

# New Neotropical species of *Chimarra* (Trichoptera, Philopotamidae)

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## Abstract

Ten new Neotropical species of *Chimarra* are described in the subgenera *Chimarra*, *Chimarrita*, and *Otarrha*. New species in the subgenus *Chimarra* include, in the *C. ortiziana* group: *C. calori* **sp. n.** (southeastern Brazil) and *C. onchyrrhina* **sp. n.** (Venezuela); in the *C. picea* group: *C. inchoata* **sp. n.** (Venezuela), *C. nicehub* **sp. n.** (Venezuela), and *C. sunima* **sp. n.** (Colombia); and in the *C. poolei* group: *C. cauca* **sp. n.** (Colombia) and *C. desirae* **sp. n.** (Bolivia). New species in the subgenus *Chimarrita* include, in the *C. simpliciforma* group: *C. curvipenis* **sp. n.** (SE Brazil) and *C. latiforceps* **sp. n.** (SE Brazil). A single new species in the subgenus *Otarrha* is also described: *C. soroa* **sp. n.** (Cuba). Males and females for all of the new species are illustrated, except for *C. desirae*, for which female specimens were unavailable. Additionally, the female of *C. (Chimarrita) camella*, which was previously unknown, is illustrated.

## Keywords

Trichoptera, Philopotamidae, *Chimarra*, *Chimarrita*, *Otarrha*, new species, caddisfly, Neotropics

## Introduction

The genus *Chimarra* Stephens, 1829, with about 700 species worldwide, is the second largest genus in the order Trichoptera (following *Rhyacophila* Pictet, 1834, with about

750 species), and is nearly cosmopolitan in distribution. Many additional species are either known or likely to be described from material existing in collections. Currently 4 subgenera are recognized, *Chimarra* Stephens, 1829; *Curgia* Walker, 1860; *Chimarrita* Blahnik, 1997; and *Otarrha* Blahnik, 2002. All of these occur in the New World, with the latter 3 subgenera restricted to the New World, primarily in the Neotropical region. Collectively, 240 species of *Chimarra* are recognized for the New World, or somewhat over a third of the world fauna. This entire New World fauna has been relatively recently revised: the subgenus *Chimarra* for Eastern United States by Lago and Harris (1987), Neotropical and Mexican species of the subgenus *Chimarra*, including species from western United States, by Blahnik (1998), the subgenus *Curgia* by Flint (1998), the subgenus *Chimarrita* by Blahnik (1997), and the subgenus *Otarrha* by Blahnik (2002). Two additional species were treated as *incertae sedis* as to subgenus in the paper on *Otarrha* by Blahnik (2002). Only 2 new Neotropical species have been described since these works appeared: *Chimarra chimalapa*, in the subgenus *Chimarra*, described by Bueno-Soria et al. (2001) from Mexico, and *Chimarra paucispina*, in the subgenus *Curgia*, described by Santos and Nessimian (2009) from Brazil. This paper includes new species in the subgenera *Chimarra*, *Chimarrita*, and *Otarrha*, based on material collected or curated subsequent to these revisions. All of these species fit within the general phylogenetic infrastructure established for these subgenera by Blahnik (1997, 1998, 2002), and the sister taxon relationships discussed here are based on those analyses. New species in the subgenus *Chimarra* fall within the *C. ortiziana*, *C. picea*, and *C. poolei* groups, which also represent several of the most species diverse of the 17 New World species groups recognized by Blahnik (1998). A key to species groups and previously described species can be found in the same work (Blahnik 1998: 18). The 2 new species in the subgenus *Chimarrita* fall in the *C. simpliciforma* group, and individually represent closely related sister taxa to 2 of the described species. The new species in the subgenus *Otarrha* from Cuba falls within the Greater Antillean lineage of species in that subgenus and is a probable sister taxon to *C. garciai* Botosaneanu, 1980, also described from Cuba.

## Materials and methods

Methodology follows that used by Blahnik (1998) for *Chimarra* and as discussed by Blahnik and Holzenthal (2004) for caddisflies in general. Additionally (when possible), the lactic acid method (Blahnik et al. 2007) was used to fully inflate the endotheca of individual specimens of most species. Because of the very elongate, narrow endotheca often found in *Chimarra* (*Chimarra*), the method was most successful on specimens in which the endotheca was already partially inflated. Illustrations were drawn with use of an optical grid, scanned, and illustrated in Adobe Illustrator CS®. Terminology follows that established by Blahnik (1997, 1998, 2002) for the respective subgenera of *Chimarra*. Descriptions for new species were formulated to closely follow those in the corresponding publications.

Each pinned specimen, or lot of specimens in alcohol, examined during the study, was affixed with a barcode label (4 mil polyester, 8 × 14 mm, code 49) with a unique alphanumeric sequence preceded with the prefix UMSP. The prefix is not meant to imply ownership by the University of Minnesota Collection, but only to indicate that the specimen was databased in that collection. Specimen taxonomic and collection data are stored in Biota® (v. 2.0, Sinauer Associates, Inc.) (Colwell 2003). Specimen barcode label information is included for holotypes in the list of material examined. A detailed list of all material examined, including individual barcode numbers, is maintained at UMSP and can be provided on request.

Holotypes are deposited in the collections of the University of Minnesota, St. Paul, Minnesota, USA (UMSP), the National Museum of Natural History, Smithsonian Institution, Washington DC, USA (NMNH), the Museu de Zoologia, Universidade de São Paulo, São Paulo, Brazil (MZUSP), and the Museo de Historia Natural Noel Kempff Mercado, Santa Cruz de la Sierra, Bolivia (UASC), as designated in the species descriptions. Paratypes are deposited in the same institutions, and also in the Museo del Instituto de Zoología Agrícola, Universidad Central de Venezuela, Maracay, Venezuela (MIZA).

## Species descriptions

### *Chimarra* (*Chimarra*) *ortiziana* group

Blahnik (1998) recognized 12 species in this group, distributed from Mexico to Ecuador and Venezuela. The new species in this group from southeastern Brazil represents a significant range extension for the group. The group is recognized primarily on the structures of the male genitalia, and particularly the general shape of the inferior appendages, which is very consistent among the described species, relatively short, with a prominent dorsal thumb-like process, which is typically somewhat mesally curved. The group is closely related to several other species groups, including the *C. amica*, *C. densa*, and *C. bidens* groups (and possibly also the *C. cornuta* and *C. virgencita* groups), based especially on the structure of the phallosomal sclerite complex and general similarity in structure of the inferior appendages. Of these, only the *C. bidens* group, with 6 described species, has more than 1 or 2 species. The new species described here represent sister species to 2 of the described species in the *C. ortiziana* group, based both on characters from the original analysis and also overall similarity.

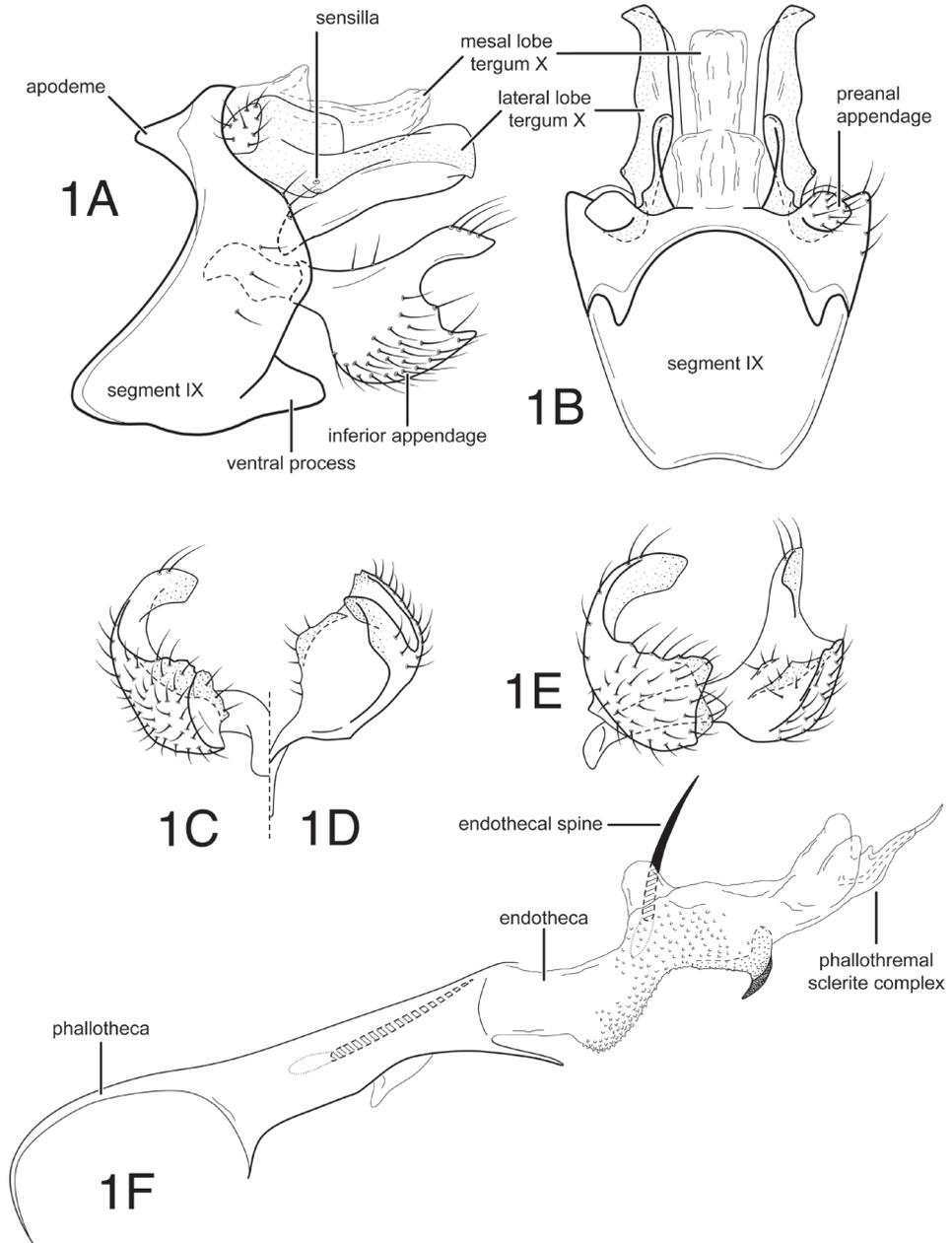
### *Chimarra* (*Chimarra*) *calori* Blahnik & Holzenthal, sp. n.

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[http://species-id.net/wiki/Chimarra\\_calori](http://species-id.net/wiki/Chimarra_calori)

Figs 1A–F, 8

**Description.** This species is most closely related to *Chimarra gondela* Flint, 1974, based on characters of the male and female genitalia. Character synapomorphies include, es-



**Figure 1.** *Chimarra (Chimarra) calori* sp. n. Male genitalia: **A** lateral **B** segment IX and tergum X, dorsal **C** inferior appendage, caudal **D** inferior appendage, dorsal **E** inferior appendages, oblique lateral **F** phallic apparatus, lateral.

pecially, the general shape of the lateral lobes tergum X, which are narrow overall and each of which has a raised basodorsal protuberance and basally located sensilla; and also the structure of the phallic apparatus, which includes a short, curved, sclerotized

apicoventral endothecal spine in both species, in addition to the usual pair of basal endothecal spines. The lateral lobes in *C. calori* differ in that they are not quite as narrow or strongly sclerotized apically as in *C. gondela*. The most significant difference is in the dorsal thumb-like projections of the inferior appendages, which in *C. calori* are bluntly rounded apically and closely resemble those of many other species in the *C. ortiziana* group, but in *C. gondela* are acute apically and very narrowed and bent.

*Adult.* Forewing length (male) 4.4–4.9 mm, (female) 4.7–5.5 mm. Cuticle of head and thorax very dark, nearly black, setae of anteromesal and frontal setal warts whitish, setae of other setal warts brownish-black, grizzled (a few setae gray or with apices grayish), femora brown, otherwise color nearly uniformly brownish-black (fuscous), including appendages and antennae. Postocular parietal sclerite short (not greatly extended behind eye). Second segment of maxillary palp slightly shorter than segment 3. Male protarsal claws enlarged, asymmetrical in size and shape, outer claw much larger, twisted, nearly linear apically.

*Male genitalia.* Abdominal segment IX, in lateral view, with pronounced sinuous extension of anteroventral margin and with distinct apodemes from the anterodorsal margin; posteroventral process moderately elongate, subtriangular, relatively wide basally, subacute apically. Tergum X with mesal lobe membranous; lateral lobes sclerotized, each bearing short conical lateral projection basally, with 2 sensilla, lobes relatively narrow, as viewed laterally, sclerotized along dorsal margins; apices of paired lobes diverging, as viewed dorsally, forming small, angular projections. Preanal appendage short, knob-like. Inferior appendage, in lateral view, with subquadrate base, dorsally with flattened, thumb-like extension, flexed caudally as viewed laterally, and mesally as viewed caudally, apex of thumb-like projection rounded, mesal surface with sclerotized ridge. Phallosome with apicoventral extension; endotheca with minute spines and sclerous region formed into short curved spine, endothecal spines 2, subequal in length, relatively short. Phallosomal sclerite complex composed of elongate rod and ring structure, with associated pair of wishbone-like sclerites from anteroventral margin.

*Female genitalia.* Sternum IX with ventral lobes broadly truncate apically, laterally with distinct cupped clasper receptacles. Vaginal apparatus, as viewed ventrally, with transverse apicodorsal sclerite, somewhat narrowed mesally and forming slightly projecting lobes laterally; apicoventrally with paired, subquadrate sclerites, each with narrow, sclerotized anterior extension, projecting onto lateral margin of vaginal apparatus; lateral margins rounded and membranous; vaginal apparatus anteriorly with deflexed, cup-like sclerite and paired preapical dorsal and ventral sclerites, dorsal pair elongate, narrow, ventral pair shorter, subtriangular.

**Holotype, male** (pinned) (UMSP000120377): **BRAZIL: São Paulo:** Altinópolis, Cachoeira Dos Macacos, 20°55.380'S, 47°22.758'W, 759 m, 18.xi.2003, Holzenthal, Paprocki, Calor (MZUSP).

**Paratypes. BRAZIL: Minas Gerais:** spring trib. to Rio Macauba, near Pandeiros, 15°28.637'S, 44°44.627'W, 525 m, 17.xi.2001, Paprocki & Blahnik, 3 males, 23 females (pinned) (UMSP); Parque Nacional Peruaçu, Rio Peruaçu, 15°06.674'S, 44°14.487'W, 590 m, 16.xi.2001, Holzenthal, Paprocki, Blahnik, Amarante, 13

males, 11 females (pinned) (UMSP) (MZUSP) (NMNH), 1 male (alcohol) (UMSP); Rio Guanhães, downstream from Salto Grande dam, 19°06.289'S, 42°42.635'W, 20.x.1998, Paprocki, 1 male, 1 female (pinned) (UMSP); **São Paulo**: same data as holotype, 3 males, 2 females (pinned) (UMSP).

**Etymology.** This species is named *Chimarra calori*, for Dr. Adolfo Calor, Universidade Federal da Bahia, Brazil, who helped collect the type specimen, in recognition of his contributions to the study of the Neotropical caddisflies.

***Chimarra (Chimarra) onchyrhina* Blahnik & Holzenthal, sp. n.**

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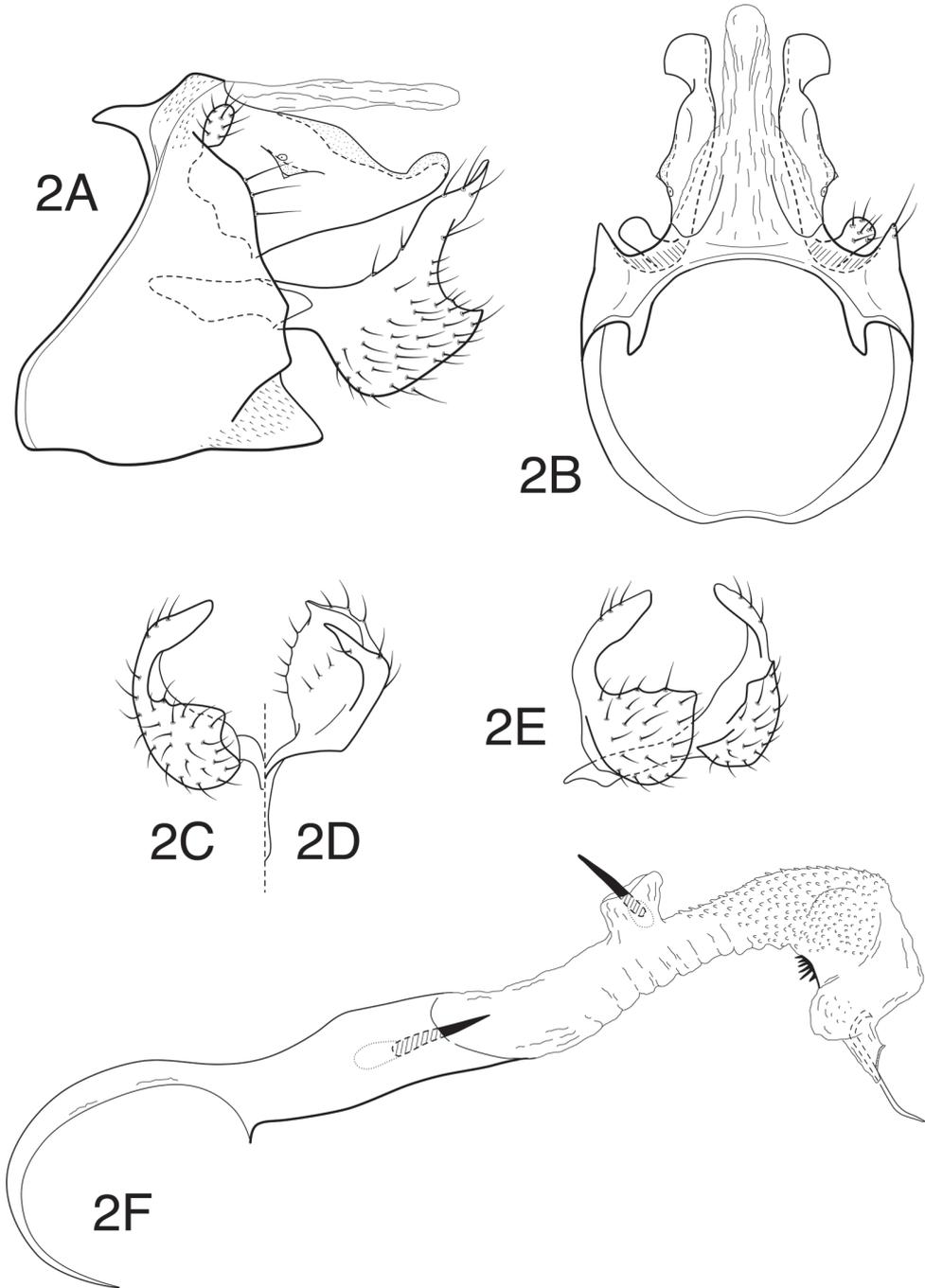
[http://species-id.net/wiki/Chimarra\\_onchyrhina](http://species-id.net/wiki/Chimarra_onchyrhina)

Figs 2A–F, 9

**Description.** This species is very similar to *C. platyrhina* Flint, 1981, especially in the general shape of the lateral lobes of tergum X, as viewed dorsally. In both species, the lateral lobes of tergum X each have a broadly rounded apicolateral projection. The difference in shape of this projection, however, is distinctive and diagnostic, that of *C. platyrhina* being broad and uniformly rounded, and that of *C. onchyrhina* being somewhat angular laterally. Both species also have a linear cluster of small spines located near the ventral apex of the endotheca, also present in some other species of the *C. ortiziana* group. The latter character is, however, absent in *C. ortiziana*, which otherwise resembles *C. onchyrhina* in the general shape of the apex of the lateral lobes of tergum X. An additional difference separating them is that *Chimarra ortiziana* has the lateral sensilla of tergum X placed on a concavely developed lateral projection. The lateral projections of *C. onchyrhina* and *C. platyrhina* are simple in structure. The female genitalia of *C. onchyrhina* also generally resemble *C. platyrhina*, especially in the shape of apical sclerites of the vaginal apparatus. However the vaginal apparatus has distinctive lateral projections, not present in *C. platyrhina*. The overall similarities of these species, both in male and female genitalia, are indicative of their sister relationship.

**Adult.** Forewing length (male) 3.9–5.0 mm, (female) 4.8–5.5 mm. Cuticle of head and thorax dark brown, setae of anteromesal and frontal setal warts whitish, setae of other setal warts dark brown, grizzled (grayish in part or intermixed), femora brown, otherwise color nearly uniformly brownish-black (fuscous), including appendages and antennae. Postocular parietal sclerite very short (not extended behind eye). Second segment of maxillary palp much shorter than segment 3 (about 2/3 length). Male protarsal claws enlarged, asymmetrical in size and shape, outer claw much larger, twisted, nearly linear apically.

**Male genitalia.** Abdominal segment IX, in lateral view, with pronounced sinuous extension of anteroventral margin and with distinct apodemes from anterodorsal margin; posteroventral process moderately elongate, subtriangular, relatively broad basally, subacute apically. Tergum X membranous mesally, with 2 sclerotized lateral lobes, each



**Figure 2.** *Chimarra (Chimarra) onchyrbina* sp. n. Male genitalia: **A** lateral **B** segment IX and tergum X, dorsal **C** inferior appendage, caudal **D** inferior appendage, dorsal **E** inferior appendages, oblique lateral **F** phallic apparatus, lateral.

bearing short rounded projection laterally in basal portion, with 2 sensilla on tiny projections; terminus of lateral lobe inflated, broadly rounded, but with distinct, obtuse angle on lateral margin. Preanal appendage short, knob-like. Inferior appendage, in lateral view, with rounded to subquadrate base, subacute apically; dorsally with flattened, thumb-like extension, flexed caudally as viewed laterally, and mesally as viewed caudally; apex of thumb-like projection rounded. Phallosome with apicoventral margin projecting; endosoma forming collar of minute spines in apical 1/2, slightly ballooned laterally, apicoventrally with sclerotized region possessing array of short spines, endosomal spines 2, very short, subequal in length. Phallosomal sclerite complex composed of elongate rod and ring structure with associated pair of wishbone-like sclerites from anteroventral margin.

*Female genitalia.* Sternum IX with ventral lobes broadly truncate apically. Vaginal apparatus, as viewed ventrally, with paired, subtruncate, lightly sclerotized apicoventral sclerites; laterally with short projecting sclerotized lobes on either side, each with short, digitate apical projection; vaginal apparatus anteriorly with deflexed, cup-like sclerite and elongate, paired, dorsolateral and ventrolateral sclerites, these extending more than 1/2 length of vaginal apparatus.

**Holotype, male** (pinned) (UMSP000026958): **VENEZUELA: Sucre:** Península de Paria, Puerto Viejo, “Río el Pozo”, 10°43.073'N, 62°28.569'S, 20 m, 3.iv.1995, Holzenthal, Flint, Cressa (UMSP).

**Paratypes. VENEZUELA: Falcón:** Quebrada El Charo at cataratas, 10°46.771'N, 69°12.174'W, 425 m, Holzenthal, Blahnik, Paprocki, Cressa, 3 males (alcohol) (UMSP); **Monagas:** Guachero Cave N.P., 10°10.322'N, 63°33.315'W, 1110 m, 20–21.vii.2010, Holzenthal, Thomson, Cressa, 4 males, 6 females (pinned) (UMSP); **Sucre:** same data as holotype, 12 males (pinned), 33 males, 20 females (alcohol) (UMSP); Península de Paria, Santa Isabel, Río Santa Isabel, 10°44.294'N, 62°38.954'W, 20 m, 4.iv.1995, Holzenthal, Flint, Cressa, 9 males, 1 female (pinned), 28 males, 45 females (alcohol) (UMSP); Península de Paria, Puerto Viejo, Río Puerto Viejo, 10°43.137'N, 62°28.743'W, 15 m, 2.iv.1995, Holzenthal, Flint, Cressa, 3 males (pinned), 20 males, 60 females (alcohol) (UMSP); Parque Nacional Península de Paria, Río San Francisco, 10°42.713'N, 62°00.066'W, 10 m, 1.iv.1995, Holzenthal, Flint, Cressa, 2 males (pinned) (UMSP); Parque Nacional Península de Paria, Uquire, Río La Viuda, 10°42.830'N, 61°57.661'W, 15 m, 30.iii–1.iv.1995, Holzenthal, Flint, Cressa, 15 males (pinned), 18 males, 43 females (alcohol) (UMSP) (NMNH) (MIZA); Quebrada Zapateral, 1.5 km SE Las Piedras de Cocollar, 10°09.753'N, 63°47.587'W, 810 m, 9.iv.1995, Holzenthal & Flint, 2 males, 1 female (alcohol) (NMNH); Río Cocollar, 1.5 km SE Las Piedras de Cocollar, 10°09.617'N, 63°47.605'W, 810 m, 7–8.iv.1995, Holzenthal & Flint, 12 males, 10 females (alcohol) (MIZA).

**Etymology.** This species is named *C. onchyrhina* from the Greek words *onkos*, meaning a hook or angle, and *rhinos*, a nose, and referring to the slightly angled lateral process on tergum X of this species, which distinguishes it from the more uniformly rounded process in *C. platyrhina*.

***Chimarra* (*Chimarra*) *picea* group**

Blahnik (1998) recognized 11 species in this group, distributed from lower Central America to Ecuador and Venezuela. The species all have very similar, though somewhat differently developed, inferior appendages (very short with elongate lateral setae and small, sclerotized, strongly mesally curved dorsomesal processes, not generally evident in lateral view), and are especially diagnosed by differences in the shape of the lateral lobes of tergum X and their sensilla-bearing protuberances. The 3 new species recognized here are similar in general characters to other described species and bring the total number of species in the group to 14.

***Chimarra* (*Chimarra*) *inchoata* Blahnik & Holzenthal, sp. n.**

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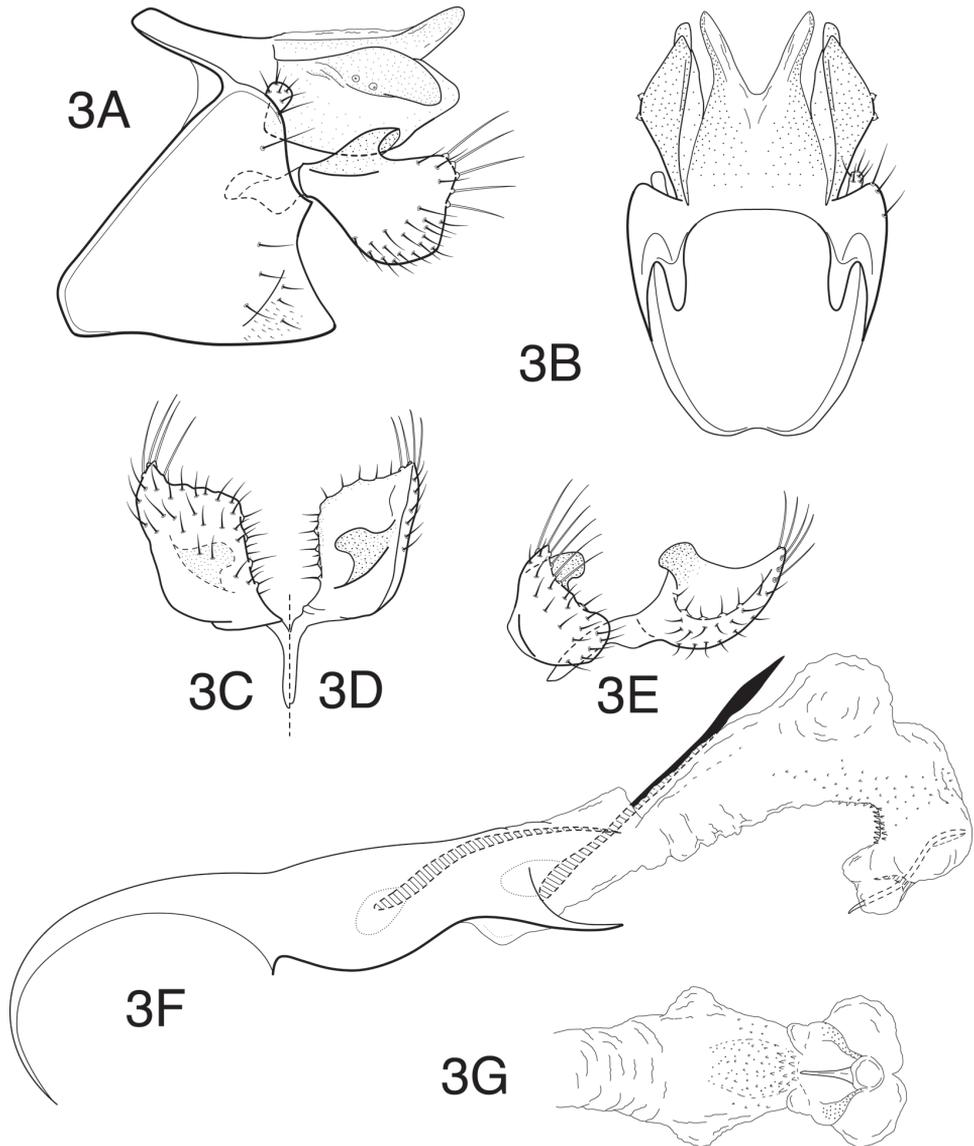
[http://species-id.net/wiki/Chimarra\\_inchoata](http://species-id.net/wiki/Chimarra_inchoata)

Figs 3A–G, 10

**Description.** This species is most closely related to *C. creagra* Flint, 1981 and *C. para-creagra* Blahnik, 1998, based on the similarly developed, sclerotized, dorsolateral margins of the mesal lobe of tergum X. In *C. inchoata*, however, this structure is not as strongly sclerotized, and while somewhat curved apically, does not form the strongly recurved and acutely hooked projections found in the two described species. Additionally, the sclerotized basodorsal, mesally curved, thumb-like processes of the inferior appendage are distinctly evident even in lateral view, and the lateral lobes of tergum X are shorter and have much more broadly rounded lateral sensilla-bearing processes.

