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## Revision of Afrotropical *Chonocephalus* Wandolleck (Diptera: Phoridae)

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### Abstract

*Chonocephalus justini* sp. nov., *C. modestus* sp. nov. and *C. pudicus* sp. nov. are described from the Seychelles; *C. cummingae* sp. nov. is described from Madagascar, South Africa and Zimbabwe; and *C. cautus* sp. nov. and *C. steineri* sp. nov. from Madagascar. *C. dimakae* Paulian is synonymized with *C. depressus* Meijere. A key to males and a partial key to the females of the 14 Afrotropical species are provided.

**Keywords:** Afrotropical Region, *Chonocephalus*, Diptera, keys, new species, Phoridae

### Introduction

The tiny scuttle flies of the genus *Chonocephalus* Wandolleck are noted for their sexual dimorphism, with the females being flightless but the males being normally winged. Many species breed in ripe fruits, while some exploit other sources of fermenting detritus or plant material, and some are fungivores. The males transport females to suitable larval pabula during nuptial flights (Disney 1994).

Many casual collectors seem unaware of the sexual dimorphism in this genus and consequently have tended to collect only one sex. The naming of undescribed species on the basis of one sex only created the current taxonomic chaos. The growing list of undescribed males and females had become such that I am now naming undescribed males but assigning code letters only to undescribed females as yet unassociated with their males. Such a policy runs the risk that we may describe as new some named species already known in the female sex only. As these are associated with their males, we will thereby create some synonyms. This is probably a smaller price to pay than a confusing proliferation of species (described from males alone) known by code numbers only alongside a smaller list of females known only by code letters. Museum collections abound in misidentified specimens and many species awaiting description. In order to provide the basis for moving forward, all named species in literature were recently reviewed and keys to the Nearctic and Palearctic species were provided. Furthermore, this revision of the 43 previously

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recognized species on the world list reduced this to 32 valid species, with the possibility that some only known in the female sex might be the missing females of some species only known in the male sex (Disney 2002). In this paper I describe six new species of Afrotropical species, propose one synonym and provide keys to both sexes for the species of this region. Some females only known in this sex are given code letters only.

## Methods

The identification of members of this genus requires slide-mounted specimens. Indeed the females can only be reliably identified by means of internal features of the abdomen (see below). The preferred mounting medium is the so-called Berlese Fluid gum chloral medium, used with coverslips of 10 and 6 mm diameter (Disney 1983, 1994). Upton (1993) has advised against use of this mountant, but some of his criticisms are based on a number of dubious assumptions and misapprehensions (Disney 2001).

For males, the recognition of the species depends primarily on the details of the hypopygium. These are best detached from the rest of the fly and mounted under a separate 6 mm coverslip with the underside uppermost. When several specimens are available then it is useful if some are mounted to display the left face of the hypopygium. Females are mounted whole with the dorsal face uppermost. When several specimens are available it is useful to detach the legs from at least one specimen and mount these under separate coverslips.

### **Genus *Chonocephalus* Wandolleck, 1898**

*Type species.* *Chonocephalus dorsalis* Wandolleck, 1898, p 428.

The genus is readily identified in the most recent key to world genera (Disney 1994), with the modification that the genus *Epichonocephalus* Schmitz was synonymized with *Chonocephalus* in my recent revision, which provides a detailed diagnosis of the genus in both sexes (Disney 2002). The wings of the males are distinctive (Figure 40) as is the general appearance of the females (Figure 32).

### *Males*

The recognition of species depends primarily on the details of the hypopygium, which is at first sight very complex. However, if one ignores the, often elaborate, penis complex (X), the details of the epandrium (E) and hypandrium (H) that are referred to in the key below are indicated in Figure 1. This represents a generalized, stylized, hypopygium. While the anal tube (A) is not utilized in the recognition of species it is a useful point of reference. Any one of the labelled structures may be modified and may sometimes be very elaborate in form. In the inferred groundplan state the rear margin of the hypandrium bears four processes. These are the gonopods (g) and a pair of median lobes (l). In the plesiomorphic state the gonopods articulate with the dorsal face of the hypandrium, but more frequently they arise from it. One (usually the left) or both may be reduced or absent. The median lobes (l) may form a single bilobed structure or be reduced to a single lobe (which may be greatly elongated) or be lost altogether. Ventrally each side of the epandrium (E) typically bears an anterior process (a) and a posterior process (p). In some species the anterior processes (a) may appear to be appendages (attaching to the inner face of the epandrium)

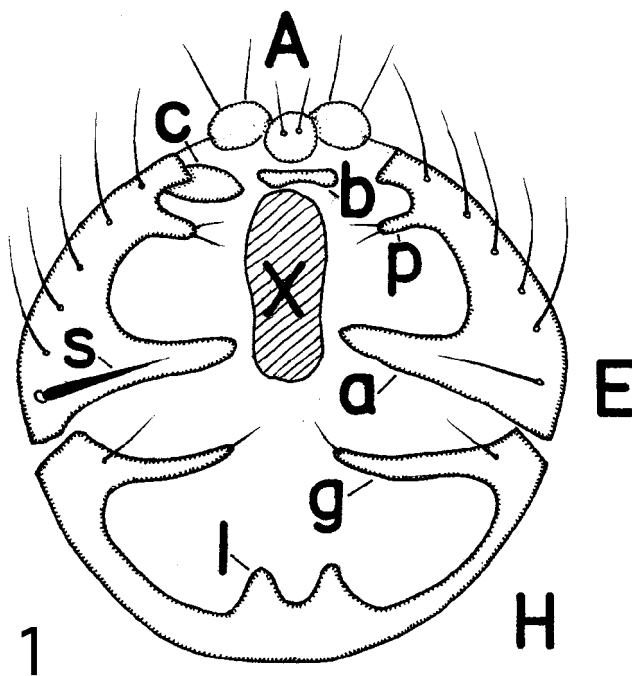


Figure 1. *Chonocephalus* male hypopygium, diagrammatic ventral view of a generalized species. A, anal tube (with median hypoproct and paired cerci); E, epandrium; H, hypandrium; X, penis complex (simplified). a, p, anterior and posterior processes (probably=subepandrial sclerites) of epandrium; l, lobe(s) of hypandrium; g, gonopod; b, bridge (probably=sternite 10); c, left surstylus (clasper); s, spine (modified bristle) of epandrium.

rather than simple projections of the epandrium. A presumed true left surstylus or clasper (c) is frequently present (e.g. Figure 18), variably fused to the epandrium, and is sometimes elaborate. Occasionally it is fused to the bridge (b), which is sometimes present and probably represents sternite 10. The most anterior (lower) bristle of the left side of the epandrium is sometimes modified into a spine (s), which may be further modified.

Key to males of Afrotropical species

- 1 Right gonopod with stem preceding swollen tip about four times as long as latter (Figure 46) . . . . . *hibisci* Paulian
- Right gonopod clearly shorter . . . . . 2
- 2 Right gonopod as Figure 50. Left gonopod as Figure 49. Left epandrial process is a long rectangle (Figure 47) whose posterobasal region attaches to the tip of the posterior arm of the large T-shaped right process (Figure 48) to form a complex bridge. The true bridge (b) is only sclerotized in the left two-thirds (Figure 47) . . . . . *justini* sp. nov.
- Not so . . . . . 3
- 3 The lowest bristle on left side of epandrium (S in Figure 1) is differentiated as a strong spine and brown left surstylus is present (C in Figure 1) (Figures 14, 18, 59) . . . . 4
- Bristle S is not differentiated and left surstylus absent . . . . . 7

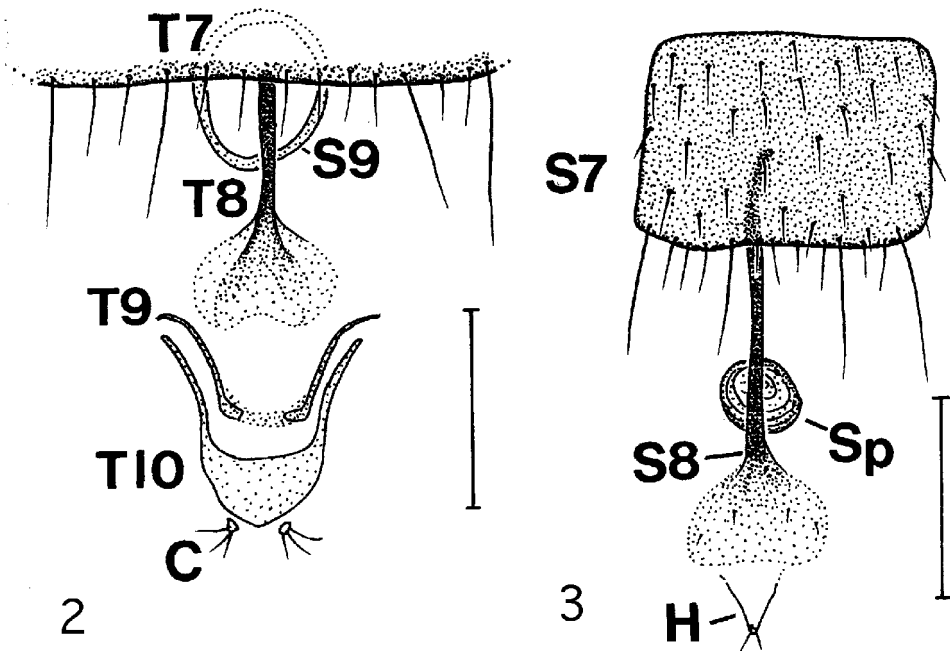
- 4 Bristle S of left side of epandrium stands at base of a dark brown, bare, leaf-shaped process (Figure 14). Other details of hypopygium as Figures 15–17 . . . *collini* Disney
  - Without this dark process associated with bristle S. . . . . 5
- 5 Right lobe of hypandrium long and tapering to a dark brown pointed tip (Figure 19) . . . . . *cunninggae* sp. nov.
  - Right hypandrial lobe shorter, broader and not tapered to a darker pointed tip (Figures 13, 62). . . . . 6
- 6 Right gonopod with spine-like bristles as Figure 61, otherwise bare. Thumb-like posterior lobe of left side of epandrium with fine hairs to tip (Figure 59). . . . .
  - . . . . . *steineri* sp. nov.
  - Right gonopod with different spines and numerous fine hairs (Figure 13). Thumb-like posterior lobe of left side of epandrium bare between fine hairs at base and longer ones at tip (Figure 10) . . . . . *cautus* sp. nov.
- 7 Hypandrial lobes and left gonopod reduced to short brown lobes that are at most as long as broad (Figures 23, 52) and the brown right gonopod is a long process tapering to a point (Figures 24, 51) . . . . . 8
  - Gonopods and hypandrial lobes otherwise. . . . . 9
- 8 Epandrial processes as Figure 23, the left anterior process having a small process towards its base . . . . . *depressus* Meijere
  - Epandrial processes as Figure 51, the left process having a small dark ridge running backwards from its base . . . . . *madagascariensis* Paulian
- 9 Left side of epandrium with at least 10 hairs (Figures 4, 29, 30, 34, 41) . . . . . 10
  - Left side of epandrium with fewer than 10 hairs (Figures 53, 57) . . . . . 13
- 10 The microtrichia of the left side below the hairs are modified into pointed scales (m in Figure 4). Gonopods and lobes of hypandrium as Figures 5–7. . . . .
  - . . . . . *americanus* Borgmeier
  - Microtrichia of left side near margin absent and nearest ones are not modified. Details of gonopods and lobes of hypandrium otherwise (Figures 28–31, 36, 41) . . . . . 11
- 11 Bridge (b in Figure 1) in form of distinctive horseshoe shape (Figure 34). Gonopods as Figure 36 . . . . . *fletcheri* Schmitz
  - Bridge not of this form. Gonopods otherwise (Figures 28–31, 41) . . . . . 12
- 12 Right gonopod asymmetrically expanded distally and with the longer arm directed rearwards and likewise the right process a of the epandrium; and left gonopod a long narrow process bearing a pair of bristles at its slightly expanded tip (Figure 41) . . . . . *heymonsi* Stobbe
  - Right gonopod otherwise and left gonopod much more robust and with a single bristle at its tip (Figures 28–31). Right process a of epandrium similar. *dominicanus* Borgmeier
- 13 The two to three most anterior bristles on each side of epandrium are distinctly smaller than the rest and right side of epandrium with processes as Figure 57. . . . .
  - . . . . . *pudicus* sp. nov.
  - The two to three most anterior bristles on each side of epandrium not differentiated from the rest and right side of epandrium with processes as Figure 54. . . . .
    - . . . . . *modestus* sp. nov.

*Females*

The morphology of the females has been discussed elsewhere (Disney 1986, 2002). It was concluded that the first, long, abdominal tergite is a composite of T1+T2 fused together,

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and that the last, also relatively long, fully developed tergite is T7 (Figure 32). The microtrichia, lying between the hairs on these tergites, are frequently reduced in size and consequently tend to be more densely packed (cf. Figures 38, 39). Otherwise the taxonomically useful features are mainly the form and size of the modified abdominal tergite (T8) and sternite 8 (S8), the internalized sternite 9 (furca) and the spermatheca. Typically the remnants of T9 are variably fused to the anterolateral apodemes of T10. These structures are most fully developed in *C. blackithorum* (Figures 2, 3). The form and dimensions of sternite 8 have proved to be especially valuable taxonomically. This sternite has seemingly evolved from an isosceles triangular sternite whose anterior end continues internally as an anteriorly directed apodeme (e.g. Figure 3). In many species the external sternite is greatly reduced or lost while the internal apodeme has increased in length. In some species a small sternite is retained as an externally visible projection (e.g. Figure 9). Tergite 8 is frequently reduced or seemingly absent. In the latter case it is present but only very lightly pigmented. Its presence may be discerned in many such cases by locating a minute hair at each posterolateral corner (e.g. Figure 8). However, these hairs are sometimes absent. There can be some confusion between the furca and spermatheca. Both are subcircular structures lying close to each other between T8 (when present) and S8. The spermatheca is typically a lightly pigmented bowl-shaped structure, as in *C. blackithorum* (Sp in Figure 3) while the furca is hoop-shaped and paler (S9 in Figure 2). However, in many species one or other or both of these structures may be very pale and it may require critical adjustment of the microscope's lighting in order to discern them both. In observing a female mounted on a slide with its dorsal side uppermost, as one focuses downwards the sequence of encounter is T8–furca (S9)–spermatheca–S8 (e.g. Figure 26). Where an egg is



Figures 2, 3. *Chonocephalus blackithorum* female, details of terminal segments of abdomen. (2) From above. c, cercus; S9, sternite 9 (furca); T7–T10, tergites 7–10. (3) From below. H, hypoproct; S7–S8, sternites 7–8; sp, spermatheca. Scale bars: 0.1 mm.

in place ready for laying, then it lies below T8 and the furca but above the spermatheca and S8. Indeed, the furca is often displayed to view most clearly against the background of such an egg. When no egg is in this position the furca may be tilted sideways on (as viewed from above or below).

