SYSTEMATICS OF *CERNOTINA* ROSS AND *CYRNELLUS* BANKS (INSECTA: TRICHOPTERA: POLYCENTROPODIDAE)

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DEDICATION

To all the native peoples of the Americas, still fighting to preserve their lives and their lands full of life and diversity.

DISCLAIMER

The species names provided in the following text are provisional and are not published within the meaning of the International Code of Zoological Nomenclature (ICZN 1999; article 9). The names and nomenclatural acts established in this dissertation are, therefore, not available within the meaning of the Code (ICZN, article 10).

ABSTRACT

The family Polycentropodidae occurs worldwide, and is represented in the Americas by *Cernotina* Ross 1938, *Cyrnellus* Banks 1913, *Nyctiophylax* Brauer 1865, *Polycentropus* Banks 1907 and *Polyplectropus* Ulmer 1905. *Cernotina* and *Cyrnellus* are exclusive to the New World, reaching their highest diversity in the Neotropics, with 75 and 12 described species respectively. Despite this diversity, none of the two have had revisionary work done, and the taxonomic information is scattered in many different papers by many authors across the 20th and early 21st Century.

In Chapter 1, I ran the first phylogenetic analyses on the diverse genus Cernotina, using morphological characters of the male adult, especially the genitalia. To analyze the character matrix, I used Maximum Parsimony and Bayesian inference. In Maximum Parsimony, I used equally-weighted analyses with two different search strategies, one simple run and another with multiple rounds saving suboptimal trees to filter for a better set of most parsimonious trees, and an implied-weights analysis, using a posteriori character weigthing to achieve better resolution. In the Bayesian inference, I used Mk model + lognormal distribution, commonly used in morphological data. The results suggest the monophyly of Cernotina, adds phylogenetic evidence for synonymization of *Ce. perpendicularis* with *Ce. lanceolata*, and *Ce. hastilis* with *Ce. nigridentata*, and group certain species with morphological and geographic congruence, such as *Ce. acalyptra* + *Ce. cystophora* + *Ce. encrypta*, and *Ce. lutea* + *Ce. cadeti*, respectively. However, the overall resolution of the simple maximum-parsimony and the Bayesian trees were very low. In addition, the branch support for most nodes is also very low. This result might be due to the nature of the genitalic characters of *Cernotina*, being extremely variable on all its components, making the task of finding character congruence difficult. With additional data such as DNA sequence and geometric morphometrics, such issues could be alleviated.

In Chapter 2, I revised the genus *Cernotina* at species-level. I discussed the complex homology of the morphological characters of the male genitalia, especially concerning the intermediate appendage and its relation to the Xth tergum and the preanal appendage, produced illustrations and comparative diagnoses for each species in the genus, and taxonomic descriptions for 64 species. In addition, I described 16 new species. I also proposed 2 synonymies considering the phylogenetic data from Chapter 1: *Ce. lanceolata* as junior synonym of *Ce. perpendicularis*, and *Ce. nigridentata* as junior synonym of *Ce. hastilis*.

In Chapter 3, I revised the genus *Cyrnellus* at species-level. I also discussed the homology of the morphological characters of the much simpler male genitalia of the genus, produced a key to species of *Cyrnellus*, provided illustrations, and full taxonomic descriptions for 11 species. In addition, I reinstated the validity of *Cy. minimus* based on the morphology of the inferior appendage in ventral view. I also synonymized 2 species based on morphological similarity and high variability among specimens: *Cy. keskes* as junior synonym of *Cy. minimus*, and *Cy. kozepes* as junior synonym of *Cy. ulmeri*.

Table of Contents

List of Tables

List of Figures

List of Supplementary Material

Supplementary Material 1. Character matrix nexus file
Supplementary Material 2. MrBayes Block with specified parameters

Chapter 1. Phylogeny of *Cernotina* Ross 1938 (Trichoptera, Polycentropodidae)

Introduction

Trichoptera, or caddisflies, is a very diverse, abundant, and globally widespread order of aquatic insects. With more than 16,000 species described, the group is considered the seventh largest order within Insecta, being more diverse than, with the exception of Diptera, the total diversity of the other primary aquatic insect orders (Ephemeroptera, Odonata, Plecoptera, Megaloptera) and almost as diverse as all freshwater vertebrate groups combined (Malm et al. 2013). Its peak diversity is reached in the Oriental Region, with around 5,000 species, while the region with the most endemism is the Australasian, with 73% endemic genera, followed closely by the Neotropics, with 69% (de Moor and Ivanov 2008).

With its first undisputed representative, *Liadotaulius maior* (Handlirsch, 1906), appearing in the fossil record in the lower Jurrasic, Trichoptera has been long recognized as monophyletic and the sister group to Lepidoptera, together forming the clade Amphiesmenoptera. Examples of synapomorphies of the latter include: silk secretion by the larvae; the prolabium fused with the hypopharynx, forming the proboscis in Lepidoptera and the haustellum in Trichoptera; the garmented wings with scales and/or setae; and dizygotic females. Despite having relatively conserved larval cases in rock impressions in Siberia and Mongolia (Sukatsheva 1985, 1984) and adults in different amber deposits such as Dominican, Baltic, Mexican, and Burmese amber (Grimaldi and Engel 2005, Wichard 2013, 2011, 2007, 2006), only ~685 fossil species are described among the 16,000 total trichopteran species.

The following synapomorphic larval characters of the order include: aquatic lifestyle; apneustic (without spiracule openings); epidermic breathing through abdominal gills; larval tentorium reduced, delicate; larval antennae reduced; larval abdominal segments 1-9 without ventral prolegs; larval abdominal segment 9 with tergal plate; adults have: mandibles reduced; prelabium fused with hypopharynx forming the haustellum (Kristensen 1991, 1997, Weaver 1984; Morse 1997; Ivanov 2002; Ivanov and Sukatcheva 2002).

Caddisflies inhabit freshwater environments during their immature stages, with a few exceptions. The larva ecloses from the egg, undergoes 5 actively feeding instars, then pupates in water. While the pupa in some species can swim to the water surface for the adult to fly away, emergence can also occur underwater. Different species and groups are found exclusively in lotic (running water) environments, while others occur in lentic (standing) waters. There are also a few species whose larvae crawl on land, especially in the European genus *Enoicyla* (Mey 1983, Harding 1998); other species, such as *Ceratotrichia*, thrive in spray zones of waterfalls and hygropetric habitats (Chuluunbat et al. 2010, Pes & Hamada 2004, Holzenthal 1988); and even a family, Chathamiidae, with six species that develop in intertidal seawater, making their cases from corals and calcareous algae (Anderson and Lawson-Kerr 1977, Winterbourn & Anderson 1980).

Caddisfly larvae play an important role in the energetic flow of freshwater aquatic food webs. This role is accomplished through their various feeding habits, such as shredding litter and influencing decomposition, filtering suspended fine organic matter, grazing on periphytic algae, feeding on smaller arthopods, and being preyed upon by many other organisms, including fish (Morse 2003).

Due to their relatively low mobility, the need for flowing, highly oxygenated water, their general sensitivity to disturbed habitats, and the fact that they are relatively easy to identify to genus, Trichoptera larvae are widely used in biological monitoring for assessing water quality (Rosenberg and Resh 1993, Couceiro et al. 2006, 2010,). However, biomonitoring patterns are not easily found when the taxonomic resolution is insufficient, since many diverse genera and families may have their diversity underestimated when compared to more specific categories. This happens because in very diverse taxa, some species might be more tolerant than others to environmental disturbance, and if they are grouped in a single taxon, that information is lost and the patterns might disappear (Bailey et al. 2001, Boyero et al. 2009). In addition, little is known about distribution and biology of Neotropical species (Holzenthal and Calor 2017), making their use in biological monitoring less precise (Padial et al. 2012).

Trichoptera are subdivided in two monophyletic suborders: Annulipalpia and Integripalpia (Thomas et al. 2020). Annulipalpians have fixed retreats, with silken nets to trap prey or to filter particulate organic matter flowing in the water current. On the other hand, integripalpian larvae include the portable case-bearing caddisflies, with cases made of many different organic and inorganic materials. Integripalpia also includes families formerly included in the paraphyletic group “Spicipalpia,” the cocoon makers with different case morphologies (e.g., “purse cases,” “saddle cases”) or no cases at all.

The suborder Annulipalpia includes the family Polycentropodidae, along with Dipseudopsidae, Ecnomidae, Hydropsychidae, Kambaitipsychidae, Philopotamidae, Pseudoneureclipsidae, Psychomiidae, Stenopsychidae, Xiphocentronidae (Kjer et al. 2001, Kjer et al. 2002, Holzenthal et al. 2007b, Holzenthal et al. 2015, Thomas et al. 2020). Species of Polycentropodidae occur in all biogeographic regions, except Antarctica. It is one of the most diverse families of the suborder, with more than 800 described species in 14 genera (Johanson and Ward 2009, Oláh and Johanson 2010, Chamorro and Holzenthal 2010, 2011; Hamilton and Holzenthal 2011; Holzenthal et al. 2015; Holzenthal and Calor 2017; Barcelos-Silva et al. 2013; Morse 2020). The adults have a pair of setal warts on the mesoscutum, the third segment of the maxillary palp attaches subapically on the second, and the head has no ocelli. The larvae have sclerotized pronota, long anal claws, and no ventral abdominal gills (Angrisano and Sganga 2007).

Polycentropodid larvae build silken retreats, and gut content analyses often find insect body parts and algae in their digestive tracks (Wiggins 1996). They are found in lotic environments, usually with fixed retreats in slow currents (Wiggins 1996). These retreats can be shaped in various forms of capture nets, such as funnels, tubes, or with external strands to detect prey (Flint 1964, Wiggins 1996, Holzenthal et al. 2015).