*Adult.* Forewing length (male) 3.7–5.1 mm, (female) 4.4–5.8 mm. Cuticle of head and thorax dark brown, setae of anteromesal and frontal setal warts light brown or brownish-white, setae of other setal warts dark brown, grizzled (grayish at apices or intermixed with grayish setae), femora brown, otherwise color nearly uniformly dark brown or brownish-black (fuscous), including appendages and antennae. Postocular parietal sclerite elongate (extended behind eye). Second segment of maxillary palp much shorter than segment 3 (less than 2/3 length). Male protarsal claws enlarged, asymmetrical in size and shape, outer claw much larger, twisted, nearly linear apically.

*Male genitalia.* Abdominal segment IX, in lateral view, with pronounced linear extension of anteroventral margin and with distinct, enlarged apodemes from anterodorsal margin; posteroventral process prominent, subtriangular, broad basally, subacute apically. Tergum X with mesal lobe membranous and incised mesally, lightly sclerotized laterally, forming bluntly rounded, dorsally recurved projections; lateral lobes sclerotized, relatively short, tapering apically, each bearing broadly rounded projection laterally with 2 sensilla. Preanal appendage short, knob-like. Inferior appendage short, subtruncate, with elongate marginal setae, dorsally with short, bluntly rounded, mesally curved process, distinctly visible in both lateral and dorsal views. Phallosome with acute apicoventral projection; endotheca membranous with scattered, minute spines,



**Figure 3.** *Chimarra (Chimarra) inchoata* sp. n. Male genitalia: **A** lateral **B** segment IX and tergum X, dorsal **C** inferior appendage, ventral **D** inferior appendage, dorsal **E** inferior appendages, oblique lateral **F** phallic apparatus, lateral **G** apex of endotheca, ventral.

these slightly longer preapically on ventral margin, endotheca dorsally with slightly ballooned lateral projections, endothecal spines 2, basal one moderately elongate and curved, apical one very elongate and nearly straight. Phallotremal sclerite complex composed of rod and ring structure, rod relatively elongate, ring reclinate.

*Female genitalia.* Sternum IX with ventral lobes truncate apically, laterally with small rounded clasper receptacles. Vaginal apparatus relatively membranous apically,

with narrow, transverse preapical sclerite dorsally; ventrally with elongate, narrow, membranous lobe extending from apex to about  $\frac{1}{2}$  length, lobe with small sclerite at apex; vaginal apparatus laterally with pair of small sclerites at about midlength; anteriorly with deflexed, cup-like sclerite.

**Holotype, male** (alcohol) (UMSP000026863): **VENEZUELA: Sucre:** Península de Paria, Puerto Viejo, Río Puerto Viejo, 10°43.137'N, 62°28.743'W, 15 m, 2.iv.1995, Holzenthal, Flint, Cressa (UMSP).

**Paratypes. VENEZUELA: Monagas:** Guachero Cave N.P., 10°10.322'N, 63°33.315'W, 1110 m, 20–21.vii.2010, Holzenthal, Thomson, Cressa, 32 males, 10 females (pinned) (UMSP); **Sucre:** Río Cocollar, 1.5 km SE Las Piedras de Cocollar, 10°09.617'N, 63°47.605'W, 810 m, 7–8.iv.1995, Holzenthal & Flint, 26 males (pinned) 201 males, 101 females (alcohol) (UMSP) (MIZA); Parque Nacional Península de Paria, Río San Francisco, 10°42.713'N, 62°00.066'W, 10 m, 1.iv.1995, Holzenthal, Flint, Cressa, 1 male (pinned) (UMSP); Parque Nacional Península de Paria, Uquire, Río La Viuda, 10°42.830'N, 61°57.661'W, 15 m, 30.iii-1.iv.1995, Holzenthal, Flint, Cressa, 25 males, 1 female (pinned), 81 males, 43 females (alcohol) (UMSP) (MIZA); Península de Paria, Puerto Viejo, “Río el Pozo”, 10°43.073'N, 62°28.569'S, 20 m, 3.iv.1995, Holzenthal, Flint, Cressa, 16 males (pinned), 94 males, 18 females (alcohol) (UMSP); Península de Paria, Puerto Viejo, Río Puerto Viejo, 10°43.137'N, 62°28.743'W, 15 m, 2.iv.1995, Holzenthal, Flint, Cressa, 5 males, 2 females (pinned), 86 males, 7 females (alcohol) (UMSP) (NMNH); Península de Paria, Santa Isabel, Río Santa Isabel, 10°44.294'N, 62°38.954'W, 20 m, 4.iv.1995, Holzenthal, Flint, Cressa, 17 males (pinned), 55 males, 36 females (alcohol) (UMSP); Quebrada Zapateral, 1.5 km SE Las Piedras de Cocollar, 10°09.753'N, 63°47.587'W, 810 m, 9.iv.1995, Holzenthal & Flint, 7 males (pinned), 70 males, 24 females (alcohol) (UMSP).

**Etymology.** This species is named *C. inchoata* from the Latin word *inchoatus* (or *inchoatus*), meaning only begun, incipient, or incomplete, and referring to the development of the lateral lobes of tergum X in this species, which are only suggestively sclerotized as compared to the strongly sclerotized, hooked processes in *C. creagra* and *C. paracreagra*.

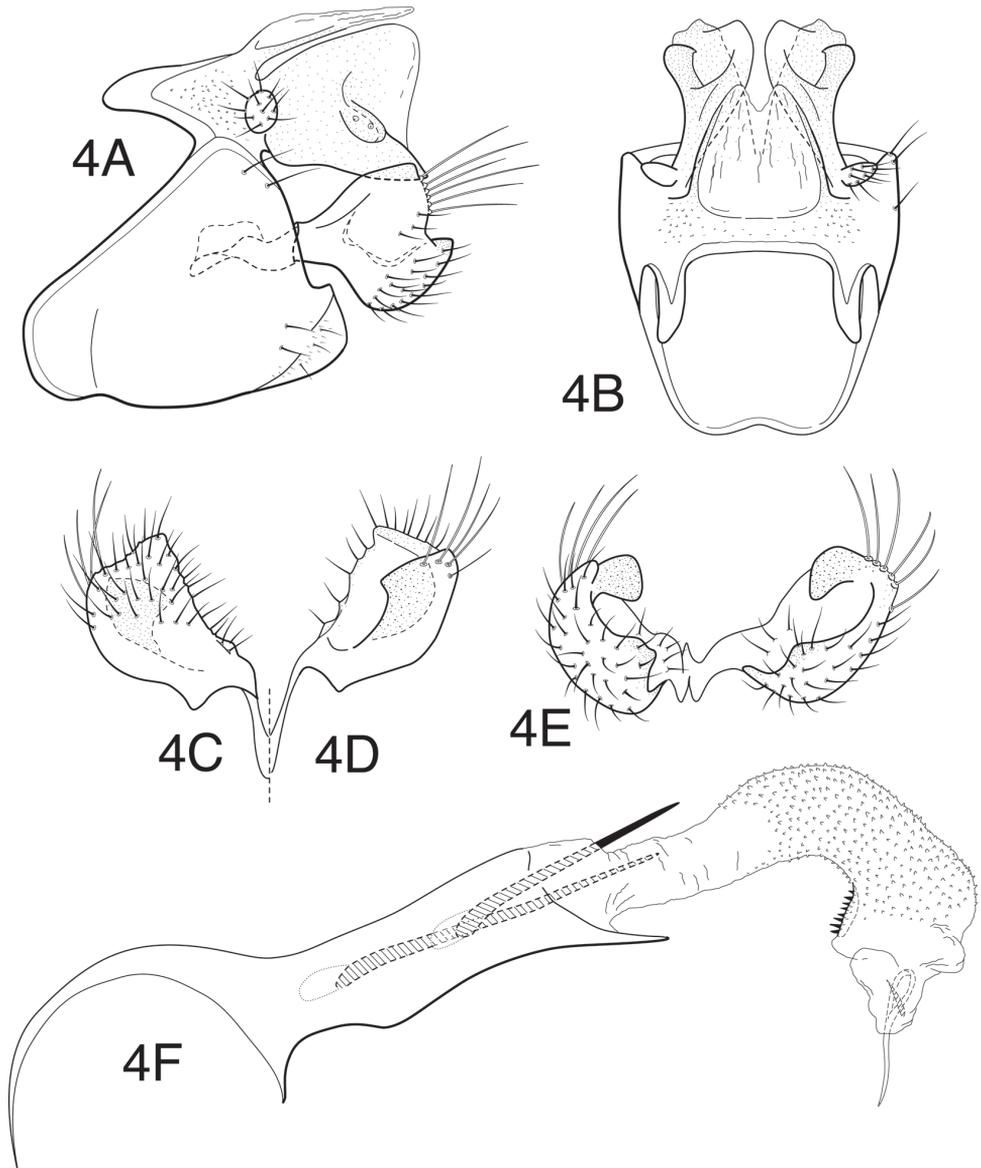
***Chimarra (Chimarra) nicehuh* Blahnik & Holzenthal, sp. n.**

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[http://species-id.net/wiki/Chimarra\\_nicehuh](http://species-id.net/wiki/Chimarra_nicehuh)

Figs 4A–F, 11

**Description.** This is perhaps one of the most distinctive of the species in the *C. picea* group described to date and unlikely to be confused with any other described species. Especially distinctive is the shape of the lateral lobes of tergum X, which are short, but broad apically, as viewed laterally, each with a small, obliquely oriented, lateral sensilla-bearing processes. Like the previous species, it has the lateral margins of the mesal lobe of tergum X somewhat sclerotized, though not projecting apically. The thumb-like dorsolateral projections of the inferior appendages are especially blunt and



**Figure 4.** *Chimarra (Chimarra) nicehub* sp. n. Male genitalia: **A** lateral **B** segment IX and tergum X, dorsal **C** inferior appendage, ventral **D** inferior appendage, dorsal **E** inferior appendages, oblique lateral **F** phallic apparatus, lateral.

strongly curled, not clearly evident in either lateral or dorsal views. Additionally the apicoventral margin of the appendage is recurved, and thus evident as a ridge on the mesal surface, as viewed caudally.

*Adult.* Forewing length (male) 5.1–5.3 mm, (female) 5.5–5.9 mm. Cuticle of head and thorax very dark, nearly black, setae of anteromesal and frontal setal warts brown or

brownish-white, setae of other setal warts and tegulae black, grizzled (grayish at apices or intermixed with grayish setae), otherwise color nearly uniformly dark brownish-black (fuscous), including appendages and antennae (femora not or hardly paler). Postocular parietal sclerite elongate (extended behind eye). Second segment of maxillary palp much shorter than segment 3 (less than 2/3 length). Male protarsal claws enlarged, asymmetrical in size and shape, outer claw much larger, twisted, nearly linear apically.

*Male genitalia.* Abdominal segment IX, in lateral view, with pronounced linear extension of anteroventral margin and with distinct, enlarged apodemes from anterodorsal margin; posteroventral process short, broad basally, rounded apically. Tergum X with mesal lobe membranous and weakly incised mesally, lightly sclerotized laterally; lateral lobes sclerotized, relatively short, very broadly truncate apically as viewed laterally, each bearing short, lateral, obliquely flattened projection with 2 sensilla. Preanal appendage short, knob-like. Inferior appendage very short, apicoventral margin weakly projecting and slightly recurved, apically with elongate marginal setae, dorsally with very short, bluntly rounded, mesally curved process, visible in caudal view, but not fully evident in either lateral or dorsal views. Phallosome with acute apicoventral projection; endotheca membranous, elongate tubular, with numerous minute spines in apical 1/2, preapically on ventral margin with very short sclerotized spines, endothecal spines 2, basal one elongate, apical one moderately elongate. Phallosomal sclerite complex composed of rod and ring structure, rod relatively elongate, ring reclinate, complex laterally with pair of short sclerites.

*Female genitalia.* Sternum IX rounded apically, laterally with small, broadly rounded clasper receptacles. Vaginal apparatus relatively membranous apically; laterally with conspicuous, projecting preapical sclerites on either side; anteriorly with deflexed, cup-like sclerite.

**Holotype, male** (pinned) (UMSP000026909): **VENEZUELA: Trujillo:** Quebrada Potrerito, 7.5 km NE Boconó, 9°16.435'N, 70°13.102'W, 1530 m, 29–30.iv.1995, Holzenthal, Cressa, Gutic (UMSP).

**Paratypes. VENEZUELA: Lara:** Parque Nacional Dinira, Quebrada Buenos Aires, 9°36.407'N, 70°04.178'W, 1850 m, 18–19.vi.2001, Holzenthal, Blahnik, Paprocki, Cressa, 3 males (pinned) (UMSP); **Trujillo:** same data as holotype, 5 males, 5 females (pinned) (UMSP) (MIZA).

**Etymology.** The name of this species should be considered an arbitrary combination of letters. It resulted from an observation made by the first author when seeing the genitalia of this distinctive species for the first time, “Nice, huh?”

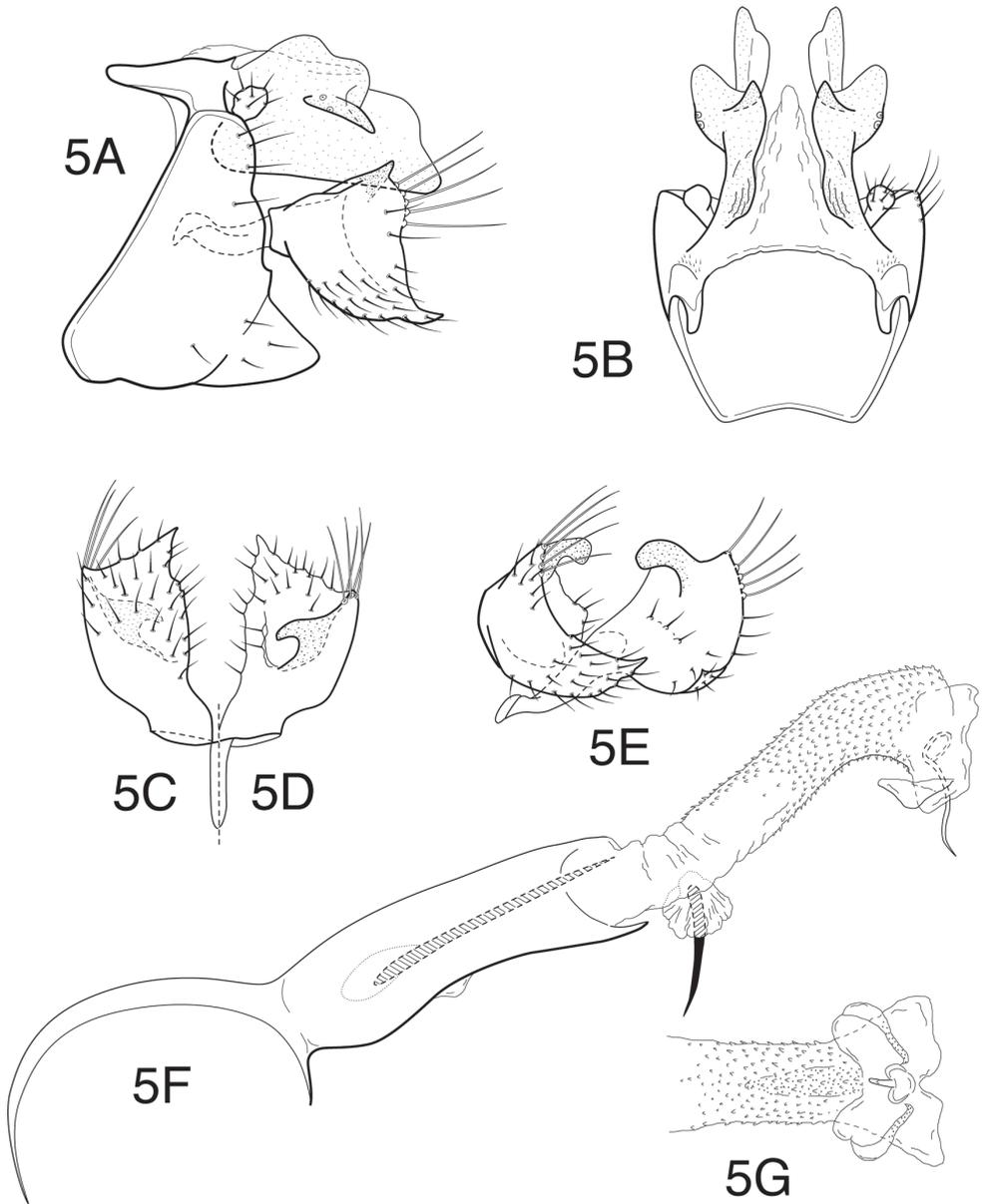
***Chimarra (Chimarra) sunima* Blahnik & Holzenthal, sp. n.**

urn:lsid:zoobank.org:act:C41FE4CB-F191-4B84-8C4A-6F83A03894A2

[http://species-id.net/wiki/Chimarra\\_sunima](http://species-id.net/wiki/Chimarra_sunima)

Figs 5A–G, 12

**Description.** This species most closely resembles *C. onima* Flint, 1991, especially in the structure of the lateral sensilla bearing processes of tergum X. In both species the



**Figure 5.** *Chimarra (Chimarra) sunima* sp. n. Male genitalia: **A** lateral **B** segment IX and tergum X, dorsal **C** inferior appendage, ventral **D** inferior appendage, dorsal **E** inferior appendages, oblique lateral **F** phallic apparatus, lateral **G** apex of endotheca, ventral.

processes have their posterior margins detached and project “ear-like”, as viewed dorsally, although those of *C. sunima* are perhaps not quite so elongate. Differences are found in the basal part of the lateral lobes of tergum X, which in *C. sunima* are more

dorsally projecting in lateral view, and in the structure of the inferior appendages. The latter are very distinctive in *C. onima*, with the dorsal margin projecting, so that the dorsomesal processes are clearly apical, as viewed laterally, and the posterior margin concave, whereas in *C. sunima*, the inferior appendages are more or less typical of a number of other species in the group (i.e., *C. tapanti* Blahnik, 1998 or *C. limon* Blahnik, 1998) in that the dorsomesal processes are slightly recessed compared to the elongate, fringing posterolateral setae of the appendage.

*Adult.* Forewing length (male) 3.8–4.5 mm, (female) 4.3–5.2 mm. Cuticle of head and thorax dark brown, setae of anteromesal and frontal setal warts light brown or whitish, setae of other setal warts dark brown, grizzled (grayish in part or intermixed), otherwise color nearly uniformly brownish-black (fuscous), including appendages and antennae. Postocular parietal sclerite elongate (extended behind eye). Second segment of maxillary palp much shorter than segment 3 (less than 2/3 length). Male protarsal claws enlarged, asymmetrical in size and shape, outer claw larger, twisted, nearly linear apically.

*Male genitalia.* Abdominal segment IX, in lateral view, with pronounced linear extension of anteroventral margin and with distinct, enlarged apodemes from anterodorsal margin; posteroventral process prominent, subtriangular, broad basally, subacute apically. Tergum X with mesal lobe membranous; lateral lobes sclerotized, moderately elongate, ventral margin slightly projecting, each lobe bearing broadly truncate, basodorsal projection and dorsoventrally flattened, ear-like lateral projections with 2 sensilla. Preanal appendage short, knob-like. Inferior appendage short, apicoventral margin acutely projecting, apically with elongate marginal setae, dorsally with short, bluntly rounded, mesally curved process, distinctly evident in caudal view, partially evident in lateral and dorsal views. Phallosome with acute apicoventral projection; endotheca membranous, elongate tubular, with numerous minute spines in apical ½, endothecal spines 2, basal one elongate, apical one short and curved. Phallosomal sclerite complex composed of rod and ring structure, rod relatively elongate, ring reclinate, laterally with short sclerites attached to membranous apical wing-like projections.

*Female genitalia.* Sternum IX with ventral lobes tapering, subacute, extreme apex nearly membranous, laterally with large rounded clasper receptacles. Vaginal apparatus relatively membranous apically, with very narrow, elongate mesal lobe extending from apex to more than ½ length, lobe very lightly sclerotized; laterally with conspicuous, projecting preapical lobes on either side, these largely membranous, but with conspicuous, rounded, premarginal ventral sclerites; anterolateral margins of vaginal apparatus lightly sclerotized; anteriorly with deflexed, cup-like sclerite.

**Holotype, male** (pinned) (UMSP000209321): **COLOMBIA: Valle:** Municipio de Buenaventura, Río Escalerete, frente a casa de "Acua Valle", ca. 15 km SE Cordoba, 3°49'38"N, 76°52'15"W, 200 m, 1.xii.1997, F. Muñoz-Q. et al. (UMSP)

**Paratypes. COLOMBIA: Valle:** same data as holotype, 12 males 17 females (pinned) (UMSP) (NMNH); Municipio de Buenaventura, Río Escalerete, 1 km E casa de "Acua Valle", ca. 16 km SE Cordoba, 3°49'38"N, 76°52'15"W, 210 m, 2.xii.1997, F. Muñoz-Q. et al., 9 males, 4 females (pinned) (UMSP).

**Etymology.** The species name should be considered an arbitrary combination of letters, suggested by its similarity in form to that of other species in this species group (i.e., *C. emima* Ross, 1959; *C. onima* Flint, 1991; and *C. jemima* Blahnik & Holzenthal, 1992).

### ***Chimarra (Chimarra) poolei* group**

Blahnik (1998) recognized 10 species in this group, broadly distributed from Costa Rica in Central America through the Brazilian subregion of South America, including southeastern Brazil. Species are readily recognized by the spine-like projections from the posterodorsal margin of segment IX (as distinguished from the spine-like modifications of tergum X in several species of the *C. picea* group). All of the species have very short inferior appendages, either without or with very small dorsomesal projections, not generally evident in lateral view. The group is closely related to the *C. bidentata* group. The 2 new species recognized here increase the species group to 12 species. The new species and new records of this group from Bolivia also represent a range extension for the species group.

### ***Chimarra (Chimarra) cauca* Blahnik & Holzenthal, sp. n.**

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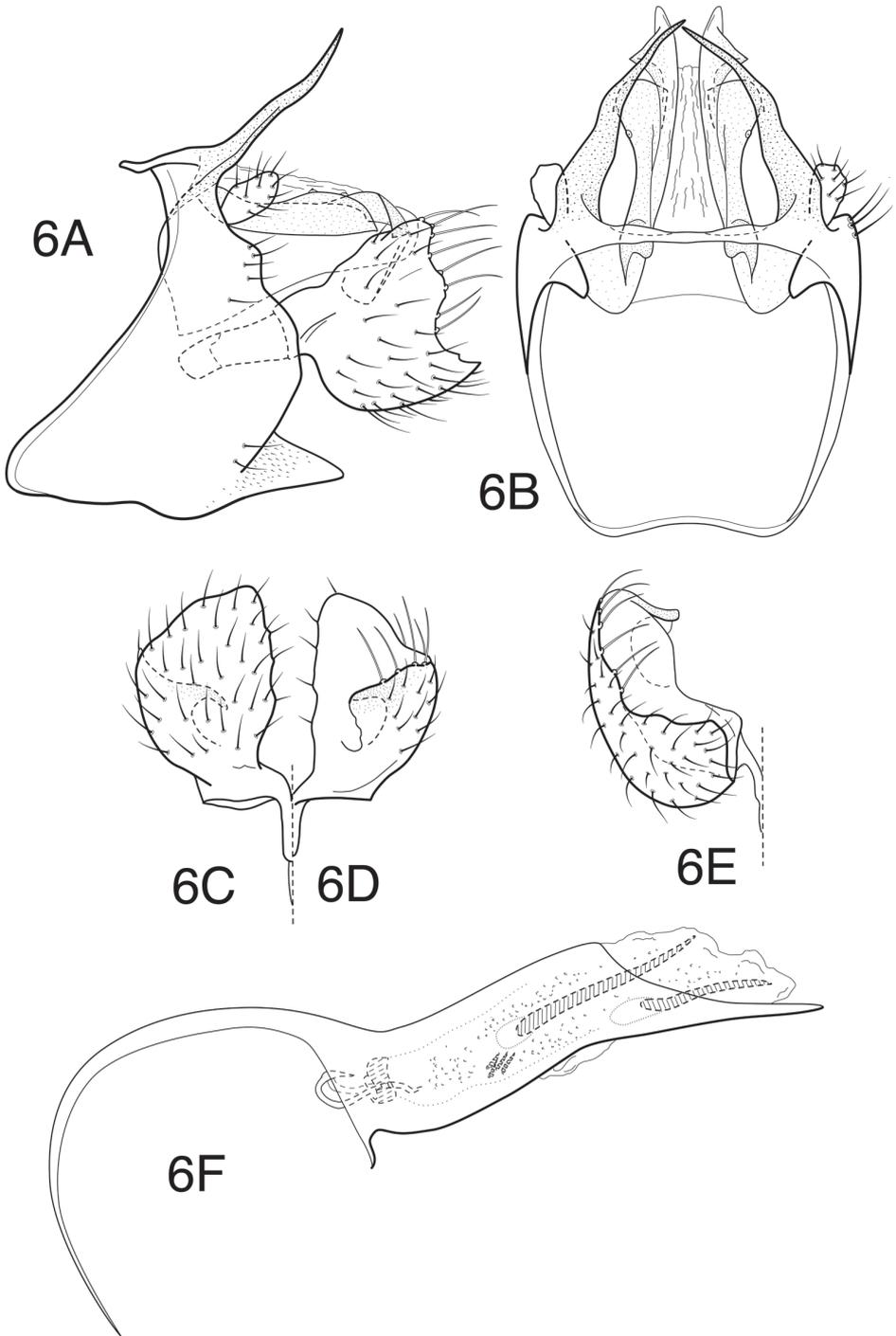
[http://species-id.net/wiki/Chimarra\\_cauca](http://species-id.net/wiki/Chimarra_cauca)

Figs 6A–F, 13

**Description.** This new species is most closely related to *C. zamora* Blahnik, 1998. Notable synapomorphies are found in the overall structure of the lateral lobes of tergum X, which in both species have a somewhat concavely developed apical protuberance and also projecting, sensilla-bearing lateral projections. In *C. cauca*, the sensilla-bearing projections are larger and more broadly rounded. Additionally, the spine-like processes of segment IX are much more prominent in *C. cauca*. Female genitalia for the 2 species, while having some similarities, are also different, confirming that these are indeed distinct species.

*Adult.* Forewing length (male) 4.8–5.4 mm, (female) 5.7 mm. Cuticle of head and thorax dark brown, setae of anteromesal and frontal setal warts light brown, setae of other setal warts dark brown, grizzled (grayish in part or intermixed), femora brown, otherwise color nearly uniformly brownish-black (fuscous), including appendages and antennae. Postocular parietal sclerite short (not extended behind eye). Second segment of maxillary palp much shorter than segment 3 (about 2/3 length). Male protarsal claws enlarged, asymmetrical in size and shape, outer claw larger, twisted, nearly linear apically.