Key to females of Afrotropical species

It should be noted that abdominal tergite 3 (T3) is the second apparent tergite as T1 is vestigial or fused to T2.

*Caution:* these keys to females not only include species given code letters only (until they can be linked to their males) but omit several species, as the number of these coded females is smaller than the number of species still only known in the male sex.

- 1 Microtrichia, between the hairs, on frons as strongly developed as those on abdominal tergites and not so densely packed (e.g. Figure 39). Without obvious submarginal dark bands at rear of abdominal tergites. Tip of sternite 8 (S8) and spermatheca as Figure 9 . . . . . *americanus* Borgmeier
- Microtrichia on frons much smaller and more densely packed than those on T1+2–T6 or else they are small and dense in both situations (e.g. Figure 38). Without other features combined . . . . . 2
- 2 T1+2–T6 with submarginal dark bands at rear margins (e.g. Figure 32) . . . . . 3
- No such dark bands (S8 as Figure 37) . . . . . *fletcheri* Schmitz
- 3 T3 with less than 20 hairs (most arising from pale spots) at rear margin (e.g. Figure 32) . . . . . 4
- T3 with more than 20 hairs at rear margin (e.g. Figure 43) . . . . . 6
- 4 Microtrichia of T1+2–T6 a little longer and less dense than those on thoracic notum . . . . . 5
- These microtrichia as small and as dense as those on thoracic notum. . . . . 6
- 5 T8 more strongly developed and furca a simple ring (Figures 21, 22). Hind tarsus with ventral hair palisade on basitarsus only . . . . . *cummingae* sp. nov.
- T8 weaker and furca more complex (Figure 33). Hind tarsus with ventral hair palisade on first two segments . . . . . *dominicanus* Borgmeier
- 6 Microtrichia on T1+2–T6 larger and less dense (e.g. Figure 39) . . . . . 7
- These microtrichia smaller and more dense (Figure 38) . . . . . 8
- 7 T8 obscure in posterior two-thirds, posterior end of S8 in form of a stirrup-like loop (which may be pale) and spermatheca relatively large (Figure 45) . . . *heymonsi* Stobbe
- T8 more strongly developed, no loop at rear of S8 and spermatheca relatively small (Figures 65, 66) . . . . . Species H
- 8 T8 a distinct rod, spermatheca and furca smaller and pale, S8 without loop at rear end (Figures 63, 64). Hind tarsus with ventral hair palisade on basitarsus only. . . . . Species G
- T8 obscure, spermatheca and furca larger and former dark, S8 with a posterior loop (Figures 26, 27). First two segments of hind tarsus with a ventral hair palisade. . . . . *depressus* Meijere

**Review of species**

The descriptions of the new species are brief as the significant features of the males are largely restricted to the details of the hypopygia. Likewise in the females there are relatively few features that distinguish the species apart from the details of the abdominal terminalia. The formal diagnoses, therefore, are the features used to distinguish the species in the keys above.

The depositories of the material examined are as follows: Cambridge University Museum of Zoology (CUMZ); Department of Environmental Biology, University of Guelph, Canada (DEBU); Natural History Museum, Los Angeles County (LACM); Zoologisch Staatssammlung, München (ZSM); National Museum of Wales, Cardiff (NMW); and University Museum, Oxford (UMO). The final reference number given after the code for the depository, e.g. 16-34, is the reference written on the slide mount and refers to my notebook entry and page number. In this example this means notebook 16 page 34.

***Chonocephalus americanus*** Borgmeier, 1963

(Figures 4–9)

*Chonocephalus americanus* Borgmeier 1963, p 250.

*Chonocephalus digitalis* Borgmeier 1967, p 207 (part). Disney 2002, p 9.

This is a tramp species transported around the world by man.

*Material*

One male, one female, **Seychelles**, Silhouette Island, Grand Barbe, mangroves, 19–25 May 2001, J. Gerlach (CUMZ—8-135); one female, Jardin Marron, leaf litter under palms (Palmae, *Lodoicea* Comm. ex DC), 18 January 1999, J. Gerlach (CUMZ—8-99). Also recorded from the Nearctic, Neotropical and Oriental Regions.

***Chonocephalus cautus*** sp. nov.

(Figures 10–13)

*Material*

Holotype: male, **Madagascar**, Fianarantosa, 7 km W. Ranomafana, 20.83°S, 44.7°E, Malaise pans, 22–31 October 1988, W. E. Steiner (LACM Ent. 095334—26-60).

*Etymology*

The name means careful or wary and refers to the fact that unless one is careful one may confuse this species with *C. steineri*.

*Male*

A generally brown species but mostly not dark. Antennae and palps light brown, the latter with numerous hairs but apical one only a little differentiated. All femora and tibiae light brown, but hind femur with a darker ventral band in basal half. Wing 1.2–1.3 mm long. Costal index about 0.6. Membrane tinged brown. Hypopygium brown and as Figures 10–13; with the most anterior bristle on left side of epandrium strongly differentiated as a spine and right gonopod with a long and a short robust bristle. Surstylus well-developed; processes of right side of epandrium and hypandrial lobes distinctive.

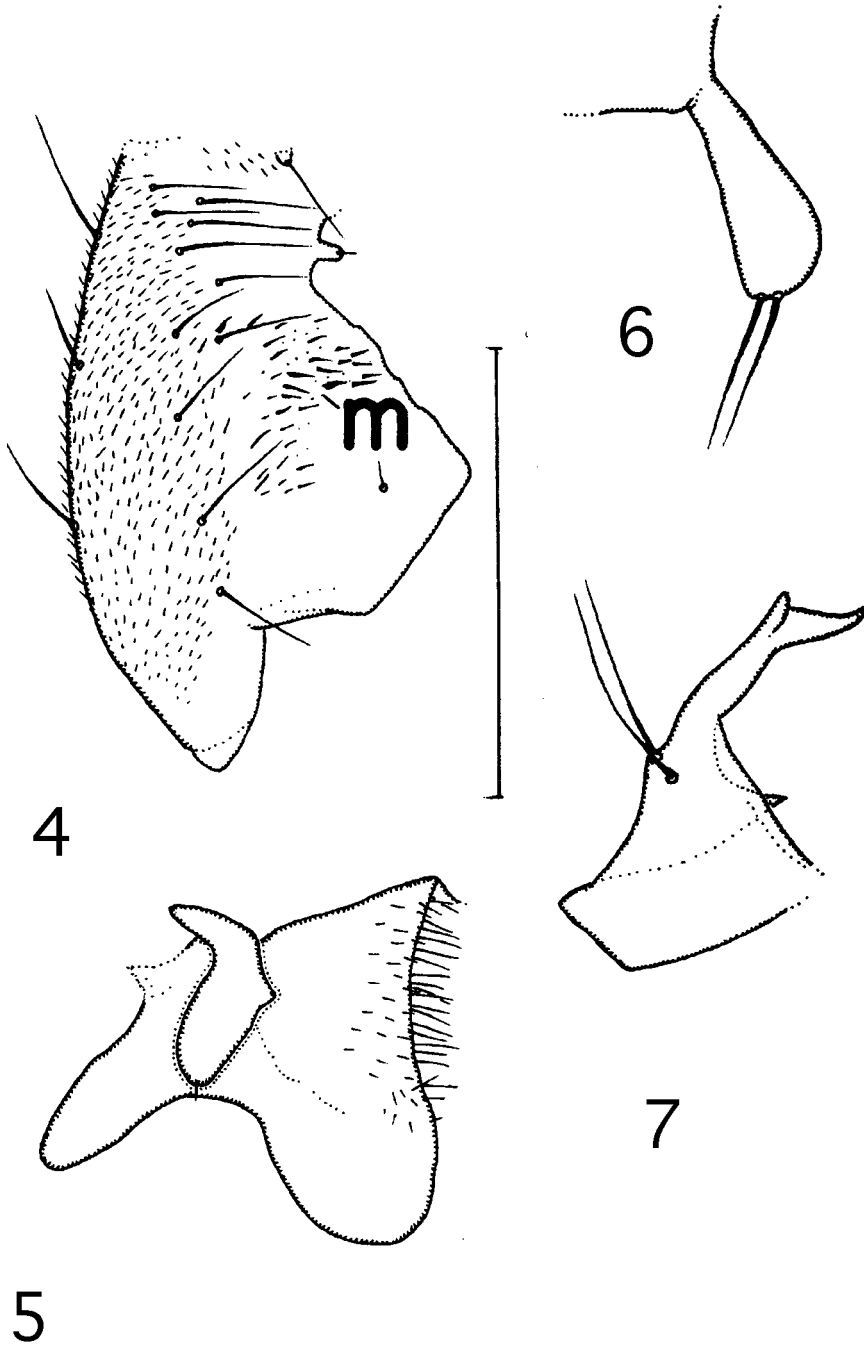
***Chonocephalus collini*** Disney, 2002

(Figures 14–17)

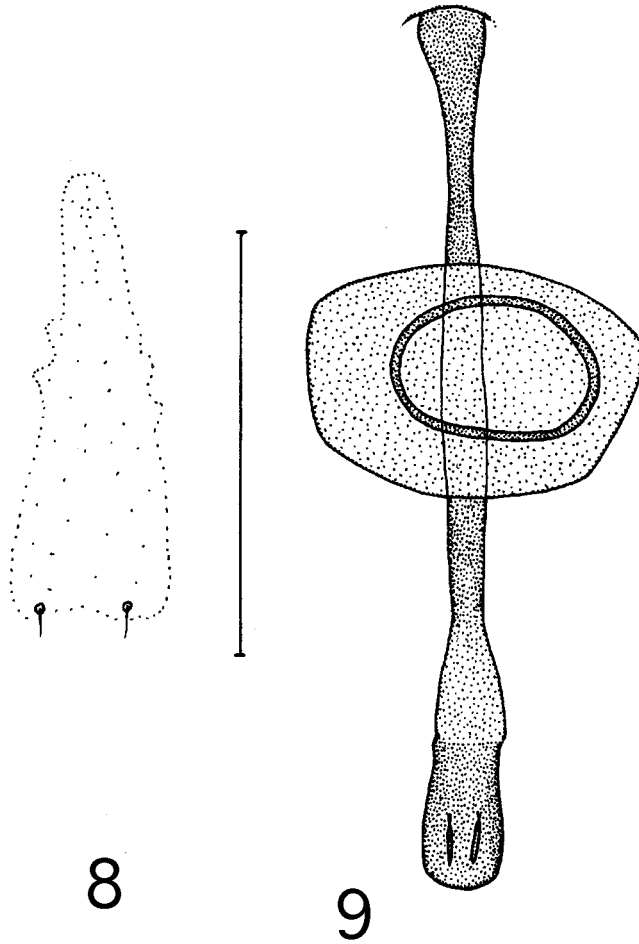
*Chonocephalus collini* Disney 2002 p 13 (male only).

*Chonocephalus similis* Collin 1912, p 105, part (male only) nec Brues 1905. Misidentification, Disney 2002, p 13.





Figures 4–7. *Chonocephalus americanus* male, details of hypopygium from below. (4) Left side of epandrium from below. (5) Hypandrial lobes, deflected forwards so that upper (inner) face is exposed to view. (6) Left gonopod. (7) Right gonopod. Scale bar: 0.1 mm.



Figures 8, 9. *Chonocephalus americanus* female, details of abdomen. (8) Tergite 8. (9) Sternite 8, furca and spermatheca. Scale bar: 0.1 mm.

#### *Material*

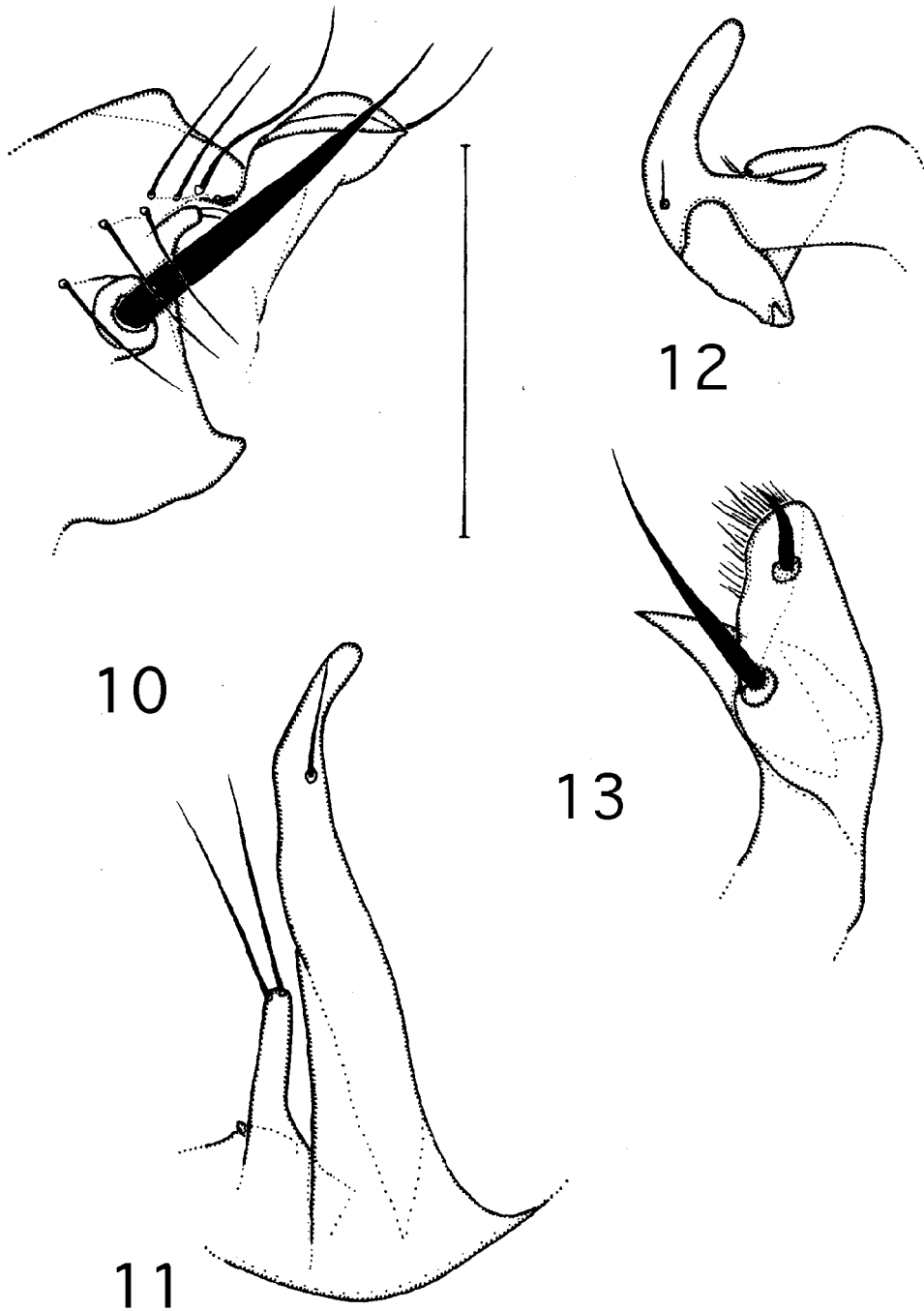
Holotype: male, **Seychelles**, Silhouette Island, Jardin Marron, 2000–2001, J. Gerlach (CUMZ—8-131). Paratypes: 16 males, as holotype (8-130–132); one male, Lantana/Lantana North, marsh edge, Malaise trap in open, 30 July to 1 August 2000, J. Gerlach CUMZ—8-126); one male, Mahé, 1908–1909 (Collin—120) (CUMZ—8-121); two males, Mahé, 1908–1909 (Collin—120 and 134 misidentified as *C. similis*) (UMO—8-140).