Polycentropodinae (previously Polycentropinae) was proposed initially by Ulmer (1903) to include six genera with 3 protibial spurs as a subfamily of Hydropsychidae. The included genera in the Palearctic region were all described by the end of the 19th century. Ulmer (1906) later raised Polycentopodinae to family status and Brues and Melander (1915) emended the name from Polycentropidae to Polycentropodidae.

Over the years, having 3 spurs on the foretibia was a defining character for taxa to be placed within Psychomyiidae, especially by researchers in the United States (Ross 1944, Riek 1970, Flint 1980, 1981, 1991a), those taxa being Dipseudopsidae, Ecnomidae, Hyalospychinae, Polycentropodidae and Psychomyiidae. Larval, pupal and adult characters were shown to separate Polycentropodidae, Ecnomidae, and Psychomyiidae as distinct families (Lepneva 1956). Lepneva (1956) included different characters in her study, such as differences in the silken retreats and laval chaetotaxy, and in pupal mouthparts, respiratory organs and terminal appendages. These three families, Polycentropodidae, Ecnomidae, and Psychomyiidae, are currently accepted (Ulmer 1951, Mosely and Kimmins 1953, Fischer 1962, Lepneva 1964, 1970, Ross 1967, Flint et al. 1999, Hozenthal and Calor 2017).

In 1951, Ulmer included Pseudoneureclipsinae in Polycentropodidae (1951) to encompass the genus *Pseudoneureclipsis* (Fischer 1972) in the family. Li et al. (2001) transfered *Pseudoneureclipsis* to Dipseudopsidae, according to the results of the cladistic analysis. Pseudoneureclispinae now includes the two genera *Pseunoneureclispis* and *Antillopsyche* Banks 1941 (Flint 1964, Holzenthal and Calor 2017, Morse 2018), both with very similar immature stages. Chamorro and Holzenthal (2011) raised Pseudoneureclipsinae to family status, separate from Dispseudopsidae.

The subfamily most recently included in Polycentropodidae was Kambaitipsychinae from Southeast Asia, and its single genus, *Kambaitipsyche* Malicky 1992 . Chamorro and Holzenthal (2011) considered Kambaitipsychidae as a separate family from Polycentropodidae, especially due to adult characters of males and females, such as wing venation, labial palps, and phallic structures.

Current synapomorphies of adult polycentropodids include the lack of ocelli, a pair of setal warts on the mesoscutum, and the third segment of the maxilary palp inserting subapically on the second. The larvae are characterized by the sclerotized pronotum, by the long anal claw with dorsal sutures, and by the absence of ventral abdominal gills (Angrisano and Sganga 2009).

Among the genera of Polycentropodidae, two of them are restricted to the New World, with most of their diversity in the Neotropical region: *Cernotina* Ross, 1938 (with 73 species); *Cyrnellus* Banks, 1913 (with 10 species) (Holzenthal and Calor 2017, Camargos et al. 2017).

Adults of *Cernotina* lack the preapical spur on the protibia (tibial spur formula 2,4,4), and they possess forks II, IV, and V on the anterior wing. *Cyrnellus* have a preapical spur on the protibia (tibial spur formula 3,4,4) and lack fork I on both wings (Wiggins 1996).

As in the majority of polycentropodid genera, the species diversity within these genera is not well known phylogenetically. Chamorro and Holzenthal (2011) suggested a sister group relationship between *Cernotina* and *Cyrnellus* in analyses that excluded taxa with no larval and pupal data, whereas other results, with *Cyrnodes* Ulmer, 1910 and *Pahamunaya* Schmid 1958 included, recovered *Cernotina* and *Cyrnellus* as closely related to a polyphyletic *Pahamunaya* and to *Cyrnodes* (in the case of *Cyrnellus*) (Fig. 2A). Additionally, Johanson et al. (2012) obtained a phylogenetic tree of Polycentropodidae using molecular data (cytochrome oxidase I, cadherine like gene and isocitrate dehydrogenase). In this work, *Cyrnodes* and the previously analysed species *Pahamunaya jihmta* and *P. joda* were excluded from the analysis and *Cernotina* and *Cyrnellus* formed a strongly supported monophyletic group (Fig. 2B).

Despite initial phylogenetic studies and a history of collections and descriptions of New World Polycentropodidae, much of the caddisfly diversity in the Neotropics is still unknown (Holzenthal and Calor 2017). With basic knowledge of identity, presence and phylogenetic history of the species, research can be done to elucidate classification problems (Amorim 2002), to offer evolutionary information needed for biogeographical analysis (Humphries and Parenti 1999; Crisp et al. 2011), to study phylogenetic niche conservatism (Wiens and Graham 2005), to remove historical components from the data with independent phylogenetic contrasts and refer only to ecological influence (Ackerly 2000, Diniz-Filho et al. 2012) or to consider historical components to better explain evolutionary trends on species traits (Godoy and Camargos 2013, Godoy et al. 2018, Guénard et al. 2011).

From the Neotropical Polycentropodidae genera, only *Polycentropus* and *Polyplectropus* already had revisionary taxonomic and phylogenetic work by Hamilton (1986) and Chamorro (2010), respectively. Neotropical *Nyctiophylax* are not as diverse as their sister groups within the family, with only 4 species in the region. Additionally, there is increasing evidence supporting a different origin of the Neotropical *Nyctiophylax* from the Old World species (Chamorro and Holzenthal 2011, Flint et al. 1999), rendering the group polyphyletic. *Cernotina* and *Cyrnellus* remain the two exclusively New World polycentropodids with mostly Neotropical distribution with no systematic revision.

Recording the distribution of species is fundamental to understanding biogeographic and phylogeographic processes that led to differentiations of species (Loyola et al. 2008). It is also important to eliminate biases that restrict most of the records of many different groups of organisms to regions close to large research facilities and sites easily accessed (Bini et al. 2006, Hortal et al. 2015), which often excludes aquatic insects (Esteban and Finlay 2010) Therefore, this work aims to add basic taxonomic, evolutionary, and distributional information for two caddisfly genera, *Cernotina* and *Cyrnellus*, both poorly known and with most of their species occurring in the Neotropics.

Historical background

Due to the history of colonization of Latin American countries, the first descriptions of Neotropical caddisfies were written by European naturalists, thus the type specimens were mostly deposited in museums in Europe. The first Trichoptera species described for Latin America, *Phryganea maculata*, currently with the valid name *Macrostemum brasiliense* (Fischer 1970), was described originally by the German naturalist Josef Maximilian Perty in 1833. Other 19th century European naturalists continued describing Neotropical species (e.g., Pictet 1836, Burmeister 1939, Brauer 1865, McLachlan 1871). Later, Georg Ulmer described and recorded species from the Neotropics (Ulmer 1913). Unfortunately, most of his original material was likely destroyed when Hamburg was bombed during the Second World War.

During the 20th century, most the new Neotropical species were described by North American researchers. Starting in 1963, the late Dr. Oliver Flint, Jr. started his long and consistent descriptions and revisions of Neotropical species, with collecting trips to the Caribbean, to many localities in the Amazon Forest, to the Andes and the Southern Cone. By the end of the last century and the beginning of the 21st, the group led by Dr. Ralph Holzenthal produced many works on Neotropical Trichoptera, with phylogenetic analyses, revisions, descriptions, checklists and even a catalog in partnership with Dr. Flint. Holzenthal's group made important collections in Nicaragua, Costa Rica, Bolivia, Ecuador, Peru, Venezuela, southeastern Brazil, and Chile, and researchers from such areas authored many of the articles describing that material.

In the specific case of Brazil, some of the earliest intensive taxonomic works on caddisflies, by the end of the 19th Century, are the descriptions of the German-born naturalist Dr. Johann Friedrich Fritz Müller, who lived most of his life in southern Brazil. The first description done by a Brazilian-born citizen of that country was written by Dr. Angelo Machado, who described *Helicopsyche planorboides* in 1957. The next description of new species of Brazilian caddisflies by a native researcher was done in 2002, almost 50 years later, by Dr. Gisele Almeida, in collaboration with Dr. Flint (Almeida and Flint 2002).

Due to the deeply unfortunate fire in the National Museum of Natural History in Rio de Janeiro in September 2018, some of the original material observed by Müller was lost. Not many caddisfly types were deposited there, but the loss to world science and general knowledge will still be felt long after the museum reconstruction. It highlights the importance of museums to maintain the history of planet Earth and human societies, and how such places of knowledge are not being given much attention (Kury et al. 2018).

In 21st century, many researchers native to Latin America authored publications with Neotropical caddisflies (Rázuri-Gonzales and Armitage 2019, Calor and Quinteiro 2017, Holzenthal and Calor 2017). This is especially important due to the speed at which the Neotropical biomes are being devastated by habitat loss, invasive species, and climate change (França et al. 2020).

The Amazon basin, is going through an intense process of deforestation, mainly due to the advancement of crops and pastures (Picoli et al. 2018), but mining oil concessions, and logging also play a role in the fragmentation of the biome (Bass et al. 2010, Killeen 2007, Viña et al. 2004, O'Rourke and Connolly 2003). There is a steep increase in forest fires in the region across different countries, with a specific severe event in the middle of 2019 (Barlow et al. 2020), a danger with which the biome has no ecological or evolutionary experience (Nogueira et al. 2019). It is unlikely that the forest will return to its sustainable level of ecosystem services in a short time scale (Elias et al. 2020), and such processes can also be observed in other biomes such as the dry Cerrado, in which even the most dedicated conservation efforts may not be sufficient to protect its threatened species (Vieira et al. 2018).

To describe the biodiversity in the 21st century, especially in the threatened yet so very rich Neotropical biomes, is of great importance to better grasp the role of the different species in their ecosystems before they go extinct. Worldwide, the decline of insect populations is of great concern, threatening entire ecosystems and human food production. Insects in general provide a variety of different ecosystem services, such as pollination, pest control, and nutrient cycling in the food web. Another type of such service can be seen in caddisflies; in constructing portable cases and fixed retreats, they play an important role as ecosystem engineers, modifying the environment by providing more heterogeneous habitats, leading to a higher species diversity in such environments (Wright and Jones 2006, Lill and Marquis 2003).