*Male genitalia.* Abdominal segment IX, in lateral view, with pronounced linear extension of anteroventral margin and with distinct small apodemes from anterodorsal margin; posterodorsal margin with prominent pair of acute, spine-like projections, ex-



**Figure 6.** *Chimarra (Chimarra) cauca* sp. n. Male genitalia: **A** lateral **B** segment IX and tergum X, dorsal **C** inferior appendage, ventral **D** inferior appendage, dorsal **E** inferior appendage, caudal **F** phallic apparatus, lateral.

tending about 2/3 length of tergum X; posteroventral process prominent, subtriangular, broad basally, acute apically, length slightly greater than width at base. Tergum X with mesal lobe membranous; lateral lobes sclerotized, moderately elongate, each with distinct, preapical, lateral projection, more or less concave on anterior margin (acute as viewed dorsally), lobe laterally with rounded projection bearing 2 sensilla. Preanal appendage short, knob-like. Inferior appendage, in lateral view, very short and strongly cupped basally; apical margin truncate, dorsally with very short, mesally curved process, process very angularly bent. Phallosome with acute apicoventral projection; endothenca membranous, apparently with numerous minute spines and cluster of short sclerotized spines, endothenca spines 2, basal one moderately elongate, apical one short. Phallosomal sclerite complex composed of rod and ring structure, rod relatively short and ring with small, but distinct apicodorsal extension; complex also with small lateral sclerites.

*Female genitalia.* Sternum IX with ventral lobes short, subacute apically, laterally with small rounded clasper receptacles. Vaginal apparatus distinctly sclerotized apically, with sclerotized mesal lobe extending less than 1/2 length of vaginal apparatus, lobe with distinctly sclerotized lateral margins, appearing as sclerotized ridges; preapically with conspicuous, sclerotized, rounded lateral lobes; vaginal apparatus laterally with small rounded, lightly sclerotized projections at about midlength, each with acute awl-like apical projection; anterior half of vaginal apparatus membranous, parallel-sided, anteriorly with deflexed cup-like sclerite.

**Holotype, male** (pinned) (UMSP000108722): **COLOMBIA: Cauca:** Municipio de Inzá, Quebrada San Andrés, ca. 500 m, W Restaurante “La Portada”, San Andrés de Pisimbalá, 2°34'56"N, 76°2'36"W, 1750 m, 21.xii.1997, F. Muñoz-Q. et al. (UMSP).

**Paratypes. COLOMBIA: Cauca:** same data as holotype, 4 males (pinned) (UMSP) (NMNH); Municipio de Belalcazar, Quebrada Tálaga, ca. 14 km N Páez (Belalcazar), 2°42'24"N, 76°1'5"W, 1680 m, 22.xii.1997, F. Muñoz-Q. et al., 2 males (pinned) (UMSP); **Magdalena:** Municipio Ciénaga, ca. 25 km NW Estación Exp. San Lorenzo, Sierra Nevada de Santa Marta, Río Cordoba, 11°2'22"N, 74°2'18"W, 930 m, 12.xii.1997, F. Muñoz-Q. et al., 1 male, 1 female (pinned) (UMSP).

**Etymology.** This species is named *C. cauca*, used as noun in apposition, for the Department (regional area) in Colombia where the type specimens were collected.

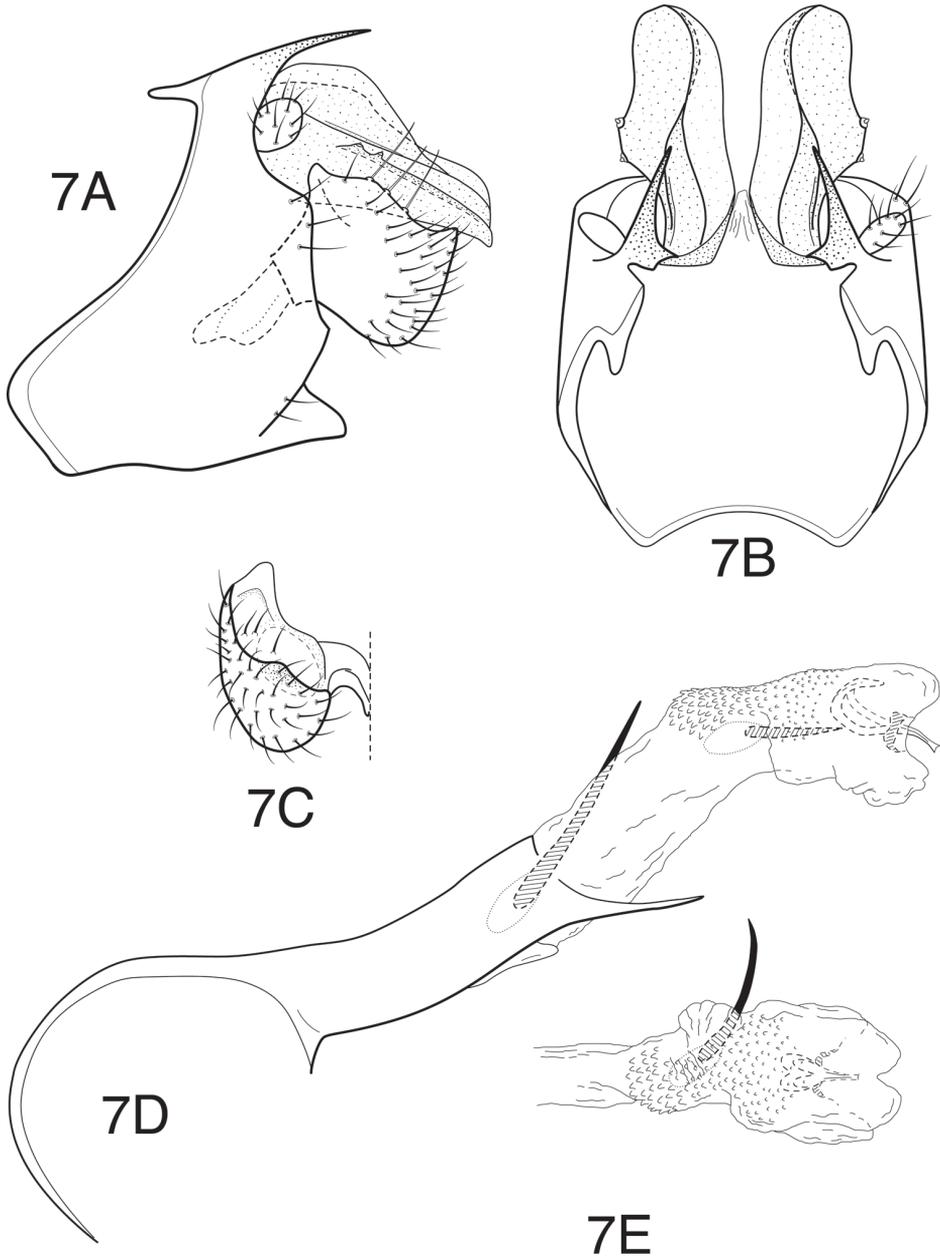
***Chimarra (Chimarra) desirae* Blahnik & Holzenthal, sp. n.**

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[http://species-id.net/wiki/Chimarra\\_desirae](http://species-id.net/wiki/Chimarra_desirae)

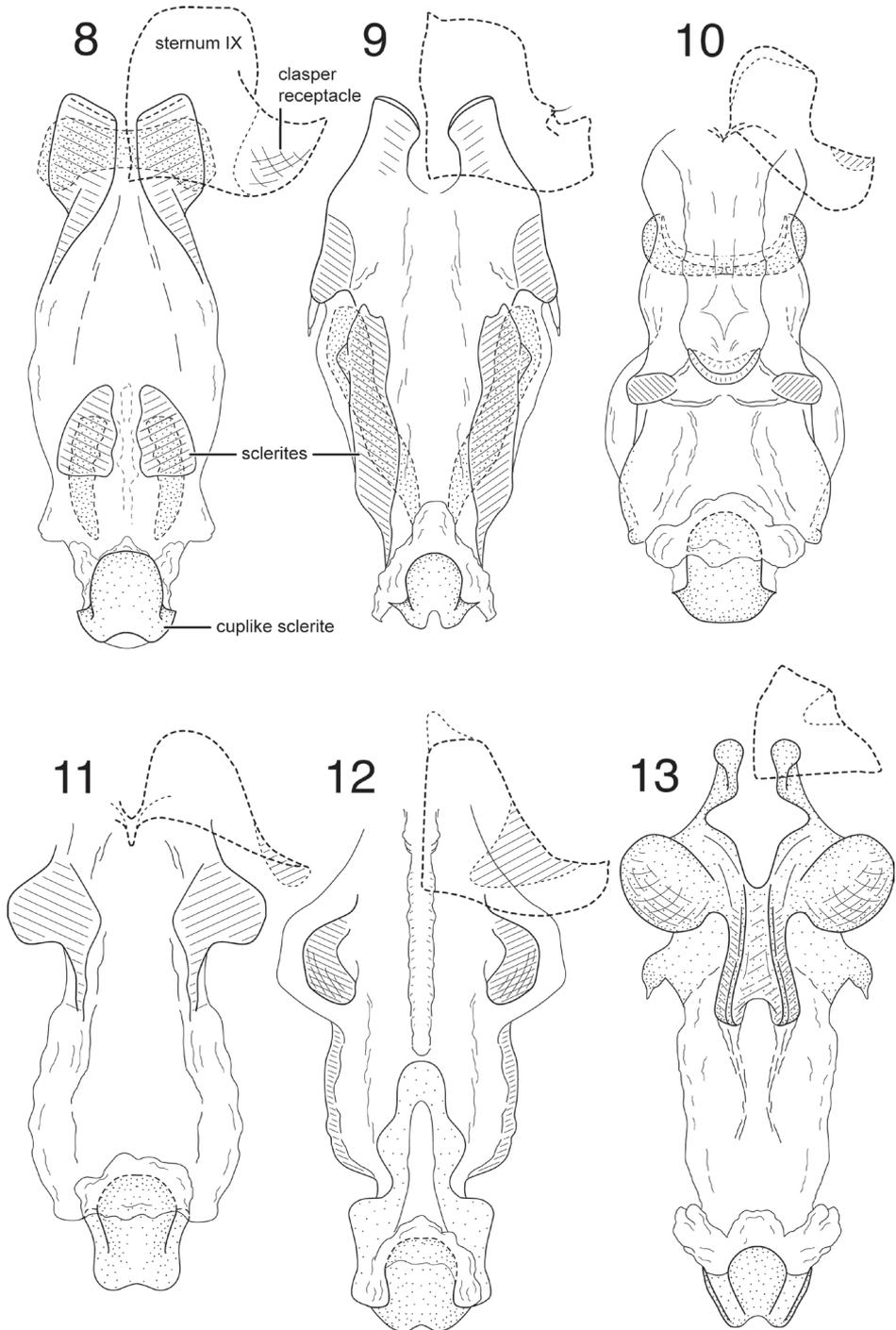
Fig. 7A–E

**Description.** This is a distinctive species, most closely related to *Chimarra adamsae* Blahnik, 1998. The most distinctive diagnostic feature, as in most species of the *C. poolei* group, is found in the structure of the lateral lobes of tergum X. In *C. desirae* these are distinctly sclerotized and have an upright basal projection, and a dorsoventrally flattened lateral crease, so that the apices of the lobes, in dorsal view, appear broadly



**Figure 7.** *Chimarra* (*Chimarra*) *desirae* sp. n. Male genitalia: **A** lateral **B** segment IX and tergum X, dorsal **C** inferior appendage, caudal **D** phallic apparatus, lateral **E** apex of endotheca, dorsal.

rounded. *Chimarra adamsae* has these same general features, but the upright processes are subquadrate and more apical, and the lateral creases are also more apical, resulting in the apices being narrow, as viewed either laterally or dorsally. Additionally, the sensilla



**Figures 8–13.** *Chimarra* (*Chimarra*) female genitalia, ventral view of vaginal apparatus: **8** *Chimarra calori* sp. n. **9** *Chimarra onchyrrhina* sp. n. **10** *Chimarra inchoata* sp. n. **11** *Chimarra nicehub* sp. n. **12** *Chimarra sunima* sp. n. **13** *Chimarra cauca* sp. n.

of the lateral lobes in *C. desirae* are located along the lateral crease, whereas those of *C. adamsae* are basal to the crease.

*Adult.* Forewing length (male) 4.2–5.0 mm. Cuticle of head and thorax very dark, nearly black, setae of anteromesal and frontal setal warts whitish, setae of other setal warts brownish-black, grizzled (grayish in part or intermixed), otherwise color nearly uniformly brownish-black (fuscous), including appendages and antennae. Postocular parietal sclerite short (not greatly extended behind eye). Second segment of maxillary palp much shorter than segment 3 (about 2/3 length). Male protarsal claws enlarged, asymmetrical in size and shape, outer claw much larger, twisted, nearly linear apically.

*Male genitalia.* Abdominal segment IX, in lateral view, with anteroventral margin sinuously extended from dorsal margin; anterodorsal margin with short apodemes; posterodorsal margin with pair of acute, spine-like projections, extending about 1/3 length of tergum X; posteroventral process subtriangular, relatively broad basally, subacute apically. Tergum X with very short membranous mesal lobe and 2 sclerotized lateral lobes, each bearing large, upright, broadly rounded basal lobe; lateral lobe also with strongly dorsoventrally flattened lateral crease, extending from near base to apex, base of crease with 2 slightly raised sensilla; terminus of lateral lobe narrowed and slightly declivous as viewed laterally, broadly rounded as viewed dorsally. Preanal appendage short, knob-like. Inferior appendage, in lateral view, very short and strongly cupped basally; dorsomesally with small, barely suggested, angular process. Phalotheca with distinct, elongate, apicoventral extension; ventral surface of phalotheca with lightly sclerotized projection; dorsal surface of endotheca with preapical tract of minute spines, basal ones slightly longer, endothecal spines 2, basal one moderately elongate, apical one short and curved. Phalloretral sclerite complex composed of rod and ring structure, rod relatively short and ring with small, but distinct, apicodorsal extension; rod preapically with 2 small, curved, symmetric sclerites.

*Female genitalia.* Female unknown.

**Holotype, male** (pinned) (UMSP000131058): **BOLIVIA: La Paz:** AMNI Madi, San Migual de Bala, Arroyo Bacuatra Grande, 14°30.737'S, 67°31.385'W, 280 m, 17–19.vii.2003, Robertson, Blahnik, Apaza (UASC).

**Paratypes. BOLIVIA: La Paz:** same data as holotype, 8 males (pinned) (UMSP) (NMNH).

**Etymology.** We take great pleasure in naming this species *C. desirae* for Dr. Desiree Robertson-Thompson, who collected the type specimens, in acknowledgment of her contributions to the study of Neotropical caddisflies.

### *Chimarra* (*Chimarrita*) *simpliciforma* group

Blahnik (1997) recognized 10 species in this species group, which represents the largest and most broadly distributed of the 3 species groups recognized for the subgenus. Described species are mostly known from very few specimens. Species have been recorded from the Guyana Highlands, Amazon Basin, and southeastern Brazil, thus spanning a

very broad area. The apparent disjunct distribution of the group probably reflects a very inadequate knowledge about the actual distribution of known species and also the species diversity of the group. Currently 4 species are known from southeastern Brazil. The 2 new species described here are closely related to 2 of the described species. Species in the group are easily recognized by structure of the phallic apparatus in the males, which has a single and typically elongate spine that emerges from the dorsum of the phalotheca. Females in the subgenus are also distinctive because of their elongate genitalia.

***Chimarra (Chimarrita) curvipenis* Blahnik & Holzenthal, sp. n.**

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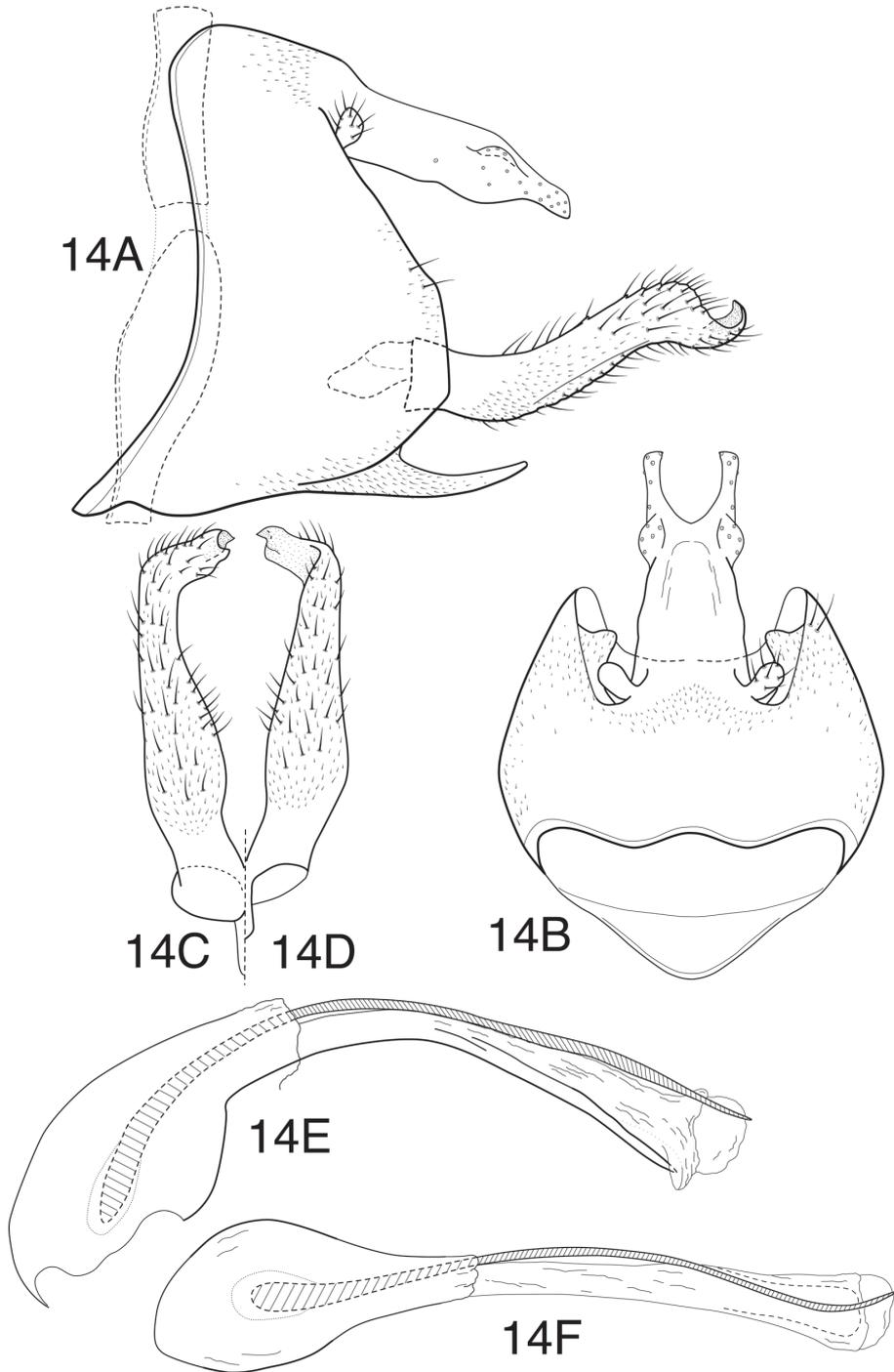
[http://species-id.net/wiki/Chimarra\\_curvipenis](http://species-id.net/wiki/Chimarra_curvipenis)

Fig. 14A–F, 16A–B

**Description.** *Chimarra curvipenis*, sp. n. is similar to *C. kontilos* Blahnik, 1997 and represents a closely related sister species. Similarities are found in the general structure of the inferior appendages and tergum X of the male. However, there are a number of differences. Tergum X has a small lateral, sensilla-bearing projection at past midlength and the inferior appendages are more elongate and have more acute apices. Additionally, the phalotheca is quite different, distinctly curved, rather than elongate, tubular, and the apex of the dorsal phallic spine lacks the distinctive whip-like extension found in *C. kontilos*. In the key by Blahnik (1997), *C. curvipenis* would come out with *C. tortuosa* Blahnik, from which it differs significantly in the shape of the inferior appendages (longer and more strongly incurved apically), and structure of the phallic apparatus (phalotheca more strongly curved and phallic spine less sinuously curved).

**Adult.** Forewing length (male 4.8 mm, (female) 4.8 mm. Overall color nearly uniformly light brown, palps slightly darker; thorax ventrally, meso- and metacoxae golden brown. Venational branching of forewing typical for *Chimarra*; Rs straight *s*, *r* and *r-m* of forewing nearly linearly arranged and unpigmented, as is *m-cu* and apex of  $Cu_2$ ; 2A of forewing with apparent apical “fork”, that to 1A elongate and broadly rounded, that to 2A very short (appearing as cross-vein). Rs of hind wing 4-branched, M 3-branched. Head short (postocular parietal sclerite short). Maxillary palps relatively short, segment 2 longer than 3. Male with protarsi unmodified.

**Male genitalia.** Segment IX relatively wide; as viewed laterally, with anterior margin concave, posterior margin angularly projecting at level of inferior appendages; anteroventral margin noticeably expanded, apex of expansion acutely rounded (as viewed dorsally or ventrally); ventral process narrow, elongate, acute, somewhat curved. Tergum X moderately elongate, fused to segment IX, apex with deep, U-shaped mesal excision, extending about 1/3 length of tergum, forming narrow, paired lobes apically (as viewed dorsally); tergum laterally with short, rounded projections at just past midlength (basal to apical lobes); apical lobes and lateral projections with numerous sensilla. Preanal appendage very small, rounded, fused near base of tergum X. Inferior appendage relatively elongate, nearly linear, except apex deflexed, narrowed, and me-



**Figure 14.** *Chimarra (Chimarrita) curvipenis* sp. n. Male genitalia: **A** lateral **B** segment IX and tergum X, dorsal **C** inferior appendage, ventral **D** inferior appendage, dorsal **E** phallic apparatus, lateral **F** phallic apparatus, dorsal.

sally curved, apex forming acute projection. Phallosome with somewhat bulbous base, otherwise elongate, narrow, ventral margin projecting and strongly curved; phallic spine single, stout, curved, very elongate (subequal in length to phallosome), emerging dorsally near base of phallosome and with slight sinuous twist. Phallosomal sclerite complex (if present) indistinct.

**Female genitalia**—Sternum VII with ventral process; process projecting, subacute, located near middle of segment, as viewed laterally. Segment VIII synsclerous, short dorsally, anterolateral margin nearly straight, indented and narrowed dorsally, rounded ventrally; segment sclerosely connected ventrally to sternum IX; anteroventral margin of segment, as viewed ventrally, with deep, mesal emargination extending almost entire length of segment, emargination strongly narrowed posteriorly, bordered laterally by distinct U-shaped sclerotization. Sternum IX elongate, with paired, angular projections, projections continuous posteriorly with elongate, narrow ventral sclerites; sternum membranous ventrally between paired sclerites, and membranous also laterally from acute basal projection to apex. Tergum IX elongate, narrow, slightly curved, moderately setose, anteroventrally with short apodemes. Segment X with elongate basal portion, furrowed dorsally, with mesal tract of setae in furrow; apically with pair of small, rounded, setose lobes, each with short apical cercus. Vaginal apparatus largely membranous, with indistinct sclerites, anterior one forming narrow ring.

**Holotype, male** (pinned) (UMSP000033831): **BRAZIL: Minas Gerais:** Serra do Cipó, Capão da Mata, 19°19.347'S, 43°32.249'W, 1170 m, 13–14.ii.1998, Holzenthal & Paprocki (MZUSP).

**Paratypes. BRAZIL: Minas Gerais:** same data as holotype, 1 female (pinned) (UMSP).

**Etymology.** This species is named *C. curvipenis* for its curved or bent phallosome, a character that helps to distinguish it from *C. kontilos*.

***Chimarra (Chimarrita) latiforceps* Blahnik & Holzenthal, sp. n.**

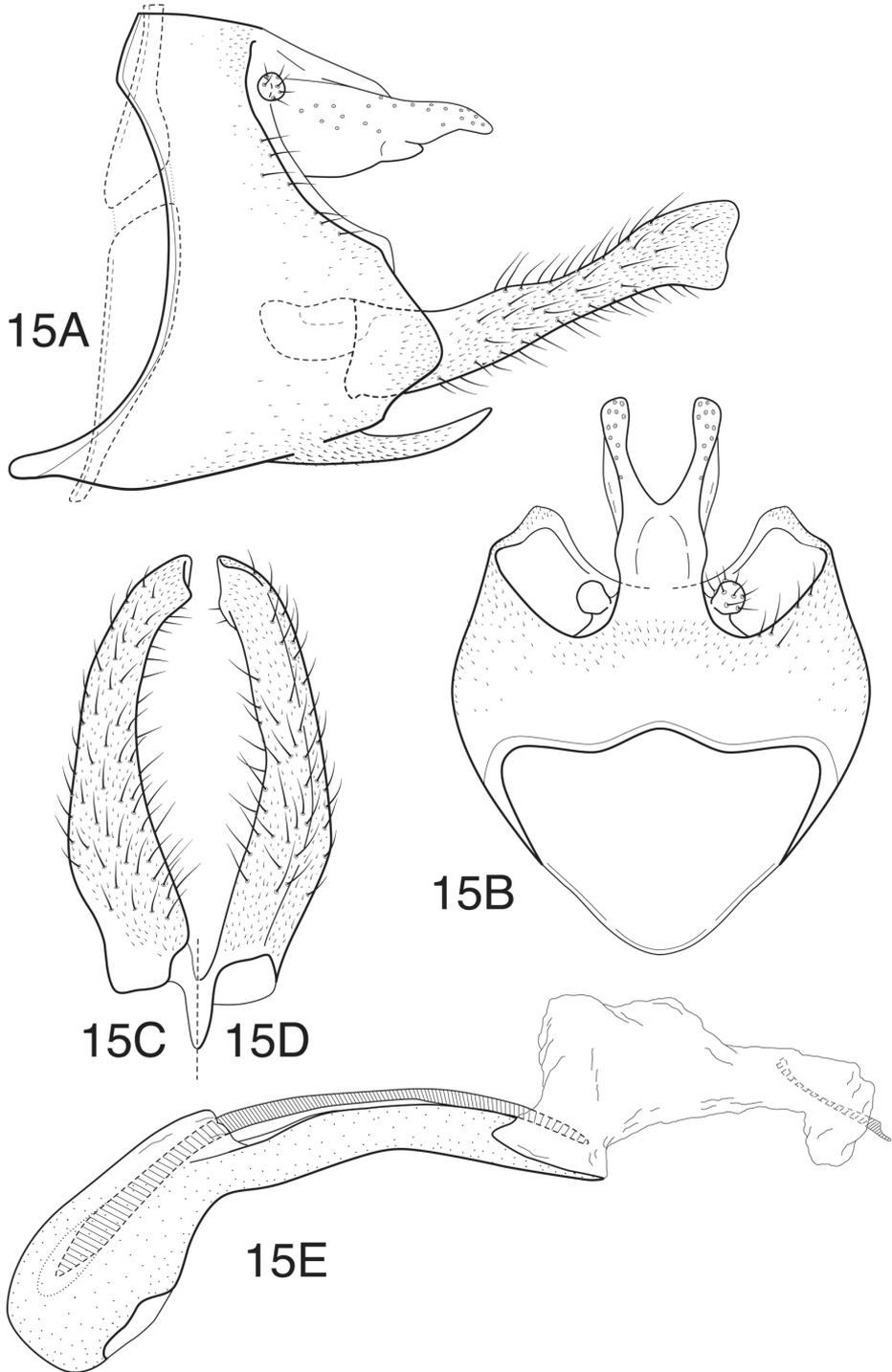
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[http://species-id.net/wiki/Chimarra\\_latiforceps](http://species-id.net/wiki/Chimarra_latiforceps)

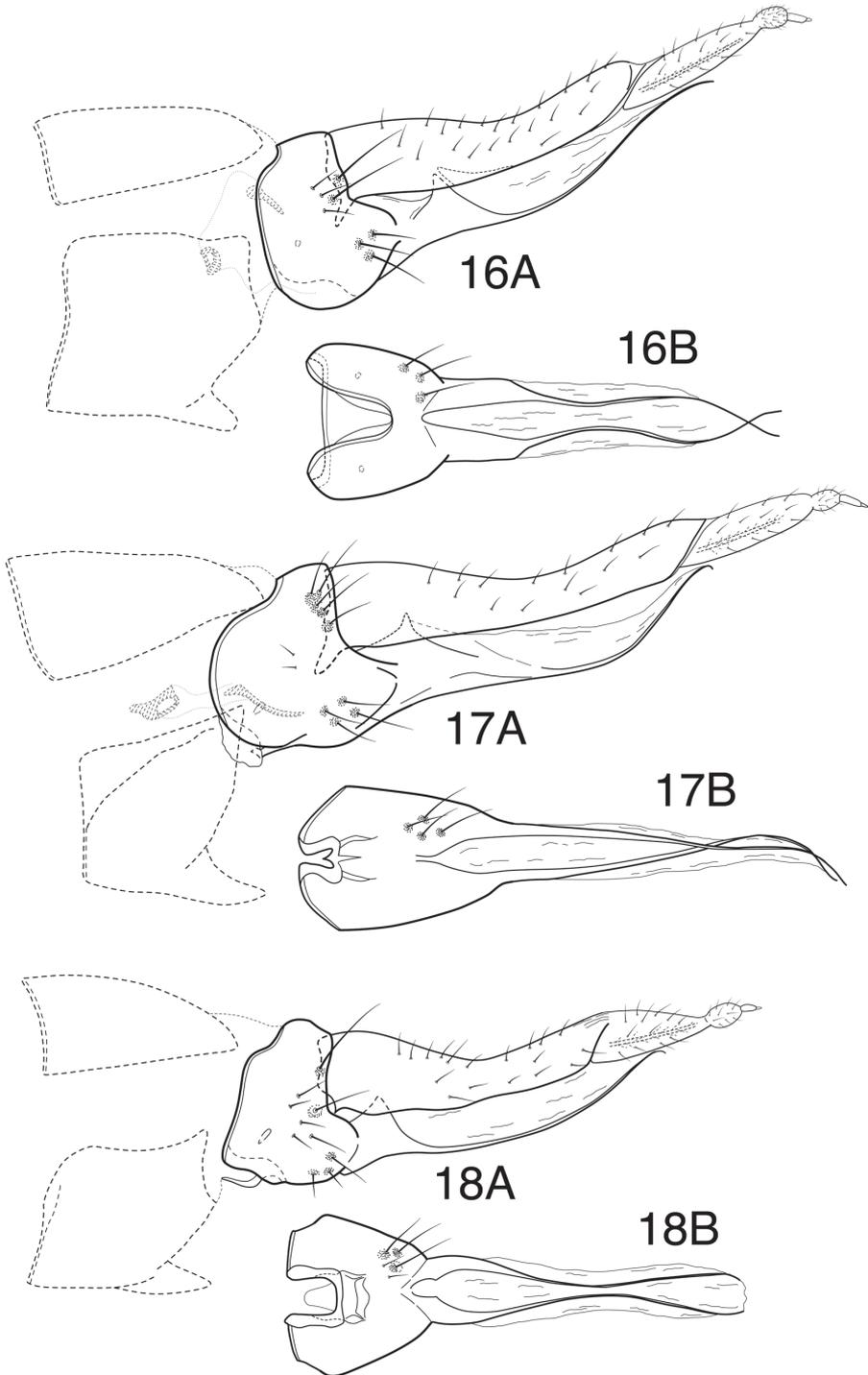
Figs 15A–E, 17A–B

**Description.** *Chimarra latiforceps* is very similar to *C. majuscula* Blahnik, 1997, particularly in the general shape of the inferior appendages and tergum X of the male, and would key out to that species in the key by Blahnik (1997). However, it does differ in details of both structures. It is also somewhat darker in overall color. The most diagnostic difference is in the shape of the inferior appendages, which are broader overall and have more truncate apices. Tergum X differs in that the lateral lobes formed by the mesal invagination are narrow, elongate, rather than inflated apically.