#### *Chonocephalus cummingae* sp. nov.

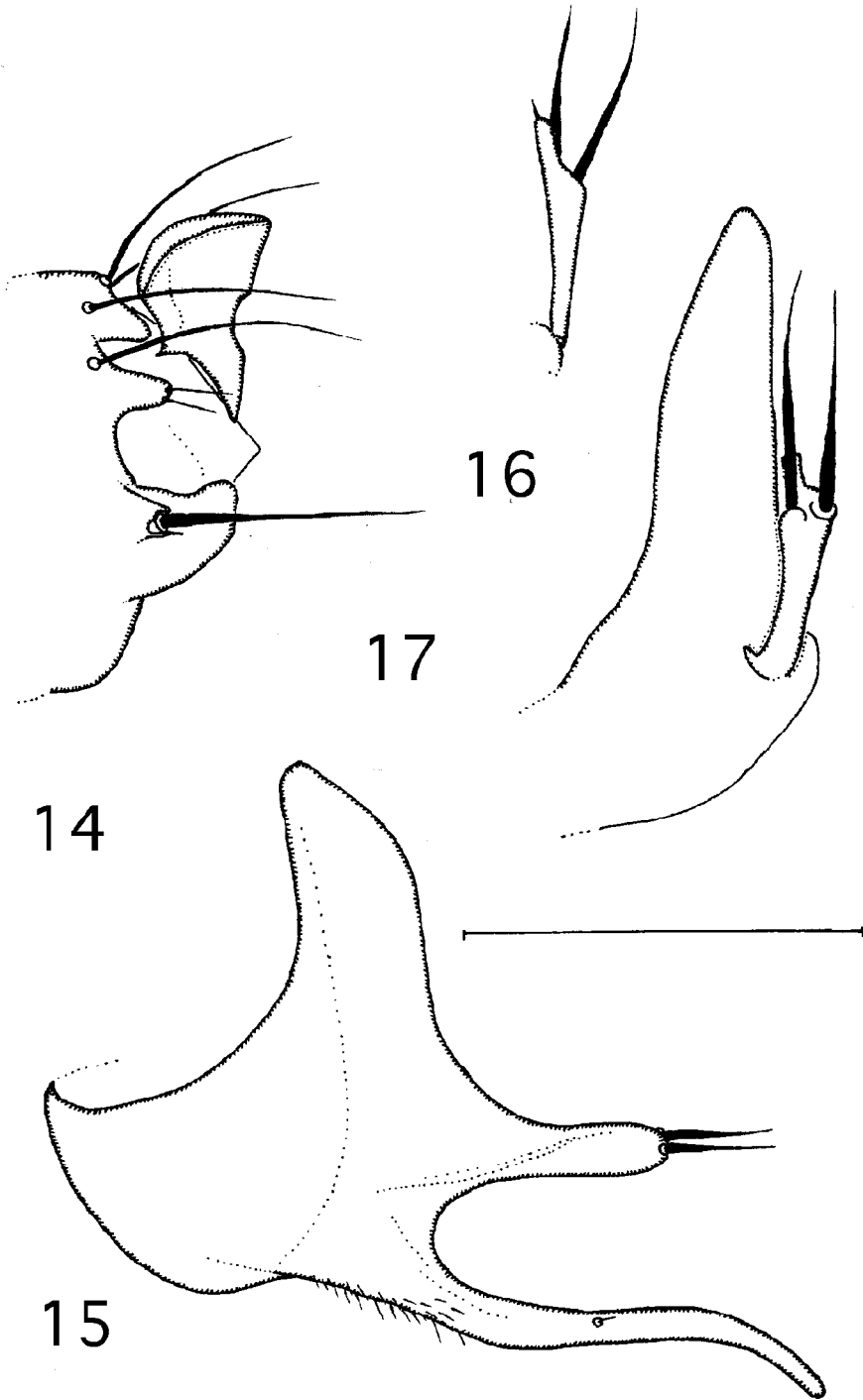
(Figures 18–22)

#### *Material*

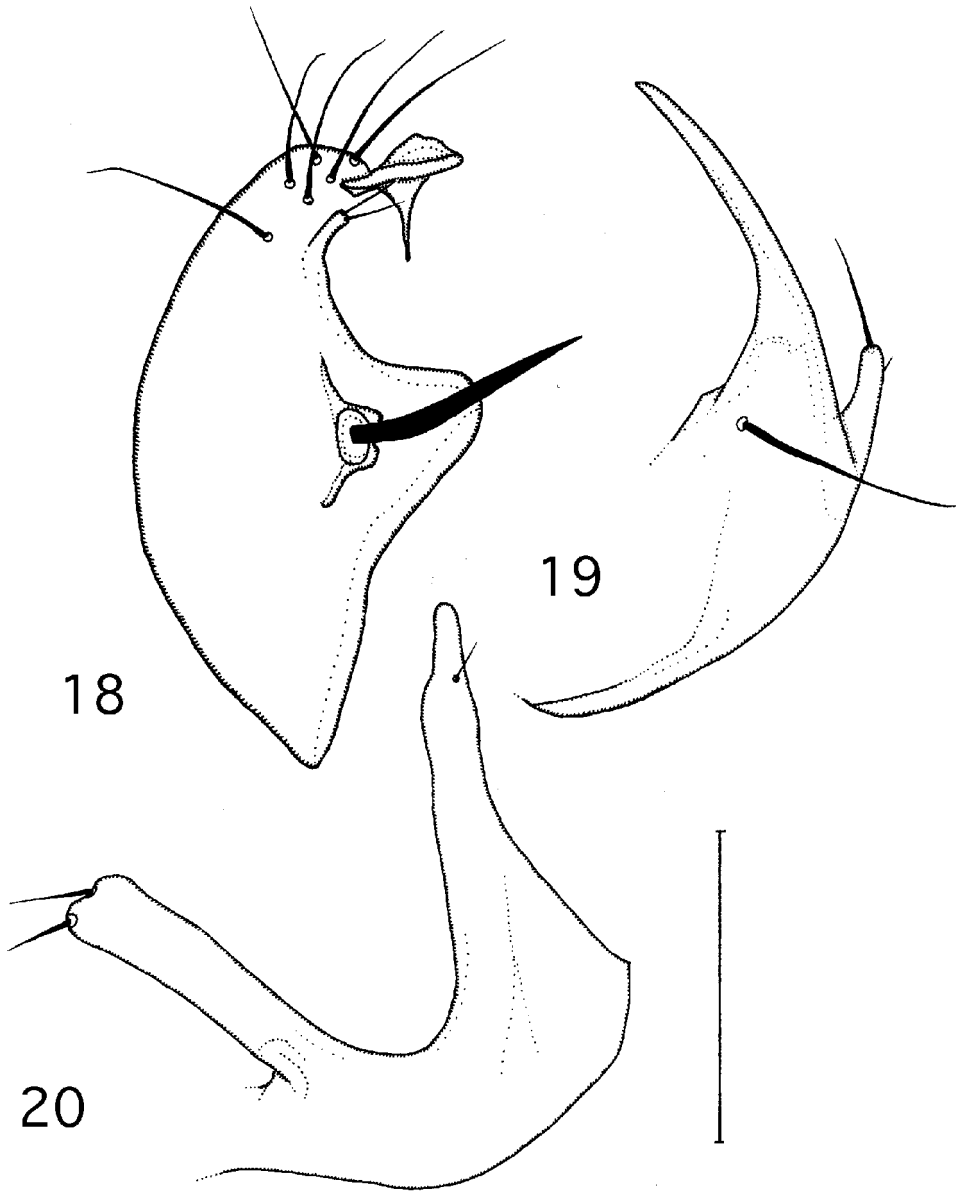
Holotype: male, **Zimbabwe**, Harare, 17°15'S, 31°02'E, water trap on compost heap, September 1991, M. Cumming (CUMZ—22-47). Paratypes: four males, one female, as



Figures 10–13. *Chonocephalus cautus* male, details of hypopygium from below. (10) Left side of epandrium and surstylus. (11) Left gonopod and hypandrial lobe. (12) Right processes of epandrium. (13) Right gonopod and hypandrial lobe. Scale bar: 0.1 mm.

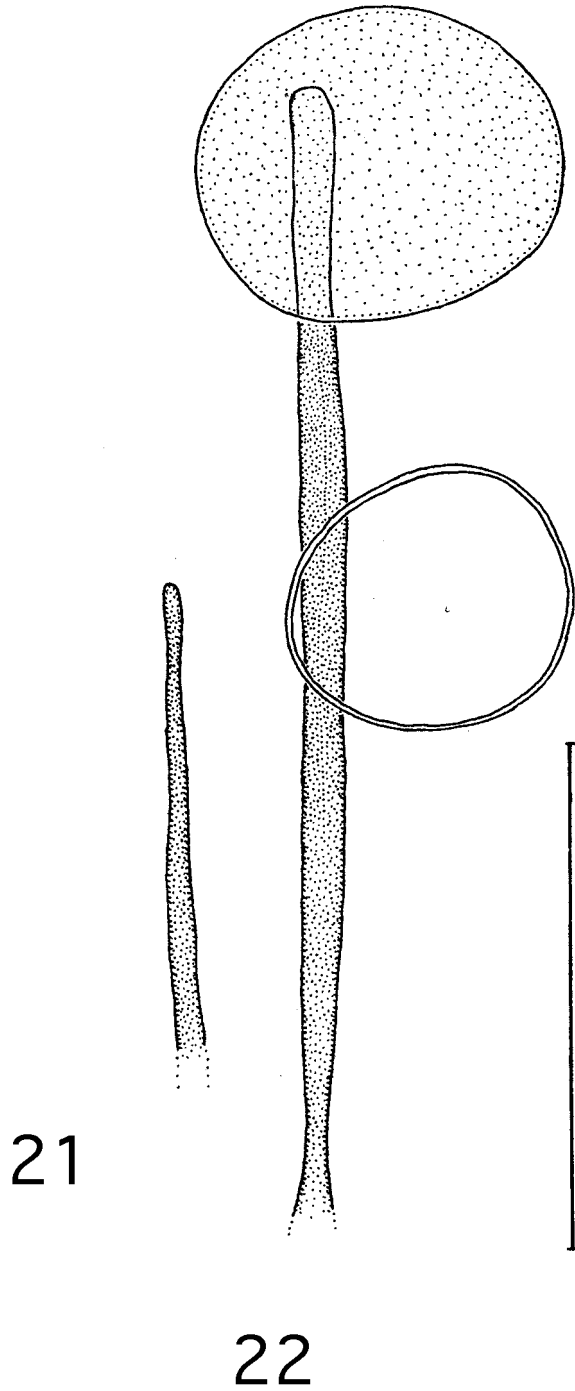


Figures 14–17. *Chonocephalus collini* male, details of hypopygium from below. (14) Left side of epandrium and surstylus. (15) Left gonopod and hypandrial process. (16) Outer branch of right gonopod. (17) Right hypandrial process and gonopod with latter at a different angle. Scale bar: 0.1 mm.



Figures 18–20. *Chonocephalus cunninggae* male, details of hypopygium from below. (18) Left side of epandrium and surstylus. (19) Right lobe of hypandrium and gonopod. (20) Left gonopod and lobe of hypandrium. Scale bar: 0.1 mm.

holotype; likewise nine males, two females, except in garden, 8–15 October 2001 (CUMZ—22-50-52). Two males, **Madagascar**, Fianarantosa, 7 km W. Ranomafana, 20.83°S, 44.7°E, Malaise pans, 22–31 October 1988, W. E. Steiner (LACM Ent. 075523, 090481—26-60). Four males, **South Africa**, Cape Prov., Tsitsikamma N. P., 33.97°S, 23.75°E, 23 December to 23 January 1995, J. Allen (LACM Ent. 052820, 052870—26-57).



Figures 21, 22. *Chonocephalus cummingae* female, details of abdomen. (21) Tergite 8. (22) Sternite 8, furca and spermatheca. Scale bar: 0.1 mm.

*Etymology*

The species is named after Meg Cumming, who collected the holotype and the only known females.

*Male*

Palps ovoid, 0.14 mm long and 0.07 mm wide, with about 24 hairs on outer face, the longest (apical) one being 0.07 mm long. Left side of epandrium with a strong spine and about six hairs, and a surstylus present (Figure 18). The right side has as many hairs but the most ventral one is developed as a differentiated longer bristle. The right hypandrial process dark brown and ending in a long curved point, the adjacent gonopod ending in a bristle (Figure 19). The left process paler and not curved or so strongly tapered, and the adjacent gonopod more parallel-sided and with two pale hairs at tip (Figure 20). Legs brown, the femora being darkest and the tarsi palest, except the distal two-thirds of mid tibiae are white. Wings 1.0–1.3 mm long. Costal index 0.5–0.6. Membrane strongly tinged grey.

*Female*

Length 1.1–1.4 mm. Frons, thoracic notum and abdominal tergites brown, but not dark apart from dark brown rear margins (embracing a pale spot at base of each hair of posterior row) of T1+2–T6. These dark bands do not extend to lateral margins of the tergites. Eyes small, with 11–13 ommatidia. Antennae pale brown. Palps straw yellow, broad, with several hairs of which the apical and a pre-apical of the lower margin are strongly differentiated. Legs straw yellow variably lightly tinged brown, especially the femora. All tarsi with a ventral hair palisade on basitarsus only. Up to 20 hairs at rear margin of T3. T8 and S8 are a simple rod-shape, the furca is pale and smaller than the large spermatheca (Figures 21, 22). Microtrichia of abdominal tergites and thoracic notum dense and minute, but still larger than those on frons.

*Chonocephalus depressus* Meijere, 1912

(Figures 23–27, 38)

*Chonocephalus depressus* Meijere 1912, p 151 (female only). Disney 1991, p 208 (male).