Trichoptera are among the orders most impacted by the insect decline, and as the seventh more diverse order, caddisfly species could face severe extinctions (Sánchez-Bayo and Wyckhuys 2019). This phenomenon is even more notable when the genetic diversity being lost is observed (Schmitt and Hewitt 2004).

With science funding being cut in many different countries, leaving museums and universities unattended to deal with their unique and irreplaceable material, the need to study the taxa we are losing is even more dire and urgent. In this work, part of the mysterious Neotropical biodiversity that intrigued naturalists centuries ago is uncovered, and our understanding of the evolutionary relationship between those species is improved.

Genus Cernotina

Despite the many species descriptions in this genus in the past century, no phylogenetic hypotheses among *Cernotina* species has ever been elucidated. The aforementioned phylogenies of Polycentropodidae only included two of the 73 described *Cernotina* species, focusing more on higher classification (subfamilies, genera), which also has only recently been phylogenetically studied.

Dr. Flint often mentioned probable relationship among the species he described (1971, 1968a), and he noted some morphological patterns. Other species rich Trichoptera genera have defined monophyletic subgroups that inform the study of the genus. A similar phylogenetic framework for species and species groups within *Cernotina* would add greatly to the information content of its classification.

This study aims to provide that information by studying the evolutionary history of the more than 70 *Cernotina* species for the first time.

Methods

Specimen preparation

The specimens observed were acquired from different museums and institutions (Table 1). Abdomens of male specimens were removed from the thorax and “cleared” following the methods described by Blahnik et al. (2007) with warm 85% lactic acid. Clearing causes sclerotized internal and external cuticular structures of the male genitalia to become semi-transparent, thus presenting a clear view of internal and external morphology. While still warm from the lactic acid, a stream of water propelled by a syringe inserted inside the abdomen was used to flush out macerated non-cuticular tissues obscuring the view. Most type specimens already had the abdomens dissected and no additional procedure was needed.

For a few specimens, especially those collected decades ago and where the soft tissue became hardened, an overnight bath in 10-12% KOH solution was also used for better clearing. After KOH treatment, specimens were bathed in 10% acetic acid in 70% ethanol to halt the clearing process by neutralizing the KOH. Some specimens also needed Chlorazole Black E (Fischer Scientific Int., Inc.) stain to observe structures that became overly transparent with the use of KOH.

Prather’s (2003) method was used to prepare wings of pinned specimens. For specimens stored in alcohol, the wings were removed, observed with the microscope, then were placed in a microvial with the remainder of the specimen(s).

Morphological terminology

Chamorro (2010) was followed For head and wing terminology used in the genus description. Terminology for male genitalia was adapted from Chamorro (2010) and

Camargos et al. (2017). Bilaterally symmetrical structures are written in singular in the character state descriptions.

Taxon sampling

Ingroup

The ingroup consisted of 75 species of *Cernotina*. All of the described species were sampled, most by direct observation, including the holotype and/or paratype of all but 9 species. Character data for the latter 9 were extracted from the literature or from specimens that matched the original descriptions (Table 1). The number of specimens observed on each taxon is described in the 'Material examined' section of the species descriptions in Chapter 2.

Outgroup

To compose the outgroup, 11 species of Polycentropodidae were sampled. Representatives from proposed closely related taxa such as *Cyrnodes scotti*, *Pahamunaya* spp., and *Cyrnellus* spp. were selected, along with more distantly related taxa such as *Polyplectropus* spp. and *Polycentropus criollo* (Table 1). Species from different families were not used due to the disparity of their male genitalia characters, which represents the majority of the character matrix, making it very difficult to find homologies between such distant taxa. Due to the uniquely diverse morphological characters of *Cernotina* which makes the homology assessment difficult, the genus *Cyrnellus* was used only as outgroup rather than another taxonomic group of interest.

Morphological characters

Character sources

Due to the fact the most specimens used in this work are smaller than 4 mm, some of which are the only representatives for their taxa, and many of them were first collected more than 50 years ago and stored in 70% alcohol, only morphological characters were observed. A few younger specimens in the University of Minnesota Insect Collection had their DNA extracted at Rutgers University, but even in that case no amplification was possible. Therefore, genitalic characters were the main source of character variation used in the matrix (Suppl. Material 1).

Since this is the first species-level phylogenetic analysis within *Cernotina*, most of the 79 characters in this analysis are herein proposed. Some characters were adapted from Chamorro and Holzental (2010) and Chamorro and Holzenthal (2011) from comparative analyses of *Polyplectropus* and the generic relations within Polycentropodidae, respectively. Such characters are referenced in the section "Character list," coded as (C&Ha) for the first work and (C&Hb) for the latter, followed by the number of that particular character in its respective article.

Characters with states that could not be discretely delimited by a clear discontinuous variation or a point of reference due to slight continuous variation, continuous numeric characters, characters variable within the same species, and invariant characters were excluded from the analysis. Very membranous characters were difficult to determine in their exact shape and size, often varied between different specimens, and were also excluded. Female and larval characters were not used due to the lack of taxonomic description of structures from these life stages for the vast majority of species known. One autapomorphic character (character 22) was coded, and was not excluded, since it is informative to the topology and branch lengths calculations of the Bayesian analysis (Lewis 2001).

The taxonomic literature was also consulted when specimens of a particular taxon could not be observed. This limitation led to character coding based on published description only (i.e., *C. chiapaneca* Bueno-Soria, *C. depressa* Flint). However, the descriptions did not include all the of character states analyzed in this work, which led to a large number of missing data for such taxa. These taxa can still be informative (Santini and Tyler 2004, Wiens 2004, Wright and Hillis 2014), and in pilot analyses the resolution of the trees were improved when a taxon with much missing data such as *C. odonta* Santos & Nessimian was included.

To simplify the discussion of character evolution, the following acronyms were used to represent the respective structures:

DLP = dorsolateral process of the preanal appendage

VMP = ventromesal process of the preanal appendage

Character coding

A very important step in phylogenetic analysis of morphological characters is character coding and homology assessment (Fitzhugh 2006, Brazeau 2011), as is the sequence alignment when molecular data are used (Wheeler 1995). The characters should reflect homology and the states coded should reflect the determination of the expression of the given character. The position of a structure, its composition, and the transformation series of intermediate forms can help determine the primary homology of that character (Haszprunar 1992). In a group with genitalic structures as divergent as in *Cernotina*, making homology assumptions can prove difficult, especially when some structures are absent in some taxa. Among the many proposed coding methods to deal with inapplicable characters are reductive, composite, non-additive binary, and presence-absence coding (Strong and Lipscomb 1999).

In this study, reductive coding was used to address inapplicable characters. First, the absence or presence of a feature was coded, then, additional characters concerning the shape, size, position, and other variations of such structure were further coded. In taxa where the structure was absent in the first place, those subsequent characters were coded with a dash sign ("–"), meaning that the character was inapplicable to that taxon. In the analysis, these data behave the same way missing data do, coded with a question mark ("?"), with the algorithm treating both as any of the existing states (Brazeau 2011). However, for the Bayesian analysis, the matrix file was modified to replace all dashes with question marks, so the program would not interpret the dash as a gap character. In all the other files, the two separate symbols were kept in order to interpret without difficulty which character was already inapplicable and which one was coded as missing at the time. The vast majority of the characters (73 of 79) have inapplicable states.

In characters where a transformation series was clearly observed, e.g. the relative length of a given structure, being shorter than, as long as or longer than another structure, and the absence is one state of that series (i.e., characters 34, 40, 41), composite or multistate coding was used.

To avoid *a priori* biases towards the interpretation of polarities of the characters, the outgroup was used for rooting the tree (Cassis and Schuh 2010). Therefore, a state assigned as 0 can be plesiomorphic or derived depending on the character, and no assumptions should be made based on the assigned number alone.

Analysis

Maximum Parsimony

An equal weights maximum parsimony (EWMP) analysis was performed using the program TNT (Goloboff et al. 2003). The Tree Bisection-Reconnection (TBR) search algorithm was run with 1000 replicates, with 10 trees kept at every run. Majority-rule consensus was applied to achieve more resolution.

To achieve higher resolution, a second multi-round equal weights maximum parsimony (MEWMP) analysis was run. For this analysis, all the trees found in the traditional TBR search were saved, then filtered, only keeping trees not longer than the most parsimonious tree for more than 10 steps. Then, the suboptimal trees were used as a starting point for subsequent analysis. The last analysis was filtered to the most parsimonious trees. This method is used by Simões et al. (2018).

As an alternative to the MEWMP, a weighted analysis using *a posteriori* implied weighting was also performed (IWMP). To observe the effect of the value of k (the constant variant), 20 individual runs were performed, with varying values of k, from 1 to 20 (Table 2). It is understood that weighting against homoplasies improves maximum parsimony analysis (Goloboff, et al. 2008), and accounting for different susceptibility to change for different characters (i.e., stable wing venation versus variable number of phallic spines) is a more realistic approach to the morphological evolution of the genus.

Bayesian inference

The dataset was also analyzed using Bayesian inference with MrBayes 3.2 (Huelsenbeck and Ronquist 2011), using Metropolis-coupled Markov Chain Monte Carlo sampling (MCMCMC), which considers tree topologies given the parameter space. The parameters come from branch lengths and the rates of character state change assumed by the specific evolutionary model. As proposed by Lewis (2001), Markov k, or Mk, the model commonly used for morphological data, was chosen. This model specifies an equal rate of character state change, not making assumptions on the transformation to and from individual states, such as many models with nucleotide sequence data do. In addition, the coding parameter was set to “variable,” due to the nature of this morphological character matrix being devoid of invariant characters.

