleurites reduced laterally, not reaching lateral margins of abdomen and not continuing to ventral side (except in segment IX+X in some specimens; this may be due to mounting). Tergopleurite II with single fenestrum in center of plate; tergopleurites III-VIII with two fenestra on each side, a lateral fenestrum surrounding spiracle openings, and a more median, typically smaller, fenestrum; tergopleurite IX+X with small, irregular fenestrum. Sternites, subgenital plate and most sternal setae displaced in all available males, and illustration only approximate; medianly continuous and wider than long in all segments. On segments II-III, weakly sclerotized plate present lateral to sternites; lateral accessory sternal plates otherwise absent on all segments. Subgenital plate long, spanning segments VI-XI but consisting of fused sternites VII-XI, reaching terminal end of abdomen. Abdominal chaetotaxy as in figure 1; central setae of tergopleurites II-VII and *sts* of sternite VI thick, blade-like; more lateral setae longer and more slender. Sclerotized sternal area lateral to sternites II-III with slender setae associated with posterior margin. Anterior subgenital plate with patch of longer, stouter setae on segment VI; long thick setae along lateral margins of distal subgenital plate.

Pigmentation: largely translucent, but carinae of head, thoracic segments and legs, as well as much of tergopleurites other than fenestra with dark pigmentation, similar to female (see Mey, 2004: fig. 10).

Male genitalia as in figure 2. Basal apodeme long, fused with parameres distally and seemingly fused with mesosome. Mesosome soft, with few clearly sclerotized parts. Proximal mesosome with wrinkled elongation overlapping distal part of basal apodeme; laterally, mesosome flares into irregular nodi; distally, mesosome dominated by paired triangular appendages (TM in figure 2) that extend beyond parameres; near distal end of each appendage a single sensillus. Parameres (PM in figure 2) short, curved medianly near base of distal appendages of mesosome; no parameral sensilla visible.

Measurements (n = 3, except AW were n = 2): TL = 1.83-1.95; HL = 0.45-0.52; HW = 0.46-0.49; PRW = 0.28-0.29; PTW = 0.47-0.49; AW = 0.70-0.72.

Material examined: *ex Struthidea c. cinerea*: 5♂, 5♀, 26 miles SE of Roma, Queensland, Australia, 28 IV 1963, coll. Harold Hall expedition, host B92 (NHML).

## Discussion

The genus *Corcorides* can be separated from all other genera in the *Philopterus*-complex, and all other ischnoceran louse genera, by the unique combination of head characters described by Mey (2004) and above. We agree with Mey (2004) that, from a morphological point of view, the two species of *Corcorides* form a very isolated

group within the Ischnocera. The combination of characters shown by *Corcorides* even makes it questionable whether this genus belongs in the *Philopterus*-complex; yet, the clear presence of trabecula indicates that the genus is an aberrant group that belongs in this complex, as this character is not found elsewhere in the Ischnocera.

Finding the closest relatives of *Corcorides* is difficult. One might expect closely related lice to be found on closely related hosts, which in the case of Corcoracidae are the Paradisaeidae and the Melampittidae (Jönsson *et al.*, 2011; 2016). However, no *Philopterus*-complex lice have been described from hosts in either of these families (Price *et al.*, 2003). Intriguingly, Mey (2004: 199) stated that the Paradisaeidae are parasitized by *Philopterus* Nitzsch 1818, and Melampittidae by *Philopteroides* Mey 2004; no such species have subsequently been described. Examination of *Philopterus*-complex lice from these hosts may provide clues to the diversification of *Corcorides*, but is it also possible that the closest living relatives of *Corcorides* are on distantly related hosts. However, a recurring pattern among *Philopterus*-complex lice is that closely related lice occur on distantly related hosts. For instance, species of *Paraphilopterus* Mey 2004, parasitize hosts in the families Cnemophilidae and Ptilonorhynchidae (Gustafsson and Bush, 2014), which are distantly related (Barker *et al.*, 2004). Similarly, the genus *Philopteroides* is known from a wide range of distantly related passerine hosts (Valim and Palma, 2013; Najer *et al.*, 2016). Thus, more information than host relatedness is necessary to understand the evolution of diversity among lice in the *Philopterus*-complex.

Morphology does not suggest any close relatives of *Corcorides*, as the preantennal structure, structure of the abdominal plates, presence of blade-like setae on the abdomen, and structure of the male genitalia are either unique among the known lice of the *Philopterus*-complex. It should be noted, however, that lice of Australo-Papuan passerines are understudied (Price *et al.*, 2003; Mey, 2004), and close relatives of *Corcorides* may be found on hosts in this region of the world. Yet, even if morphologically similar species were to be discovered, they may not be closely related. Najer *et al.* (2020) showed that even within the morphologically homogeneous genera *Philopterus* and *Philopteroides* there may be deep divergences that are not always apparent in the morphology. Genetic data will be needed to establish the position of *Corcorides* within the *Philopterus*-complex.