*Chonocephalus similis* Collin 1912, p 105 (part) nec Brues 1905. Misidentification, Disney 2002, p 14.

*Chonocephalus ecitophilus* Borgmeier and Schmitz 1923, p 145. Disney 2002, p 14.

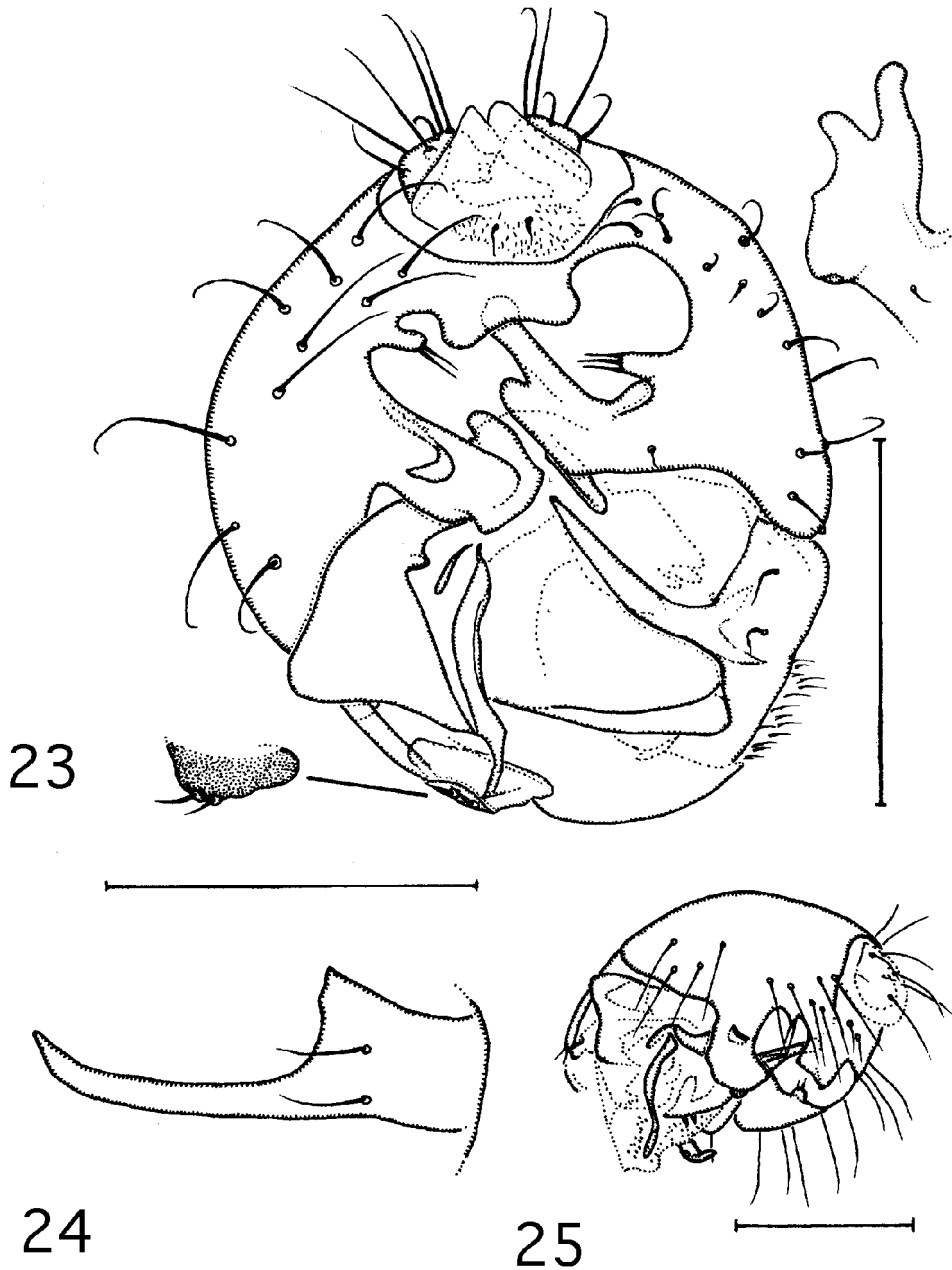
*Chonocephalus japonicus* Schmitz 1941, p 82, figure of male wing only. Disney 2002, p 15.

*Chonocephalus dimakae* Paulian 1958, p 12. **Syn. nov.**

*Chonocephalus pallidulus* Beyer 1964, in Hardy and Beyer 1964, p 298. Disney 2002, p 15.

*Chonocephalus simiolus* Beyer 1964, in Hardy and Beyer 1964, p 300. Disney 2002, p 15.

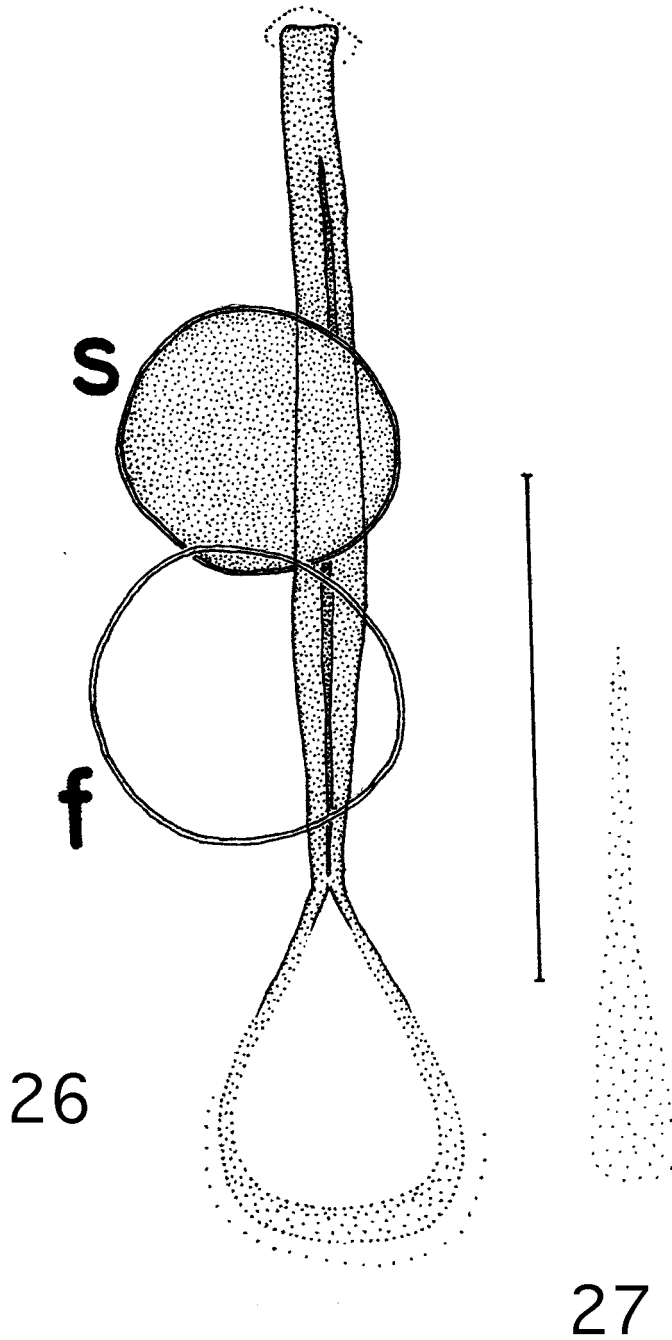
I previously proposed four synonyms of this tramp species (Disney 2002). I now propose a further synonym. The type material of *C. dimakae* is lost. Furthermore, Paulian's (1958) descriptions are inadequate in the light of current knowledge. However, his figures of the male hypopygia are the most useful parts of his descriptions. Despite being shown in a tilted side view, his figure of the hypopygium of *C. dimakae* suggested it might be *C. depressus*. I therefore mounted the male hypopygia of this species in various ways until some achieved



Figures 23–25. *Chonocephalus depressus* male, hypopygium. (23) From below, with right gonopod somewhat foreshortened and with detail of left gonopod to left and right posterior process of epandrium from another specimen and other angle. (24) Right gonopod. (25) Left face of hypopygium. Scale bars: 0.1 mm.

the same orientation as Paulian's figure for *C. dimakae*. Allowing for some simplifications in Paulian's figure (as with his figure of *C. vadoni*, which was correctly synonymized with *C. heymonsi* by Prado) these hypopygia are evidently the same. I therefore propose the synonymy of *C. dimakae* with *C. depressus*.





Figures 26, 27. *Chonocephalus depressus* female, details of abdomen. (26) Sternite 8, furca (f) and spermatheca (s). (27) Tergite 8. Scale bar: 0.1 mm.

*Material*

Ten males, 33 females, **Cape Verde Islands**, Santiago Island, São Jorge dos Orgãos, September 1982, suction trap, A. van Harten (CUMZ—22-6). Two females, **Comoros**

**Islands**, Grande Comore, Hang des Katala, near Boboni, 23 April 2002, M. Kotrba (ZSM, CUMZ—30-6). Type series of *C. dimakae*, **Madagascar**, Ambilobé, Anaborano, reared from fruits of *Borassus sambiranensis*, R. Paulian (lost). One male, two females, **Seychelles**, Mahé, 1908–1909 (Collin—103, 120, misidentified as *C. similis*) (male 120 in UMO—8-140, females 103 in CUMZ—8-121); two males, Frégate Island, 1 October 2002, J. Gerlach (CUMZ—8-143). Thirty-five males, **Yemen**, Ta'izz, light traps, January to February, July to September 1999, 2000, A. van Harten, A. Awad, Al Yarimi, M. Mahyoub (2918, 3552, 3979, 4077, 4078, 4365, 5172) (CUMZ—2-138, 139, 166, 32-30, 32, 35); 12 males, Al Kowd, light traps, July to August 1999, August, October to November 2000, A. van Harten, A. Awad, Al Haruri (3979, 3926, 4075, 4973, 4989, 5019) (CUMZ—32-23–25, 29–31); seven males, 12 km NW Manakhah, Malaise trap, 3 July to 2 August 2001, A van Harten (5987) (CUMZ—8-157, 159). Also recorded from the Neotropical, Oriental and Palaearctic Regions

#### *Natural history*

The original type series was reared from a rotting caterpillar of *Prodenia*. It has been reared from fruits of *Borassus sambiranensis* (Palmaceae) (Paulian 1958) and also from bread fruit (*Artocarpus altilis* (Z.) Frost, Moraceae) (Hardy and Beyer 1964). Some females caught on edible paddy straw mushrooms (*Volvariella*, Plutaceae) were probably ovipositing on over ripe sporophores (Disney 1994). A series caught at turmeric (*Curcuma longa* L., Zingiberaceae) infested with larval *Dichocrocis punctiferalis* (Guenée) (Lepidoptera, Pyralidae) were possibly attracted to diseased or moribund caterpillars.

#### *Chonocephalus dominicanus* Borgmeier, 1967

(Figures 28–33)

*Chonocephalus dominicanus* Borgmeier 1967, p 206.

*Chonocephalus punctifascia* auctt. nec Borgmeier 1935, p 257.

*Chonocephalus wirthorum* Disney 1980, p 363. Disney 2002, p 18.

This is a Neotropical species that has evidently been transported across the world by man.

#### *Material*

Two females, **Seychelles**, Silhouette Island, 1500 ft, August 1908, H. Scott (Collin Collection, No. 103 (part)), (CUMZ—8-121); 18 males, one female, Silhouette Island, Jardin Marron, 2000–2001, J. Gerlach (CUMZ—8-130–133); four males, Grande Barbe, *Acrostichum* L. (Adiantaceae) marsh, 3–18 June 2001, J. Gerlach (CUMZ—8-136, 145); two males, Mahé, Casse Dent, 2 August 2002, J. Gerlach (CUMZ 8-144); one male, Frégate Island, 1 October 2002 (CUMZ—8-143). Also recorded from the Neotropical Region.

#### *Natural history*

This species has been reared from the rotting spadices of *Carludovica palmata* (Cyclanthaceae) and *Heliconia mariae* (Heliconiaceae) (Disney 1980); it has also been reared from bread fruit (*Artocarpus altilis*, Moraceae) (Disney 1994).



Figures 28, 29. *Chonocephalus dominicanus* male, details of hypopygium from below. (28) Right gonopod. (29) Left side of hypopygium and epandrial processes of right side. Scale bar: 0.1 mm.

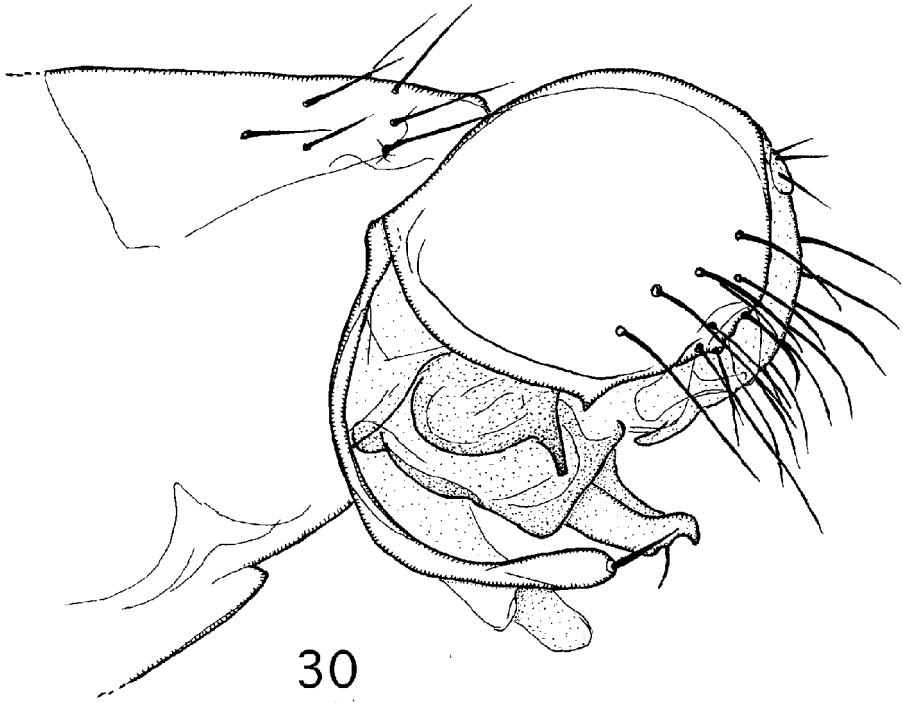
***Chonocephalus fletcheri* Schmitz, 1912**

(Figures 34–37)

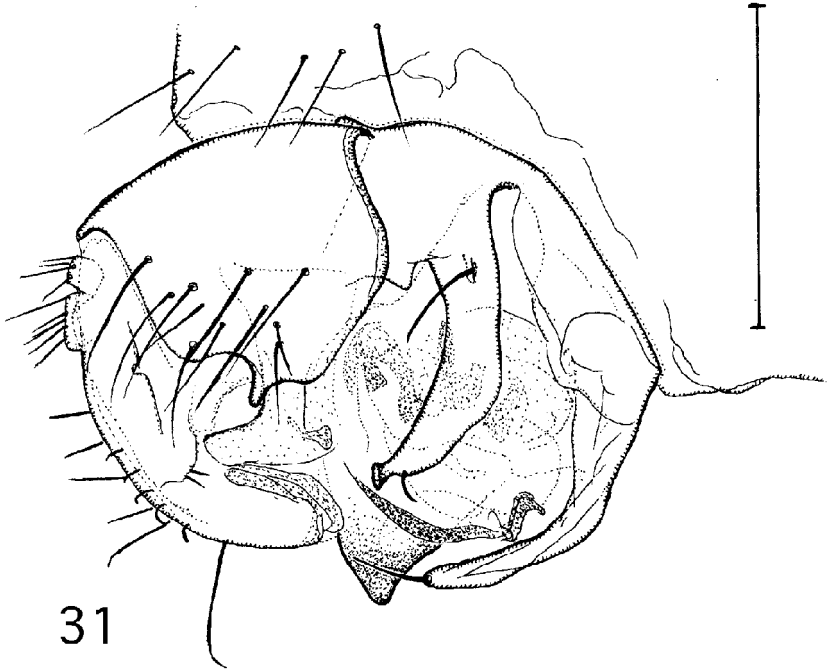
*Chonocephalus fletcheri* Schmitz 1912, p 728 (female only).