As in nucleotide sequence data, morphological character states also vary individually in their rate of change. Instead of having an area of the sequence that is conserved or variable, there are whole structures that are virtually immutable within a given taxon, such as the wing venation characters in *Cernotina*, while others vary considerably among the same group of species, such as the dorsolateral process of the preanal appendage of the male genitalia. To account for that difference, a distribution parameter is included to constrain the randomized parameters to specific subdivisions of values of such distribution (Wright 2019). On that regard, Lewis (2001) suggested the use of the gamma parameter, while more recent research has shown good outputs when a lognormal distribution is used with morphological datasets (Simões et al. 2018, Harrison and Larsson 2015, Wagner 2012). This way, lognormal distribution was used in this work (MrBayes command 'lset rates = lnorm’).

To achieve convergence of trees, 10 million generations were run, with sampling at every 1000th, and excluding the first 25% of the trees as *burn-in*. To achieve better mixing and avoid suboptimal peaks of posterior probability, two parallel MCMC runs were performed, each with 4 chains, 3 cold and 1 heated (MrBayes command ”nchains=4”). To summarize the trees, the command ‘sumt’ was used (Suppl. Material 2).

Results

Characters and states for the phylogenetic analyses

Wings

1. *Fork I on Forewing* (CHb61)*:* 0 – present; 1 – absent.

Many polycentropodids have veins R2 and R3 of the forewing separate, forming Fork I (Figs. 3E, G), while *Cernotina*, *Cyrnellus*, and closely related genera have the two veins fused (Figs. 3A, C).

2. *Fork III on Forewing* (CHb66)*:* 0 – present; 1 – absent.

Most genera in Polycentropodidae, including *Cyrnellus*, have the veins M1 and

M2 of the forewing separate, forming Fork III (Figs. 3C, E, G). *Cernotina*, *Pahamunaya*, and *Cyrnodes* have such veins fused, and the fork is thus absent (Fig. 3A).

3. *Fork I on Hind wing* (CHb84)*:* 0 – present (Figs. 3F, H); 1 – absent (Figs. 3B, D).

4. *Hind wing shape:* 0 – broad (Figs. 3D, F, H); 1 – narrow (Fig. 3B).

The hind wing was considered narrow when it was at least 3 times longer than wide.

Legs

5. *Number of protibial spurs:* 0 – three; 1 – two.

Species with three spurs have the third protibial spur preapically.

Male genitalia

6. *Relative height of sternum IX* (CHa2)*:* 0 – more than half of the genitalic complex (Figs. 4C, 5A, E); 1 – half or lower than half of the genitalic complex (Figs. 4B, 6D).

To code this character, the highest point of sternum IX in lateral view was chosen to calculate the relative height in relation to the whole genitalic complex.

7. *Sternum IX anterior vs posterior margin width:* 0 – same width (Fig. 9A, 10D; 1 – posterior margin wider than anterior (Fig. 9B); 2 – anterior margin wider than posterior (Fig. 10A).

8. *Sternum IX lateral concavity in ventral view:* 0 – absent or shallow concavity; when the lateral margin has only a slight sinuosity or is straight (Fig. 10C, D); 1 – deep concavity; when the lateral margin has a deep curve medially (Fig. 9C).

9. *Presence of concavity in anteroventral margin of sternum IX:* 0 – absent (Fig. 13B, C); 1 – present (Figs. 9, 10).

10. *Ventral ridge chiasm on sternum IX:* 0 – absent (Figs. 9D, 10B); 1 – present (Fig.9A,

B, C), 10A, C, D).

11. *Direction of ventral ridge chiasm on sternum IX:* 0 – horizontal or symmetrical (Fig. 9B, C); 1 – vertical (Fig. 9A).

The character is at state 0 when the lateral concavities of the ridge are smoother or similar to the posterior concavity, making the structure look like the letter X, and at state 1 when the lateral concavities of the ridge are stronger than the posterior concavity, making the structure look like the letter H sideways.

12. *Tergum X fusion with the intermediate appendages* (CHb96, in part)*:* 0 – fused. (Fig. 7); 1 – not fused (Fig. 13A); 2 – partially fused (Fig. 8A).

The character is at state 0 when the mesal and membranous tergum X merges with the lateral and more sclerotized intermediate appendage forming a dorsal complex. In the outgroup, there are species with the two structures entirely separate, coding as state 1. Some species have the sclerotized intermediate appendages separated from the more membranous tergum X, coding as state 2.

13. *Tergum X mid-division:* 0 – divided (Fig. 7); 1 – indistinctly divided (Fig. 8F).

This character is at state 1 when the membranous part of the intermediate appendage complex is not clearly divided in the middle, in dorsal view.

14. *Curvature of intermediate appendage complex:* 0 – straight to slightly curved ventrad (Fig. 4D, 5C, 6A, B, D, E); 1 – strongly curved ventrad (Fig. 4B, C).

15. *Shape of intermediate appendage complex:* 0 – oblong to digitate (Fig. 4E); 1 – rounded (Fig. 5C); 2 – hooked (Fig. 6C); 3 – subquadrate.

The intermediate appendage complex can be very membranous, which can make an exact definition of shape difficult throughout different specimens. The categories proposed are wide enough to accommodate for intra-species variation. The subquadrate condition is only observed in the outgroup, particularly in *Cyrnellus*.

16. *Relative size of intermediate appendage in relation to sternum IX:* 0 – as long as sternum IX; 1 – shorter than sternum IX; 2 – longer than sternum IX.

17. *Presence of strong apicoventral setae on intermediate appendage complex:* 0 – present (Fig. 4A, F, 6D, 7B, E); 1 – absent (Fig. 4C, 5D, 8A).

This character is present in species that bear strong spine-like setae apically, and in some species, those setae can almost reach the mid-length of the structure complex.

18. *Apical spine on intermediate appendage complex:* 0 – absent; 1 – present (Fig. 4E, 5D).

19. *Preapical spine on intermediate appendage complex:* 0 – absent; 1 – present (Fig. 4B, 5C).

20. *Microsetae on the surface of intermediate appendage complex:* 0 – present; 1 – absent.

21. *Densely setose medial structure on ventral surface of intermediate appendage complex:* 0 – absent; 1 – present (Fig. 6B, 7E, 8F).

A few species have this densely setose node on the ventral surface of the intermediate appendage-tergum X complex, which can be seen both on lateral and dorsal view.

22. Preanal *appendage process division:* 0 – divided in 2 lobes; 1 – not divided.

23. *Dorsolateral lobe fusion with intermediate appendage complex:* 0 – not fused; 1 – fused (Fig. 4D); 2 – partially fused (Fig. 7C).

Some species have the dorsolateral process fused with the intermediate appendage-tergum X complex, creating an auricular appendage with peg-like setae on its ventral and lateral surfaces. Other species have a slight mesal merging of the dorsolateral process with the lateral surface of the intermediate appendage-tergum X complex.

24. *Presence of peg-like setae on structure formed by fusion of intermediate appendage complex and dorsolateral process of the preanal appendage:* 0 – absent; 1 – present (Fig. 4D).

The peg-like setae, when present on the fused dorsolateral process, are located on the latero-ventral surface of the fused process.

25. *Shape of dorsolateral process:* 0 – oval to oblong (Fig. 4B, F, Fig. 5 B, C); 1 – lanceolate (Fig. 5D, F); 2 – rectangular (Fig. 6C); 3 – with strong constriction (Fig. 4C, 5E).

26. *Strong constriction in dorsolateral process:* 0 – absent; 1 – to the base up to midlength (Fig. 4C, 7B); 2 – closer to the apex (Fig. 6F).

27. *Dorsolateral lobe apex division:* 0 – entire; 1 – bifid (Fig. 8D).

This character was coded as entire when there was no branching on the dorsolateral lobe past the apical 5th of the appendage, and bifid when there was branching on the dorsolateral lobe past the apical 5th of the appendage. Such apical branches have similar lengths, making them indistinguishable from each other, rendering the characters on “secondary branch” not applicable.

28. *Relative length of dorsolateral process in relation to sternum IX:* 0 – as long as sternum IX; 1 – shorter than sternum IX; 2 – longer than sternum IX.

29. *Latero-mesal direction of dorsolateral process:* 0 – posterior, not curved; 1 – curved mesad (Fig. 7A, B, 8C); 2 – curved laterad; 3 – curved mesad then recurved posteriad (Fig. 8B).

30. *Dorso-ventral direction of dorsolateral process:* 0 – posterior, not curved; 1 – curved ventrad (Fig. 4C); 2 – curved dorsad.

31. *Presence of basal acute secondary branch:* 0 – absent; 1 – present (Fig. 6A, 7F).

This character appears especially in a few North American species, as a very thin and acute branch just ventral of the intermediate appendage complex. Due to its position, surrounded by structures from all sides, it is not easily observed in all specimens, and its point of origin is also not clear.

32. *Presence of mesal branch on dorsolateral process:* 0 – absent; 1 – present.

Unlike the previous character, with uncertain point of origin and always with an acute shape, the mesal branch on dorsolateral process is easily seen in dorsal view. It is usually glabrous, aside from very elongate setae around spines. It is mostly shorter than the rest of the dorsolateral process, but that is not the case for all species (Fig 4B [falcate]).

33. *Shape of mesal lobe branch on dorsolateral process:* 0 – oblong (Fig 7E); 1 – truncate (Fig. 4E); 2 – linear (Fig. 4C, 8E).

34. *Number of spines on mesal branch of the dorsolateral process:* 0 – no spine; 1 – 1 spine; 2 – 2 spines;

35. *Presence of ventral branch on dorsolateral process:* 0 – absent; 1 – present (Fig. 5E).

Like the mesal branch, this structure is clearly linked venral to the dorsolateral process, and can be observed easily in lateral view.

36. *Shape of ventral branch of dorsolateral process:* 0 – oblong; 1 – truncate; 2 – linear.