The morphological data is in stark contrast to the published genetic data of the group. Kolencik *et al.* (2022) included specimens identified as “*Corcorides inopinatus*” and “*Corcorides* sp. *ex Struthidea cinerea*” in their phylogeny, which were nested inside a clade otherwise containing the genera *Australophilopterus* Mey 2004, *Paraphilopterus* Mey 2004, and *Cinclosomicola* Mey 2004. These three genera are all morphologically similar, but dissimilar from *Corcorides*, with broad hyaline frons, dorsal preantennal sutures that completely surround the dorsal anterior plate, no blade-like setae, medianly continuous pteronotum, sexually monomorphic antennae, and genitalia of the same general type as those of *Philopterus* (see Mey 2004). Notably, the paraphyly of *Australophilopterus* in Kolencik *et al.* (2022) received no

**Table 1.** Prominent morphological differences between *C. inopinatus* and *C. biocellatus*. More differences may exist, but due to the partial illustrations of *C. inopinatus* and female *C. biocellatus*, an exhaustive list cannot be provided here.

Character	<i>Corcorides inopinatus</i>	<i>Corcorides biocellatus</i>
Both sexes		
<i>Preantennal seta</i>	Macroseta	Microseta
Antennae	Not sexually dimorphic	Sexually dimorphic
<i>Pronotal post-spiracular seta</i>	Situated lateral to spiracle opening	Situated median to spiracle opening
Mesometanotum	Entire	Divided medianly
Tergopleurite III	Without <i>pleural setae</i>	With <i>pleural setae</i>
Tergopleurites III–VII	With one fenestrum on each side	With two fenestra on each side
Males		
Marginal carina	Interrupted laterally	Not interrupted laterally
<i>Anterior dorsal seta</i>	Macroseta	Mesoseta
<i>Preocular seta</i>	Macroseta	Microseta
Tergopleurite XI	Undivided medianly	Divided medianly
Subgenital plate	On segment IX as rounded sclerite on each side	As medianly continuous plate covering segments VI–XI, displacing sternite VI anteriorly
Distal mesosomal appendages	Short, barely extending past base of parameres	Long, reaching far beyond distal ends of parameres
Distal sensilla of mesosome	Three sensilla visible on each side, at base of distal appendages	One sensillus visible on each side, near apical tips of distal appendages
Females		
Tergopleurites IX+X	Medianly continuous, but separate from tergopleurite XI	Medianly interrupted, but continuous with tergopleurite XI laterally
Fenestrum on tergopleurite IX+X	Absent	Present

support. Ren *et al.* (2024) reanalysed part of this dataset, and added more specimens from *Philopteroides sensu lato*, and obtained a different result, placing *Corcorides* as sister to a clade containing *Paraphilopterus* nested inside *Australophilopterus*. Ren *et al.* (2024) included only two of the three species of *Australophilopterus* used by Kolencik *et al.* (2022), indicating that choice of included species may affect the phylogeny of this case. Conclusions on the relationship between these genera may thus be premature.

Moreover, as detailed in table 1, the two species of *Corcorides* are dissimilar morphologically. In particular, the differences in sexual dimorphism of the antennae between the two species of *Corcorides* is interesting. Sexually dimorphic antennae are known to have evolved within groups of lice that otherwise have sexually monomorphic antennae, for instance in *Guimaraesiella menu-raelyrae* (Coinde 1859) (Coinde, 1859; Mey and Barker, 2014; Bush *et al.*, 2016). However, as shown here for *Corcorides*, closely related species may differ in the dimorphism of the antennae but be united by other structures that may be more taxonomically informative. In the case of *Corcorides*, the structure of the ventral carina and the male genitalia unite these two species and separate them from all other *Philopterus*-complex genera, despite the differences in the antennae. We therefore consider these two species to be congeneric, and that the presence of sexual dimorphism is not a sign that the two species should be separated generically. This is similar to many genera in the *Brueelia*-complex in which some congeneric species have sexually dimorphic antennae and some

do not [*e.g.*, *Guimaraesiella* Eichler 1949 (Eichler, 1949; Gustafsson *et al.*, 2019)]. Likewise, the difference in male antennal morphology may not be informative in *Corcorides*.

In summary, the morphology of both species of *Corcorides* makes placement of this genus difficult both within the *Philopterus*-complex and within Ischnocera as a whole, and genetic data may be necessary to address this issue. However, a large proportion of Australo-Papuan hosts have never been sampled for lice; extensive sampling of suitable hosts may be required to find close relatives for comparisons.

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