*Chonocephalus laetus* Borgmeier 1963, p 251 (male and female). Disney 2002, p 20.

This is another tramp species whose original distribution is unknown.

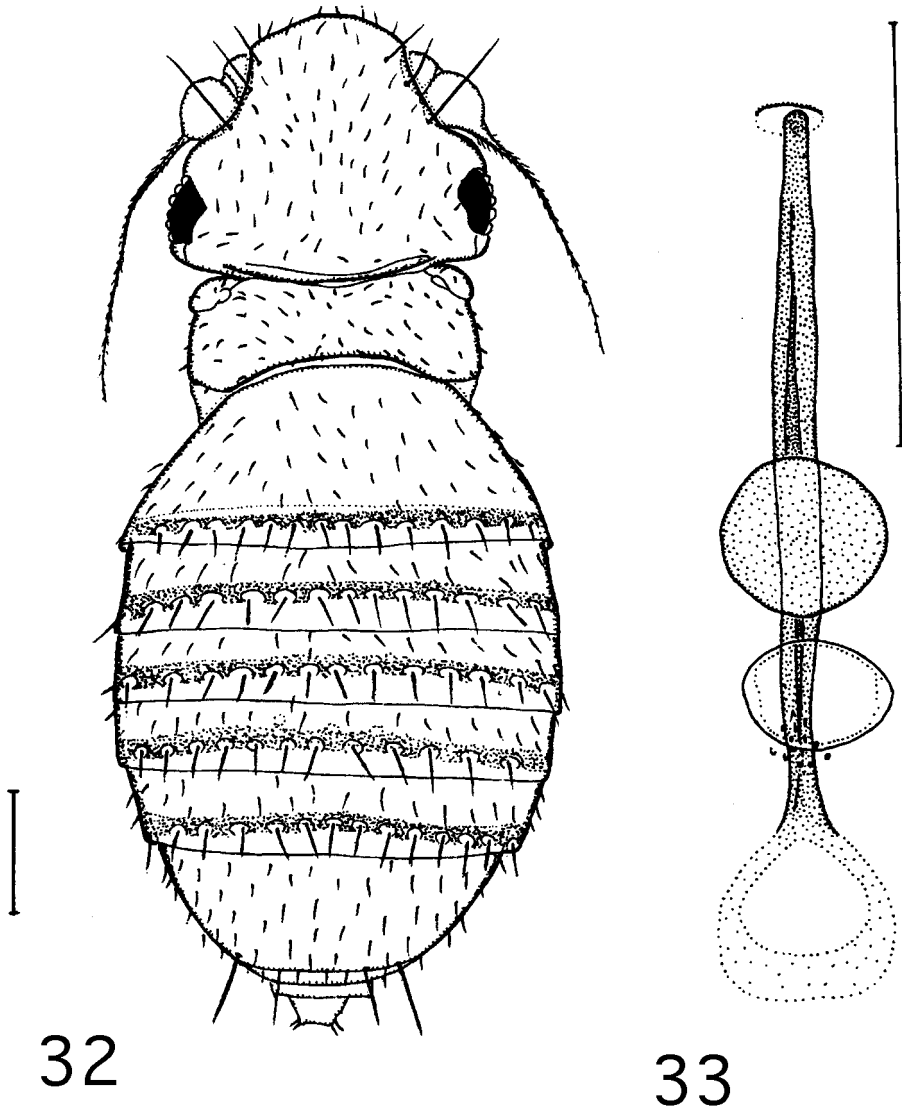


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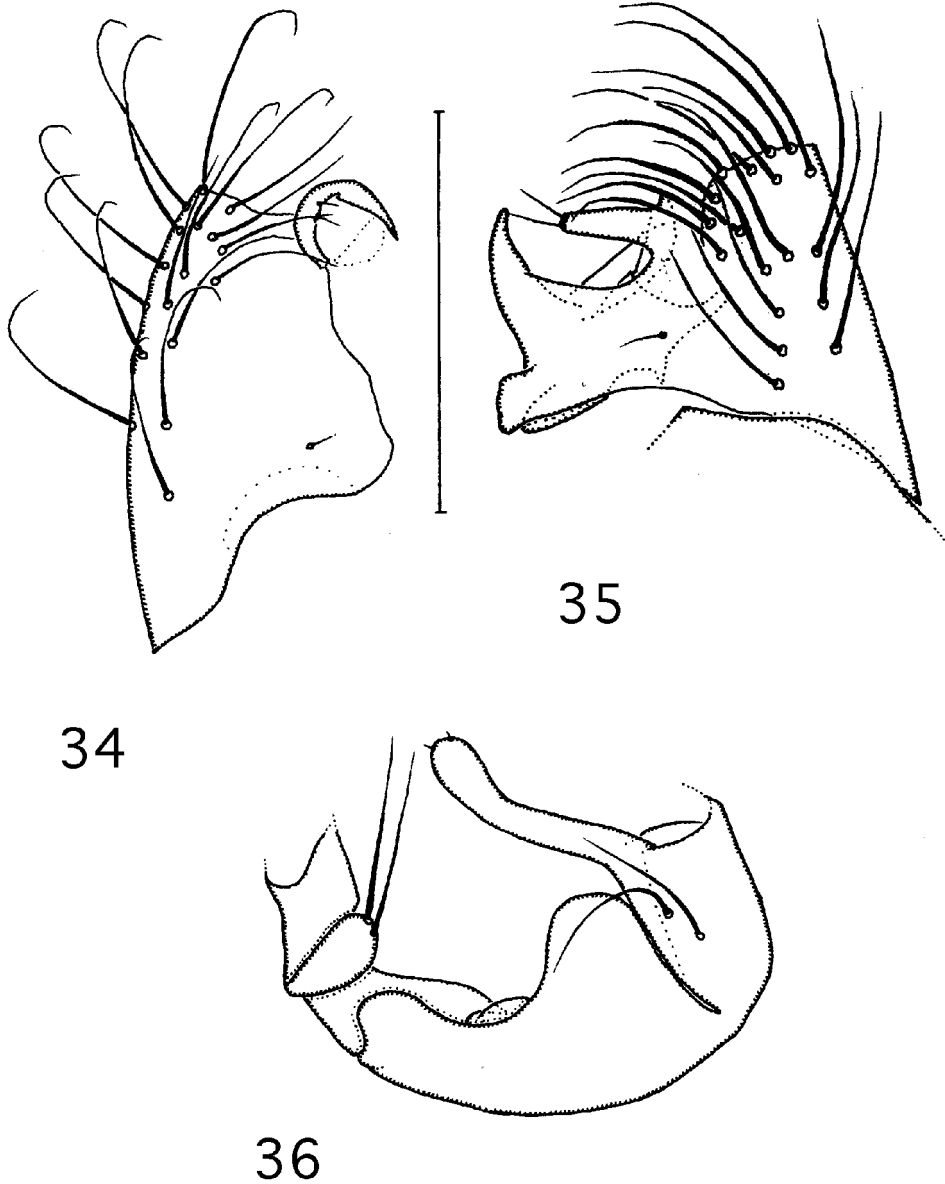
Figures 30, 31. *Chonocephalus dominicanus* male, hypopygium. (30) Left face. (31) Right face tilted a little dorsally. Scale bar: 0.1 mm.



Figures 32, 33. *Chonocephalus dominicanus* female. (32) Whole fly from above. (33) Sternite 8, furca and spermatheca. Scale bars: 0.1 mm.

*Material*

One male, **Oman**, Ruwi Waltayeh, 31 March to 2 April 1988, M. D. Gallagher (NMW) (5-145). Thirteen males, **Yemen**, Al Kadan, Malaise trap, light trap, 7 February to 31 March 1998, October to November 2001, April 2002, A. van Harten, T. Abdul-Haq (3396, 6319, 6723, 6476) (CUMZ—2-168, 174, 32-73, 75); 19 males, Al Kowd, July to August 1999, February, May to July, October to December 2000, April to May 2001, A. van Harten, A. Awad, Al Haruri (3926, 4075, 4450, 4741, 4887, 4989, 5019, 5299, 5378, 6617) (CUMZ—2-137, 32-14, 19, 20, 23, 24, 29, 31, 74); eight males, Lahj, September–December 2000, October–December 2001, March–May 2002, A. van Harten,



Figures 34–36. *Chonocephalus fletcheri* male, hypopygium from below. (34) Left side of epandrium and bridge. (35) Right side of epandrium. (36) Hypandrium, with gonopods. Scale bar: 0.1 mm.

A. Sallam (5079, 5094, 5239, 5278, 6271, 6807) (CUMZ—2-154, 32-16, 17, 26, 79); 15 males, 12 km NW Manakhah, Malaise trap, 3 July to 2 August 2001, A. van Harten (5987) (CUMZ 2-156–159); 27 males, one female, Al Lahima, Malaise traps, October to December 2000, January to July, September to December 2001, January to March 2002, A. van Harten, A. M. Hager (5402, 6168, 6230, 6315, 6591, 6602) (CUMZ—2-170, 178, 184, 32-18, 76, 78); one male, Ar Rujum, Malaise trap, 9 April to 5 June 2001, A. van Harten (5870) (CUMZ—2-180); one male, 16 females, Khamis Bani Sa'd, leaf litter in banana plantation, 23 June and 3 August 1999, A. van Harten (3710, 3802)

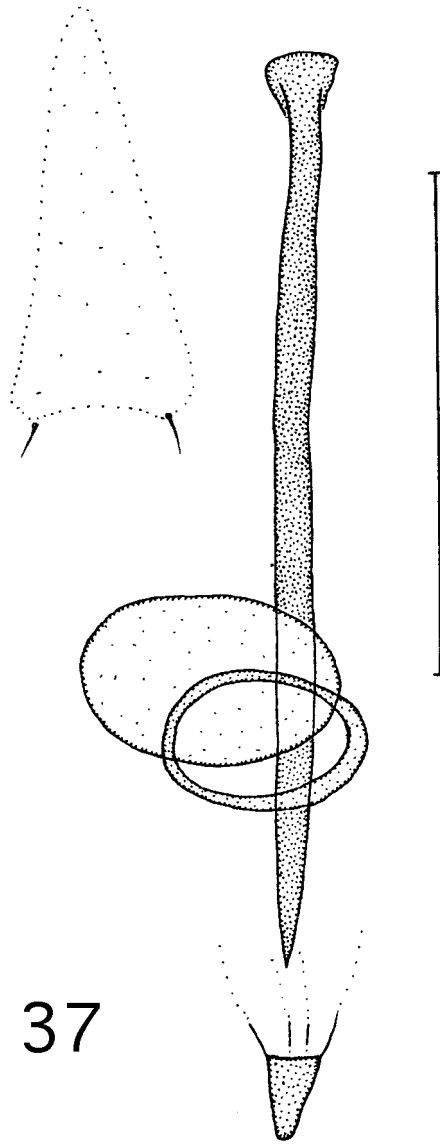
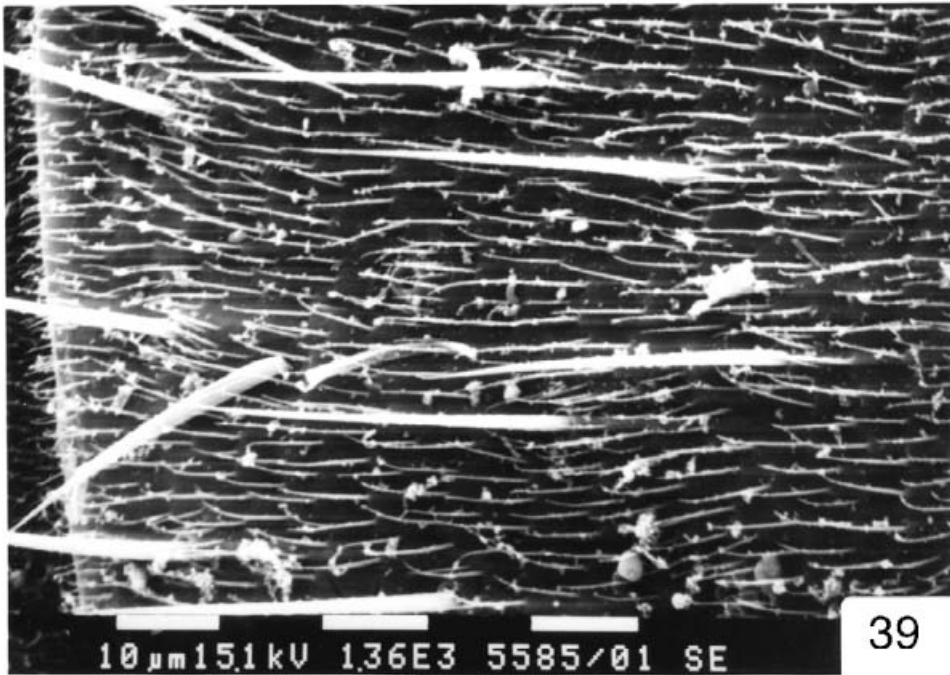


Figure 37. *Chonocephalus fletcheri* female, details of abdomen with tergite 8 to left and sternite 8, furca and spermatheca to right. Scale bar: 0.1 mm.