37. *Number of spines on ventral branch of the dorsolateral process:* 0 – no spine; 1 – 1 spine; 2 – 2 spines;

38. *Apical spines on dorsolateral process:* 0 – absent; 1 – 1 spine; 2 – 2 spines.

Unlike the previous character and character 34, this character deals with the spines on the main body of the dorsolateral process. The main body usually is more robust and bears setae and microsetae on its lateral surface.

39. *Multiple spines along the length of dorsolateral process:* 0 – absent; 1 – present (Fig. 8C).

Species with this character coded as state 1 possess spines in varied numbers, at least more than 3, arranged along the length of the dorsolateral process, not confined to the base, midlength, or apex.

40. *Number of spines on mid-length of dorsolateral process:* 0 – no spine; 1 – 1 spine; 2 – more than 1 spine.

Unlike the previous character, the spines on mid-length are confined to that region of the dorsolateral process and are usually less numerous than what is seen in character 39.

41. *Number of subapical spines on dorsolateral process:* 0 – no spine; 1 – 1 spine (Fig. 5D, 6E); 2 – 2 spines.

Subapical spines are located just before the apex of the dorsolateral process and can be varied in number.

42. *Apical stout setae on dorsolateral lobe:* 0 – absent; 1 – present (Fig. 6D).

The apical seta is usually dark, thick and spine-like. It can be mistakenly coded as a spine, if not carefully observed.

43. *Presence of numerous slender apical setae around branches and spines on the dorsolateral process:* 0 – absent; 1 – present. (Fig. 6C, E, 7D).

In some species, many long and slender apical setae are present around spines and in the case of *C. ungiculata*, around the base of the mesal branch of the dorsolateral process.

44. *Shape of ventromesal process of the preanal appendage:* 0 – produced (Fig. 4B, E); 1 – truncate (Fig. 6D, F); 2 – oblong (Fig. 5B); 3 – linear (Fig. 4F); 4 – auricular.

45. *Ventromesal protrusion on ventromesal process:* 0 – absent; 1 – present (Fig. 6A).

In ventral view, it is possible to observe a ventromesal branching or protrusion of the ventromesal process in a few species. Most of the other taxa have the ventromesal margin smoother.

46. *Fusion of the two halves of the ventromesal process* (CHa18)*:* 0 – not visibly fused (Fig. 7F, 8F); 1 – basally fused and apically divergent (Fig. 7C, 8D); 2 – entirely fused (Fig. 8E); 3 – broadly separated (Fig. 7A, B).

This character can be observed in dorsal, ventral, and caudal views. Many species have those structures either not visibly fused, slightly separated, almost touching at the base, while many other species have such structures fused basally and diverging apically. A few species have the two halves of the ventromesal process completely fused forming a single ventral plate, and others, especially from North America, have the processes completely separated and isolated to a more lateral position.

47. *Presence of setae on ventromesal process:* 0 – present; 1 – absent.

48. *Type of setae on ventromesal process:* 0 – stout; 1 – stout and slender; 2 – slender.

Most *Cernotina* have only stout setae on the ventromesal process. Some species have slender setae in addition to the stout setae usually found on the ventromesal process, and a few taxa in the outgroup possess only slender setae.

49. *Relative size of ventromesal process in relation to the dorsolateral process and the inferior appendage:* 0 – shorter than dorsolateral lobe; 1 – about as long as dorsolateral process to slightly longer; 2 – much longer than dorsolateral process and inferior appendage.

50. *Presence of spines on ventromesal process:* 0 – absent; 1 – present (Fig. 4F).

51. *Presence of the subgenital plate:* 1 – present; 0 – absent.

This structure is found ventrad of the phallus and dorsad of the inferior appendages.

52. *Inferior appendage apex in lateral view:* 0 – round or slightly oval (Fig. 4B, C); 1 – truncate (Fig. 5F, 6B, C, E); 2 – notched (Fig. 6A, F).

53. *Inferior appendage base versus apex proportion in lateral view:* 0 – roughly equal, or wider apex (Fig. 6E); 1 – base wider (Fig. 6D).

54. *Inferior appendage relative size versus sternum IX:* 0 – longer than sternum IX; 1 – as long as sternum IX; 2 – shorter than sternum IX;

55. *Inferior appendage ventral curvature in lateral view:* 0 – straight or slightly curved; 1 – with strong ventral concavity.

While most species have the ventral surface of the inferior appendage straight, a few possess a strong ventral curve, forming a concavity as seen in ventral view.

56. *Apicomesal face of inferior appendages in ventral view:* 0 – not clearly defined, not arched (Fig. 10B); 1 – straight or slightly sinuous, slightly arched inward (Fig. 10D); 2 – deeply excavated (Fig. 9B); 3 – strongly projected mesad.

The shape of the inferior appendage in ventral aspect is difficult to categorize. In face of this difficulty, the different areas of the structure were coded separately. The apicomesal margin varies considerably, being smooth, having a slight inward arch, a deep apicomesal excavation, or being strongly projected mesad in the shape of a hammer.

57. *Apicolateral margin of Inferior appendage excavation:* 0 – absent; 1 – present.

In addition to the apicomesal excavation, some species bear a lateral excavation apically on the inferior appendage.

58. *Lateral margin of inferior appendages:* 0 – straight or curved mesad; 1 – with sinous concavity at mid-length (Fig. 9C).

The lateral margin can have sinuous concavity at mid-length, which is a different character state than the apicolateral excavation.

59. *Inferior appendage anterior basal plate size* (CHa25, in part)*:* 0 – short (Fig. 9B); 1 – elongate, almost reaching anterior margin (Fig. 10C); 2 – very short, barely extending beyond posterior margin of sternum IX (Fig. 10A).

The anterior basal plate connects the two lateral halves of the inferior appendage at the base, and it can have varied lengths.

60. *Inferior appendage anterior basal plate shape* (CHa24)*:* 0 – bilobed (Fig. 13B); 1 – entire.

61. *Basodorsal lobe presence:* 0 – present; 1 – absent (Fig. 4D).

62. *Basodorsal lobe shape:* 0 – oblong; 1 – clavate (Fig. 6F); 2 – subtriangular (Fig. 5E); 3 – globular (Fig. 5B, F); 4 – appressed to the surface of the inferior appendage (Fig. 92A, C);

This structure was coded as state 4 when there was evidence of the basodorsal lobe, as dorsal bump on the inferior appendage, as well as the presence of stout setae.

63. *Basodorsal lobe direction:* 0 – direted posterodorsad (45º angle) to posterad (0º); 1 – directed dorsad (nearly 90º) (Fig. 6A);

64. *Basodorsal lobe relative length in relation to main body of the inferior appendage:* 0 – shorter than half of the body of the appendage; 1 – about half the body of the appendage; 2 – about 3/4 the body of the appendage; 3 – about as long as the body of the appendage; 4 – longer than body of the appendage.

65. *Basodorsal lobe setae:* 0 – bearing a row of setae; 1 – bearing multiple setae not arranged in a row (Fig. 5B).

66. *Position where basodorsal lobe originates:* 0 – from the base to mid-length; 1 – near the apex (Fig. 5F);

67. *Apical lobe of inferior appendage presence:* 0 – present; 1 – absent.

The apical lobe of the inferior appendage, sometimes called “apicomesal lobe” in the literature is a very complex structure to homologize. It varies considerably among the different species of *Cernotina*, and even more when compared to the outgroup. It was coded as present when a separate apical structure, usually with stout mesal setae and/or a sclerotized structure was apparent.

68. *Overlapping of apical lobe and main body of the inferior appendage in lateral view:* 0 – exposed (Fig. 4D, 5C); 1 – overlapping with the main body of the appendage (Fig. 4E, 5D).

69. *Sclerotized structure of apicomesal lobe in ventral view:* 0 – as simple teeth (Fig. 9B, 10C); 1 – as bifid teeth; 2 – as round or truncate lobe (Fig. 9C, 10D).

70. *Position where apical lobe originates in lateral view:* 0 – apical on inferior appendage (Fig. 5F); 1 – at mid-length on inferior appendage (Fig. 5A); 2 – on basodorsal lobe (Fig. 5B).

71. *Additional lip dorsal to apical lobe of inferior appendage:* 0 – without lower lip; 1 – with lower lip (Fig. 31C, 42C).

This character was coded as 1 when the apical lobe has an additional fold or lip dorsad, which in ventral view is perceived as lower.

72. *Phallus curvature:* 0 – slightly curved or bent (Fig. 11C); 1 – straight (Fig. 11D).

73. *Phallus shape in lateral view:* 0 – narrow or tapered; 1 – broad (Fig. 11A, 12A, E).

74. *Phallic ventromesal projection* (CHb116)*:* 0 – present (Fig. 13D); 1 – absent (Fig.

11A, C, E).

This projection is observed in some species in the outgroup.

75. *Number of robust phallic spines:* 0 – no spine; 1 – 1 spine; 2 – 2 spines; 3 – 3 spines; 4 – more than 3 spines.

76. *Presence of numerous minute hair-like phallic spines:* 0 – absent; 1 –present (Fig. 11A, 12A).

These spines, unlike those in the previous character, are very small, and thin.

77. *Phallus spines enveloping:* 0 – spines free in the phallic membrane; 1 – spines within a single pouch (Fig. 11A, 12A); 2 – spines each in a separate pouch (Fig. 12E).

78. *Presence of phallic sclerite:* 0 – present; 1 – absent (Fig. 11B).

79. *Position of phallic sclerite:* 0 – basal (Fig. 11D); 1 – apical (Fig. 13D).

Results of the phylogenetic analyses

Parsimony

The unweighted maximum parsimony analysis with 86 taxa and 79 characters resulted in 40 equally parsimonious trees (Length: 632; Consistency Index: 0.188; Retention Index: 0.539) and the majority consensus is shown in Fig. 14 (Length: 865; CI: 0.138; RI: 0.33). The clades with bootstrap (B) support higher than 50% are indicated in the figure.