**Adult.** Forewing length (male 4.8–6.0 mm, (female) 5.2–5.9 mm. Overall color nearly uniformly medium brown, palps slightly darker; thorax ventrally, meso- and metacoxae light brown, antennae indistinctly annulated. Venational branching of fore-



**Figure 15.** *Chimarra* (*Chimarrita*) *latiforceps* sp. n. Male genitalia: **A** lateral **B** segment IX and tergum X, dorsal **C** inferior appendage, ventral **D** inferior appendage, dorsal **E** phallic apparatus, lateral.



**Figures 16–18.** *Chimarra* (*Chimarrita*) female genitalia: **16** *Chimarra curvipenis* sp. n.: **A** lateral **B** ventral **17** *Chimarra latiforceps* sp. n.: **A** lateral **B** ventral **18** *Chimarra camella* Blahnik: **A** lateral **B** ventral.

wing typical for *Chimarra*; Rs straight *s*, *r* and *r-m* of forewing nearly linearly arranged and unpigmented, as is *m-cu* and apex of  $Cu_2$ ; 2A of forewing with apparent apical "fork", that to 1A elongate and broadly rounded, that to 2A very short (appearing as cross-vein). Rs of hind wing 4-branched, M 3-branched. Head very short and somewhat flattened (postocular parietal sclerite short). Maxillary palps relatively short, segment 2 slightly longer than 3. Male with protarsi unmodified.

*Male genitalia.* Segment IX relatively wide; as viewed laterally, with anterior margin concave, posterior margin very distinctly, angularly projecting at level of inferior appendages; anteroventral margin expanded, apex of expansion acutely rounded mesally (as viewed dorsally or ventrally); ventral process narrow, elongate, acute, somewhat curved. Tergum X relatively short (much shorter than inferior appendages), fused to segment IX, apex with deep, U-shaped mesal excision, extending about  $\frac{1}{2}$  length of tergum, forming narrow, paired lobes apically (as viewed dorsally); apical lobes and lateral margins of tergum with numerous sensilla. Preanal appendage very small, rounded, fused near base of tergum X. Inferior appendage relatively elongate, nearly linear, apex incurved and broadly subtruncate. Phallosome with somewhat bulbous base, otherwise moderately elongate, narrow, distinctly curved; phallic spine single, stout, curved, elongate (subequal in length to phallosome), emerging dorsally near base of phallosome; endosoma moderately elongate, slightly inflated in basal  $\frac{1}{2}$ . Phallosomal sclerite complex evident as elongate, narrow, sclerotized rod.

*Female genitalia.* Sternum VII with ventral process; process large, projecting, subacute, emerging near anterior margin of segment, as viewed laterally. Segment VIII synsclerous, short dorsally, anterolateral margin broadly rounded, indented and narrowed dorsally, rounded ventrally; segment sclerosely connected ventrally to sternum IX; anteroventral margin of segment, as viewed ventrally, with short, narrow mesal emargination, margins of emargination distinctly sclerotized, sclerotization extending posteriorly as pair of distinct ridges. Sternum IX elongate, with paired, angular projections, projections continuous posteriorly with elongate, narrow ventral sclerites; sternum membranous ventrally between paired sclerites, and membranous also laterally from acute basal projection to apex. Tergum IX elongate, narrow, slightly curved, moderately setose, anteroventrally with short apodemes. Segment X with elongate basal portion, furrowed dorsally, with mesal tract of setae in furrow; apically with pair of small, rounded, setose lobes, each with short apical cercus. Vaginal apparatus largely membranous, with indistinct sclerites, anterior one forming narrow ring.

**Holotype, male** (pinned) (UMSP000200929): **BRAZIL: São Paulo:** Parque Estadual de Campos do Jordão, Rio Galharda, 22°41.662'S, 45°27.783'W, 1530 m, 13–15.ix.2002, Blahnik, Prather, Melo, Huamantincó (MZUSP).

**Paratypes. BRAZIL: Minas Gerais:** Crucilândia, Fazenda Nova Limeira, 20°23.131'S, 44°22.071'W, 875 m, 22–23.ii.1998, Holzenthal, Paprocki, Huisman, 5 males, 1 female (pinned) (UMSP); Parque Estadual do Itacolomi, trib. to Rio Belchior, 20°25.302'S, 43°25.697'W, 700 m, 6.xi.2001, Holzenthal, Paprocki, Blahnik, Amarante, 1 male, 1 female (pinned) (NMNH); Parque Estadual do Ibitipoca, spring trib. near director's house, 21°42.695'S, 43°53.760'W, 1357 m, 19–20.xi.2001, Pap-

rocki & Blahnik, 3 males, 7 females (alcohol) (UMSP); **São Paulo:** Estação Biológica Boraceia, Rio Coruja, 23°40.10'S, 45°53.95'W, 850 m, 18.iv.1998, Holzenthal, Melo, Froehlich, 1 male, 1 female (pinned) (UMSP); Estação Biológica Boraceia, Rio Venerando & tribs., 23°39.185'S, 45°53.414'W, 850 m, 18–20.iv.1998, Holzenthal, Melo, Froehlich, 1 male (pinned) (UMSP); Rio Casquilho, 3.4 km NE Parque Estadual Campos do Jordão, 22°40.29'S, 45°27.87'W, 1550 m, 23.i.1998, Holzenthal, Froehlich, Paprocki, 1 male (pinned) (MZUSP); same data as holotype except, 22.i.1998, Holzenthal, Froehlich, Paprocki, 1 male (pinned) (UMSP); Parque Nacional da Serra da Bocaina, Cachoeira Santo Izidro, 22°44.830'S, 44°36.882'W, 1480 m, 2.iii.2002, Blahnik & Paprocki, 1 male (pinned) (MZUSP).

**Etymology.** This species is named *C. latiforceps*, from the Latin words *latus*, wide, and *forceps*, a pincers or tong, in reference to the inferior appendages, which are shaped something like a pair of broad tipped forceps.

***Chimarra (Chimarrita) camella* Blahnik**

[http://species-id.net/wiki/Chimarra\\_camella](http://species-id.net/wiki/Chimarra_camella)

Fig. 18A–B

**Description.** The female of this species was not previously illustrated. It is included here, since it is the only species of the subgenus for which the female is not illustrated. The female can be distinguished from other species by the nearly linear anterior margin of segment VIII and, especially, by the distinctive, subquadrate invagination of the posteroventral margin of the same segment. The mesal margin of the invagination has a lightly sclerotized, tab-like projection.

**Female genitalia.** Sternum VII with ventral process; process projecting, subacute, located near middle of segment, as viewed laterally. Segment VIII synsclerous, short dorsally, anterolateral margin nearly straight, indented and narrowed dorsally and ventrally; segment sclerously connected ventrally to sternum IX; anteroventral margin of segment, as viewed ventrally, with subquadrate mesal emargination, extending about ½ length of segment, margins of emargination very distinctly sclerotized, sclerotization extending somewhat posteriorly, mesal margin of emargination with lightly sclerotized tab-like projection. Sternum IX elongate, with paired, angular projections, projections continuous posteriorly with elongate, narrow ventral sclerites; sternum membranous ventrally between paired sclerites, and membranous also laterally from acute basal projection to apex. Tergum IX elongate, narrow, distinctly curved, moderately setose, anteroventrally with apodemes only suggestively developed. Segment X with elongate basal portion, furrowed dorsally, with mesal tract of setae in furrow; apically with pair of small, rounded, setose lobes, each with short apical cercus. Vaginal apparatus largely membranous, sclerites (if present) indistinct.

**Material examined.** **BRAZIL: Minas Gerais:** Parque Estadual do Rio Preto, trib. to Rio Preto, 18°06.879'S, 43°20.595'W, 700 m, 20.v.1998, Holzenthal & Paprocki, 1 male, 1 female (UMSP); Parque Estadual do Rio Preto, Rio Preto, 18°06.993'S,

43°20.373'W, 650 m, 19.v.1998, Holzenthal & Paprocki, 1 male (UMSP); Parque Nacional do Caparaó, Rio Caparaó at Vale Verde, 20°25.029'S, 41°50.767'W, 1350 m, 12–13.iii.2002, Holzenthal, Blahnik, Paprocki, Pather, 1 male (UMSP); Serra do Cipó, Capão da Mata, 19°19.347'S, 43°32.249'W, 1170 m, 10.iii.1996, Holzenthal, Rochetti, Oliveira, 1 female (UMSP); **Rio de Janeiro:** Parque Nacional do Itatiaia, Rio Campo Belo, trail to Veu da Noiva, 22°25.706'S, 44°37.171'W, 1310 m, 5.iii.2002, Holzenthal, Blahnik, Paprocki, Prather, 1 male (UMSP); **São Paulo:** Estação Biológica Boraceia, Rio Venerando 7 tribs. 23°39.185'S, 45°53.414'W, 850 m, 18–20.iv.1998, Holzenthal, Melo, Froehlich, 4 males, 6 females (UMSP); Parque Nacional da Serra da Bocaina, Cachoeira das Posses, 22°46.437'S, 44°36.250'W, 1250 m, 3.iii.2002, Blahnik, Paprocki, Prather, 1 male, 2 females (MZUSP); Estação Biológica Boraceia, Rio Coruja at bridge, 23°40.10'S, 45°53.95'W, 850 m, 20.ix.2002, Blahnik, Melo, Froehlich, Silva, 1 male (UMSP).

### *Chimarra* (*Otarrha*)

The subgenus *Otarrha* was established by Blahnik (2002) to include 31 species, broadly distributed in northern South America and in the Greater and Lesser Antilles, with individual species also found in lower Central America and southeastern Brazil. A clade of 10 described species occurs in the Greater Antilles. All of these were treated in the work by Blahnik (2002), except for *C. koki* Botosaneanu (1996), described from the Dominican Republic, and a subsequently described subspecies of *C. spinulifera* Flint, 1968, *C. spinulifera baoruco* Flint & Sykora, 2004, also from the Dominican Republic.. The new species described here increases the number of species in the subgenus known from Cuba to 5, and the number of species known from the Greater Antilles to 11.

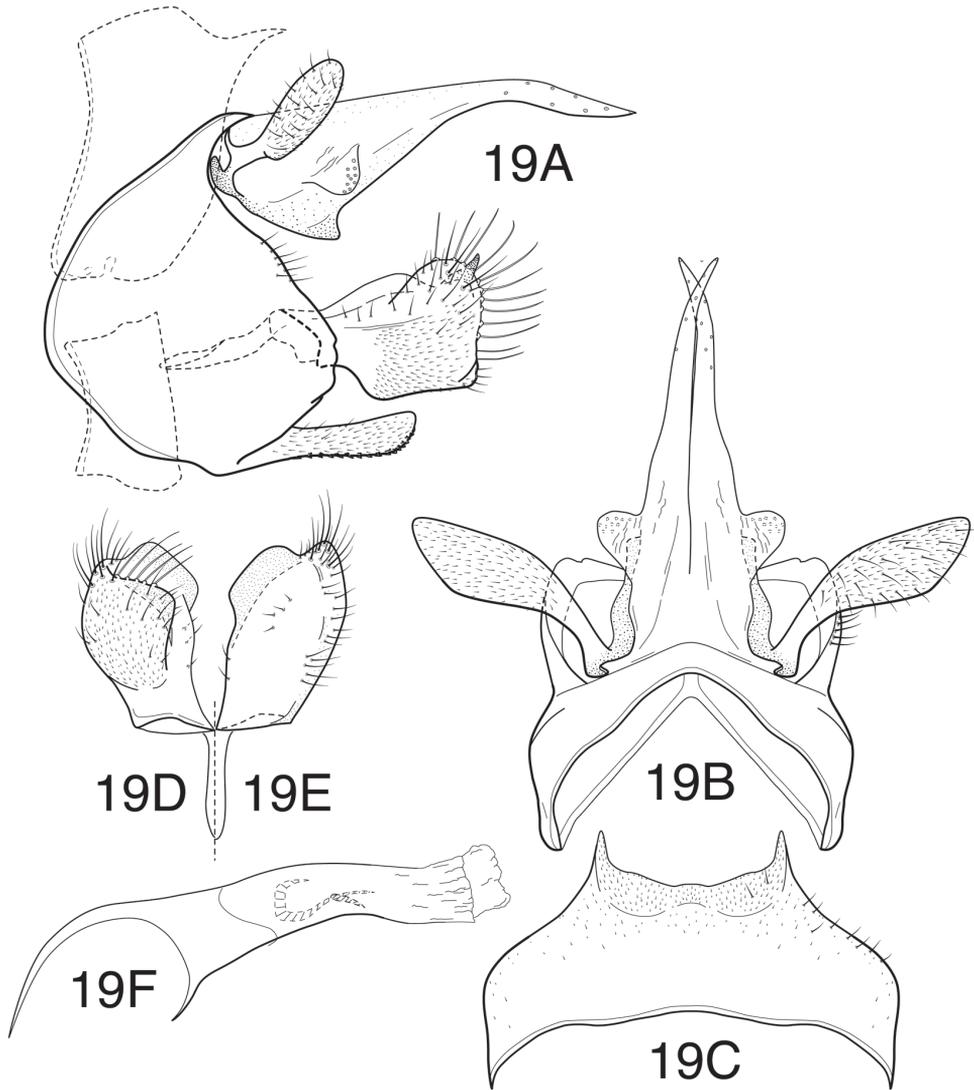
### *Chimarra* (*Otarrha*) *soroa* Blahnik & Holzenthal, sp. n.

urn:lsid:zoobank.org:act:7D1E3A56-5233-43BD-9B2A-D9C49211CC40

[http://species-id.net/wiki/Chimarra\\_soroa](http://species-id.net/wiki/Chimarra_soroa)

Fig. 19A–F, 20A–C

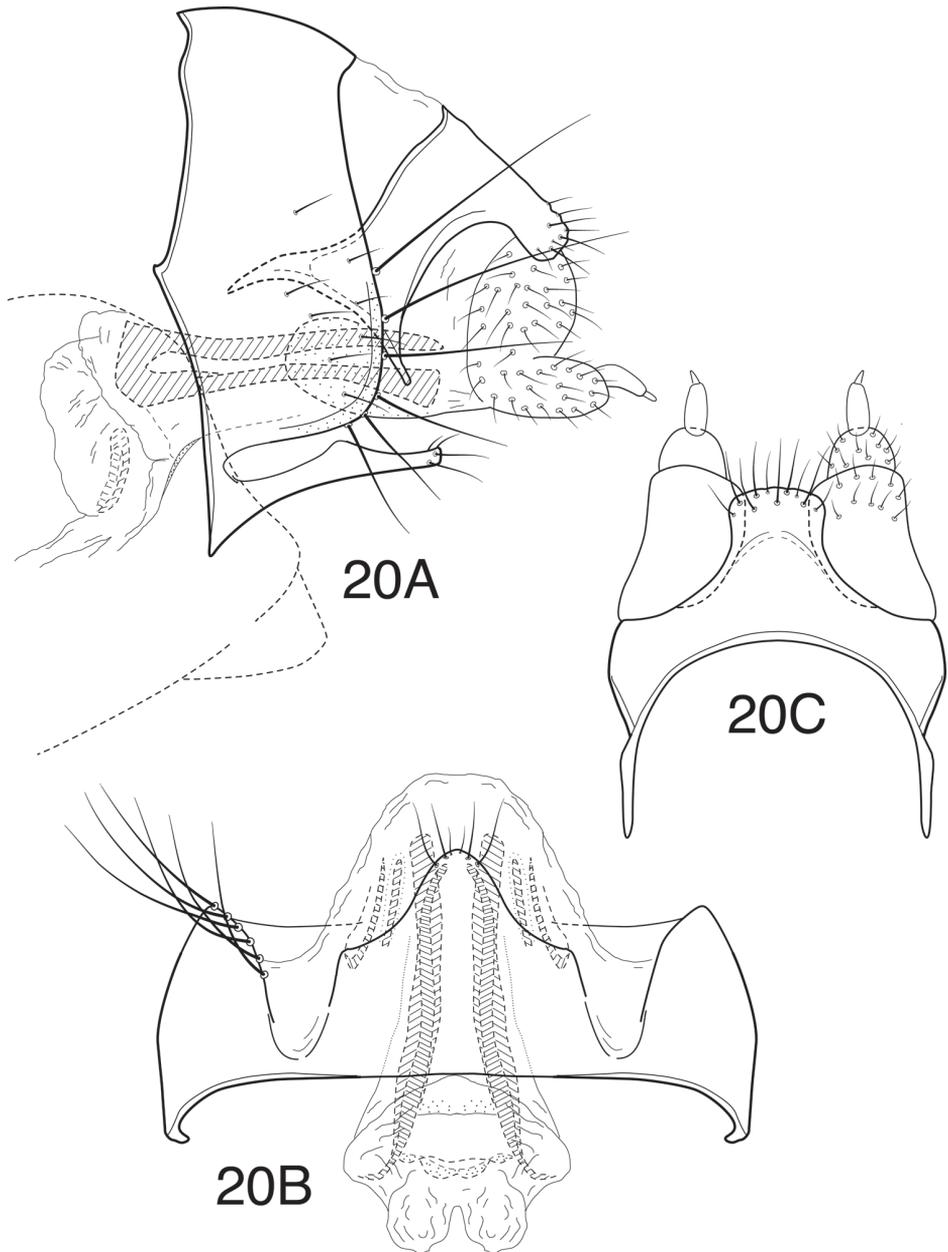
**Description.** This new species closely resembles *C. garciai* Botosaneanu, 1980, also known from Cuba, and represents a probable sister species. It is also similar in general features to *C. jamaicensis* Flint, 1968 and *C. machaerophora* Flint, 1968, both described from Jamaica. All of these species have a tergum X that is divided mesally, with very elongate lateral lobes, and similarly shaped inferior appendages. Like *C. garciai*, *C. soroa*, sp. n. has a tergum VIII with a pair of short spine-like projections, but without the mesal projection of *C. machaerophora*. In the key by Blahnik (2002), *C. soroa* would key out to the couplet including *C. garciai* and *C. jamaicensis*. It differs from *C. garciai* in lacking a pair of sclerotized spines at the base of the lobes of tergum X, and from either species in having a distinctly projecting, rounded, sensilla-bearing process



**Figure 19.** *Chimarra (Otarra) soroa* sp. n. Male genitalia: **A** lateral **B** segment IX and tergum X, dorsal **C** tergum VIII, dorsal **D** inferior appendage, ventral **E** inferior appendage, dorsal **F** phallic apparatus, lateral.

on the lateral margin of each of the lobes of tergum X. Additionally, the inferior appendages appear more truncate in lateral view than in either of those species.

*Adult.* Forewing length (male) 4.8–5.2 mm, (female) 5.3 mm. Overall color nearly uniformly medium brown, palps slightly darker; thorax ventrally, meso- and metacoxae light brown. Venation typical for subgenus, forewing with Rs straight *s*, *r* and *r-m* of forewing linearly arranged and unpigmented, as is *m-cu* and apex of *Cu*<sub>2</sub>; 2A of forewing without apical “fork” (2A and 3A both apparently looped to 1A). Rs of hind wing 3-branched, M 2-branched. Head relatively short (postocular parietal sclerite



**Figure 20.** *Chimarra (Otarra) soroa*, female genitalia: **A** lateral **B** ventral view of segment VIII and vaginal apparatus **C** dorsal of tergum IX and cerci.

short). Maxillary palps short, segment 2 much shorter than 3 (about  $\frac{1}{2}$  length). Male with protarsi unmodified.

*Male genitalia.* Tergum VIII with short, paired, acute processes from posterior margin. Abdominal segment IX widest mid-laterally, anterolateral margin broadly

rounded, narrowed dorsally and ventrally, posterolateral margin angularly projecting at level of inferior appendages; anterodorsal and anteroventral margins strongly invaginated mesally; posteroventral process elongate, projecting, narrowed basally, rounded apically. Tergum X divided mesally, forming 2 elongate sclerotized lateral lobes; each strongly tapered and somewhat arched, with scattered sensilla apically and more densely on projecting, rounded, basolateral projection. Preanal appendage very large, flattened, earlike. Inferior appendage short, truncate apically in lateral view, with short, broadly rounded process on mesal surface. Phallic apparatus with phallosome narrow, tubular, expanded basodorsally; endosoma membranous, apparently moderately elongate (incompletely expanded in holotype). Phallosomal sclerite complex composed of rod and ring structure, about  $\frac{1}{4}$  length of phallosome; ring distinct, with dorsal projection, rod only relatively elongate, with small apicolateral sclerites.

*Female genitalia.* Segment VIII short; anterior margin slightly projecting midlaterally at position of apodemes, apodemes short, angular, undeveloped; posterior margin nearly straight, with deep cleft near ventral margin, extending almost to anterior margin, ventral part of segment (below cleft) forming projecting process, narrow as viewed laterally, rounded apically as viewed ventrally; segment with elongate setae on posterolateral margin and shorter setae at apex of ventral projection. Tergum IX very short, with moderately elongate apodemes from anteroventral margin; posteromesally with projecting, short, rounded, setose projection. Sternum IX membranous. Tergum X bilobed, each lobe divided into prominent, rounded, lightly sclerotized basal region and less sclerotized apical region with cercus at apex. Vaginal apparatus moderately elongate, dorsalaterally with elongate paired sclerites, each divided for nearly entire length to form apparent pair of rod-like sclerites; apically with additional pair of short needle-like sclerites on either side of elongate sclerites; vaginal apparatus anteriorly with indistinct ring-like sclerite.

**Holotype, male** (pinned) (UMSP000095831): **CUBA: Pinar del Río:** La Caridad, 2 km NW Soroa, 22°48.6'N, 83°01.2'W, 220 m, 4–5.xii.1994. O.S. Flint, Jr. (NMNH).

**Paratypes. CUBA: Pinar del Río:** same data as holotype, 1 male (pinned) (NMNH); Soroa, 22°47.7'N, 83°00.1'W, 200 m, 4–6.xii.1994. O.S. Flint, Jr., 1 female (pinned) (NMNH).

**Etymology.** This species is named *Chimarra soroa*, used as a noun in apposition, after the resort in Cuba near which the type specimen was collected.

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# A remarkable new genus of stiletto flies from Egypt, with a key to Palaearctic genera of Phycinae (Diptera, Therevidae)

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## Abstract

An unusual new genus (*Salwaea burgensis* **gen. n., sp. n.**) of phycine stiletto flies is described from Egypt. A key to Palaearctic genera of Phycinae is presented.

## Keywords

Asiloidea, Therevidae, Phycinae

## Introduction

The stiletto fly subfamily Phycinae comprises 128 species in 18 genera (four extinct) distributed in all major biogeographic regions except Australasia (Hauser 2005; Hauser and Webb 2007). Diagnostic characters used to differentiate members of this subfamily include absence of lanceolate setae on the femora, setulae on wing vein R<sub>1</sub> (although absent in *Schlingeria* Irwin, 1977), wing costal vein terminating before vein CuA<sub>2</sub> (never circumambient), palpi with an apical pit, female terminalia with only a single set of

variously developed A1 spines on the acanthophorite (tergite 10), abdominal tergites 9 and 10 as separate sclerites, three spermathecae and absence of a spermathecal sac (Lyneborg 1972; Hauser 2005).

The nominal genus, *Phycus* Walker, 1850, is not only the most species-rich genus of Phycinae (25 spp.), it is also the most widely distributed with species recorded throughout the Oriental, Palaearctic, Afrotropical, Nearctic and Neotropical regions (Lyneborg 2003). Five extant genera occur in the New World, *Ataenogera* Kröber, 1914 (6 spp.), *Parapherocera* Irwin, 1977 (3 spp.), *Pherocera* Cole, 1923 (11 spp.), *Schlingeria* Irwin, 1977 (1 sp.) and *Phycus* Walker, 1850 (Irwin 1977, 1983; Hauser 2005; Hauser and Webb 2007). Phycinae are more diverse and species-rich in the Palaearctic and Afrotropical regions with many genera found in both regions, including *Actorthia* Kröber, 1912 (13 spp.), *Phycus* Walker, 1850, *Acathrito* Lyneborg, 1983 (9 spp.) and *Ruppellia* Wiedemann, 1830 (5 spp.) (Lyneborg 1983, 1989, 2003; Badrawy and Mohammad 2011). *Neotabuda* Kröber, 1931 (20 spp.), *Orthactia* Kröber, 1912 (7 spp.) and *Stenogephyra* Lyneborg, 1987 (7 spp.) are restricted to the Afrotropical region, being largely endemic to southern Africa (Lyneborg 1980, 1988; Hauser 2005; Webb and Hauser 2011). In contrast, three genera are restricted to the Palaearctic region; *Efflatouniella* Kröber, 1927 (3 spp.) and *Yemenia* Koçak & Kemal, 2009 (1 sp.) are found in the Middle East while *Salentia* Costa, 1857 (11 spp.) is more widely distributed (Lyneborg 1983; Hauser 2005; Mohammad and Badrawy 2011). Four fossil genera of Phycinae are known: *Kroeberella* Hauser, 2007, *Dasystethos* Hauser, 2007, *Glaesorthactia* Hennig, 1967 (all from Baltic Amber) and *Palaeopherocera* Hauser, 2005 (Florissant) (Hauser 2005, 2007).