(CUMZ—32-28, 33); one male, Ta'izz, light trap, September 2000, A. van Harten, Al Yarimi (5172) (CUMZ—32-25); one male, Zabid, light trap, October 2001, A. van Harten, Al Futayni (6561) (CUMZ—32-75). Also recorded from the Nearctic, Neotropical and Oriental Regions.

*Natural history*

A series at turmeric (*Curcuma longa*, Zingiberaceae) infested with larval *Dichocrocis punctiferalis* (Guenée) (Lepidoptera, Pyralidae) were possibly attracted to diseased or



Figures 38, 39. *Chonocephalus* females, hairing and microtrichia of abdominal tergites. (38) *C. depressus*. (39) *C. heymonsi*.

moribund caterpillars. Likewise a series reared from a cocoon mass of *Apanteles flavipes* (Cameron) (Braconidae) were probably feeding on moribund pupae. Some females caught on edible paddy straw mushrooms *Volvariella* (Plutaceae) were probably ovipositing on



over-ripe sporophores (Disney 1994). Borgmeier (1963) reported this species reared from an Easter Lily bulla and from the diseased hearts of *Cocos nucifera*. A series from Canada was reared from a rotting bulb (Disney 2002).

***Chonocephalus heymonsi* Stobbe, 1913**

(Figures 39–45)

*Chonocephalus heymonsi* Stobbe 1913, p 131 (female only).

*Chonocephalus similis* Collin 1912, p 105, part (one female only) nec Brues 1905.

Misidentification. Disney 2003, p 23.

*Chonocephalus jamaicensis* Brues 1915, p 102. Disney 1981, p 207.

*Chonocephalus punctifascia* Borgmeier 1935, p 257 (both sexes). Prado 1976, p 587.

*Chonocephalus vadoni* Paulian 1958, p 11. Prado 1976, p 587.

*Chonocephalus brisbanensis* Beyer 1960, p 85. Disney 2002, p 23.

*Chonocephalus digitalis* Borgmeier 1967, p 207 (part). Misidentifications. Disney 2003, p 23.

This tramp species has been carried around the world by man. It has accordingly been repeatedly misidentified. It has been recorded from every biogeographical region, but is seemingly most abundant in Africa south of the Sahara. For example, it is known to be common in Kenya (Disney and Darlington 1998) and abundant in Nigeria (see below). It is clearly the dominant species in mainland Africa. Through the agency of man it is now reported throughout the warmer parts of the world and in glasshouses in temperate regions (Disney 1983, 2002).

*Material*

Eight males, five females, **Cape Verde Islands**, Santiago Island, São Jorge dos Orgaos, August 1988, suction trap, A. van Harten (CUMZ—22-4-5). One male, **Congo** (Zaire), Scierie, near Kindu, November 1974, S. L. Sutton (CUMZ—2-1). Three males, one female, **Kenya**, Nairobi, National Museum garden, by nest of termites, water traps, November 1994, January 1995, J. Darlington (CUMZ—23-112, 113, 118). Type series of *C. vadoni*, **Madagascar**, Maroantsetra, Ambohitsitondroina, J. Vadon (lost). Three

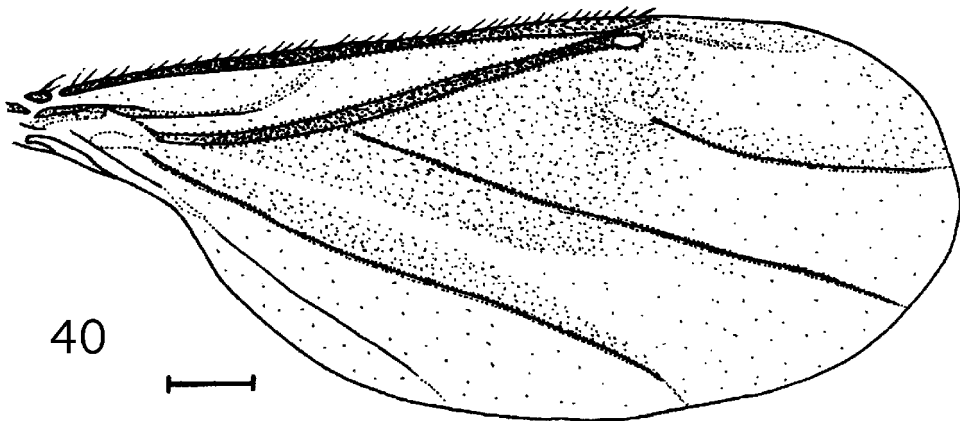
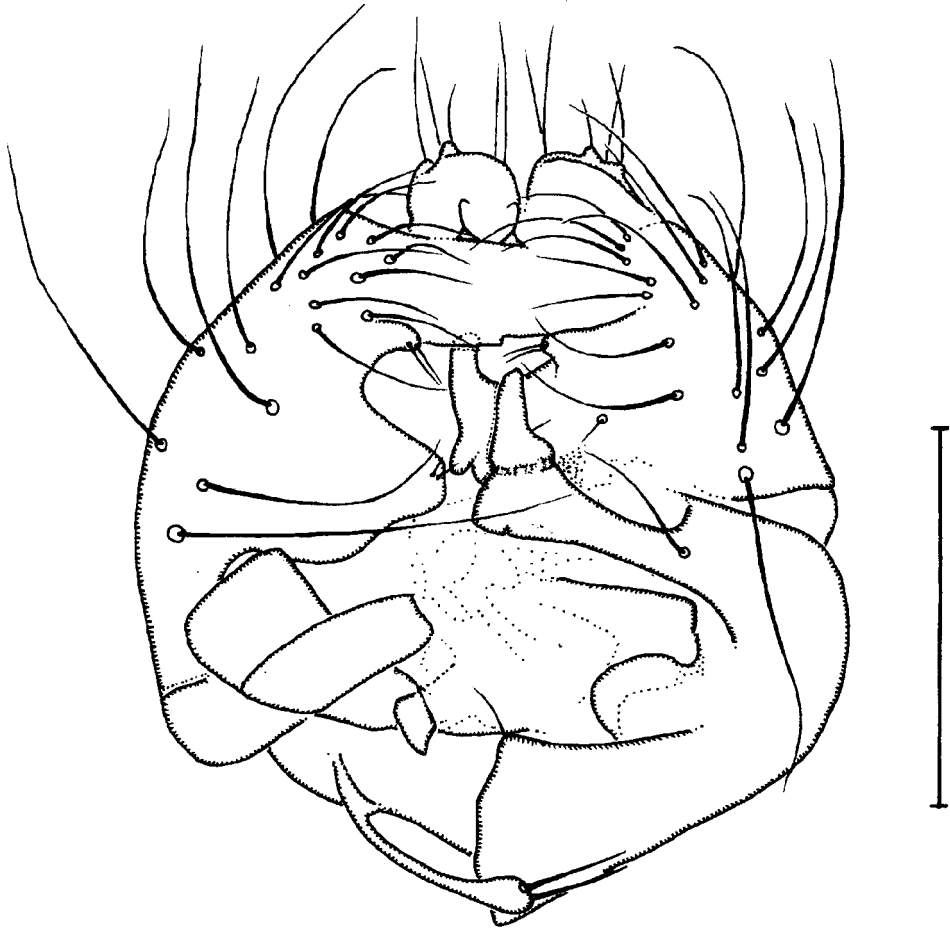
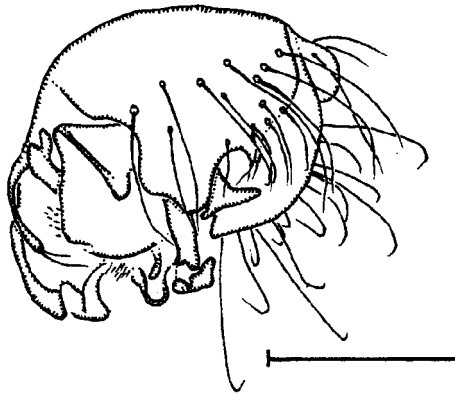


Figure 40. *Chonocephalus heymonsi* male, right wing. Scale bar: 0.1 mm.

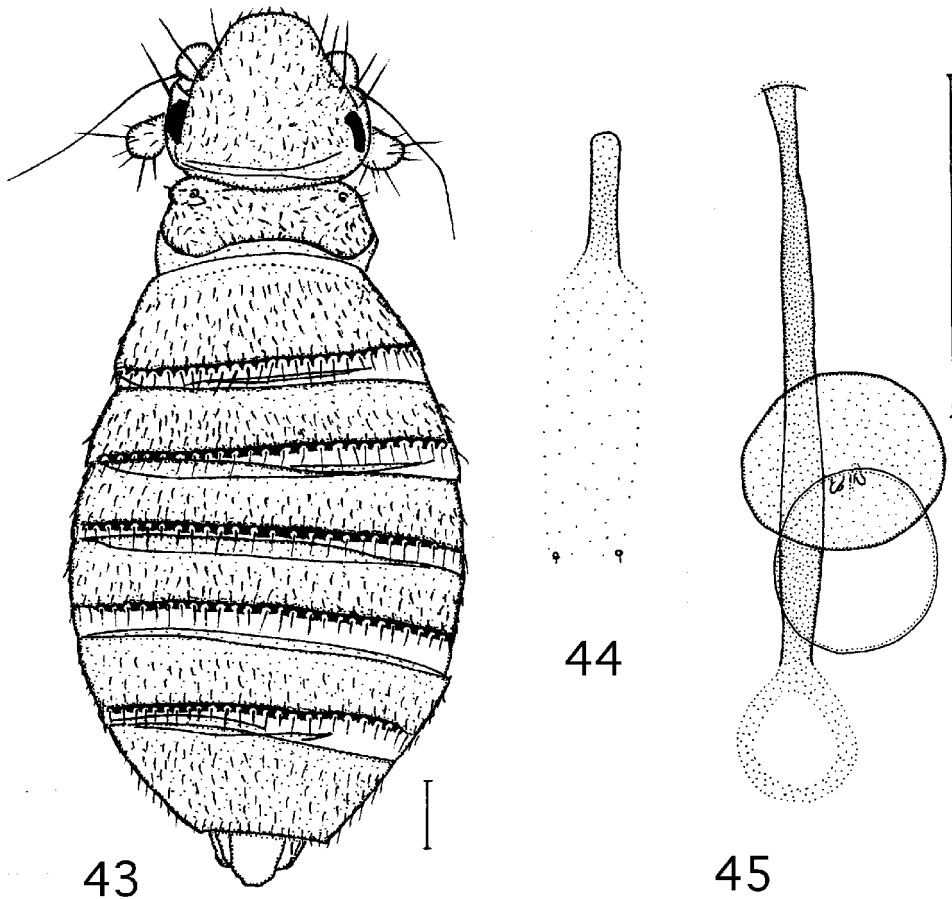


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42

Figures 41, 42. *Chonocephalus heymonsi* male, hypopygium. (41) From below. (42) Left face. Scale bars: 0.1 mm.



Figures 43–45. *Chonocephalus heymonsi* female. (43) Whole fly from above. (44) Tergite 8. (45) Sternite 8, furca and spermatheca. Scale bars: 0.1 mm.

females, **Nigeria**, Samaru, on rotting *Termitomyces* on termite mound, 28 July 1979, J. C. Deeming (CUMZ—5-55); two males, two females on slides and dozens of both in alcohol, Ibadan, IITA, secondary forest, pitfall traps, 10–17 April 1981, A. Russel-Smith (CUMZ—20-83). One female, **Seychelles**, Mahé, 1908–1909 (Collin—120, misidentified as *C. similis*) (UMO—8-140); 18 males, Mahé, Le Cap, pan traps, April 1991, M. Martin (DEBU—8-139); one male, Cousin Island, 4.20°S, 55.35°E, water trap in *Achyranthes aspersa* (Compositae) near coconuts, March to April 1978, H. Watkins (CUMZ—4-73); one male, North Island, marsh edge, swept, 30 July 2000, J. Gerlach (CUMZ—8-100); one male, Silhouette Island, Grande Barbe, mangoves, 19–25 May 2001, J. Gerlach (CUMZ—8-135); four males, one female, *Acrostichum* L. (Adiantaceae) marsh, 3–10 June 2001, J. Gerlach (CUMZ—8-136). Thirty-six males, one female, **Yemen**, Ta'izz, light traps, January to February, April to May 1998, January, July to September, November to December 1999, January 2000, September 2001, A. van Harten, A. Awad, Al Yarimi (2918, 2985, 3129, 3552, 3979, 4077, 4078, 4153, 4334, 4365, 6447) (CUMZ—2-139–141, 166, 32–30, 32, 35, 40, 41, 77). Seven males, **Zambia**, Lusaka, Malaise trap, November to December 1979, January 1980, R. A. Beaver (CUMZ—6-27–28). One male,

**Zimbabwe**, Harare, 17°15'S, 31°02'E, water trap on compost heap, September 1991, M. Cumming (CUMZ—22-47); one male, 24 October 1991, on rotting peach (CUMZ—22-50). This species has been recorded from every biogeographical region.

*Natural history*

The larvae and puparium are described by Borgmeier (1935). A female caught on the edible paddy straw mushroom *Volvariella* (Plutaceae) was probably ovipositing on an over-ripe sporophore, as was the case with the females recorded on rotting *Termitomyces* (Amanitaceae) on a termite mound. It has also been reared from bread fruit (*Artocarpus altilis* (Z.) Frost, Moraceae) (Disney 1994).

***Chonocephalus hibisci* Paulian, 1958**

(Figure 46)

*Chonocephalus hibisci* Paulian, 1958, p 13.

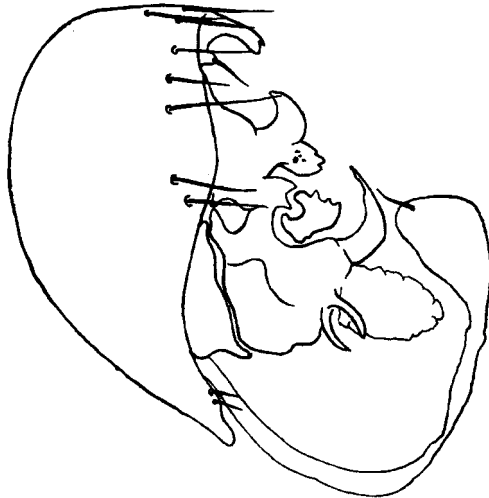
No fresh material of this species has been seen. The female is not recognizable from the perfunctory description by Paulian.

*Material*

Type series, **Madagascar**, Tananarive, Parc de Tsimbazaza, reared from stem of *Hibiscus* sp., R. Paulian (lost).

*Natural history*

Reared from stem of *Hibiscus* sp. (Paulian 1958).