The multi-round equal weights maximum parsimony (MEWMP) yielded a far better resolution than the single-round analysis, with 28 equally parsimonious trees (L: 631; CI: 1.889; RI: 0.540) and the majority consensus is shown in Fig 15 (Length: 637; CI: 0.187; RI 0.535). The clades with bootstrap support higher than 50% are indicated in the figure.

For the implied-weights analysis, the value of k = 14 was used due to a higher congruency of nodes observed in the unweighted parsimony and Bayesian analyses, as well as a higher CI, RI, and fit for value (Length: 659; CI: 0.181, RI: 0.513, fit value: 18.79). Goloboff (1993, 1997, 2014) suggested a general value of k =3, initially, with a k = 12, more used in larger datasets. The debate on how to reliably use values of k in cladistics is not settled, however. Only one most parsimonious tree was found (Table 2). Bootstrap support higher than 50% is indicated (B) (Fig. 16).

This analysis has the most resolved tree than the other three previously obtained. Many of the basal branches within *Cernotina* are resolved, differently than the Bayesian and the single-run unweighted analysis, but the relation of the genus and the outgroup taxa are largely the same.

Bayesian inference

Plots of the MCMC generations against the log probability of the data were obtained with *sump* command with 25% of samples as burn-in. There was no upward or downward trend, which suggests that the analysis reached a stationary value of log probability in the tree space (Ronquist et al. 2007), with the effective sample size (ESS) of all tree statistics above 900. With the sumt command, the analysis based its posterior probability calculations on the resulting 75% of the trees after the burn-in was discarded. A majority-rule consensus (50%) tree was generated to present the results. Values of posterior probability (PP) are displayed at the internodes, indicating the probability that each of the nodes are correct given the data and the evolutionary model.

The majority rule consensus of this analysis was poorly resolved (Fig. 17). The monophyly of *Cernotina* was recovered, although not absolutely supported (PP 0.80). The relationship between *Cernotina* and the node containing *Cyrnellus*, *Cyrnodes* and *Pahamunaya*, was well supported, and it was previously recovered in other studies (Chamorro and Holzenthal 2011, Johanson et al. 2012). The rest of the outgroup consisting of *Polycentropus* and *Polyplectropus* was then recovered as sister to the clade containing *Cernotina*, *Cyrnellus*, *Cyrnodes* and *Pahamunaya*, with *Polyplectropus* being paraphyletic in this analysis, since *Pp. alienus* was closer to the aforementioned group than to the other congeneric species. However, since less effort was put in coding characters observed specifically in any of the outgroup taxa, the relationship among outgroup species is not entirely reliable.

Within *Cernotina*, a large polytomy containing *Ce.abbreviata*, *Ce. aestheticella*, *Ce. anhanguera*, *Ce. astera*, *Ce. attenuata*, *Ce. bibrachiata*, *Ce.bispicata*, *Ce. caliginosa*, *Ce. carboneli*, *Ce. chiapaneca*, *Ce. cingulata*, *Ce. compressa*, *Ce. cygnea*, *Ce. danieli*, *Ce. declinata*, *Ce. depressa*, *Ce. ecotura*, *Ce. falcata*, *Ce. fallaciosa*, *Ce. harrisi*, *Ce. intersecta*, *Ce. laticula*, *Ce. lazzariii*, *Ce. longispina*, *Ce. longissima*, *Ce. mandeba*, *Ce. mastelleri*, *Ce. odonta*, *Ce. ohio*, *Ce. oklahoma*, *Ce. pesae*, *Ce. pulchra †*, *Ce. puri*, *Ce. riosanjuanensis*, *Ce. sexspinosa*, *Ce. sinosa*, *Ce. sinuosa*, *Ce. spicata*, *Ce. spinigera*, *Ce. spinosior*, *Ce. stannardi*, *Ce. subapicalis*, *Ce. taeniata*, *Ce. tiputini*, *Ce. truncona*, *Ce. uncifera*, *Ce. unguiculata*, *Ce. verna*, *Ce. verticalis*, *Ce. waorani*, and *Ce. zanclana*, was recovered (Fig. 17). Despite the lack of resolution in the base of the group, the analysis recovered some nodes with interesting relations.

The node containing *Ce. cadeti* and *Ce. lutea* was recovered with strong support (PP 0.99). The sister relationship between these two Caribbean species was already hypothesized by Flint (1968). The intricate, multi-branched DLP is common to both species.

Another node recovered contained the type species of the genus, *Ce. calcea*, and *Ce. pallida* (PP 0.85), both found in the Nearctic region. The two species have unique morphologies when compared to the other species, but both possess multiple spines along the length of the dorsolateral process of the preanal appendage.

A group containing *Ce. antonina*, *Ce. decumbens*, and *Ce. trispina* was also recovered (PP 0.82), although the relation between those three was not resolved. All three species possess apical and subapical spines on the DLP.

A relationship (PP 0.75) between *Ce. lobisomem* and the dichotomy (PP 0.89) of *Ce. hastilis*, and *Ce. nigridentata* is recovered. The two latter species are very similar, with only a few non-diagnostic characters, such as the relative length of the basodorsal lobe of the inferior appendage, differing one from another. And because they are monophyletic, it is possibile to synonymize of *Ce. nigridentata* as a junior synonym of *Ce. hastilis*.

A weak relationship (PP 0.69) between *Ce. artiguensis* and the strongly supported dichotomy (PP 100) of *Ce. lanceolata* and *C. perpendicularis* was recovered. All three species possess the intermediate appendage more sclerotized, probably less fused with the membranous Xth tergum than the other species in the genus. *Ce. lanceolata* and *C. perpendicularis* are identical, and their strongly supported monophyly advocates for placing *Ce. lanceolata* as a junior synonym of *Ce. perpendicularis*.

A group weakly supported (PP 0.57) was recovered, containing *Ce. filiformis*, and the dichotomy (PP 0.95) of *Ce. aruma* and *Ce. flexuosa*, both species found in Manaus and surrounding area, in Brazilian Central Amazon. All three species possess a remarkably elongate VMP with an apical spine.

Another weakly supported group (PP 0.55) containing *Ce. chelifera* sister to a group (PP 1.00) containing *Ce. encrypta* and the dichotomy (PP 0.86) of *Ce. acalyptra* and *Ce. cystophora*. The latter three species are unique in the genus, due to the fusion of the DLP with the intermediate appendage complex, forming a auricular appendage with peg-like setae on its lateral and ventral surfaces. *Ce. chelifera* has a partial fusion between those structures, making it difficult to distinguish between the two and to illustrate them in lateral view, and, to a lesser extent, dorsal view. Flint (1971) already mentioned a possible relation between *Ce. acalyptra* and *Ce. encrypta*; in this analysis, though, the more recently described *Ce. cystophora* is closer to *Ce. acalyptra*, with *Ce. encrypta* as sister to both previous species.

The last node recovered with low support (PP 0.50) consisted of *Ce. uara* sister to a group (PP 0.69) containing *Ce. medioloba* in turn sister to a dichotomy (PP 0.66) of *Ce. cacha* and *Ce. obliqua*. All the species possess a somewhat lanceolate DLP, and the three latter ones also bear a pair of stout apical setae on that same structure.

Synthesis

The Bayesian analysis (Fig. 17) recovered groups with higher support than the maximum parsimony analyses (Fig. 14, 15, 16). However, the latter analyses, especially the MEWMP (Fig. 15) and IWMP (Fig. 16) were able to recover much more resolved trees than the Bayes inference. There are multiple ways to find phylogenetic signal in parsimony, as the use of subsequent TBR runs on suboptimal trees and of implied weighting, but if the signal is weak in the first place, there is little evidence in the matrix supporting the tree topology, the support for the different branches reflects that weakness (Fishbein et al. 2001).

The branches recovered in all analysis reflect a more congruent hypothesis of relationship between taxa. Those are: The outgroup and the ingroup; (*Ce. aruma* + *Ce. flexuosa*), this group being sister to *Ce. filiformis* in the BI and IWMP, while in the EWMP and MEWMP, (*Ce. aruma* + *Ce. flexuosa*) is sister to (*Ce. filiformis* + the rest of *Cernotina*); the branch (*Ce. cadeti* + *Ce. lutea*); the branch (*Ce. calcea* + *Ce. pallida*); the branch ((*Ce. hastilis* + *Ce. nigridentata*) + *Ce.lobisomem*); the branch (*Ce. lanceolata* + *Ce. perpendiculata*), being sister to *Ce. artiguensis* in the BI and weighted analysis, while being sister to *Ce. cingulata* in the MEWMP (Fig. 15) and EWMP (Fig. 14); the branch (*Ce. acalyptra* + *Ce. cystophora* + *Ce. encrypta*); and *Ce. cacha* + *Ce. obliqua* in a group, either polytomous with other species in EWMP (Fig. 14), or as sister taxa in the other topologies.

Other branches that were recovered in all but one topology are: (*Ce. antonina* + *Ce. decumbens* + *Ce. trispina*), absent only in the EWMP; the branch (*Ce. cacha* + *Ce. oblique* + *Ce. medioloba* + *Ce. uara*), not recovered in the IWMP; and the group (*Ce. lazzarii* + *Ce. falcata*), absent in the BI topology.

Discussion

This work cotain the first phylogenetic analyses for the species of *Cenotina*. The morphological characters here proposed can be used and adapted in future research. Some morphological patterns such as the clade containing species with the intermediate appendage complex fused with the dorsolateral process can be detected. In addition, the results from the analyses allowed the synonimyzation of two pairs of species.

However, the phylogenetic trees found in this work suffer from overall resolution and/or weak branch support. Understanding the causes for each of these problems can help future analysis improve upon what is already established.