Seven phycine genera are currently known from Egypt and the Middle East (*Salentia*, *Phycus*, *Actorthia*, *Acathrito*, *Ruppellia*, *Efflatouniella* and *Yemenia*) (Hauser 2005; Mohammad and Badrawy 2011; Badrawy and Mohammad 2011). Recent examinations of material collected during the early part of the 20<sup>th</sup> century by the renowned Egyptian entomologist Hassan C. Efflatoun, has uncovered an unusual new therevid from northern Egypt. This species represents a remarkable new genus of Phycinae with particular characteristics not seen previously in Therevidae. Although only a single female specimen is known, *Salwaea burgensis* gen. et sp. n. is diagnosed from other phycine genera by distinctively shaped head and antennae and termination of the costal vein in the radial field. This new genus and species is described and figured herein, and a dichotomous key to Palaearctic genera of Phycinae is presented.

## Materials and methods

Adult morphological terminology follows McAlpine (1981) and Hauser (2005) with genitalic morphology as modified by Winterton et al. (1999a,b) and Winterton (2006). Genitalia were macerated in 10% KOH to remove soft tissue, then rinsed in distilled water and dilute glacial acetic acid, and dissected in 80% ethanol. Genitalia

preparations were placed in glycerine in a genitalia vial mounted on the pin beneath the specimen.

Specimen images were taken at different focal points using a digital camera and subsequently combined into a serial montage image using Helicon Focus software. All new nomenclatural acts and literature are registered in ZooBank (Pyle and Michel 2008).

## Taxonomy

### *Salwaea* gen. n.

urn:lsid:zoobank.org:act:D47A75EA-5ACF-414E-AE67-BC9C5239C28E

<http://species-id.net/wiki/Salwaea>

**Type species.** *Salwaea burgensis* sp. n. (by present designation)

**Diagnosis.** Body length: 6.5 mm (female). Antenna longer than head; enlarged bulbous scape with erect strong macrosetae (absent medially); pedicel medio-dorsally inserted on scape; flagellum two-segmented, large paddle-like first flagellomere longer than combined scape and pedicel length, style apical; parafacial without setae; proboscis barely protruding from oral cavity; prosternal depression and mid coxa without setae; metanepisternum without postspiracular setae; hind coxal knob present; costal vein ending just beyond  $R_4$ ;  $R_1$  with single row of setulae;  $M_1$  and  $M_2$  terminating before wing margin; costal margin with scattered setae, not arranged in two rows; cell  $m_3$  closed, petiolate to margin; distal tarsomere with pulvilli and claws relatively small, aligned with axis of leg, dorsal seta[e] on distal tarsomere elongate and projecting; sternite 8 rounded, strongly convex, posteriorly emarginate; tergite 10 as paired sclerites, not fused medially; acanthophorite spines greatly reduced in size.

**Etymology.** This genus is named in honour of Prof. Dr. Salwa K. Mohammad. Gender is feminine.

**Relationship to other phycine genera.** It is difficult to identify characters likely to support the phylogenetic placement of *Salwaea burgensis* gen. et sp. n., as it exhibits a series of both autapomorphies, unique to the taxon, and plesiomorphies, which it shares with all genera of Phycinae. Notable characters found only in this new genus are the large paddle-like shape of the flagellum and the termination of the costal vein just beyond where  $R_4$  joins the wing margin. In all other genera the flagellum ranges from cylindrical to turbinate, while the costal vein is either circumambient (most Therevinae and Agapophytinae), terminates at  $M_2$  (Xestomyzinae) or terminates at various points typically between  $M_1$  and  $CuA_2$  (Phycinae). In rare cases in all subfamilies except Xestomyzinae, individual species have the costal vein terminating in the radial field (typically  $R_3$ ) with medial veins terminating before the wing margin. The reduction of the pulvilli is shared with some species of *Pherocera*, *Orthactia* and *Phycus*. In the latter genus the following species have completely reduced pulvilli: *P. annulipes*, Lyneborg

1978 (Kenya), *P. flavus* Lyneborg, 1978 (South Africa), *P. lacteipennis* Lyneborg, 2002 (Morocco), *P. marginatus* Kröber, 1912 (Egypt, Chad, Congo, Mali, Nigeria, Senegal, Sudan) and *P. mirabilis* Lyneborg, 1978 (Botswana, South Africa, Zimbabwe). Some *Phycus* species have very short and barely discernable pulvilli that may consist only of a pulvillus sclerite remnant: *P. angustifrons* Lyneborg, 2003 (Thailand), *P. insignis* Loew, 1874 (Egypt, Middle East to Central Asia), *P. kroeberi* (Brauns, 1924) (South Africa), and *P. stylatus* Lyneborg, 1978 (Kenya, Botswana, Tanzania). Although there is no resolved species-level phylogeny for the genus *Phycus*, taxonomic affinities suggest that pulvilli reduction occurred several times independently in this genus as a derived feature. According to Kröber (1927) the pulvilli are absent in *Efflatouniella*, although specimens examined have pulvilli that are slightly reduced in a few specimens. The enlarged scape is also found in *Neotabuda* and *Salentia*, putative sister genera according to Lyneborg (1980) and Hauser (2005). The furca of *Salwaea* gen. n. has a distinctive quadrangular shape, suggesting a close relationship with *Salentia* or *Phycus* or, perhaps, the pleiomorphic condition of the furca in Phycinae (Fig. 5). *Actorthia*, *Acathrito* and *Efflatouniella* display a very different configuration of the furca whereas the furca of two species of *Neotabuda* examined are unique among phycines. The furca of *Salwaea* gen. n. is typical for Phycinae, which always has two compartments, in contrast to the undivided furca type of higher Therevidae like *Thereva*. The presence of an anteroventral seta on the fore and hind femora in *Salwaea* gen. n. is also found in *Salentia* and *Neotabuda*, but not with *Phycus*.

***Salwaea burgensis* sp. n.**

urn:lsid:zoobank.org:act:3F23A487-AFD0-4734-BBBC-09E4E1B67DB4

[http://species-id.net/wiki/Salwaea\\_burgensis](http://species-id.net/wiki/Salwaea_burgensis)

Figs 1–5

**Type material. Holotype** female, EGYPT: Alexandria: Borg El-Arab, 30.8856°[N], 29.5834°[E], 11.viii.1934, Shafik.

The type specimen is mounted with minuten pin on circular card, with two rectangular labels: Burg 11.7.34 [handwritten, black ink] / Zool. Dep. Collection, Egyptian University, Collector [printed, black ink, all caps] Shafik [handwritten, black ink] (Cairo University Collection (CUC)).

**Diagnosis.** See genus diagnosis.

**Description.** Body Length= 6.5 mm (female). *Head.* Head very wide, 2x head length (excluding antennae); eyes widely separated, frons width at narrowest point 3x width of ocellar tubercle; eye relatively small and globose; frons broadly concave, glossy brown with glaucous (pale bluish) grey pubescence, irregular raised callosities around antennal base and along eye lower margin, callosities with dark erect setae of varying length; parafacial with silver pubescence and glabrous band between antennal base and eye margin; occiput broadly rounded convex with glaucous grey pubescence and scattered erect black macrosetae, longer macrosetae along postocular ridge, medium length



**Figure 1.** *Salwaea burgensis* gen. et sp. n., female Holotype habitus, dorsal view, body length 6.5 mm.

on occiput admixed with very short setae; gena rounded with grey-silver pubescence, admixed with short, erect white setae, darker anteriorly, angular process projecting anteriorly from gena with short dark setae; mouthparts reduced, proboscis narrow, barely protruding from oral cavity, palpus not observed as oral cavity obscured; antenna 2× length of head; scape shorter than head length, glossy dark yellow, bulbous and non-symmetrical in lateral view, with dark erect macrosetae (longer ventrally), absent

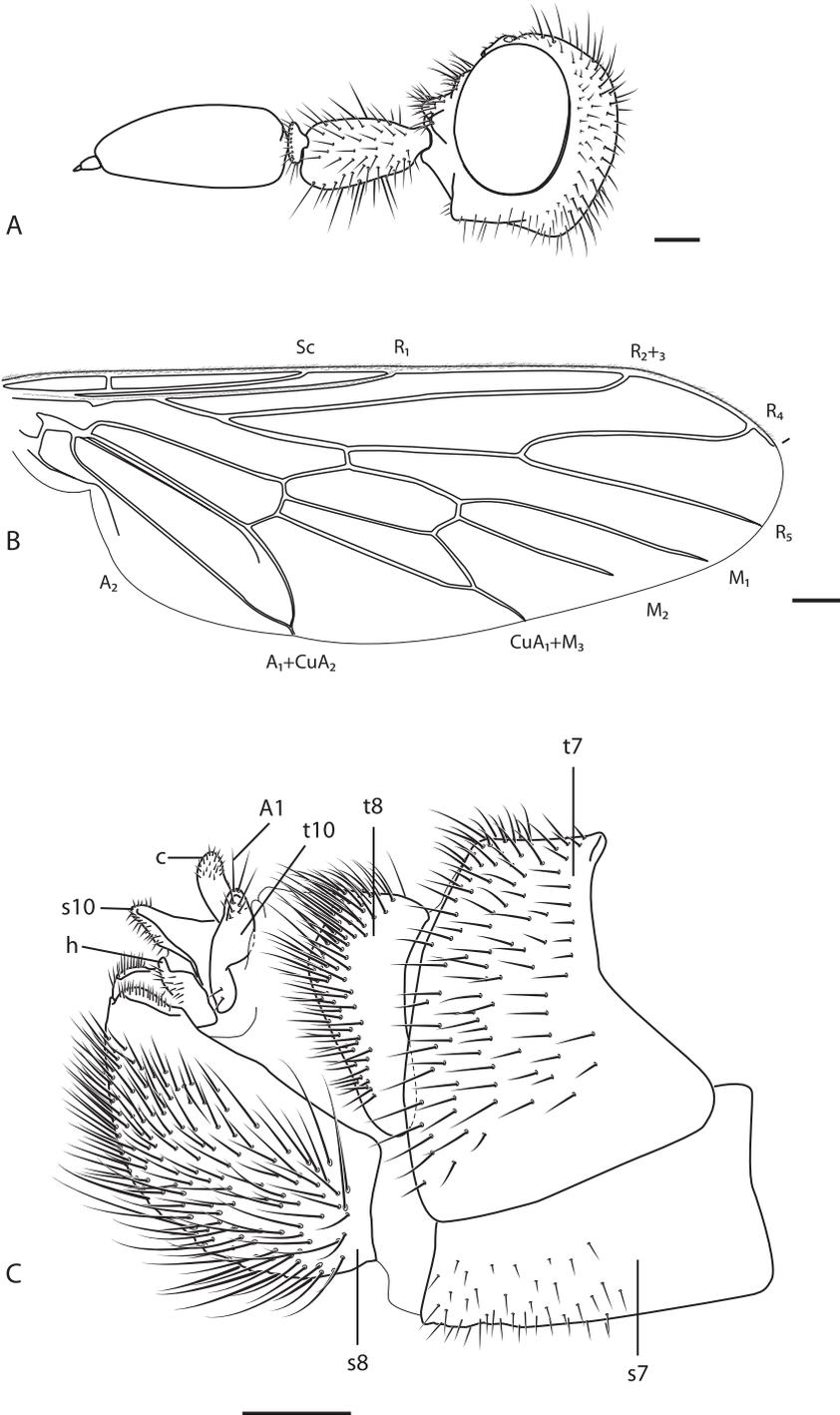


**Figure 2.** *Salwaea burgensis* gen. et sp. n., female Holotype habitus, oblique view, body length 6.5 mm.

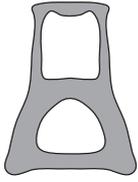


**Figure 3.** *Salwaea burgensis* gen. et sp. n., female Holotype habitus, lateral view, body length 6.5 mm.

medially, sparse pubescence on medial surface; pedicel brown with row of erect dark macrosetae; flagellum length equal to head, basal flagellomere large, paddle-shaped, style terminal. *Thorax*. Cuticle dark yellow to brown with dense glaucous grey pubescence, scutum with diffuse medial stripe and light brown patches laterally on prescutal area and supra-alar callus; scutal pile as short dark setae; scutellum dark yellow, overlain with uniform grey pubescence; pleuron dense glaucous grey pubescent with short pale setae on postpronotum, postcervical sclerite, anepisternum, and katatergite; coxae grey glaucous pubescent with short pale setae on anterior surfaces, macrosetae few in number, black; legs dark brown with short dark setae; basitarsus equal length to remaining tarsomeres combined; tarsal segments with short macrosetae apically; tarsal claws short, straight, elongate terminal setae extending from apical segment (one setae on fore and mid leg, three setae on hind leg); haltere stem light brown, knob cream; wing membrane smoky infuscate due to dense microtrichia, darker anteriorly around



**Figure 4.** *Salwaea burgensis* gen. et sp. n. **A** female head, lateral view **B** wing **C** female terminalia, lateral view. Abbreviations: **A1** acanthophorite spines **c** cercus **h** hypoproct **t7–10** tergites 7–10 **s7–10** sternites 7–10. Scale line = 0.2 mm.



*Salwaea burgensis*



*Salentia* sp.  
(Morocco)



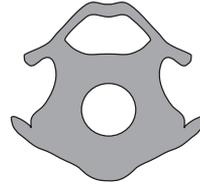
*Salentia* sp.  
(Spain)



*Neotabuda pubescens*



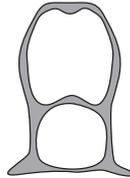
*Neotabuda major*



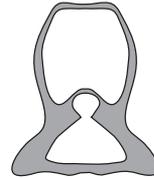
*Efflatouniella sinatica*



*Acauthrito robusta*



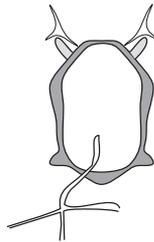
*Phycus frommeri*



*Phycus robustus*



*Actorthia pulchella*



*Thereva* sp.

**Figure 5.** *Salwaea burgensis* gen. et sp. n., Female furca of various Phycinae. *Thereva* included for comparison. Figures not to scale.

pterostigma; scutal chaetotaxy (macrosetae pairs): notopleural, 3; supra alar, 1; post alar, 1; dorsocentral, 2; scutellar, 1. *Abdomen*. Cuticle glossy dark brown, posterior margins and intersegmental membranes of all segment yellow to white, tergites dark yellow along narrow posterolaterally margin; sparse short dark setae on all segments, denser posteriorly and on terminalia. *Female genitalia*. Acanthophorite spines reduced in size; sternite 8 emarginate along posterior margin, upturned and strongly convex with elongate setae admixed with shorter setae; furca rectangular, broad at base with two openings.

**Etymology.** The species epithet is derived from the type locality, Burg (meaning tower in Arabic), or more recently Borg El-Arab, and is located within Alexandria, Egypt.

**Comments.** The male of *Salwaea burgensis* gen. et sp. n. is unknown. The body length is relatively short with a body length of 6.5 mm in the only known female specimen. The type locality is today very close to developed urban areas and this species may possibly be locally extinct there. It is remarkable that despite modern collecting efforts in Egypt and adjacent countries, no further specimens of this stiletto fly have been found.

### Key to Palaearctic genera of Phycinae

- 1 Wing costal vein ends in radial or medial fields..... 2
- Wing costal vein ends at  $CuA_2+A_1$  ..... 6
- 2 Flagellum large and paddle-shaped (Fig. 4A); costal vein ending just past  $R_4$  (Figs 1, 4B)..... ***Salwaea* gen. n**
- Flagellum turbinate, conical to elongate cylindrical, never paddle-like; costal vein terminating at or beyond  $R_5$  ..... 3
- 3 Wing costal vein ends at  $CuA_1+M_3$ ; male frons wider than ocellar tubercle...  
..... ***Yemenia* Koçak & Kemal, 2009**
- Wing costal vein ends at  $R_5$ ,  $M_1$  or  $M_2$ ; male with eyes contiguous ..... 4
- 4 Head height greater than length; frons usually with black spot or line medially; costal vein ends at  $R_5$ ; relatively small individuals (< 5.0 mm body length) ..... ***Eflatouniella* Kröber, 1927 (in part)**
- Head height subequal to length; frons usually without medial mark; costal vein ends in medial field; larger individuals, usually greater than 5.0 mm ... 5
- 5 Wing costal vein ending at  $M_2$ ..... ***Ruppellia* Wiedemann, 1830**
- Wing costal vein ending at  $M_1$ ..... ***Acathrito* Lyneborg, 1983**
- 6 Flagellum elongate, longer than head..... ***Phycus* Walker, 1850**
- Flagellum shorter than head..... 7
- 7 Hind coxal knob absent..... ***Actorthia* Kröber, 1912 (13 spp.)**
- Hind coxal knob present..... 8
- 8 Head height greater than length; frons usually with black spot or line medially; body covered with extensive glaucous grey pubescence; prosternum without pile in central depression; wing with discal cell truncated basally;

- antennal scape not elongate or bulbous; small specimens (body length < 5.0 mm body length) ..... ***Efflatouniella* Kröber, 1927 (in part)**
- Head height subequal to length; frons usually without medial mark; body uniformly black, without extensive grey pubescence; prosternum with pile in central depression; wing with discal cell acute basally; antennal scape elongate, frequently bulbous; larger specimens (body length usually > 5.0 mm) ..  
..... ***Salentia* Costa, 1857**

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# Review of the species of *Michotamia* from China with a description of a new species (Diptera, Asilidae)

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## Abstract

Three species of *Michotamia* are recorded from China. Of these *M. aurata* (Fabricius, 1794) was previously reported from Hainan and Taiwan. *M. assamensis* Joseph & Parui, 1995 is recorded from China and Laos for the first time, and *M. yunnanensis* **sp. n.**, is described and figured. A key to the known species from China is provided. A new name, *Michotamia subnigra*, is given to *Michotamia nigra* Scarbrough & Hill, 2000, which is preoccupied by *Michotamia nigra* (Meijere, 1911).

## Keywords

Diptera, Asilidae, *Michotamia*, new species, China

## Introduction

The species of *Michotamia* Macquart, 1838 are distinguished from the other Ommatiinae genera by the elongated postpedicel (see Stuckenberg 1999), which is at least 1.5 times longer than the combined length of the scape and pedicel. Of the known 24

species, 22 occur in the Oriental Region (Joseph and Parui 1983, 1984, 1987, 1995; Scarbrough and Hill 2000; Tomasovic and Grootaert 2003, 2008). The remaining two are from the Afrotropical and the Australasian/Oceanian regions, respectively (Geller-Grimm 2003/2004). The species from China remain poorly known with only one species, *M. aurata* (Fabricius, 1794), reported from Hainan (Hua 1985) and Taiwan (Joseph and Parui 1998). Here *M. assamensis* Joseph and Parui is recorded from China and Laos for the first time, and a new species, *M. yunnanensis* sp. n., is described and figured. A key to the known species of *Michotamia* from China is included. Types are deposited in Institute of Zoology (IOZ), Chinese Academy of Sciences.

**Taxonomy**

**Key to the known species of *Michotamia* (male) from China**

- 1 Hind femur reddish-yellow or brownish-yellow; apical 1/3 of epandrium abruptly curved dorsally, apex obtuse, about 1/3 as wide as epandrium at middle distance from base to apex in lateral view ..... *M. aurata*
- Hind femur largely or at least dorsally black; epandrium wide, margins parallel from base to apex, apex with a weak emargination and prominent dorsal and ventral corners..... **2**
- 2 Wing hyaline, microtrichia sparse, most abundant apically (Figs 6–7); postpedical 3.5 times combined length of pedicel and scape; fore & mid femora yellow; dorsal surface of hind femur mostly blackish-brown with narrow yellow basally; hind femur narrow, about 7 times longer than diameter medially, blackish dorsally and extending anteriorly, remaining yellowish; apex of epandrium somewhat angular with dorsal corner produced well beyond ventral corner (Figs 2–5)..... *M. yunnanensis* sp. n.
- Wing brownish-yellow, darkest anteriorly, microtrichia wide spread; fore & mid femora yellowish-orange, black extending from base to near apex dorsally & anteriorly; hind femur wider, 5 times longer than diameter medially, mostly black, basal 1/5 reddish-yellow or yellow; apex of epandrium subtruncate, dorsal corner only slightly produced beyond ventral corner ..... *M. assamensis*

**Genus *Michotamia* Macquart**

<http://species-id.net/wiki/Michotamia>

*Michotamia* Macquart, 1838, 1(2): 72. Type species: *Michotamia analis* Macquart, 1838, monotypic. Hull 1962, 2: 438 [genus description, species list]. Oldroyd 1975, 2: 130 [catalog]; 1980: 346 [catalog]. Daniels 1989: 333 [catalog]. Joseph

and Parui 1998, 1: 169 [revision, Indian species]. Scarbrough and Hill 2000: 347 [Sri Lanka].

*Allocotosia* Schiner, 1866, 16: 845. Type species: *Asilus aurata* Fabricius, 1794; by original designation.

*Allocotosia* Wulp, 1872, 7: 249. *Lapsus calarni*.

**Diagnosis.** Slender, medium [15-20 mm] flies with sparse, short setae on the thorax. *Head:* Face ventrally with unusually long, stout bristles; proboscis thick, robust with numerous ventral setae, the latter often clustered apically; postpedicel attenuate, at least 1.5 as long as scape and pedicel combined, and at least 1/2 as long as stylus; wide stripe of long, abundant setae present on lower 1/2 of frons; ocellarium with two short, thin setae. *Thorax:* Mesonotum with dorsocentral bristles either thin or absent; scutellar groove absent. *Wing:* Mostly or entirely dense microtrichose. *Leg:* Row of anteroventral bristles absent. *Abdomen:* Usually clavate. *Terminalia:* Aedeagus long, often thick, curved dorsally, with apex at or beyond cercus; sternite 8 in females with short V-shaped notch along apical margin apically, a short furrow or fissure, broad X-shaped or U-shaped apodeme internally (Scarbrough 2010; Scarbrough and Tomasovic 2010).

**Remarks.** The long postpedicel is useful in diagnosing most species of *Michotamia*. A few undescribed species of *Ommatius* (Scarbrough, Dikow, & Tomasovic, in manuscript) and *O. speciosus* Scarbrough & Hill, 2000 and *O. sparsus* Scarbrough & Hill, 2000 have an unusually long postpedicel, i.e. ~1.5 times as long as the pedicel and scape combined. In addition, *Michotamia* has a low flattened mesonotum in which the maximum vertical height is less than 1/2 the length of the mesonotum, absence of stout anteroventral bristles on the hind femur, and a much longer, curved dorsad aedeagus distinguish the species. Further, a V-shaped apical notch medially which ends in a narrow fissure and a stout X- or U-shaped apodeme on the internal surface of sternite 8 distinguish females. In *Ommatius*, the postpedicel is usually only as long as the pedicel and/or scape, rarely much longer; the mesonotum is strongly arched with the maximum vertical height being nearly 2/3 the length of the mesonotum; presence of stout anteroventral bristles on the hind femur; and a much shorter aedeagus, never curved dorsad and reaching the level of the cercus distinguish the species. Females lack a V-shaped apical notch medially that terminates in a fissure posteriorly and a stout X- or U-shaped apodeme on the internal surface of sternite 8.

***Michotamia assamensis* Joseph and Parui, 1995**

[http://species-id.net/wiki/Michotamia\\_assamensis](http://species-id.net/wiki/Michotamia_assamensis)

*Michotamia assamensis* Joseph & Parui, 1995: 14. Type locality: India: Amsoi Forest (26°00'46.57"N, 92°32'46.14"E), Assam; Joseph and Parui 1998: 172.

**New records. China: Yunnan:** 1 male, Xishuangbanna, Xiaomengyang (22°05'15.15"N, 100°53'57.92"E), 850m, 1957. IX.7, Shuyong Wang; 1 female,

Xishuangbanna, Xiaomengyang, 850 m, 1957. X.11, Lingchao Zang. **Laos: Vientiane:** 1 male, Ban Van Eue, (17°57'48.72"N, 102°36'50.01"E) 1965.XI.30 ~ Native collector, Bishop Museum; 1 male, same data except 1966.II.15, native collector, malaise trap; 1 male, same data except 1966.III.30; 1 male, Vientiane, Ci Sion, Vill. de Tha Ngone (18°07'56.86"N, 102°37'41.44"E), 1966.X.24-31, ~ Native collector.

**Diagnosis.** Antennal pedicel brownish yellow, scape and postpedicel black; postpedicel 2.5 times as long as scape and pedicel combined. Fore and mid femora yellowish-orange, black extending from base to near apex dorsally and anteriorly; hind femur wider medially, 5 times longer than diameter, mostly black, basal 1/5 reddish-yellow or yellow; epandrium of male genitalia wide with parallel dorsal and ventral margins, apex subtruncate, slightly emarginated, dorsal corner only slightly beyond ventral corner.

**Distribution.** China: Yunnan; India (Assam); Laos (Vientiane).

***Michotamia aurata* (Fabricius, 1794)**

[http://species-id.net/wiki/Michotamia\\_aurata](http://species-id.net/wiki/Michotamia_aurata)

*Asilus aurata* Fabricius, 1794: 387. Type locality: East India.

*Lochites testaceus* Bigot, 1878: (10)1, 425. Type locality: Myanmar (=Burma).

*Michotamia aurata* Oldroyd, 1975, 2, 130; Joseph and Parui (113), 36; 1998, 173.

**New records. China: Hainan:** 2 males, 1934.VIII.31, Qi He; 1 female, Qiongzong (19°02'00.13"N, 109°50'18.20"E), 400 m, 1960. VII. 14, Fushang Li. **Yunnan:** 2 females, Lancang (22°33'11.19"N, 99°55'55.56"E), 1000 m, 1957.VII. Lingchao Zang.

**Diagnosis.** Antennal scape and pedicel yellow, postpedicel black and twice as long as scape and pedicel combined. Dorsocentral and scutellar bristles absent. All legs yellow, brownish yellow or reddish yellow. Wing with anterior basal half pale yellow and the rest infuscated, r-m well beyond middle of discal-cell.

**Distribution.** China: Hainan, Yunnan, Taiwan; Bangladesh; India (Andaman Islands, Andhra Pradesh, Bihar, Karnataka, Kerala, Madhya Pradesh, Orissa, Pondicherry, Tamil Nadu, Uttar Pradesh, and West Bengal); Indonesia (Maluku Islands, Sulawesi); Laos; Myanmar; Pakistan; Sri Lanka (Amparai, Anuradhapura, Colombo, Galle, Hambantota, Kandy, Matara, Mannar, Monarapala, Polonnaruwa, Trincomalee, Vavuniya); Thailand.

***Michotamia subnigra*, nom. n.**

[http://species-id.net/wiki/Michotamia\\_subnigra](http://species-id.net/wiki/Michotamia_subnigra)

*Michotamia nigra* Scarbrough and Hill, 2000: 357. Type locality: Sri Lanka: Kan.: Kandy: Udawattakele Sancturay (7°17'55.96"N, 80°38'32.65"E). [preoccupied by *Michotamia nigra* (Meijere, 1911: 312 (Java).]

**Note.** Scarbrough and Hill (2000) described *Michotamia nigra* from Sri Lanka. Unfortunately they failed to note that the binomen *M. nigra* (Meijere, 1911) had been used earlier for a species from Java. We propose *M. subnigra* as a replacement name for *M. nigra* Scarbrough and Hill.

**Distribution.** Sri Lanka.

***Michotamia yunnanensis* sp. n.**

urn:lsid:zoobank.org:act:27E799F0-7FB8-40F3-B0C6-7A4EB465BCC6

[http://species-id.net/wiki/Michotamia\\_yunnanensis](http://species-id.net/wiki/Michotamia_yunnanensis)

Figs 1–7

**Diagnosis.** Dorsal postocular bristles black and strong, middle and lower postocular bristles pale and thinner. Antenna black, postpedicel 3.5 times longer than scape and pedicel combined. Fore and mid femora yellow, dorsal surface of hind femur mostly blackish-brown, base narrowly yellow. Wing hyaline; crossvein r-m at apical 1/3 of discal cell.