46

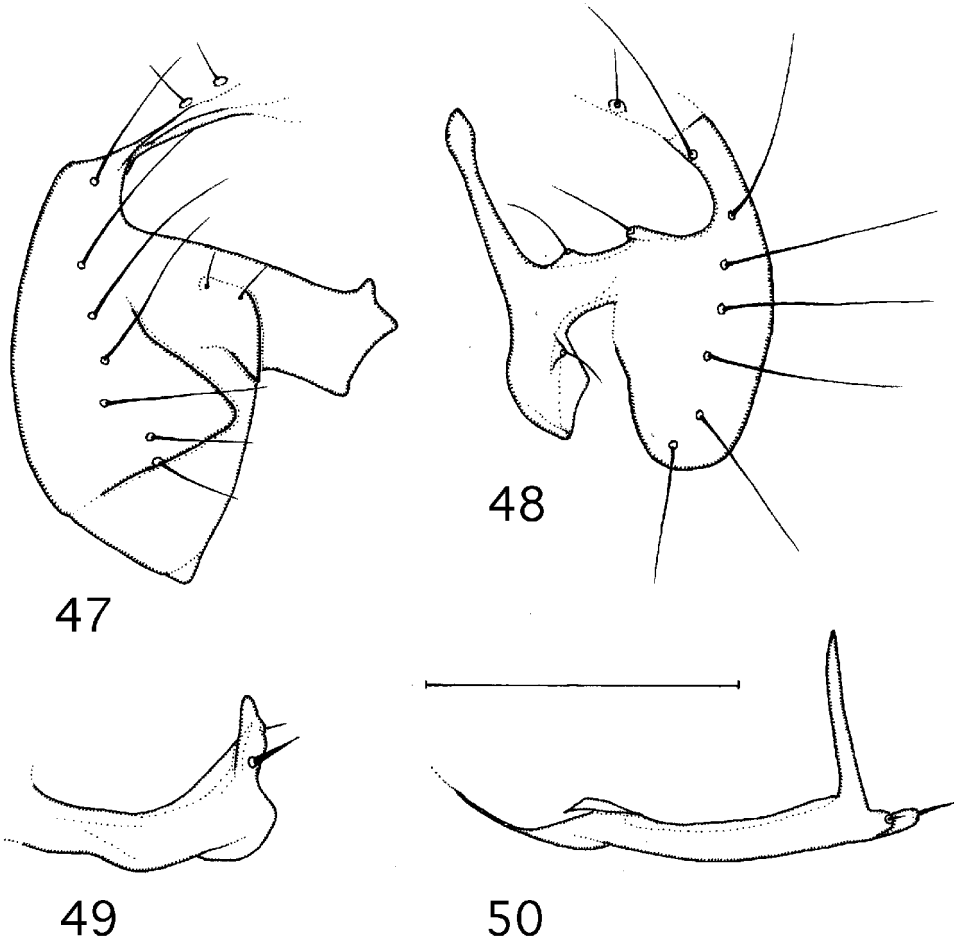
Figure 46. *Chonocephalus hibisci* male, hypopygium (from Paulian 1958).

*Chonocephalus justini* sp. nov.  
(Figures 47–50)

Species G, only known from a single female (see below), was caught in the same trap as two males of this species. It is probable, therefore, that species G is the female of this species.

*Material*

Holotype: male, **Seychelles**, Silhouette Island, La Passe, above mausoleum, Malaise trap, 1–4 July 2000, J. Gerlach (CUMZ—8-127). Paratypes: three males, as holotype except (two CUMZ 8-98, one NMW—8-127); one male, North Island, marsh edge, swept, 30 July 2000, J. Gerlach (CUMZ—8-100); two males, Frégate Island, 1 October 2002, J. Gerlach (CUMZ—8-143).



Figures 47–50. *Chonocephalus justini* male, details of hypopygium. (47) Left side of epandrium from below. (48) right side of epandrium from below. (49) Left gonopod, upper (inner) face. (50) Right gonopod, lower face from above. Scale bar: 0.1 mm.

*Etymology*

Named after the collector, Dr Justin Gerlach.

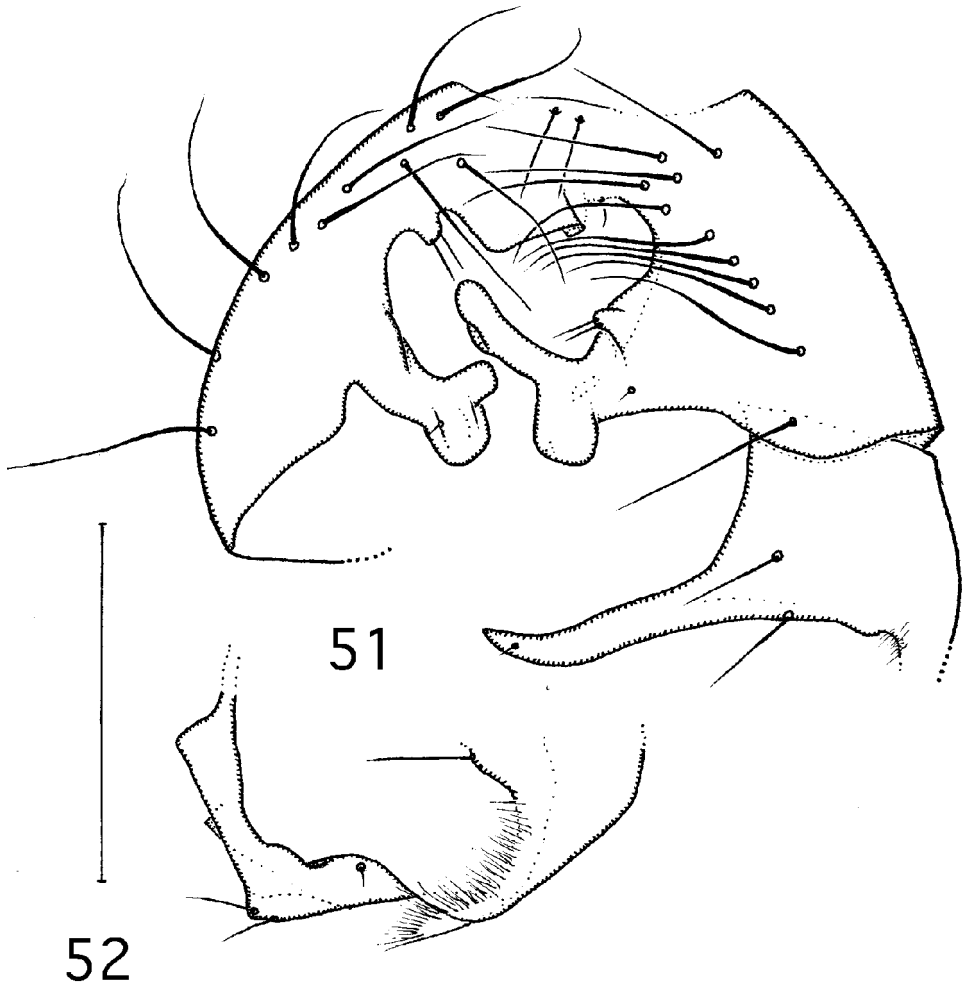
*Male*

Frons, postpedicels, thorax and abdominal tergites brown. Palps grey, with many hairs but apical one only slightly differentiated. Legs straw yellow, except dorsal edge and distal half of hind femur variably tinged brown. Wing length 0.85–0.95 mm. Costal index 0.51–0.54. Membrane tinged grey. Hypopygium brown. Processes of epandrium and gonopods distinctive (Figures 47–50).

*Chonocephalus madagascariensis* Paulian, 1958

(Figures 51, 52)

*Chonocephalus madagascariensis* Paulian 1958, p 12.



Figures 51, 52. *Chonocephalus madagascariensis* male, details of hypopygium from below. (51) Epandrium and right gonopod. (52) Hypandrium and vestigial left gonopod. Scale bar: 0.1 mm.

The type series has been lost. One of a freshly collected series of males from the Comoros Islands has been designated the neotype (deposited in ZSM). The female is not recognizable from the perfunctory description by Paulian.

*Material*

Type series, **Madagascar**, Tananarive, Parc de Tsimbazaza, reared from fungi, R. Paulian (lost). Nine males, including neotype, **Comoros Islands**, Moheli, Hoani, Chalet St Antoine, 400 m, from tree trunk, 21 April 2002, M. Kotrba (ZSM, CUMZ—30-6).

*Natural history*

Reared from fungi (Paulian 1958).

***Chonocephalus modestus*** sp. nov.  
(Figures 53–56)

A female of species H (see below) was caught in the same trap as the five males reported below. Possibly it represents the female of this species.

*Material*

Holotype: male, **Seychelles**, Silhouette Island, Jardin Marron, 2000–2001, J. Gerlach (CUMZ—8-132). Paratypes: four males, as holotype (8-130, 131, 132).

*Etymology*

The name refers to the lack of any striking features.

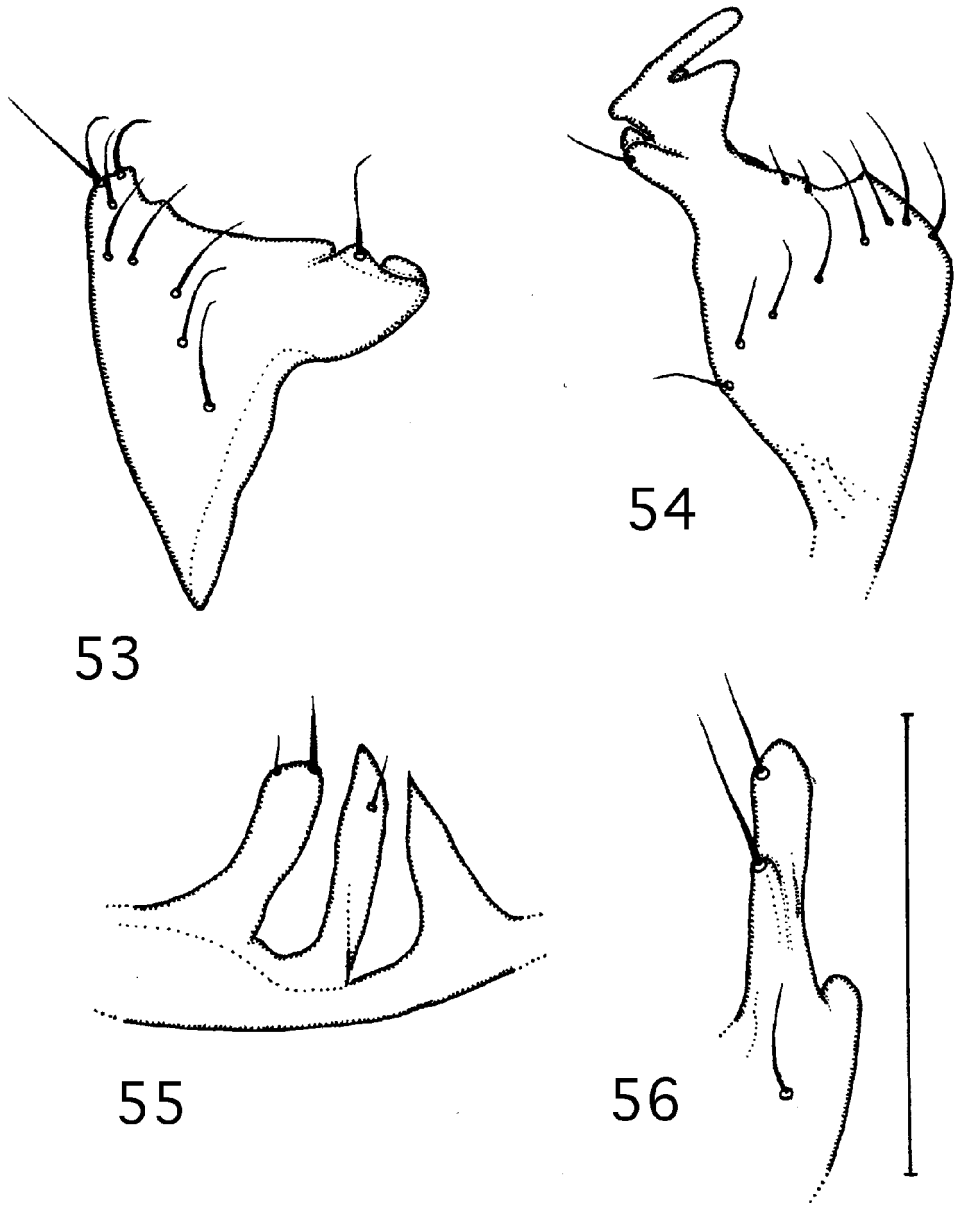
*Male*

Frons dark brown, abdominal tergites paler, thorax somewhat paler and postpedicels and palps even paler brown. The latter with many hairs and a long, robust apical bristle. Legs largely brown with paler tarsi. Wing length 0.95–1.1 mm. Costal index 0.5–0.6. Membrane tinged grey. Hypopygium yellowish brown. Processes of epandrium, hypandrium and gonopods as Figure 53–56.

***Chonocephalus pudicus*** sp. nov.  
(Figures 57, 58)

*Material*

Holotype: male, **Seychelles**, Cousine Island, 4 April 2001, J. Gerlach (CUMZ—8-118). Paratypes: one male, Silhouette Island, La Passe, Malaise trap, 1–4 July 2000, J. Gerlach (NMW—8-127); one male, Cerf Island, 13 December 2001, J. Gerlach (CUMZ—8-147).



Figures 53–56. *Chonocephalus modestus* male, details of hypopygium from below: (53) left side of epandrium; (54) right side of epandrium; (55) left gonopod and hypandrial lobes; (56) right gonopod. Scale bar: 0.1 mm.

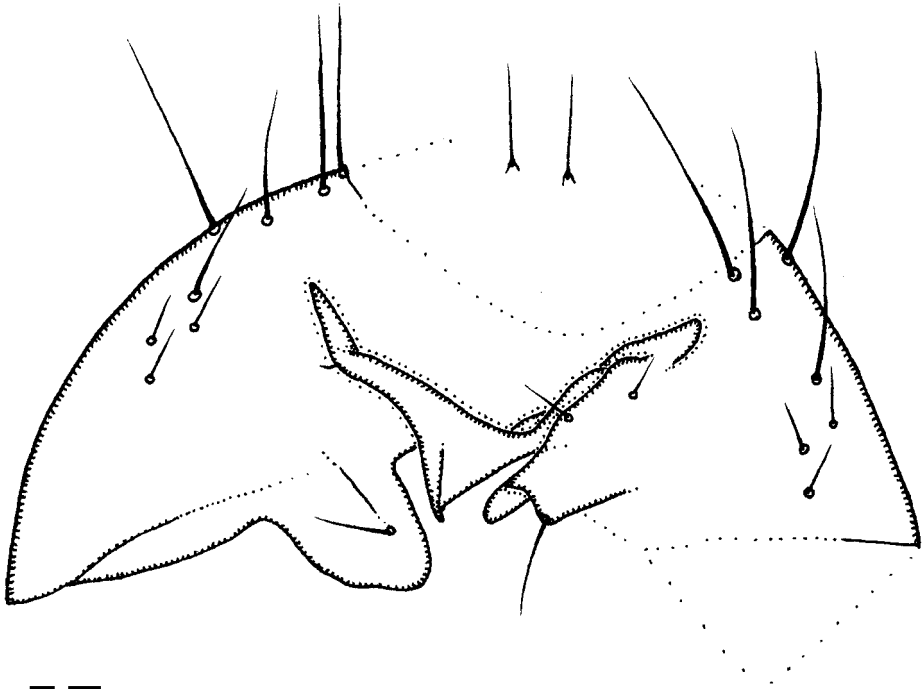
*Etymology*

Pudicus means modest and refers to the lack of any striking features.