The lack of resolution can be attributed to many reasons (Wiens 2006, Wiens and Moen 2008), one of them being the low number of characters. As previously explained, the age, frailty, and uniqueness of the specimens were major restrictions against the use of molecular techniques, which could have increased considerably the number of characters. Therefore, only morphological data were coded, especially the genitalia, since the other body parts are evolutionarily conserved. Due to the high variability of shapes of the genitalic structure, it is difficult to homologize different structures unequivocally.

This way, many putative characters had to be discarded as the coding was being done because of their very complex variations.

In addition to impeding the use of multiple additional characters, the extremely varied genitalic morphology of *Cernotina* weakens the support for each branch, since most characters are highly homoplastic. The species in this genus are only distinguished in their genitalia, having the other structures largely constant across all the species. The problem that arises is that characters are either uninformative due to little to no variation, or very homoplastic due to the extremely high inter-specific variation. This can be evidence of a recent radiation of species, rendering the species very similar in their general shape, and variable where selective pressure is stronger, i.e., genitalia. This results in very unresolved branches at the base of the three, with some phylogenetic information recovered in smaller apical groups. With characters as highly variable as the male genitalia of *Cernotina* species, the phylogenetic signal is weakened by uniting distant groups by convergence, and separating close taxa due to strong differences in particular structures. As a result, some smaller groups as stated below are more reliably recovered, while large patterns are lost.

This possible rapid radiation of *Cernotina* lineages in itself can be detrimental to the values of branch support (Banks and Whitfield 2006, Fishbein et al. 2001), and this problem is compound when the quantity of data is low (Fishbein et al. 2001). In the case of bootstrap support, the overall weak values indicate a low level of redundancy between characters, or the amount of evidence in the data that supports a given branch, not a probability of that branch being monophyletic (Wiesemüller and Rothe 2006). And although branch posterior probabilities are also understood as a measure of branch support, they are not entirely equivalent to the methods used in parsimony, and can yield different values, as observed in this case (García-Sandoval 2014), with slightly stronger posterior probability values.

Nevertheless, some clades had their monophyly confirmed, with strong or weak support. *Cernotina* is recovered as monophyletic in all the analysis, which was also found in previous works using fewer species from the genus. In combination with this in-depth taxon sampling, it is reasonable to accept that the genus is monophyletic.

As stated above, monophyly of the branch containing *Ce. acalyptra*, *Ce. cystophora* and *Ce. encrypta* is found in all trees, and points to a single origin of the fusion of the dorsolateral process and the intermediate appendage complex, bearing peg-like setae. The characters that differentiate them, such as the shape of the mesal curvature of the inferior appendage (Flint 1971), are very homoplasic, and this plasticity makes the internal arrangement of this node more difficult to resolve. All three species occur in Central Amazon, and due to their strong similarity, they probably have evolved recently.

In all of the analyses, *Ce. cadeti* and *Ce. lutea* are recovered as sister groups, suggesting a speciation event in the more isolated region of the Antilles, St. Lucia and Dominica, respectively. The relationship between the two species was already hypothesized by Flint (1968a).

Considering the branches found only in the more resolved topologies (MEWMP and IWMP), more speculations could be made about the evolution of *Cernotina*. However, such hypotheses should be approached with caution due to the very low support, as previously mentioned.

Almost all North American species, aside from *Ce. truncona* in the MEWMP (Fig. 15) and *Ce. chiapaneca* in the IWMP (Fig. 16) were recovered as a group in both of the most resolved trees, containing also Caribbean (*Ce. cadeti*, *Ce. lutea*, *Ce. riosanjuanensis*), and a few Amazonian species (only *Ce. sinuosa* in the IWMP, and *Ce. acalyptra*, *Ce. encrypta*, *Ce. cystophora*, and *Ce. spinigera* in the MEWMP). The two North American species missing from this branch in both trees were coded only from the taxonomic literature and the number of missing data entries from each of them may have impacted their position in the topologies. This pattern observed in this large branch may reflect a speciation event of those species reaching Central and North America, with dispersal events from individual lineages going back to South America subsequently.

Another group that has some congruence, although with additional different species in each topology is composed of *Ce. fallaciosa*, *Ce. sexspinosa*, and *Ce. verticalis*, three species from subtropical South America with enlarged basodorsal lobe displaced to the apex of the inferior appendages (with *Ce. verna* also included in the MEWMP). Flint (1983) already mentioned the similarity between these species in their original description and, aside from discrepancies that might be the result of data deficiency, his observation stands consistent with the hypotheses of relationship here presented.

Another branch recovered in both MEWMP (Fig. 15) and IWMP (Fig. 16) is the one containing *Ce. abbreviata*, *Ce. falcata*, *Ce. lazzarii*, *Ce. puri* and *Ce. tiputini* (with a dichotomy of *Ce. unguiculata* and *Ce. cingulata* also included). Those species grouped in both topologies all have short dorsolateral process of preanal appendage with spines, sometimes with mesal branches also bearing spines. They come from different areas of South America, from the Amazon to the Cerrado and the mountainous region of the Atlantic Forest, probably suggesting high mobility of the ancestor lineages, probably along the riverbeds, to different biomes. There is also a possibility that some of those species have a much larger distribution range, such as *Ce. spinigera*, first described from the Amazon, then recorded from Cerrado (Barcelos-Silva et al. 2013). This wallacean shortfall, i.e. the research bias favoring data collection in specific regions of the planet with more infrastructure or ease of access rather than in poorer and distant regions (Hortal et al. 2015), is particularly severe in Neotropical Trichoptera (de Moor and Ivanov 2008) and can affect our understanding on where individual lineages have evolved.

Concerning the biogeography of the genus, it is remarkable that in none of the analyses, did the Amazonian species form a single monophyletic group, indicating multiple origins in the region, contradicting what Flint (1971) proposed. In most apical branches, especially those recovered in all trees, such biogeographical congruence is observed. This result can also be explained by the nature of the data matrix, which has aforementioned highly variable characters hiding large patterns of lineage diversification.

Conclusion

The genus *Cerotina* is species rich and highly variable in the structures of the male genitalia, thus presenting problems for homology assessment and inferring phylogenetic patterns of relationship. As the first attempt to analyze the phylogenetic relationships of the genus, 72 characters were first homologized in this work. However, the analyses proved very difficult to find highly resolved and strongly supported general patterns of relationships among the 75 species.

The monophyly of the genus was strongly supported and some apical branches were recovered in all topologies, while the relationships at the base of the tree were not congruent among the trees recovered in the different analyses, being extremely polytomous in the Bayesian inference and the equal weights maximum parsimony. Under maximum parsimony, the analyses using multiple rounds or implied weighting were better at finding phylogenetic signal and had far more resolved trees, although the branch support for most clades was very weak due to the low redundancy of the characters.

For future research, it is important to improve the data matrix by adding additional characters from other sources and techniques, such as ultrastructure by CTscan, and sequence data from molecular techniques. Even such additions should be approached carefully. Finding genes that can provide phylogenetic information at the base of the tree and in the apical branches can be as challenging as finding morphological characters that could solve the same issues. Geometric morphometry methods could also help using continuous morphological characters, thus providing more data that could be useful to better resolve the trees.

This study represent the first comprehensive phylogenetic study of the Neotropical genus *Cernotina*, proposed a large number or morphological characters of the male genitalia, and provided interesting insights about the evolution of the group in the Americas. Further research on the analysis of molecular data and biogeographical patterns of speciation are going to elucidate some of the ideas here proposed and bring forth more questions about the evolution of this group.