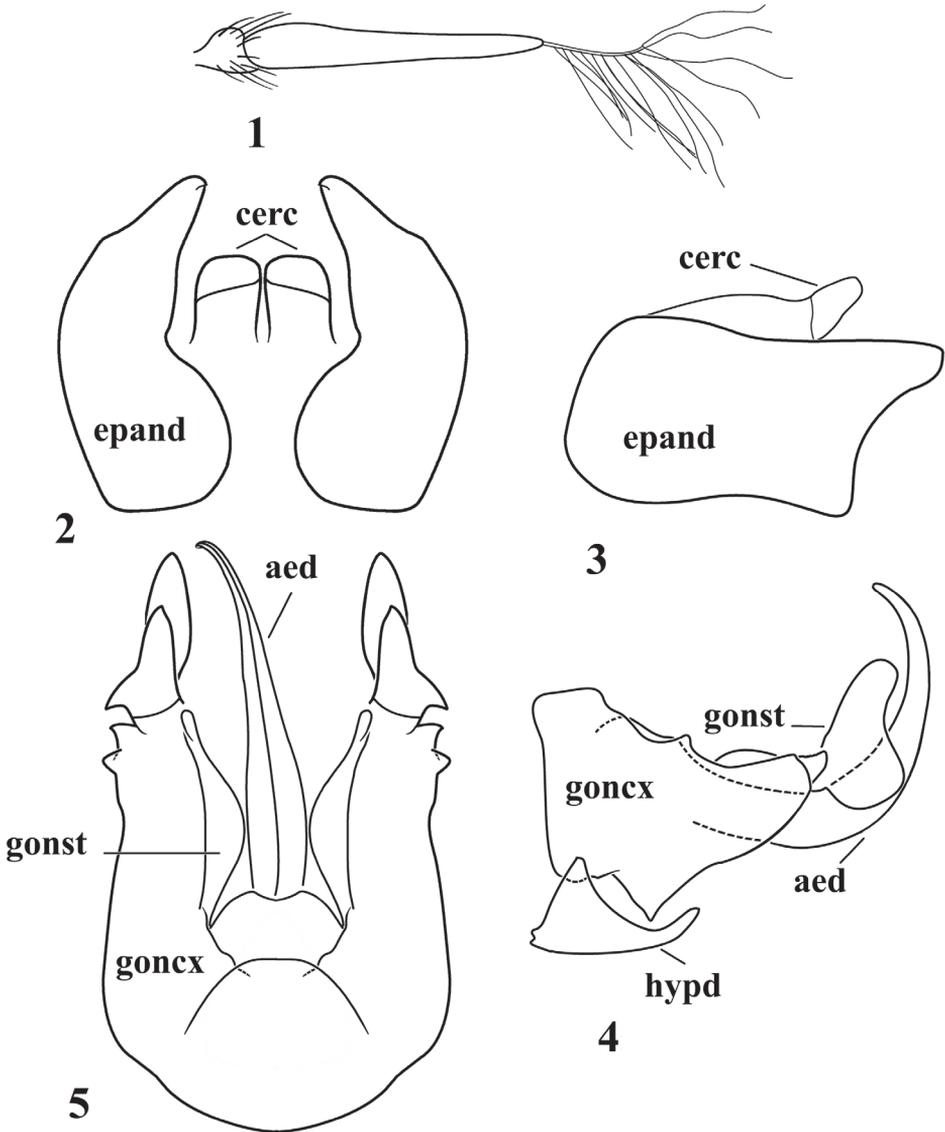
**Description.** Male. Body length 13 mm, wing length 10 mm.

Head. Face brown, sparsely pale haired below antenna and with 2 vertical rows of 6 black bristles on lower 2/3, mystax with strong, yellow bristles; frons blackish-brown, several black bristles laterally; vertex blackish-brown; occiput with pale hairs, its lower portion with long pale hairs; dorsal postocular bristles black, middle and lower postocular bristles pale. Antenna (Fig. 1) black, wide apex of scape and pedicel reddish, postpedicel black, 3.5 times longer than scape and pedicel combined; stylus brown, less than 1/2 as long as postpedicel. Proboscis black, pale hairs basally and apically; palpus black, with black hairs and bristles.

Thorax. Black with white pubescence. Mesonotum black with golden yellow pubescence laterally; 2 dc, 2 npl, 1 spal and 1 pal. Scutellum black with pale hairs and 2 weak marginal scutellar setae. Pleuron wholly black, with dense pale white pubescence. Katatergite with a row of 7 brown bristles. Wing (Figs 6–7) hyaline, tinged grayish apically; veins basally yellowish and apically brown to blackish; crossvein r-m at apical 1/3 of discal cell. Anal cell closed with short stalk. Halter yellow.

Legs (Figs 6–7). Largely yellow; coxae black, with dense pale pubescence and strong pale bristles. Fore and mid femora yellow with black tip, hind femur mostly yellow, blackish anterodorsally. Tarsi reddish-brown except basal half of tarsomere 1 brownish-yellow. Legs with most hairs and bristles black. Fore tibia with 1 av, 2 ad and 2 pd bristles, mid tibia with 2 ad; hind tibia with 1 av, 2 ad and 2 pd bristles. Claws black.

Abdomen (Figs 6–7) with long pale hairs laterally and shorter brown hairs dorsally. Abdominal tergite 1 black, tergite 2 black with yellow band posteriorly, tergites 3–4 blackish at middle, remaining tergites black; abdominal sternites 1–3 yellow, sternite 4 brownish. Abdominal segments 5–7 black. Male genitalia yellow (Figs 2–5). Epandrium wide basally, apex angular and with shallow emargination, dorsal corner produced well beyond ventral corner. Hypandrium somewhat triangular.



**Figures 1–5.** *Michotamia yunnanensis* sp. n. 1 antenna 2–3 epandrium & cercus (dorsal and lateral views) 4–5 hypandrium & gonocoxites (ventral and lateral views).

Female. Unknown.

**Type material.** Holotype ♂, Yunnan: Xishuangbanna, Menghun (21°50'31.37"N, 100°23'08.00"E), 750 m, 1958.VI.1, Chunpei Hong.

**Etymology.** The species name *yunnanensis* refers to the Province of Yunnan.

**Remarks.** *Michotamia yunnanensis* sp. n. is distinguished from *M. assamensis* by the hyaline wings (Figs 6-7), color of the femora as described in the key, and the com-



Figures 6–7. *Michotamia yunnanensis* sp. n. 7 Habitus, lateral 8 dorsal views.

bined characters of the terminalia, especially the shape of the epandrium (Figs 2-5). In *M. assamensis*, the fore and mid femora are yellowish-orange ventrally and posteriorly, black dorsally and anteriorly from base to near apex, the hind femur is mostly black with the narrow base yellowish-orange, and the wing is dark brownish-yellow and basal 1/3 of the anal lobe is hyaline (Joseph and Parui 1995, 1998).

**Distribution.** China: Yunnan.

## Acknowledgments

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# Three new species of the genus *Lathrobium* Gravenhorst (Coleoptera, Staphylinidae, Paederinae) from the Jiulongshan Natural Reserve, East China

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<sup>§</sup> [urn:lsid:zoobank.org:author:FBE4FA1F-5BCF-405E-98C1-4F86894643EA](https://doi.org/urn:lsid:zoobank.org:author:FBE4FA1F-5BCF-405E-98C1-4F86894643EA)

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## Abstract

Three new species of the genus *Lathrobium* Gravenhorst from Jiulongshan Natural Reserve, Zhejiang, East China, *L. jiulongshanense* sp. n., *L. sheni* sp. n. and *L. zhaotiexiongi* sp. n. are described and illustrated. A key to the *Lathrobium* species from Zhejiang Province is provided.

## Keywords

Coleoptera, Staphylinidae, taxonomy, *Lathrobium*, new species, key to species, Jiulongshan, Zhejiang, China

## Introduction

Up to today, eight species have been recorded from Zhejiang Province: *L. imadatei* Watanabe & Luo, 1992 and *L. tamurai* Watanabe & Luo, 1992 from Wuyanling Natural Reserve, *L. cooteri* Watanabe, 1999 from the Lin-long Shan Mountain, *L. rougemonti*

Watanabe, 1999 and *L. tianmushanense* Watanabe, 1999 from the West Tianmushan Mountain, and *L. lingae* Peng, Li & Zhao, 2012, *L. longwangshanense* Peng, Li & Zhao, 2012 and *L. unicum* Peng, Li & Zhao, 2012 from the Longwangshan Mountain. Jiulongshan is a Natural Reserve located in southwestern Zhejiang, and no *Lathrobium* species have been reported from there.

In 2006, our colleagues made a collecting trip to the Jiulongshan Natural Reserve (at 28°21'N, 118°53'E), and obtained a large number of *Lathrobium* specimens. Three species were recognized and all of them are new to science. In addition, some specimens collected recently in Zhuji City (approximately 29°43'N, 119°59'E) were provided by Mr. Tie-Xiong Zhao, all of them are belonging to one of the new species mentioned above.

A map (Fig. 5) showing the distribution of *Lathrobium* in Zhejiang and a key is provided.

## Material and methods

All specimens were collected from the leaf litter of the forest floor by sifting. The following abbreviations are used in the text, with all measurements in millimeters:

- BL** body length: length of body from the labral anterior margin to the anal apex;
- HL** head length: length of head from the clypeal anterior margin to the posterior margin of the head;
- HW** head width: maximum width of head;
- PL** pronotum length: length of pronotum along midline;
- PW** pronotum width: maximum width of pronotum;
- EL** elytra length: length of elytra from the apex of the scutellum to the elytral posterior margin.

The type materials is deposited in the Insect Collection of Shanghai Normal University (SNUC).

## Descriptions

### *Lathrobium jiulongshanense* Peng & Li, sp. n.

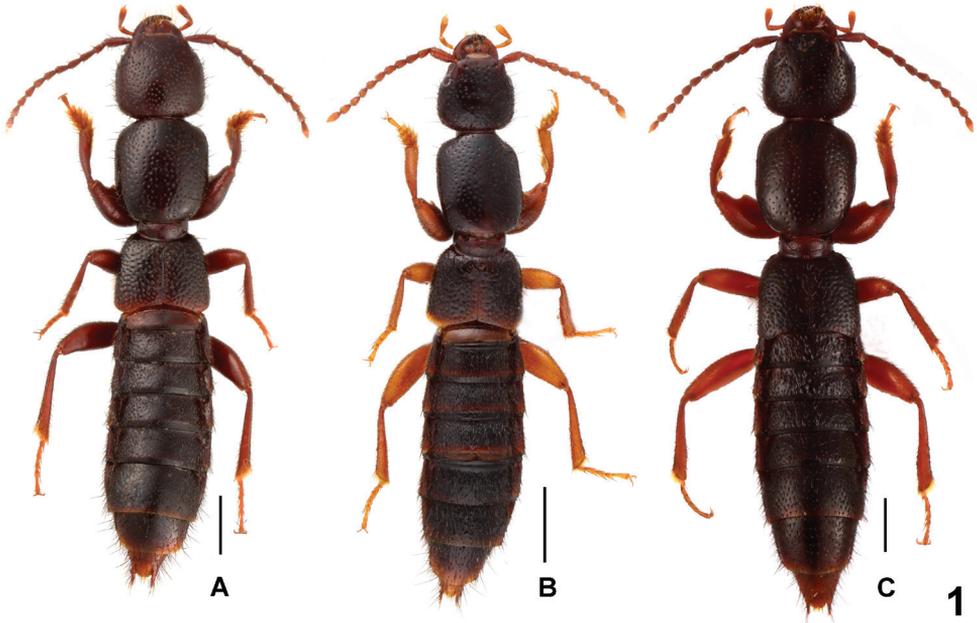
urn:lsid:zoobank.org:act:558DE96D-6F1C-4A37-8BDE-C642DD835556

[http://species-id.net/wiki/Lathrobium\\_jiulongshanense](http://species-id.net/wiki/Lathrobium_jiulongshanense)

Figs 1A, 2

**Type locality.** Jiulongshan Natural Reserve, Zhejiang Province, East China

**Type material** (22 ♂♂, 20 ♀♀). HOLOTYPE: ♂, labeled 'CHINA: Zhejiang Prov. / Suichang County / Jiulongshan N. R. / 31.vii.2006, alt. 500–700 m / Li & Shen



**Figure 1.** Male habitus of *Lathrobium* spp., **A** *L. jiulongshanense* **B** *L. sheni* **C** *L. zhaotixiongi*. Scales: 1.0 mm.

leg.'. PARATYPES: 13 ♂♂, 7 ♀♀, same label data as holotype; 8 ♂♂, 12 ♀♀, same, except '30.v.2006'; 1 ♀, same, except '28.v.2006'.

**Description.** Measurements and ratios: BL 8.90–10.08, HL 1.43–1.52, HW 1.56–1.61, PL 1.80–1.92, PW 1.55–1.71, EL 1.09–1.18, HW/HL 0.95–1.11, HW/PW 0.94–1.02, HL/PL 0.77–0.81, PL/PW 1.10–1.15, EL/PL 0.61–0.66.

Habitus as in Fig. 1A. Body brown with paler apex, legs brown, antennae brown to reddish brown.

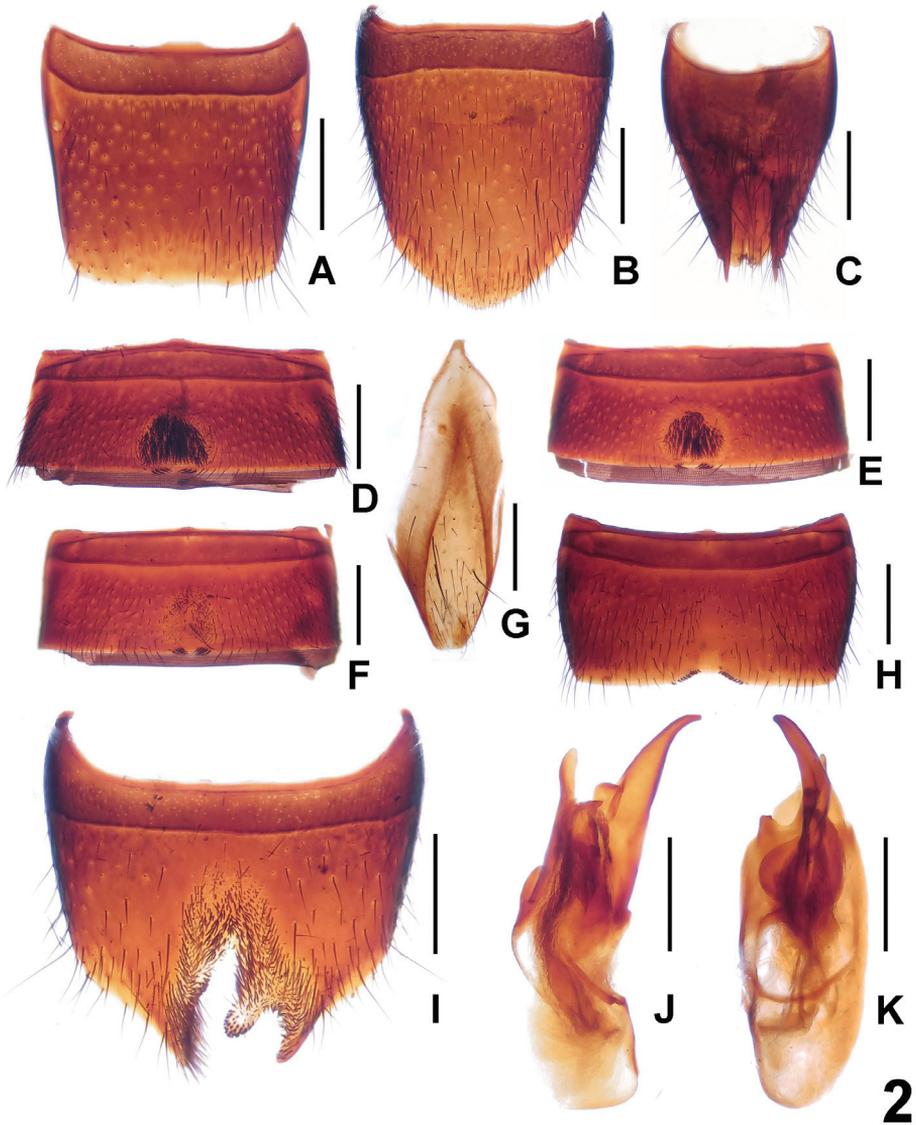
Head subquadrate; punctuation coarse and moderately sparse; interstices with shallow microsculpture; eyes small, usually approximately  $1/3$ – $3/8$  the length of postocular region in dorsal view.

Pronotum with lateral margins weakly convex in dorsal view; punctuation sparser than that of head; impunctate midline narrow; interstices without microsculpture.

Elytra with punctuation denser than that of pronotum and well-defined; hind wings reduced.

Abdomen with dense punctuation; interstices with shallow microsculpture.

Male. Sternite IV (Fig. 2D) and V (Fig. 2E) with dense short darkish setae in postero-median concavity, on posterior margin with 6–10 peg-like setae; sternite VI (Fig. 2F) similar to V, but with much sparser setae in median concavity; sternite VII (Fig. 2H) with narrow impression, on either side of this impression with 9–12 peg-like setae; sternite VIII (Fig. 2I) with different length of setae surrounding distinctly



**Figure 2.** *Lathrobium jiulongshanense*. **A** female tergite VIII **B** female sternite VIII **C** female tergites IX–X **D** male sternite IV **E** male sternite V **F** male sternite VI **G** male sternite IX **H** male sternite VII **I** male sternite VIII **J** aedeagus in lateral view **K** aedeagus in ventral view. Scales: 0.5 mm.

asymmetric and deep emargination in postero-median portion; sternite IX (Fig. 2G) asymmetric; aedeagus (Fig. 2J, 2K) with conspicuously long ventral process and short dorsal sclerite.

Female. Posterior margin of tergite VIII (Fig. 2A) truncate; sternite VIII (Fig. 2B) longer than that of male, posterior margin broadly convex and with micro-

pubescence; tergite IX (Fig. 2C) not separated from X (Fig. 2C) with short lateral processes.

**Distribution.** East China (Zhejiang: Jiulongshan Natural Reserve).

**Etymology.** The species is named after its type locality.

**Remarks.** The new species is distinguished from all its congeners in the following points: male sternites IV–VI with several peg-like setae at the posterior margin; male sternite VIII with the different length of setae surrounding the asymmetric and relatively deep emargination.

***Lathrobium sheni* Peng & Li, sp. n.**

urn:lsid:zoobank.org:act:33725E9C-7290-48A9-9194-20B31850D88A

[http://species-id.net/wiki/Lathrobium\\_sheni](http://species-id.net/wiki/Lathrobium_sheni)

Figs 1B, 3

**Type locality.** Jiulongshan Natural Reserve, Zhejiang Province, East China

**Type material** (2 ♂♂, 1 ♀). HOLOTYPE: ♂, labeled 'CHINA: Zhejiang Prov. / Suichang County / Jiulongshan N. R. / 31.vii.2006, alt. 500–700 m / Li & Shen leg.'. PARATYPES: 1 ♂, 1 ♀, same label data as holotype.

**Description.** Measurements and ratios: BL 6.12–7.51, HL 0.83–0.93, HW 0.93–1.02, PL 1.15–1.26, PW 1.00–1.11, EL 0.74–0.83, HW/HL 0.93–1.12, HW/PW 0.90–0.93, HL/PL 0.72–0.81, PL/PW 1.14–1.17, EL/PL 0.64–0.66.

Habitus as in Fig. 1B. General appearance similar to *L. jiulongshanense*, except for the lighter coloration of the legs, the much smaller body size, and the sparser punctuation on head and pronotum.

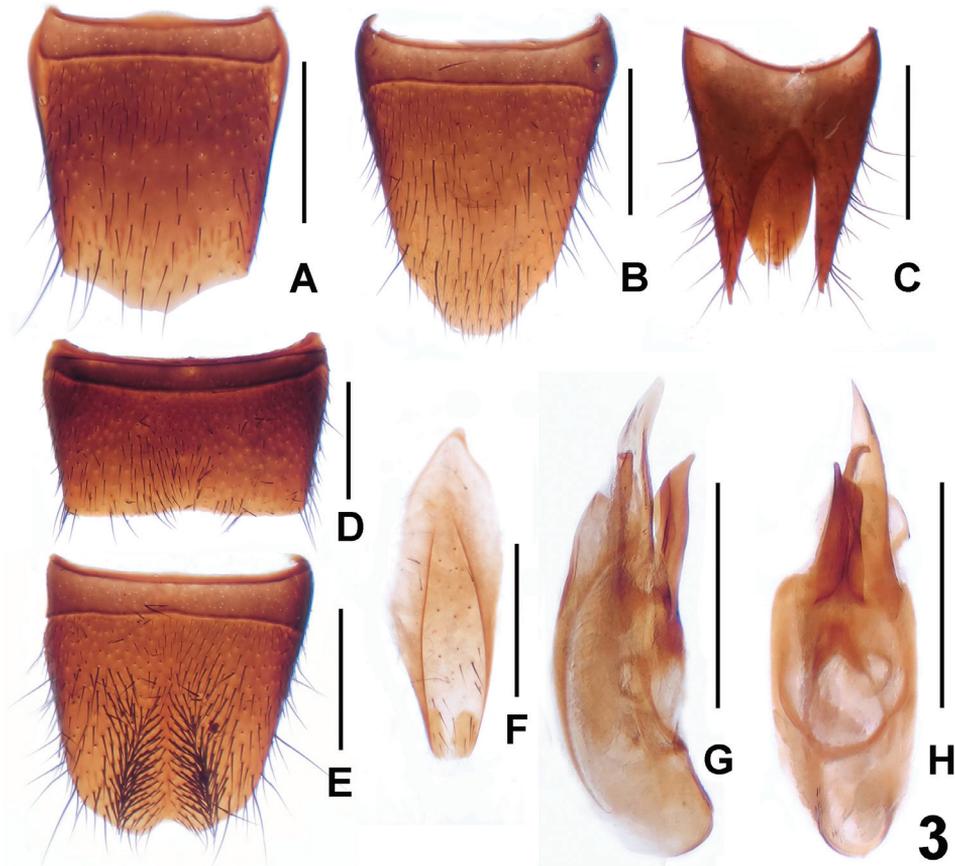
Male. Posterior margin of sternite VII (Fig. 3D) weakly concave; sternite VIII (Fig. 3E) with two rows of dense setae; sternite IX (Fig. 3F) almost symmetric; aedeagus (Fig. 3G, 3H) with short ventral process and longer dorsal sclerites.

Female. Posterior margin of tergite VIII (Fig. 3A) pointed in middle; sternite VIII (Fig. 3B) much longer than that of male, posterior margin strongly convex; tergite IX (Fig. 3C) narrowly separated from X (Fig. 3C) and with slender lateral processes.

**Distribution.** East China (Zhejiang: Jiulongshan Natural Reserve).

**Etymology.** The species is named after Shan-Jia Shen, collector of the type specimens.

**Remarks.** This species resembles *L. tamurai* Watanabe, 1992, which too was described from Zhejiang Province, in having an aedeagus with a short and apically hook-shaped ventral process. It resembles *L. yinae* Watanabe, 1997 from Yunnan in having the posterior margin of the male sternite VII weakly concave and two rows of dense setae on male sternite VIII. The new species can be readily distinguished from these species by two rows of dense setae on the male sternite VIII and by the much shorter ventral process of the aedeagus. In *L. tamurai*, the male sternite VIII has short darkish setae. In *L. yinae*, the ventral process of the aedeagus is elongate.



**Figure 3.** *Lathrobium sheni*. **A** female tergite VIII **B** female sternite VIII **C** female tergites IX–X **D** male sternite VII **E** male sternite VIII **F** male sternite IX **G** aedeagus in lateral view **H** aedeagus in ventral view. Scales: 0.5 mm.

***Lathrobium zhaotixiongi* Peng & Li, sp. n.**

urn:lsid:zoobank.org:act:F4B95489-78F5-4D69-95E5-B2BEB7342939

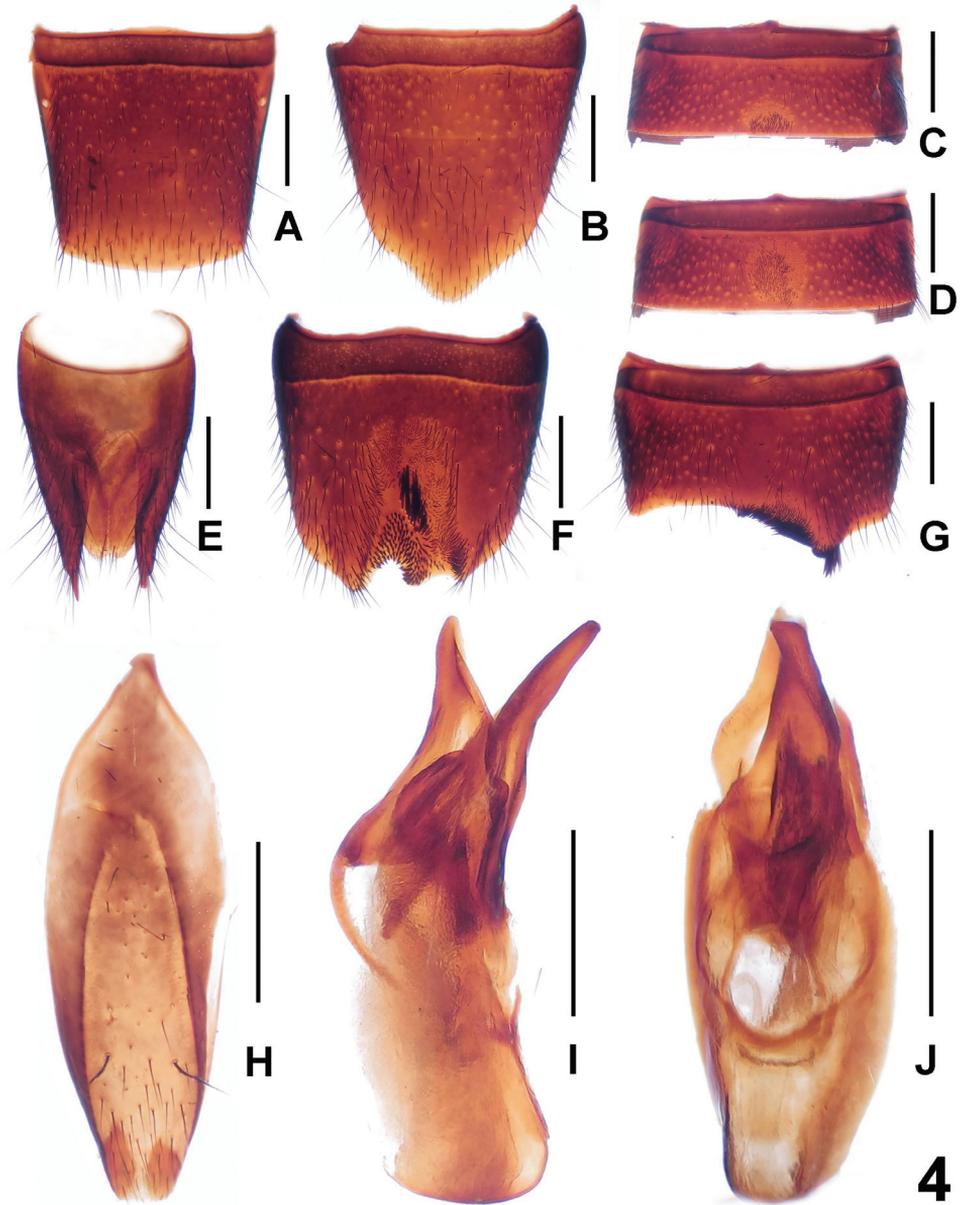
[http://species-id.net/wiki/Lathrobium\\_zhaotixiongi](http://species-id.net/wiki/Lathrobium_zhaotixiongi)

Figs 1C, 4

**Type locality.** Jiulongshan Natural Reserve, Zhejiang Province, East China

**Type material** (7 ♂♂, 5 ♀♀). HOLOTYPE: ♂, labeled ‘CHINA: Zhejiang Prov. / Suichang County / Jiulongshan N. R. / 28.vii.2006, alt. 500–600 m / Li & Shen leg.’. PARATYPES: 2 ♂♂, 3 ♀♀, same label data as holotype; 4 ♂♂, 2 ♀♀, same data, except ‘Zhuji City / Majian Town / 16.x.2011, alt. 200 m / Tie-Xiong Zhao leg.’.