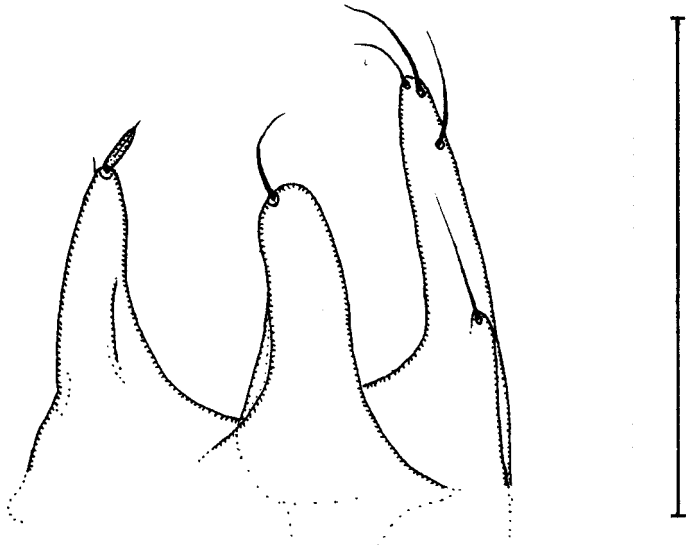
*Male*

Frons dark brown, thorax and abdominal tergites a little paler, especially thorax other than scutellum. Postpedicels and palps pale brown, the latter with many hairs and a strongly





57



58

Figures 57, 58. *Chonocephalus pudicus* male, details of hypopygium from below. (57) Epandrium and proctiger hairs. (58) Gonopods and hypandrial lobe. Scale bar: 0.1 mm.

differentiated apical bristle. Hind and mid femora mainly light brown, otherwise legs mainly straw yellow. Wing length 0.8–0.9 mm. Costal index 0.4–0.5. Membrane tinged grey. Hypopygium light brown. Processes of epandrium, hypandrium and gonopods as Figures 57, 58.

***Chonocephalus steineri*** sp. nov.

(Figures 59–62)

*Material*

Holotype: male, **Madagascar**, Fianarantsoa, 7 km W Ranomafana, 20.83°S, 44.7°E, 1100 m, 1–7 November 1988, W. E. Steiner (LACM Ent 039841–26-57). Paratype: male, as holotype (Ent 039883).

*Etymology*

Named after the collector, W. E. Steiner.

*Male*

Frons, scutellum and abdominal tergites brown, rest of thorax paler. Postpedicels and palps light brown. The latter with many hairs and longer, but fine, apical hair. Femora yellowish brown. Rest of legs straw yellow variably lightly tinged brown. Wing length 1.4 mm. Costal index 0.64–0.65. Membrane tinged grey. Hypopygium chestnut brown and relatively large. Surstylus, lower left side of epandrium, hypandrial lobes and gonopods as Figures 59–62.

***Chonocephalus*** species G

(Figures 63, 64)

Two males of *C. justini* were caught in the same trap on the same dates. So species G is possibly the female of this species.

*Material*

Female, **Seychelles**, Silhouette Island, La Passe, above mausoleum, Malaise trap, 1–4 July 2000 (J. Gerlach) (CUMZ—8-98).

*Female*

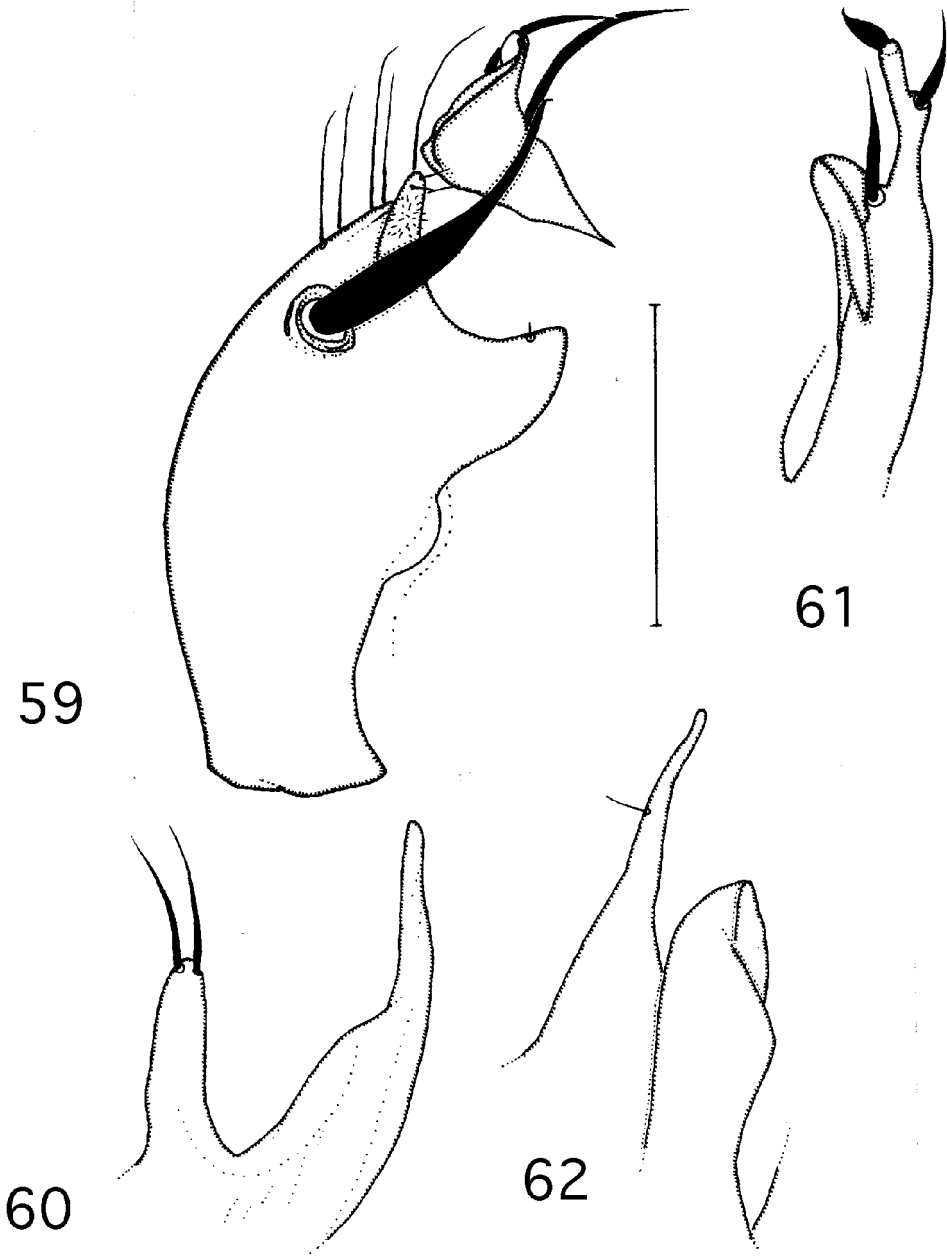
Length of eye subequal to diameter of pale brownish yellow postpedicel. Palps straw yellow with up to 20 hairs of which the two subapicals are clearly longer. Frons, thoracic notum and abdominal tergites light brown; T1+2–T6 with dark bands at rear margins, but these not extending to the edges of the tergites; thus T3 with 20–24 hairs at rear margin, but only half lie within the dark band. Microtrichia of frons, thoracic notum and abdominal tergites all minute and dense. Legs straw yellow but femora, especially those of the mid and hind legs, very lightly tinged brown. Hind tarsus with ventral hair palisade on basitarsus only. Details of abdominal terminalia as Figures 63, 64.

***Chonocephalus*** species H

(Figures 65, 66)

*Chonocephalus similis* Collin 1912, p 105 (part) nec Brues 1905. Misidentification.

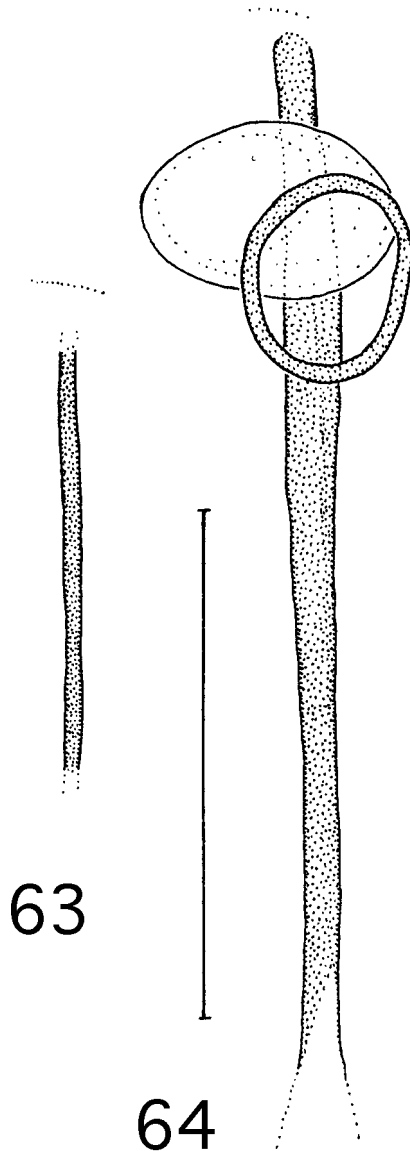
Five males of *C. modestus* were caught in the same trap. So species H is possibly the female of this species.



Figures 59–62. *Chonocephalus steineri* male, details of hypopygium from below. (59) Left side of epandrium and surstylus. (60) Left gonopod and hypandrial lobe. (61) Right gonopod. (62) Hypandrial lobes. Scale bar: 0.1 mm.

*Material*

Three females, **Seychelles**, Silhouette Island, 1500 ft, ex rotting jack fruit (*Artocarpus heterophyllus* Lam., Moraceae), 1908–1909 (J. E. Collin—103) (CUMZ—8-121); female, same island, Jardin Marron, Malaise trap, 2000–2001 (J. Gerlach) (CUMZ—8-130); four

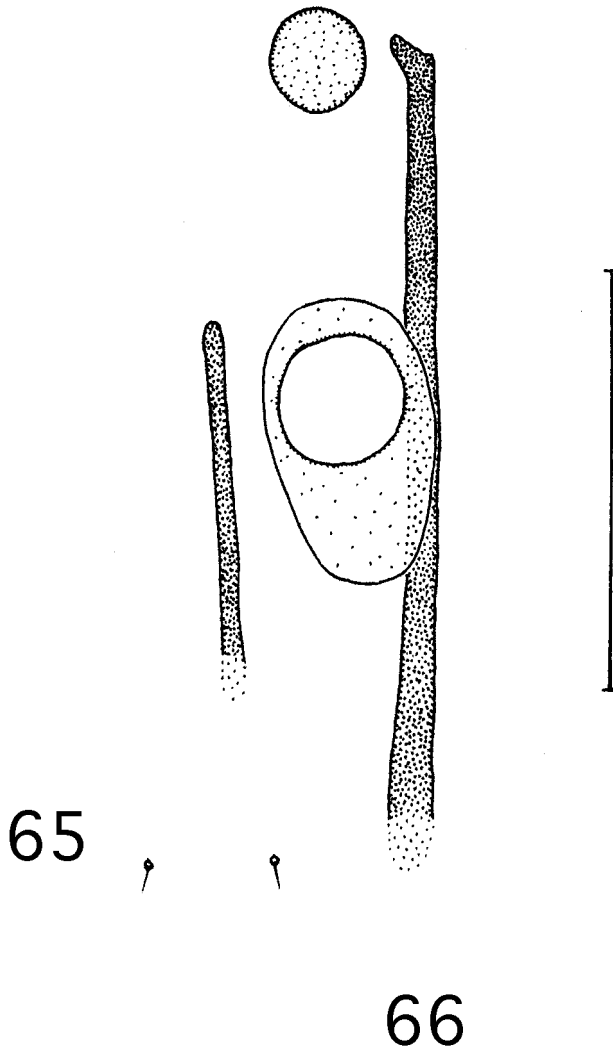


Figures 63, 64. *Chonocephalus* species G, female, details of abdomen. (63) Tergite 8. (64) Sternite 8, furca and spermatheca. Scale bar: 0.1 mm.

females, same locality, in fruits of *Phoenixophorium borsigianum* H. Wendl (Palmae), 28 March 2002 (J. Gerlach ) (CUMZ—8-147).

#### *Female*

Length 0.8–1.2 mm. Length of eye (viewed from above) slightly longer than diameter of light brown postpedicel. Frons, thoracic notum and abdominal tergites brown. T1+2–T6



Figures 65, 66. *Chonocephalus* species H, female, details of abdomen. (63) Tergite 8. (64) Sternite 8, furca and spermatheca. Scale bar: 0.1 mm.

with dark bands at rear margins. T3 with about two dozen hairs at hind margin. Microtrichia of frons minute and dense, those of thoracic notum longer and those of abdominal tergites even longer. Legs largely yellowish brown. Hind tarsus with ventral hair palisade on first two segments. Details of abdominal terminalia as Figures 65, 66.

*Natural history*

Most of these females were procured from rotting jack fruit (*Artocarpus heterophyllus*, Moraceae) by Collin and in fruits of *Phoenicophorium borsigianum* (Palmae) by Justin Gerlach. These fruits are probably the larval pabulum.

## Discussion

Of the 14 species now known from the Afrotropical Region, five are tramp species transported around the world by man. Of these *C. heymonsi* is the dominant species in mainland Africa and this was probably its original distribution. Likewise, the prevalence of *C. fletcheri* in Arabia suggests that this may be its original locality. Of the nine species apparently restricted to the Afrotropical Region only *C. cummingae* is recorded from mainland Africa so far. It also occurs in Madagascar, along with four of the other Afrotropical species. The other four are so far only known from the Seychelles. More intensive collecting may alter this picture.

The new species are mainly only known in the male sex. But the two species only known as females (G and H), which cannot be formally named until associated with their males, probably belong to two of these. I would therefore welcome any reared series or pairs caught *in copula*. Such specimens are best preserved in 70–80% ethanol.

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