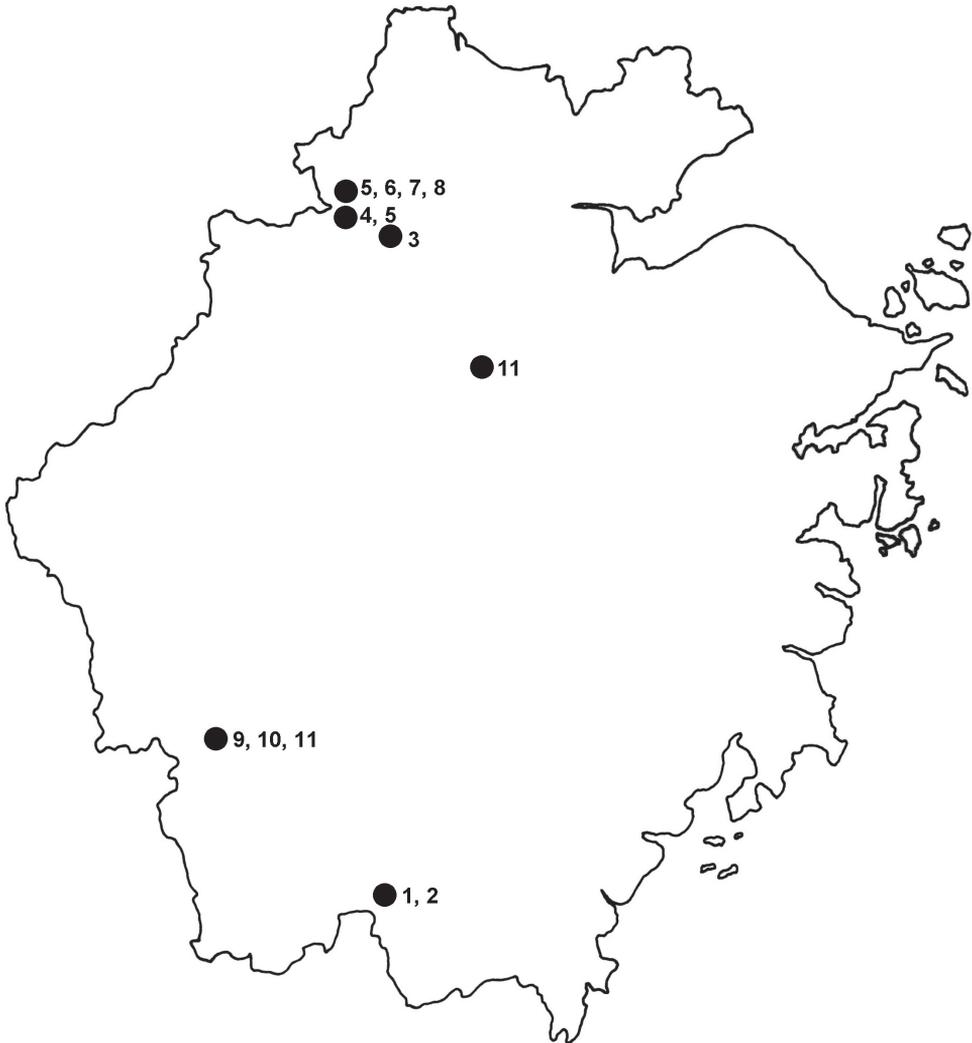
**Description.** Measurements and ratios: BL 9.90–11.12, HL 1.36–1.43, HW 1.49–1.58, PL 1.74–1.80, PW 1.56–1.61, EL 1.05–1.14, HW/HL 1.07–1.14, HW/PW 0.94–0.98, HL/PL 0.76–0.80, PL/PW 1.12–1.13, EL/PL 0.59–0.65.



**Figure 4.** *Lathrobium zhaotixiongi*. **A** female tergite VIII **B** female sternite VIII **C** male sternite V **D** male sternite VI **E** female tergites IX–X **F** male sternite VIII **G** male sternite VII **H** male sternite IX **I** aedeagus in lateral view **J** aedeagus in ventral view. Scales: 0.5 mm.

Habitus as in Fig. 1C. Generally similar to *L. jiulongshanense*, except for the lighter coloration of the legs, the somewhat larger body size, and the moderately sparse punctation on head and pronotum.

Male. Sternite V (Fig. 4C) with dense short darkish setae in posterior concavity; sternite VI (Fig. 4D) similar to sternite V, but with slightly shorter setae in median concavity; sternite VII (Fig. 4G) with different length of setae surrounding the distinctly asymmetric emargination in posterior portion; sternite VIII (Fig. 4F) with different length of setae in large impression and shallow posterior emargination; sternite IX (Fig. 4H) almost asymmetric; aedeagus (Fig. 4I, 4J) with short ventral process and dorsal sclerite.



**Figure 5.** Distribution of the *Lathrobium* species in Zhejiang. **1** *L. imadatei* Watanabe & Luo **2** *L. tamurai* Watanabe & Luo **3** *L. cooteri* Watanabe **4** *L. rougemonti* Watanabe **5** *L. tianmushanense* Watanabe **6** *L. lingae* Peng, Li & Zhao **7** *L. longwangshanense* Peng, Li & Zhao **8** *L. uncum* Peng, Li & Zhao **9** *L. jiulongshanense* sp. n. **10** *L. sheni* sp. n. **11** *L. zhaotiexiongii* sp. n.

Female. Posterior margin of tergite VIII (Fig. 4A) slightly convex; sternite VIII (Fig. 4B) longer than that of male, posterior margin distinctly pointed in the middle; tergite IX (Fig. 4C) narrowly separated from X (Fig. 4C) and with moderately slender lateral processes.

**Distribution.** East China (Zhejiang: Jiulongshan Natural Reserve and Majian Town).

**Etymology.** The species is named after Tie-Xiong Zhao, collector of the type series, a 12-year-old boy who is most enthusiastic about collecting beetles.

**Remarks.** From other *Lathrobium* species of the Jiulongshan N. R., *L. zhaotiei-iongi* is readily separated by the male sternite VII having setae of variable length surrounding the posterior emargination and the male sternite VIII having setae of variable length in the postero-median impression.

### Key to the *Lathrobium* species of Zhejiang Province

- 1 Length of body no more than 8.0 mm.....2
- Length of body larger than 8.5 mm ..... 6
- 2 Male sternite VIII with symmetric emargination in posterior portion ..... 3
- Male sternite VIII with asymmetric emargination in posterior portion ..... 5
- 3 Male sternite VII lacking short darkish setae; male sternite VIII (Fig. 3E) with two rows of long setae; BL 6.12–7.51 ..... *L. sheni* sp. n.
- Male sternite VII with short darkish setae; chaetotaxy of male sternite VIII different..... 4
- 4 Male sternite VIII with sparse modified setae in shallow impression; aedeagus with hook-shaped ventral process. BL 5.35–5.93... *L. uncum* Peng, Li & Zhao
- Male sternite VIII with dense modified setae in deep impression; aedeagus with long and slender ventral process. BL 6.88.... *L. lingae* Peng, Li & Zhao
- 5 Aedeagus with hook-shaped ventral process apically and broad dorsal sclerite. BL 5.90–6.30 ..... *L. tamurai* Watanabe & Luo
- Aedeagus with apically straight ventral process and narrow dorsal sclerite. BL 5.60–6.50 ..... *L. rougemonti* Watanabe
- 6 Male sternite IV (Fig. 2D) with postero-median concavity. BL 8.90–10.08.. ..... *L. jiulongshanense* sp. n.
- Male sternite IV without postero-median concavity.....7
- 7 PL/PW  $\geq$  1.30; male sternite VI without sexual characters. BL 9.80–10.50 .. ..... *L. cooteri* Watanabe
- PL/PW  $\leq$  1.20; male sternite VI with sexual characters..... 8
- 8 Male sternite VI with U-shaped posterior impression, aedeagus with short and broad dorsal sclerite. BL 8.70–9.00.....*L. imadatei* Watanabe & Luo
- Male sternite VI with rounded postero-median concavity, aedeagus with dorsal sclerite of different shape.....9

- 9 Male sternite VI with tuft of pubescence at concavity; aedeagus with long ventral process. BL 9.56.....***L. longwangshanense* Peng, Li & Zhao**
- Male sternite VI lacking tuft of pubescence at concavity; aedeagus with short ventral process ..... **10**
- 10 Male sternite VII with distinctly asymmetric emargination in posterior portion; aedeagus (Fig. 4E, 4F) with short dorsal sclerite. Posterior margin of female tergite VIII (Fig. 4B) symmetric. BL 9.90–11.12.....
- Male sternite VII with weak and symmetric emargination in posterior portion; aedeagus with long dorsal sclerite. Posterior margin of female tergite VIII weakly asymmetric. BL 9.40 ..... ***L. zhaotiexiongi* sp. n.**
- Male sternite VII with weak and symmetric emargination in posterior portion; aedeagus with long dorsal sclerite. Posterior margin of female tergite VIII weakly asymmetric. BL 9.40 ..... ***L. tianmushanense* Watanabe**

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# A revision and key to the genera of Afrotropical Mantispidae (Neuropterida, Neuroptera), with the description of a new genus

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## Abstract

The Afrotropical Mantispidae genera have previously been neglected and are poorly known. The genera are revised and redescribed. A new genus *Afromantispa* Snyman and Ohl is described with *Afromantispa tenella* **comb. n.** as type species. *Perlamantispa* (Handschin, 1960) is synonymised with *Sagittalata* Handschin, 1959. The new combinations within the genus include *S. austroafrica* **comb. n.**, *S. bequaerti* **comb. n.**, *S. dorsalis* **comb. n.**, *S. girardi* **comb. n.**, *S. nubila* **comb. n.**, *S. perla* **comb. n.**, *S. pusilla* **comb. n.**, *S. similata* **comb. n.**, *S. royi* **comb. n.**, *S. tincta* **comb. n.** and *S. vassei* **comb. n.** An illustrated key to the genera *Afromantispa* **gen. n.**, *Sagittalata* Handschin, 1959, *Mantispa* Illiger, 1798, *Cercomantispa* Handschin, 1959, *Rectinerva* Handschin, 1959, *Nampista* Navás, 1914, and *Pseudoclimaciella* Handschin, 1960 is provided. The wing venation of Mantispidae is redescribed. Similarities between the genera are discussed. Subsequent studies will focus on revising the taxonomic status of species, which are not dealt with in this study.

## Keywords

Mantispidae, Neuroptera, Afrotropical, lacewings, key

## Introduction

The superorder Neuropterida is considered to comprise a diversity of clades, many of which are characterized by a large number of plesiomorphic characters. It includes the orders Raphidioptera, Megaloptera and Neuroptera (Aspöck 2001; Aspöck et al. 2001; Winterton et al. 2010). The latter two are well represented in the Afrotropical Region, with approximately 1200 species in 15 families (Mansell 2010).

The significance of the order Neuroptera is well documented in fields other than taxonomy. All larvae are obligate predators, while adults are predacious or pollen-feeders and consequently fulfil vital roles in the functioning of natural ecosystems. The order is therefore ideal for studies in biological fields other than taxonomy (Picker 1984; Mansell 2002; Ohl 2004). Furthermore, their diverse range of habitats and life strategies make them ideal indicator species for global warming, fresh water health, and habitat fragmentation and destruction (Picker 1984; Mansell 2002; Ohl 2004). Despite their importance, some families are poorly studied with only a few groups having received any modern scientific scrutiny.

The Afrotropical Mantispidae are certainly one of the families that is in urgent need of revision (Ohl 2004, 2005). Reasons for this include the taxonomic complexity of the family and the confusing scientific legacy left by most previous authors. Adults are morphologically difficult to distinguish and the lack of comprehensive modern revisions makes the taxonomic status of most taxa difficult to interpret. They are consequently not easily accessible to other non-taxonomic research fields because of the paucity of taxonomic revisions or morphological keys to provide easy access to the group. Modern revisions and morphological keys are consequently of extreme importance (Ohl 2004, 2005).

The Mantispinae are the only subfamily known from the Afrotropical Region, and since the Afrotropical Mantispidae have received little attention, their potential impact on other fields of biology cannot be readily assessed. The positive impact of other families of Neuroptera has proven to be of great value in fields such as agriculture as biological control agents taxonomy (Picker 1984; Stelzl and Devetak 1999; Mansell 2002). Furthermore, revisions are important for biodiversity inventories, not only for the relevant country, but also for global biodiversity (Mansell 2002; Ohl 2004, 2005).

This study forms part of two programmes, a southern African initiative and a global programme. The first will form part of the programme: ‘Monitoring lacewings (Insecta: Neuroptera) in southern Africa’ (Mansell 2002). This initiative has five main areas of focus or operational components, namely (1) Biodiversity audit, (2) Systematic revisions and phylogenetic analysis (3) Larval biology and ecological requirements (4) Distribution patterns and predictive modelling (5) Conservation status and protective measures, which are all underpinned by a relational database of Afrotropical Neuroptera (Mansell and Kenyon 2002). The second programme entitled, ‘Towards a global inventory of Mantispidae - the state-of-the-art in mantispid taxonomy’ has revisions and morphological key generation as the central theme (Ohl 2004, 2005). The cur-

rent study thus contributes significantly to improving both our local and international knowledge of this poorly known group.

The ultimate long term aim of the study is to resolve the taxonomy of Afrotropical Mantispidae in order to facilitate further research on the group. Since the Afrotropical Mantispids has never received a comparative and large scale revision, this manuscript will form the basis of long term directional research. To achieve this, generic groups was redefined on the basis of clear autapomorphies to support their monophyly, and future molecular studies will be carried out to determine whether these morphologically-defined genera are supported by DNA evidence. Current as well as subsequent studies on the taxonomy and biology of the species can be carried out within the context of these generic concepts.

### **Biology of Mantispinae**

Female Mantispinae lay large batches of stalked eggs ranging from several hundred to several thousand (Redborg and MacLeod 1985; Redborg 1998). The substrate to which the eggs are attached varies and oviposition preference behaviour of females has not been investigated (Hoffman 1992; Redborg 1998). It has however been hypothesised that females do select specific areas, *e.g.* those with high spider prevalence. Some support for this observation has been found, but has not been tested. Stalked eggs are common in Neuroptera and it has been hypothesised that this adaptation is due to the cannibalistic behaviour of the first instar larvae (Penny 1982). Mantispine larvae, however, are not generalist predators and all known species are predators of spider eggs and have been reported to only kill fellow larvae once inside an egg-sac (Redborg and MacLeod 1985; Hoffman 1992; Redborg 1998). The reason for the evolution of stalked eggs, consequently, remains unclear.

A campodeiform, triungulin larvae hatches from the stalked eggs and uses one of two strategies for locating a food source (Hoffman and Brushwein 1990, 1992; Hoffman 1992; Redborg 1998). Either the larvae, termed obligate egg-sac penetrators, actively move about in search of an egg-sac or those termed obligate spider boarders will board a spider (Hoffman and Brushwein 1990, 1992; Hoffman 1992; Redborg 1998). It is thought that larvae that use the former strategy are attracted to spider silk (Redborg and MacLeod 1985). The second strategy includes phoretic behaviour. The larva is equipped with caudal suckers that are attached to a substrate. The head and thorax are then raised upwards to assume the phoretic position (Redborg and MacLeod 1985; Redborg 1998). The larva will sway back and forth with legs outstretched waiting for a spider to pass by. Once a spider has been boarded, the larva will usually wrap itself around the pedicel of the spider or it enters a book lung (Redborg and MacLeod 1985; Redborg 1998). A first instar larvae attached to the pedicel of an immature Clubionoidea spider has been recorded from Eocene Baltic amber (Ohl 2011). Some species are known to make use of both strategies and this is termed facultative boarders/penetrators (Redborg and MacLeod 1985; Redborg 1998). Once inside an egg-sac, the

larva produces an allomone that limits the development of the spider eggs to increase the feeding time of the larva (Redborg 1983).

The larvae undergo a unique ontological pattern. It has been proposed that the developmental pattern can be termed hypermetamorphic ontogeny but some authors do not agree (Brauer 1869; Redborg 1998). The development is certainly not as complex as that of beetles in the family Meloidae, but much more complex than most known insect ontogenies (Redborg 1998). The first-instar moults into a less mobile, less sclerotised second-instar. The second-instar is eruciform to scarabaeiform. The final- and third-instar is grub-like, immobile and scarabaeiform (Redborg 1998). As in other Neuroptera larvae, the Malpighian tubules are modified into silk-producing glands that are used to produce a cocoon in the now-empty egg-sac (Bissett and Moran 1967). When the construction of the cocoon is initiated, remaining eggs are ignored. However, if the entire batch of spider eggs is consumed spinning is initiated. It has been found that there is a direct relationship between the adult and the amount of food ingested by the third instar larva, leading to extreme variation in adult size (Redborg and MacLeod 1985). Redborg and MacLeod (1985) found individuals twice the size of other individuals of the same species that could be correlated with the number of eggs consumed. The adults are generally predacious, but it has been suggested that some may be pollinators (Tjeder 1963; Hoffman 1992). The evidence is not conclusive and flowers might just be a suitable platform for ambushing prey as is manifest by some praying mantids (Mantodea) and crab spiders (Thomisidae).

The mating behaviour of mantispids has received some attention (Eltringham 1932; Redborg and MacLeod 1985; Redborg 1998). The adults face each other and a series of movements are followed, probably for recognition purposes since cannibalism is common when adults encounter one another (Eltringham 1932; Redborg and MacLeod 1985; Hoffman 1992; Redborg 1998). An organ termed Eltringham's extrusible gland (EEG) is situated dorsally in the fourth and fifth abdominal segments of some male mantispids (Eltringham 1932). It is thought that the gland secretes a pheromone that has a calming effect on the female (Eltringham 1932; Redborg and MacLeod 1985; Hoffman 1992; Redborg 1998). The pheromone is probably distributed by short and regular bursts of 'wing flapping' during the mating ritual (Redborg and MacLeod 1985; Hoffman 1992). Mating may take more than 24 hours and the whitish spermatophore can be seen after mating while entering the female genitalia (Redborg and MacLeod 1985).

## **Systematic status of Afrotropical Mantispidae**

### **Taxonomic complexity**

The Afrotropical Mantispidae are taxonomically extremely complex. Interspecific morphology differs only slightly, while marked intraspecific variation adds to the complexity. Appropriate distinguishing characters must consequently be carefully

sought. The literature on southern African taxa is limited. Most of the species descriptions are vague and not intelligible, often lacking sufficient illustrations. This is probably because several authors were not Neuropterists and described the specimens using inappropriate characters and often overlooked important distinguishing criteria. As an example, Mansell (2010) found that Longinos Navás described over 764 Afrotropical neuropteran taxa (mostly species) of which 50% have already proven to be invalid. Museum material reveals that Navás misspelled names and misidentified several species, including type specimens, and re-described some species that he had originally described himself, often classifying the re-described species into a different genus. All Navás' descriptions and names consequently require careful evaluation.

### **Previous works**

Previous authors did little comparative studies and described new taxa without conclusively capering them with similar taxa (Handschin 1959, 1960a, b, 1963). Therefore, the main taxonomic impediment in the family appears to be synonymy. No complete, comparative revisions of the generic groups has previously been published, with only Poivre (1982b) attempting to compare some of the genera by using a matrix consisting of six relatively weak characters. To use the matrix for identification purposes, the specimen must be dissected and consequently destroyed. Furthermore, the matrix proved to be inadequate to identify several specimens to generic level.

The most recent publications on the Afrotropical taxa were by Poivre in the early 1980's (Poivre 1980; 1981a, b; 1982a, b; 1984a; 1985). Several new species were described and a limited revision was done on some of the West African species. Poivre's publications are complex and his statements difficult to interpret. He frequently used anatomical morphological characters such as internal genitalic structures for descriptions, but did not provide comparative descriptions or keys. Several of the Poivre types (e.g. *Pseudoclimaciella ivoiriensis* Poivre, 1982b and *P. cachani* Poivre, 1982b) housed in MNHN are completely dissected, macerated and mounted on slides. The major concern is the loss of information from material preserved on slides. Colours and patterns, which are of extreme importance, are both difficult to communicate in articles and are lost when using slides as a method of preservation.

### ***Nampista* Navás, 1914**

This Palaearctic genus was recently revised by Ohl (2009) so does not require re-description. It is incorporated into the key because *N. auriventris* (Guérin-Méneville), *N. africana* (Esben-Petersen) and *N. ragazziana* (Navás) also occur in African countries (Egypt, Sudan, Eritrea, Ethiopia, Djibouti and possibly Somalia) bordering the Arabian Peninsula.

## Mantispa

*Mantispa* Illiger, 1798 is treated as a Palearctic genus and is not redescribed in this study. Only a few specimens were available for this revision. Material is currently being obtained for a full comparative study of *Mantispa* and *Sagittalata* Handschin, 1959.

## Mantispa and Perlamantispa

It has been suggested that *Perlamantispa* Handschin, 1960 may be a synonym of *Mantispa* (Aspöck et al. 1980a). For the purposes of this study, the genera have been kept separate (see discussion below).

## Material and methods

**Wing terminology:** This study followed the wing terminology of Lambkin (1986a, b) with additions from Ferris (1940), Aspöck et al. (1980b) and Hoffman (1992). Some minor changes to vein systems at the wing margins have been made. The changes include a different interpretation of Sc+R, Rs, M, Cu and A (anal vein system in only the hind wing) (Fig. 1). The wing venation of Mantispidae is complex with controversy abounding. The complexity is due to the major veins that are often fused and the relatively reduced number of minor veins. The median fused with the radius in both the forewing (FW) and the hind wing (HW) have been interpreted differently by several authors (Ferris 1940; Aspöck et al. 1980b; Lambkin 1986a, b), the most recent being Machado and Rafael (2010).

In the FW Rs+M<sub>a</sub> splits into Rs and M<sub>a</sub> at the first fork (Fig. 1). The M<sub>a</sub> vein follows a path directly to the posterior margin. The Rs form the three radial cells and the anterior half of a hexagon-shaped cell (radial cell 4) before reaching the apical margin. In the FW Ferris (1940) interpreted the M<sub>a</sub> as a vein fused with Rs that separated from the Rs by forking into yet another anterior and posterior M<sub>a</sub> with the anterior M<sub>a</sub> following the fusion with the radial sector up to the first crossvein originating from the first radial cell. This interpretation (or assumption as referred to by Ferris) has been widely adopted with only Lambkin questioning the statement by explaining several different scenarios (Lambkin 1986a). In the present study only the proximal border of the first radial cell is considered to be a fusion between M<sub>a</sub> and Rs. Consequently, no crossvein originating from a radial cell is considered to be fused with M<sub>a</sub>. The interpretations of the mantispid wing are illustrated in Figure 1.

**Male genitalia:** No dissections were made because it proved to be unnecessary for the delimitation of monophyletic groups. Preliminary studies indicated that internal genitalic structures might not be a necessary character for the elucidation of the Afrotropical Mantispidae genera even though it is valuable for species delimitation. The only genus where the ectoprocts as well as the pseudopenis are autapomorphic for the Afrotropical genera is *Cercomantispa* Handschin, 1959 (Fig. 4f; also see discussion below *Cercoman-*



in MNHN but have apparently been lost. Due to the lack of identified specimens of either of the genera in museum collections, as well as the inadequate descriptions, they are excluded from this revision. The fauna of Madagascar will only be revised once the type specimens are either located or sufficient specimens are collected.

Name combinations and museums holding valuable collections were identified using LDL (Lacewing Digital Library) and the Ohl catalogue (2004). All specimens studied were dried pinned specimens. The collections studied are housed in the following institutions:

<b>SANC</b>	South African National Collection of Insects, Pretoria, South Africa
<b>MZB</b>	Museo de Zoologia, Barcelona, Spain
<b>MRAC</b>	Musée Royal de l'Afrique Centrale, Tervuren, Belgium
<b>ZMB</b>	Museum für Naturkunde an der Humboldt-Universität, Berlin, Germany
<b>MNHN</b>	Museum National d'Histoire Naturelle, Paris, France
<b>DMNH</b>	Ditsong Museum of Natural History (formerly Transvaal Museum of Natural History), Pretoria, South Africa

**Genus *Afromantispa* Snyman & Ohl, gen. n.**

urn:lsid:zoobank.org:act:23AFF0D1-4D05-4E15-8B91-79F32AE4A9D0

<http://species-id.net/wiki/Afromantispa>

*Afromantispa* Snyman and Ohl gen. n. Type species: *Afromantispa tenella* (Erichson, 1839: 169) comb. n., designated here.

**Remarks.** Both Handschin (1959, 1960a) and Poivre (1980, 1982b) considered the Afrotropical Mantispidae to be part of *Mantispa* without comparing the Afrotropical species to the type species of *Mantispa* (*Mantis pagana* Fabricius, 1775 (= *M. styriaca* Poda, 1761)). The new genus *Afromantispa* can easily be identified and clearly differs morphologically from the Palearctic *Mantispa* although the two genera are possibly closely related. (see discussion below). Species complexes within this genus must be investigated, with at least one species with a distribution from South Africa to the Arabian Peninsula lacking morphological variation. Sexual dimorphism has not been formally investigated, but it appears to be absent in the genus.

**Distribution.** Widespread throughout Africa. A few species have been collected in the Palearctic Region sharing borders with Africa such as Spain and the Arabian Peninsula.

**Diagnosis.** Prothorax granulated; granules dark (Fig. 3e). Antennae with distinct yellowish white band in the apical third (Fig. 4a). Even species with pale antennae have a few darker flagellomeres two-thirds apically from the base of the antennae and on the apex to form a yellowish-white band. The crossvein between  $Cu_a$  and  $Cu_p + A_a$  in hind



**Figure 2.** Wing variation in the Afrotropical Mantispinae. **a** *Pseudoclimaciella apicipennis* (Kolbe) **b** *Afro-mantispia* sp. **c** *Sagittalata* sp. **d** *Cercomantispia* sp. **e** *Nampista ragaziana* (Navás) **f** *Rectinerva braconidiformis* Handschin.



**Figure 3.** Pronotum variation in the Afrotropical Mantispa: **a** *Pseudoclimaciella apicipennis* (Kolbe) **b** *Sagittalata hilaris* (Navás) **c** *Cercomantispa* sp. **d** *Rectinerva braconidiformis* Handschin **e** *Afromantispa* sp. **f** *Nampista ragazziana* (Navás) **g** *Mantispa mandarina* Navás.

wing attenuated or absent (Fig. 2b). These characteristics combined are unique to this genus and can be used to distinguish *Afromantispa* species from all other genera.

**Description.** *Head:* Antennae moniliform; colour variable but all with conspicuous yellowish-white band in apical third; scape and pedicel yellow. Posterior vertex concave except for slight convex elevation directly posterior to and between antennal bases; median tubercle projection at posterior margin of vertex, vertex not visible in lateral view. Compound eyes large, each eye slightly broader medially at epistomal suture. Labrum circular. Mandible with dark apices; inner margins dark.

*Thorax:* Pronotum narrow and elongated; prothorax longer than pterothorax; granulated; granules dark; pronotum transversely slightly wrinkled or rugulose; setae



**Figure 4.** Apomorphic characters of the Afrotropical Mantispinae **a** *Afromantispa* sp., antennal band and discontinuous fore-coxal line **b** *Sagittalata* sp., continuous line on fore-coxae **c** *Rectinerva braconidiformis* Handschin, Elongated antennae and light pleura **d** *Nampista ragazziana* (Navás), lamellate flagella **e** *Pseudoclimaciella apicipennis* (Kolbe), black maculae and pronotal markings **f** Male *Cercomantispa perparva* (Esben-Peterson), elongated ectoprocts and pseudopenis **g** Male *Sagittalata* sp., slightly enlarged/swollen ectoprocts **h** *Cercomantispa* sp., anterior scape and pedicel always yellow **i** Male *Cercomantispa perparva* (Esben-Peterson), inner femoral surface.

present. Maculae slightly raised and inconspicuous; not pigmented in lighter coloured species, pigmented and shiny in darker species. Prozona slightly broader than base. Meso- and metathorax of similar size and distinctly separated by a deep cleft.

*Wings* (Fig. 2b): Wings always hyaline, lacking pigment except for the pterostigma. Pterostigma slightly concave in dorsal view; semi-circular and truncate appearance; pterostigma of most species with reddish appearance. Radial cell 1 and 2 of similar size with radial cell 3 smaller and narrower; a single crossvein from third radial cell to anterior margin (C). *Hind wings*: Crossvein between  $Cu_a$  and  $Cu_p + A_a$  attenuated or absent;  $Cu_a$  with sharp angle to and from attenuated crossvein to form inverted triangle.

*Legs*: Median line on the anterior surface of the forecoxae never continuous from thorax to femur (Fig. 4a). Mid- and hind legs differ considerably between species. Fore tarsal claw reduced to a single claw lacking arolium; Mid- and hind pretarsal claws pectinate (5–6 teeth) with the middle tooth elongated giving the claw a sharp triangular appearance; arolium present on mid and hind tarsi.

*Abdomen/Genitalia*: Males with ectoprocts slightly enlarged (Fig. 4j). Pseudopenis visible in lateral and dorsal view. EEG present. No morphological significance regarding the female genitalia.

**Etymology.** The new genus name is a combination of *Afro-* and *Mantispa*, which emphasises the African distribution of this *Mantispa*-like taxon.

**Included species.** Besides the type species, 18 confirmed and 7 unconfirmed species names will be added in the future. These numbers are, however, certain to change. Synonyms need to be identified and new species described. A subsequent full revision of *Afromantispa* is currently in progress. The genus for the time being will therefore be based on the type species only.

### Genus *Mantispa* Illiger

<http://species-id.net/wiki/Mantispa>

*Mantispa* Illiger in Kugelann, 1798: 499. Type species: *Mantis pagana* Fabricius, 1775: 278 (= *Raphidia styriaca* Poda, 1761: 101), by monotypy.

*Amycla* Rafinesque, 1815: 118. Unjustified emendation of *Mantispa* Illiger in Kugelann, 1798. *Amycla* was considered an emendation of *Mantispa* Illiger in Kugelann, 1798, by Neave, 1939, 1: 167.

*Mantispillia* Enderlein, 1910: 346 (as subgenus of *Mantispa* Illiger in Kugelann, 1798).

Type species: *Mantispa indica* Westwood, 1852: 268, by original designation. Synonymised with *Mantispa* by Penny, 1982: 217.

**Remarks.** The genus was described by Illiger (1798) in a single sentence more than two centuries ago with the European species *Mantis pagana* Fabricius, 1775 (= *M. styriaca* (Poda, 1761)) as the type species. It became the best-known Mantispidae genus probably due to the age of the genus, and several species described worldwide were incorrectly assigned to the genus. It therefore became the most speciose genus in the family

Mantispidae (Ohl 2004; Machado and Rafael 2010). More recently, Hoffman (2002) proposed that revisions should focus on elucidating the true taxonomy of *Mantispa*. Newly described genera in the New World replaced the universal *Mantispa* name that is now restricted to the Old world (Hoffman 2002; Machado and Rafael 2010). *Mantispa* might be confined to the Old World but is probably only represented by a few Palaearctic and Oriental species and not by species from the Afrotropics.

**Distribution.** Palaearctic genus with some species records from the Afrotropical Region. These countries include Morocco and countries bordering the Arabian Peninsula.

**Diagnosis.** Ectoprocts slightly swollen/enlarged. Pterostigma elongated and dark red. Prothorax with setae and slightly transversely rugulose (Fig. 3g). Fore coxae lack continuous median line on anterior surface (Fig. 4b).

### Genus *Sagittalata* Handschin

<http://species-id.net/wiki/Sagittalata>

*Sagittalata* Handschin, 1959: 215. Type species: *Mantispilla hilaris* Navás, 1925: 573 (as “*Sagittalata hilaris* (Navás 1924) [sic]”), by original designation

*Perlamantispa* Handschin, 1960a: 191. Type species: *Mantis perla* Pallas, 1772: 14 (as “*Mantispa perla*”), by original designation. syn. n.

### New combinations

*austroafrica* (Poivre)

*Perlamantispa austroafrica* Poivre, 1984b: 642. syn. n.

*bequaerti* (Navás)

*Mantispilla bequaerti* Navás, 1932: 279. Synonymized with *Perlamantispa bequaerti* (Navás) by Handschin 1960a: 197.

*Mantispilla bequaerti* var. *decolor* Navás, 1932: 280. Synonymized with *Perlamantispa bequaerti* (Navás) by Handschin 1960a: 197.

*Mantispilla kibumbana* Navás, 1936c: 355. Synonymized with *Perlamantispa bequaerti* (Navás) by Handschin 1960a: 197.

*Perlamantispa bequaerti* (Navás). As a new combination by Handschin 1960a: 197. syn. n.

*dorsalis* (Erichson)

*Mantispa dorsalis* Erichson, 1839: 168.

*Mantispilla hemichroa* Navás, 1931: 129.

*Mantispilla hypophoea* Navás, 1932: 279.

*Perlamantispa dorsalis* (Erichson). As a new combination by Handschin 1960a: 196. syn. n.

*girardi* Poivre

*Perlamantispa girardi* Poivre, 1982a: 194. syn. n.

*nubila* (Stitz)*Mantisquilla nubila* Stitz, 1913: 15.*Mantispa nubila* (Stitz, 1913) syn. n.*perla* (Pallas)*Mantis perla* Pallas, 1772: 14.*Mantispa christiana* Charpentier, 1825: 93. Synonymized with *Mantispa perla* by Erichson 1839: 167.*Mantispa flaveola* Erichson, 1839: 168.*Mantispa victorii* Guérin-Méneville, 1844: 391. Synonymized with *Mantispa perla* by Hagen 1858: 128.*Mantispa perla* var. *brunnea* Navás, 1906: 102.*Perlamantispa perla* (Pallas, 1772). As a new combination by Handschin 1960a: 191. syn. n.*pusilla* (Pallas)*Mantis pusilla* Pallas, 1772: 15*Mantis brevicornis* De Geer, 1778: 620, pl. 46, figs 9–10. Synonymized with *Mantispa pusilla* by Burmeister 1839: 967.*Perlamantispa pusilla* (Pallas, 1772) As a new combination by Handschin 1960a: 191. syn. n.*similata* (Navás)*Mantisquilla similata* Navás, 1922: 396.*Perlamantispa similata* (Navas, 1922). Listed as valid combination in Ohl (2004) and LDL. syn. n.*royi* Poivre*Perlamantispa royi* Poivre, 1982a: 191. syn. n.*tincta* (Navás)*Mantisquilla tincta* Navás, 1929: 107*Perlamantispa tincta* (Navás, 1929). As a new combination by Handschin 1960a: 200. syn. n.*vassei* (Navás)*Mantispa vassei* Navás, 1909: 474.*Mantispa* (*Mantisquilla*) *lineatifrons* Enderlein, 1910: 346. Synonymized with *Perlamantispa vassei* by Handschin 1960a: 193.*Mantisquilla sankitana* Navás, 1922: 395. Synonymized with *Perlamantispa vassei* by Handschin 1960a: 193.*Mantisquilla burgeoni* Navás, 1923: 77., Probable synonym of *Perlamantispa vassei* according to Handschin 1960a: 193.*Perlamantispa vassei* (Navás, 1909) As a new combination by Handschin 1960a: 193. syn. n.

**Remarks.** Handschin seemed to confuse the female *Cercomantispa* specimens and the genus he described as *Sagittalata*. In his revision (1960a) he mentioned that types of *S. tristis* and *S. tristella* are both female and that he is certain they are *Sagittalata* spe-

cies. He mentions that the wing venation and prothorax corresponds with *Sagittalata*. However, the complete fusion between the  $Cu_a$  and  $Cu_p + A_a$  veins in the hind wing to form a rectangle (Fig. 2d) occurs in *S. tristis* (= *C. tristis*) and *S. tristella* (= *C. tristella*) corresponds with *Cercomantispa* and not with the type species *S. hilaris* or any of the other species (*S. lugubris* Poivre 1981a, *S. jucunda* Poivre 1981a) that do conform to the genus *Sagittalata*. The pronotum them also differs between the genera: *S. tristis* and *S. tristella* have a smooth elongated pronotum with a thin metazona, again corresponding with *Cercomantispa* and not *S. hilaris*. In addition, the colour patterns of the prozona as well as the antennae also suggest these two species should be placed with *Cercomantispa* and not *Sagittalata*. Furthermore, the wing venation and genitalia suggest that *Perlamantispa* species conform to all the characteristics of *S. hilaris*. The only morphological difference is a subtle robustness of the pronotum. Some species of *Perlamantispa* seem to have a slightly more robust pronotum. *Perlamantispa* is consequently relegated as a synonym of *Sagittalata*. The difference between *Mantispa* and *Sagittalata* is weak as well, as explained in the systematic account above. Finding an autapomorphy proved to be difficult. The only consistent character was a continuous median longitudinal line on the anterior surface of the coxae of *Sagittalata* species. In addition to the coxal line, the presence of setae on the pronotum of *Mantispa* are lacking in the Afrotropical *Sagittalata*. However, two species did not conform to this character. The raptorial legs of *Perlamantispa* (= *Sagittalata*) *dorsalis* is completely black and therefore lacks the line. The second species, *Mantispa* (= *Sagittalata*) *nubila* lacks the line. Both species, however, lack setae on their pronotum. The rest of the *Sagittalata* species studied conforms to the characteristics. Distribution therefore plays an extremely important role in the delimitation of the genera. The type species of *Perlamantispa*, *P. perla* however, is well known in Europe and *Mantispa styriaca* occurs in Morocco. C.-k. Yang (Yang and Peng, 1998; Yang, 1999) described three *Sagittalata* species from China. The descriptions are unfortunately in Chinese that could not be translated and the specimens were not studied. These species probably belong to *Mantispa* instead of *Sagittalata*. Except for these species the distribution patterns of the genera are quite clear with *Sagittalata* an Afrotropical genus and *Mantispa* a Palearctic genus. Unfortunately it might be a genus that one will identify by eliminating other genera. Ongoing studies are in progress to find the relationship between *Sagittalata* and *Mantispa*.

**Distribution.** Widespread in the Afrotropical Region. Also occur in the Palearctic and Oriental Regions

**Diagnosis.** An Afrotropical genus with four species currently known from the Palearctic Region. Ectoprocts of males slightly swollen (Fig. 4g), pseudopenis visible in dorsal view. Pterostigma elongated and dark red or black. Prothorax transversly rugulose; lacks setae (Fig. 3b). Fore coxae with continuous median line on anterior surface (Fig. 4b).

**Description.** *Head:* Antennae moniliform. Flagellum dark, may end in two or three yellow flagellomeres. Anterior scape and pedicel either yellow or black; vertex flat, not visible in lateral view; frons and mouthparts vary in colour; eye margin yellow in dark species and black/dark brown in light species.

*Thorax*: Maculae inconspicuous, never pigmented in a different colour from the surrounding pronotum; pronotum lacks setae, transversely rugulose; prothorax longer than pterothorax.

*Wings* (Fig. 2c): Wings usually hyaline, may be partly or completely pigmented, pterostigma elongated and robust, always reddish or black; crossvein between radial cells 1 and 2 perpendicular to R; a single crossvein from third radial cell to anterior margin (C); *Hind wings*: Crossvein between  $Cu_a$  and  $Cu_p + A_a$  attenuated, rarely absent;  $Cu_a$  with sharp angle to and from attenuated crossvein to form inverted triangle shape.

*Legs*: Raptorial legs differ in colour, coxal sulcus conspicuous, surrounding patterns never visible on sulcus; continuous line on anterior surface of fore coxae; fore tarsal claw reduced to a single claw lacking an arolium. Mid- and hind pretarsal claws pectinate (5–6 teeth); median tooth longer than surrounding teeth; pointed appearance; arolium present on mid and hind tarsi.

*Abdomen/Genitalia*: EEG present. Ectoprocts of male slightly swollen; slightly smaller than ectoprocts of members of *Afromantispa* and *Mantispa*; pseudopenis visible in dorsal view.

**Discussion.** *Afromantispa*, *Mantispa* and *Sagittalata* seem to form a group with several similar aspects regarding their morphology. All three genera seem to have similar genitalic structures. In addition to the genitalia, the general wing venation is extremely similar with only the pterostigma of *Afromantispa* slightly different with a reddish, roundish and truncate appearance. In the hind wing, the inverted “V” shape made by the  $Cu_a$  when descending towards the attenuated or absent crossvein extending to  $Cu_p + A_a$  and again ascending after the crossvein is prominent and easily identified in this group (Figs 2b, c). The median coxal line is not a strong autapomorphy since some of the *Mantispa* specimens studied had a discontinuous line on the anterior coxa, but the geographic distribution of the genera does support separate genera. A decision to keep the genera separate has consequently been made, thereby ensuring that relevant morphological information is not lost before a conclusive result is achieved. Of significant importance is the presence of the EEG that manifests in this group only.

### Genus *Cercomantispa* Handschin

<http://species-id.net/wiki/Cercomantispa>

*Cercomantispa* Handschin, 1959: 224. Type species: *Mantispa mozambica* Westwood, 1852: 269 by original designation.

**Remarks.** *Cercomantispa* is probably the most complex of all the Afrotropical genera. This is not only because of the sexual dimorphism and the general small size, but because of the confusion in the literature and physical state of the type specimen. Males are easily recognised by their elongated ectoprocts, but females do not have conspicuous genitalia and differ morphologically from the males in terms of colour and patterns. Females were therefore described as different species from the males and placed in sev-

eral other genera. In addition to the confusion between the female *Cercomantispa* and *Sagittalata* there is a lack of clarity regarding the generic boundaries of *Cercomantispa*, *Necyla* and *Orientispa*. *Necyla* and *Cercomantispa* could be synonyms (Tjeder 1963). The name *Necyla* inexplicably disappeared from the literature. It is thought to be a genus comprising Oriental species with the type species *Necyla exigua* Navás being represented by a female holotype. The type species of *Necyla* could not be studied and photographs studied show a specimen in poor condition and pinned with closed wings. In addition to *Necyla* and *Cercomantispa*, male *Orientispa* Poivre 1984a also have elongated ectoprocts. The literature is not sufficiently unambiguous to synonymise these genera and for the purposes of this study, the genera *Necyla*, *Cercomantispa* and *Orientispa* will remain separate until further investigation can either confirm or reject the synonymy.

**Distribution.** Widespread throughout the Afrotropical Region

**Diagnosis.** The flagella of the antennae are very dark with the anterior surface of the scape and pedicel always yellow, even in the very dark species (Figs 3c, 4h). Pronotum smooth, lacks setae (Fig. 3c). The rectangular cell formed by the fusion of  $A_2$  and  $Cu_p$  in the hind wing is very diagnostic and no other mantispid genus has such a structure (Fig. 2d). All wing cells lacks pigment except for the pterostigma. The mid- and hind legs yellowish-brown to yellow covered in black setae. The males have elongated ectoprocts as well as an elongated pseudopenis, both longer than the 8<sup>th</sup> tergite, and bent ventrally (Fig. 4f).

**Description.** *Head:* Antennae long, moniliform; flagellomeres black; the apical three flagellomeres might be lighter in colour; anterior scape and pedicel always yellow, even in very dark species; vertex medially convex, clearly visible in lateral view; vertex bordered by conspicuous yellow eye margin; frons with longitudinal dark median line, not visible in very dark species (*e.g.* *C. tristis*); mandibles usually yellow or lighter than coloration of frons; black tipped with black inner margin

*Thorax:* Pronotum smooth, lacking setae; maculae conspicuous, not always pigmented; similar in length or slightly longer than pterothorax; in most species a dark median line forms two circular dorso-lateral yellow markings on prozona; prozona much wider than metazona, metazona narrow;

*Wings* (Fig. 2d): Wing venation comparatively simple; always lacks pigmented cells; pterostigma elongated, narrow; dark brown; a single crossvein from third radial cell to anterior margin (C); a single radial sector vein extending posteriorly from each radial cell 1, 2 and 3 respectively; four or five crossveins reaching posterior wing margin from  $M_p$  in hind wing; a rectangle shaped cell formed by the fusion of  $A_a + Cu_p$  and  $Cu_a$ .

*Legs:* Raptorial forelegs yellow; fore tarsal claw reduced to a single claw lacking an arolium; inner femoral surface dark in females; often only distal half dark in males (Fig. 4i), outer femur of both sexes with a narrow, brown latero-dorsal line; middle and hind legs yellow-brown to yellow covered in setae; most species with a narrow dark longitudinal line along femur and tibia; pretarsal claws pectinate; middle tooth projecting beyond the others giving the claw a sharp appearance.

*Abdomen/Genitalia:* *Male:* Ectoprocts elongated, longer than tergite 8; slightly swollen apically; apices bent downwards; pseudopenis elongated and bent ventrally; visible between ectoprocts in ventral and dorsal view; EEG absent

**Genus *Rectinerva* Handschin**

<http://species-id.net/wiki/Rectinerva>

*Rectinerva* Handschin 1959: 215. Type species: *Rectinerva braconidiformis* Handschin 1959: 221, by original designation.

**Remarks.** *Rectinerva* is a monotypic genus. Only two female specimens have been collected, one being the holotype collected in 1933 (MRAC) the other collected in 1976 (MNHN) and described by Poivre (1985). The male remains undiscovered and sexual dimorphism therefore unknown.

**Distribution.** Katanga (Democratic Republic of Congo) and Cameroon

**Diagnosis.** Light red-brown. The antennal flagellae long slender and black, proximal half covered in prominent thick black setae (Fig. 4c). The anepimeron, anepisternum, katepimeron as well as katepisternum much lighter than the rest of the body, almost white (Fig. 4c). Three radial sector veins extending posteriad from radial cells 1–3. The wing colouration is unique among mantispids from the region (Fig. 2f).

**Description.** *Head:* Head capsule light reddish-brown except for black tipped mandibles, vertex and pedicels. Scape light reddish-brown and pedicel black; flagellum long slender, black, proximal half covered in prominent thick black setae. Vertex medially raised in convex shape, visible in lateral view; raised vertex from antennal bases to posterior margin; black. Inner mandible margins lack black pigment. Eyes small; black to dark grey.

*Thorax:* Pronotum light reddish-brown; smooth; covered in light inconspicuous setae. Maculae inconspicuous; same colour as pronotum. Pterothorax uniform light red-brown; sutures inconspicuous and smooth; lacks deep clefts. Anepimeron, anepisternum, katepimeron as well as katepisternum lighter, almost white, conspicuous against the uniform light red-brown of the pteronota.

*Wings* (Fig. 2f): Both wings pigmented in banded formation with colours ranging from dark-brown to light red-brown. Pterostigma black and slightly concave in dorsal view. A single vein from radial cell 3 to the anterior wing margin (C). Radial cells broad, Radial cell 1 being the largest, radial cell 2 somewhat smaller and rectangular in shape with the radial cell 3 being the smallest. Lacks the hexagonal radial cell 4 found in other Afrotropical Mantispidae genera. Three radial sector veins extending in posterior direction from radial cells 1–3. *Hind wing:*  $Cu_a$  parallel with  $A_2+Cu_p$ .  $Cu_a - A_2+Cu_p$  crossvein not attenuated and close to posterior margin.

*Legs:* Raptorial legs uniformly light reddish-brown; coxal sulcus same colour and inconspicuous; tibia-tarsal joint and fist tarsal segment black; fore tarsal claw reduced to a single claw lacking an arolium. Mid- and hind pretarsal claws pectinate (5–6 teeth); median tooth longer than surrounding teeth; pointed; arolium present on mid and hind tarsi. The rest of the mid leg light red-brown. Femur of hind leg light red-brown as well as the proximal third of the tibia, distal two-thirds and tarsal segments black; pre-tarsus light red-brown with some dark brown at pretarsal-claw bases.

*Genitalia:* At the time of this study the macerated female genitalia (prepared by Ragner Hall in 1983) were missing.

**Discussion.** *Cercomantispa* and *Rectinerva* form a group because of synapomorphies. The male of *Rectinerva* is not yet known, so the genitalia cannot be used as a morphological character and sexual dimorphism cannot be excluded. However, the antennae of both genera are quite long compared to other Afrotropical taxa, and the flagellomeres are black with the anterior surface of the scape and pedicel yellow (Fig. 4h). Furthermore, the pronota of members of both genera are very similar in structure, smooth and narrow posterior to the maculae (Figs 3c, d). The rectangular shape of the cell formed by the fusion of  $A_a + Cu_p$  and  $Cu_a$  is present in only *Cercomantispa*. However, the second cell between the  $Cu_p + A_a$  and the posterior wing margin of *Rectinerva* is quite similar in shape but lacks the fusion between  $A_a + Cu_p$  and  $Cu_a$ . In addition to these, the comparatively simple wing venation and reduced number of radial sector cross veins in both genera seems to confirm the close relationship (Figs 2d, f).

### **Genus *Nampista* Navás**

<http://species-id.net/wiki/Nampista>

*Nampista* Navás, 1914: 97. Type species *Nampista speciosa* Navás, 1914: 98 (= *Mantispa auriventris* Guérin-Méneville 1838: 202), by monotypy

*Forciada* Kozhanchikov, 1949: 355. Type species: *Forciada relictata* Kozhanchikov, 1949: 356 (= *Mantispa auriventris* Guérin-Méneville), by monotypy

*Bucharispa* Martynov, 1936: 437. Name unavailable, no type species was assigned to the genus.

**Distribution.** Predominantly a Palaearctic genus In the Afrotropics the genus is found only in the countries bordering the Arabian Peninsula where it is represented by three species (Handschin 1960b, Ohl 2009).

**Diagnosis.** The only Afrotropical genus close to *Nampista* is *Pseudoclimaciella*. It can easily be distinguished from *Pseudoclimaciella* by the following characteristics: Flagellomeres asymmetrically lamellate (Fig. 4d); deeply incised ventrally. Prothorax shorter than pterothorax (Fig. 3f). The basal half of the forewings always pigmented; the majority of the basal half of the hind wings clear (Fig. 2e).

**Description.** Revised by Ohl (2009):

### **Genus *Pseudoclimaciella* Handschin**

<http://species-id.net/wiki/Pseudoclimaciella>

*Pseudoclimaciella* Handschin, 1960a: 207. Type species: *Mantispa erichsonii* Guérin-Méneville, 1844: 391 (as “*Pseudoclimaciella erichsoni* [sic] (Guérin-Méneville 1844)” on page 207, and as “*Climaciella erichsoni* [sic] Guérin-Méneville 1844”

on page 210), by original designation. *Mantispa erichsonii* is a replacement name for *Mantispa grandis* Erichson, 1839: 164, which is a junior secondary homonym of *Mantispa grandis* Guérin-Méneville, 1831: 196.

**Remarks.** *Pseudoclimaciella* can easily be recognised and confusion with other genera is unlikely. *Tuberonotha* Handschin 1961, a genus with a Palaearctic, Oriental and Australasian distribution is similar in appearance but always lacks an apical stain on the wings. Four Afrotropical species also lack an apical stain and were assigned to *Pseudoclimaciella* by either Handschin (*Ps. congensis* (Navás, 1936); *Ps. coronata* (Stitz, 1913)) or Poivre (*Ps. cachani* 1982b; *Ps. ivoiriensis* Poivre, 1982b) but all four have the characteristic elongated radial cells as well as a large number of crossveins originating from the radial cells. In addition to these, two crossveins originate from radial cell 3 and terminate at the anterior wing margin, all other Afrotropical mantispines have only one such vein. The members of *Pseudoclimaciella* are generally large mantispids. They may be mimics of certain Vespidae (Hymenoptera) species, an adaptation apparently not rare in Mantispidae. Colour patterns on the head as well as the pronotum fades with time and older museum specimens are frequently difficult to identify. Sexual dimorphism is unknown in *Pseudoclimaciella*.

**Distribution.** The genus is probably confined to woodland and forests in the Eastern Tropical Corridor. All the locality data indicate a C-shaped distribution extending from the tropical areas in western Africa such as Sierra Leone through central Africa extending down into South Africa east of the plateau, and into Madagascar.

**Diagnosis.** All members of *Pseudoclimaciella* are rusty reddish to brown. Basal cells of forewings always pigmented; basal cells of the hind wing always clear (Fig. 2a). Two or three veins originate from radial cell 3 and terminate at anterior wing margin (Fig. 2a); radial cells 1–3 elongated and narrow (Fig. 2a). Two yellow bands extend from pronotal maculae to ventral basal margin forming an inverted “V” shape on the dorsal side (Figs 3a, 4e). Hind tibia rusty reddish at joints and yellow in middle.

**Description.** *Head:* Antennae moniliform; most flagellomeres dark in colour; twice as broad as long, one to three bright yellow flagellomeres apically; scape and pedicel rusty reddish. Vertex convex, not visible in lateral view; slightly raised posteriorly; vertex always yellow or rusty reddish; epistomal suture black except in *P. elisabethae* (Navás 1936); mandibles black tipped with black inner margin. Eye margins rusty reddish.

*Thorax:* Pronotal maculae conspicuous, from the pronotal maculae two yellow bands with black margins extend to ventral basal margin forming an inverted “V” shape on the dorsal side; prescutum with yellow margin forming another inverted “V” shape; prothorax longer than pterothorax, prozona relatively smooth, anterior margin of prothorax black, might be discontinuous medially; metazona with transversely rugulose, lacks setae. Postnota 2 and 3 often yellow as well as posterior abdominal margins providing a vespid wasp-like appearance.

*Wings* (Fig. 2a): Wing venation complex. Pterostigma elongated, narrow, rusty-reddish. Radial cells 1–3 elongated and narrow; of similar length; at least 8 radial sector

veins extending in posterior direction from radial cells 1–3. Two veins from radial cell 3 extending towards anterior margin (C), (very few specimens with three such veins but only in one wing so some individual variation present). All species except for above mentioned 4 with apical pigmentation in both wings. *Hind wings*: Crossvein between  $Cu_a$  and  $Cu_p+A_a$  prominent;  $Cu_a$  almost parallel with basal half of  $Cu_p+A_a$ ; inverted triangle formed by  $Cu_a$  shallow.

*Legs*: Raptorial femur, tibia and tarsi uniformly red; lacks patterns on inner femoral surface; suture in fore coxa prominent and paler; single fore tarsal claw lacking an arolium. Mid- and hind pretarsal claws pectinate (5–6 teeth); teeth of similar size; spoon-shaped appearance; arolium present on mid- and hind-tarsi. Proximal joint of hind tibia dark rusty-red, distal joint lighter rusty red; proximad third of tibia same dark rusty red as joint, two distal thirds of tibia yellow.

*Abdomen/Genitalia*: Males with ectoprocts inconspicuous to slightly enlarged. Pseudopenis visible in lateral and dorsal view; continuous variation in both ectoproct size and pseudopenis size. EEG absent. No morphological significance regarding the female genitalia.

**Discussion.** *Pseudoclimaciella* and *Nampista* are quite similar in many aspects. Species of both genera are generally quite large, reddish in appearance with wings often pigmented with a similar colour. From an Afrotropical perspective, they may form a group, but with other genera such as *Tuberonotha* from the Oriental Region that is in most aspects identical to *Pseudoclimaciella*, it is likely that *Nampista* is not the most closely related taxon to any of the Afrotropical genera.

### Key to the genera of the Afrotropical Mantispidae

- 1a Flagellomeres asymmetrical and lamellate (Fig. 4d) ..... *Nampista*
- Flagellomeres symmetrical and moniliform (Figs 4a, b, c, e) ..... **2**
- 2a Crossvein between  $A_2$  and  $Cu_p$  in hind wing attenuated or absent (Figs 2b, c, f) ..... **3**
- $A_2$  and  $Cu_p$  in hind wing fused (Fig. 2d) or crossvein between  $A_2$  and  $Cu_p$  in hind wing prominent (Fig. 2a) ..... **4**
- 3a Prothorax granulated (Fig. 3e), white band present in distal third of antennae (Fig. 4a) ..... *Afromantispa*
- Prothorax either smooth (Figs 3c, d), rugulose (Figs 3a, f) or covered in setae but lack granules (Fig. 3g) and white band in distal third of the antenna absent ..... **7**
- 4a Prothorax smooth ..... **5**
- Prothorax rugulose ..... *Pseudoclimaciella*
- 5a Prothorax smooth and rectangle cell formed by fusion of  $A_a+C_u_p$  and  $Cu_a$  in hind wing (Fig. 2d) ..... *Cercomantispa*
- Prothorax smooth (Figs 3d, 4c) but no fusion between  $A_2$  and  $Cu_p$  in hind wing (Fig. 2f) ..... *Rectinerva* (in part)

- 7a In the hind wing  $Cu_p$  forms a sharp angle when bending towards  $A_2$  (Fig. 2c) ..... **8**
- In the hind wing  $Cu_p$  do not form a sharp angle towards  $A_2$  (Fig. 2f) ..... ***Rectinerva* (in part)**
- 8a Median line on anterior surface of fore coxae present (Fig. 4b), prothorax lacks setae (Fig. 3b), Afrotropical distribution ..... ***Sagittalata***
- Median line absent on anterior surface of fore coxae, setae present on prothorax (Fig. 3g), Palearctic distribution..... ***Mantispa***

**The way forward**

The taxonomic ultimate aim is to comprehensively revise the family. The present study will serve as a basis for future taxonomic research on the lower taxa of Afrotropical Mantispidae. The complexity of the Mantispidae has consequently been arranged into smaller monophyletic groups each with at least one autapomorphy. Future studies should therefore focus on revising each genus thereby avoiding an unnecessary increase in the already confusing list of invalid names in the region.

Genitalic structures may prove to be important to elucidate the species and should be thoroughly investigated. Given the diversity and complexity of the Afrotropical Mantispidae, molecular and behavioural studies may delimit what traditional morphological tools cannot resolve.

Fundamental knowledge regarding the basic biology of Mantispidae is sparse and requires attention. Studies that aim to investigate the oviposition preference of females, larval cues used for locating food sources and host specificity should be priority. This might allow for easier collection of specimens as well as raising other important questions regarding their evolution, behaviour and ecology.

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