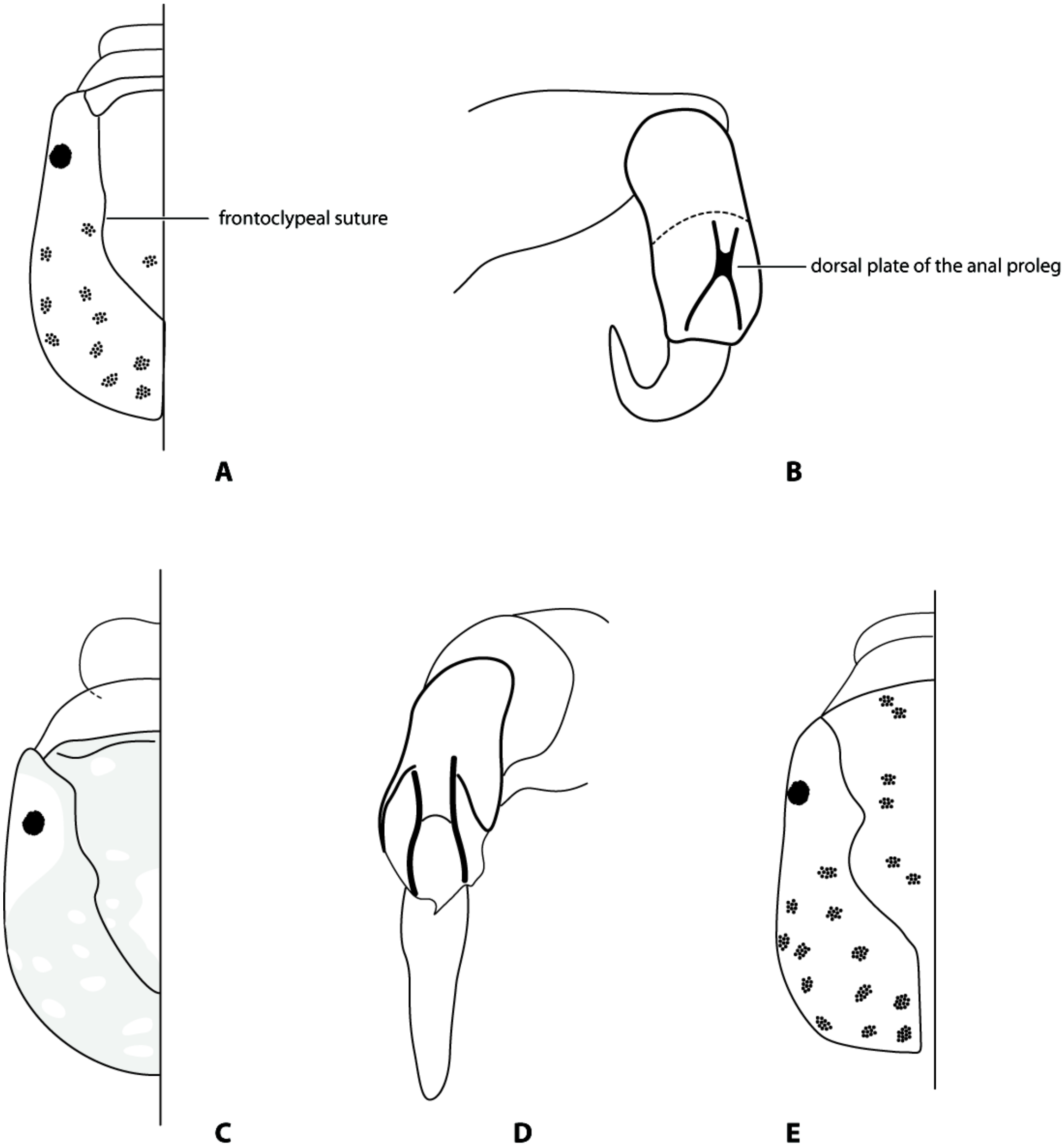

Figure 1. Larval characters of Polycentropodidae. Cernotina: A – head, dorsal view; B – claw of the anal proleg. Cyrnellus: C – head, dorsal view; D – claw of the anal proleg. Polycentropus: E – head, dorsal view.

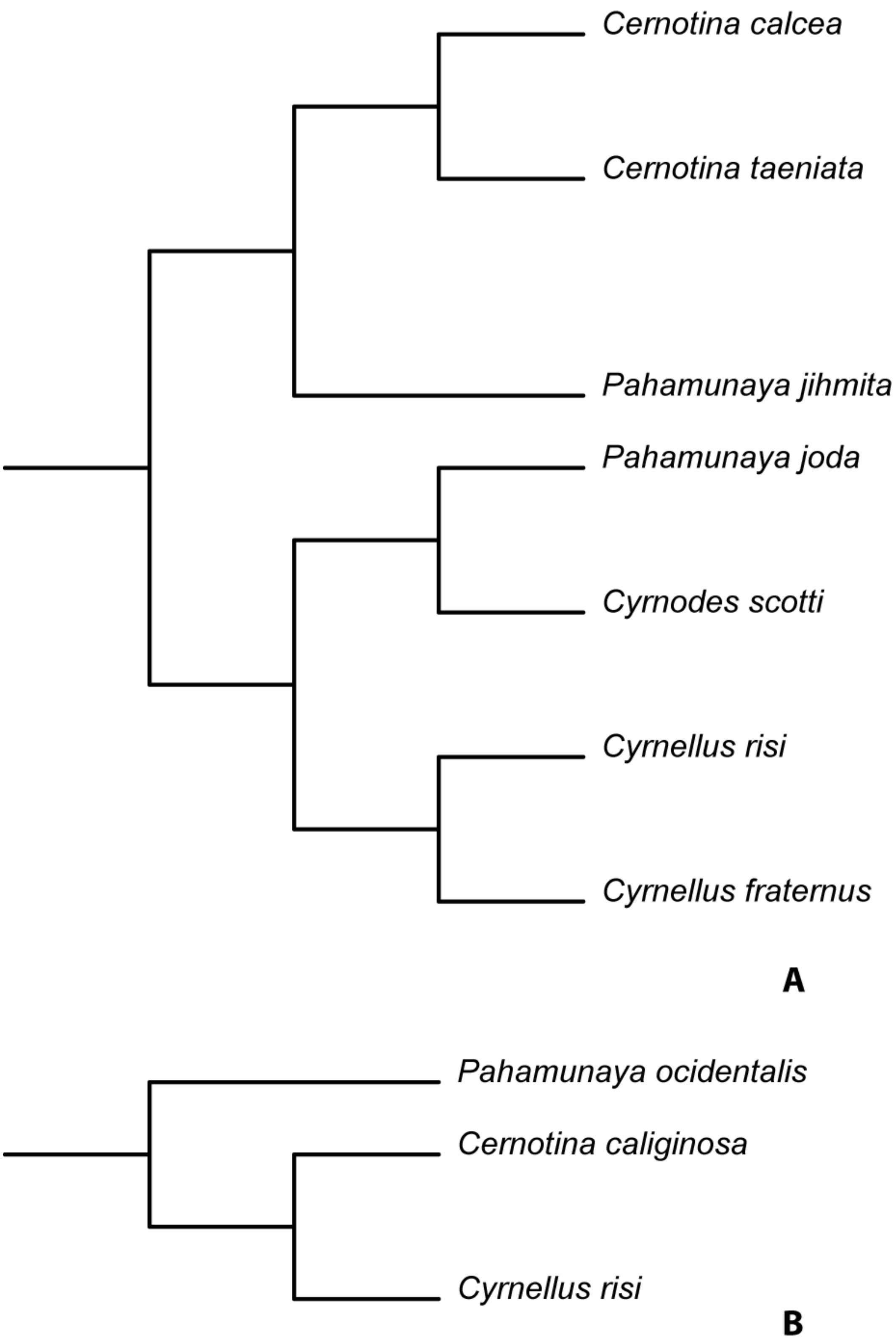

Figure 2. Summary of Polycentropodidae phylogeny, focusing on the groups closely related to *Cernotina*. A – based on Chamorro and Holzenthal 2011; B – based on Johanson et al. 2012.

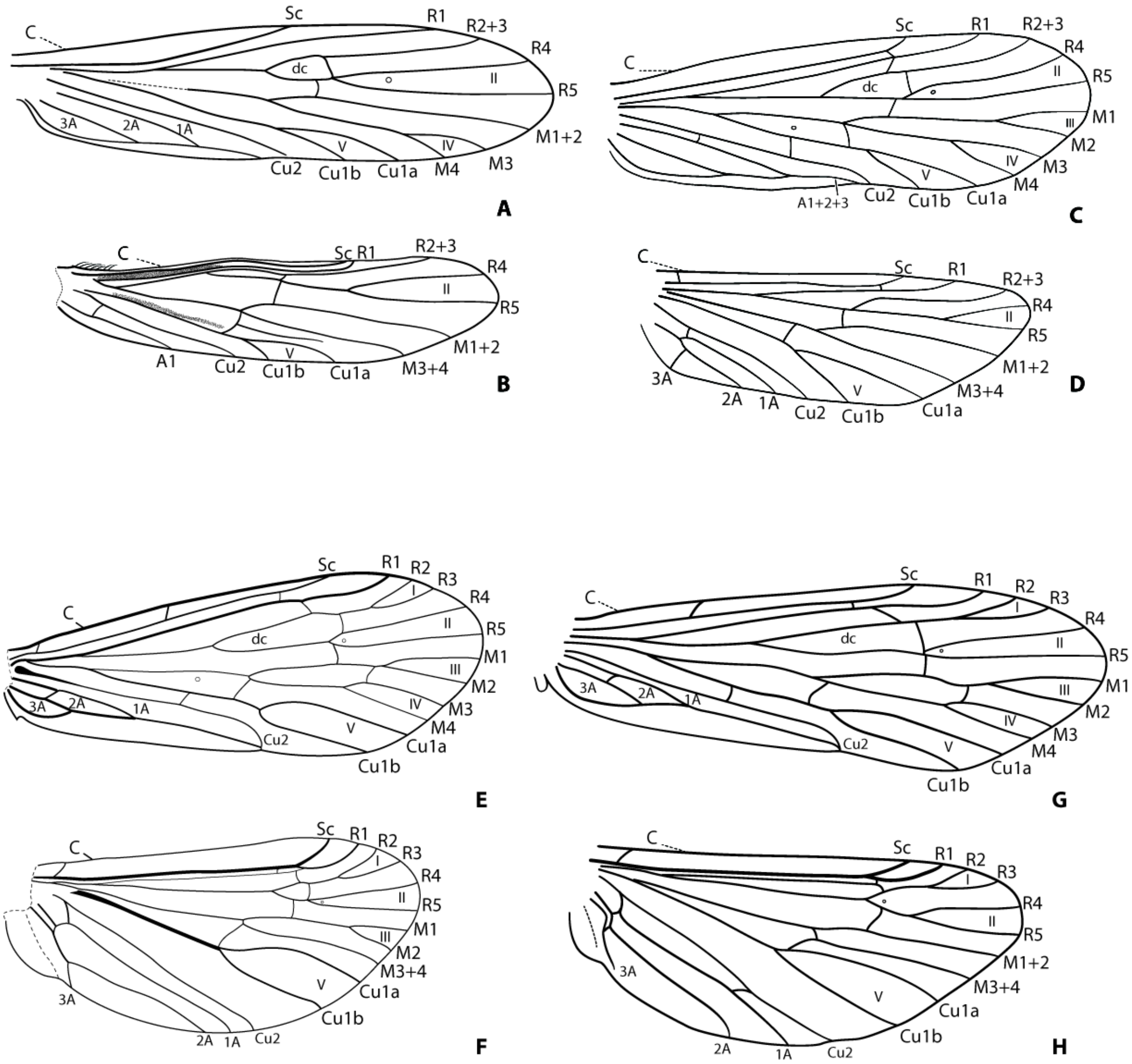

Figure 3. Wing venation. *Cernotina calcea*: A – forewing; B – hind wing. *Cyrnellus fraternus*: C – forewing; D – hind wing. *Polyplectropus weedi* (based on Chamorro and Holzenthal 2010): E – forewing; D – hind wing. *Polycentropus nigriceps* (based on Hamilton 1986).

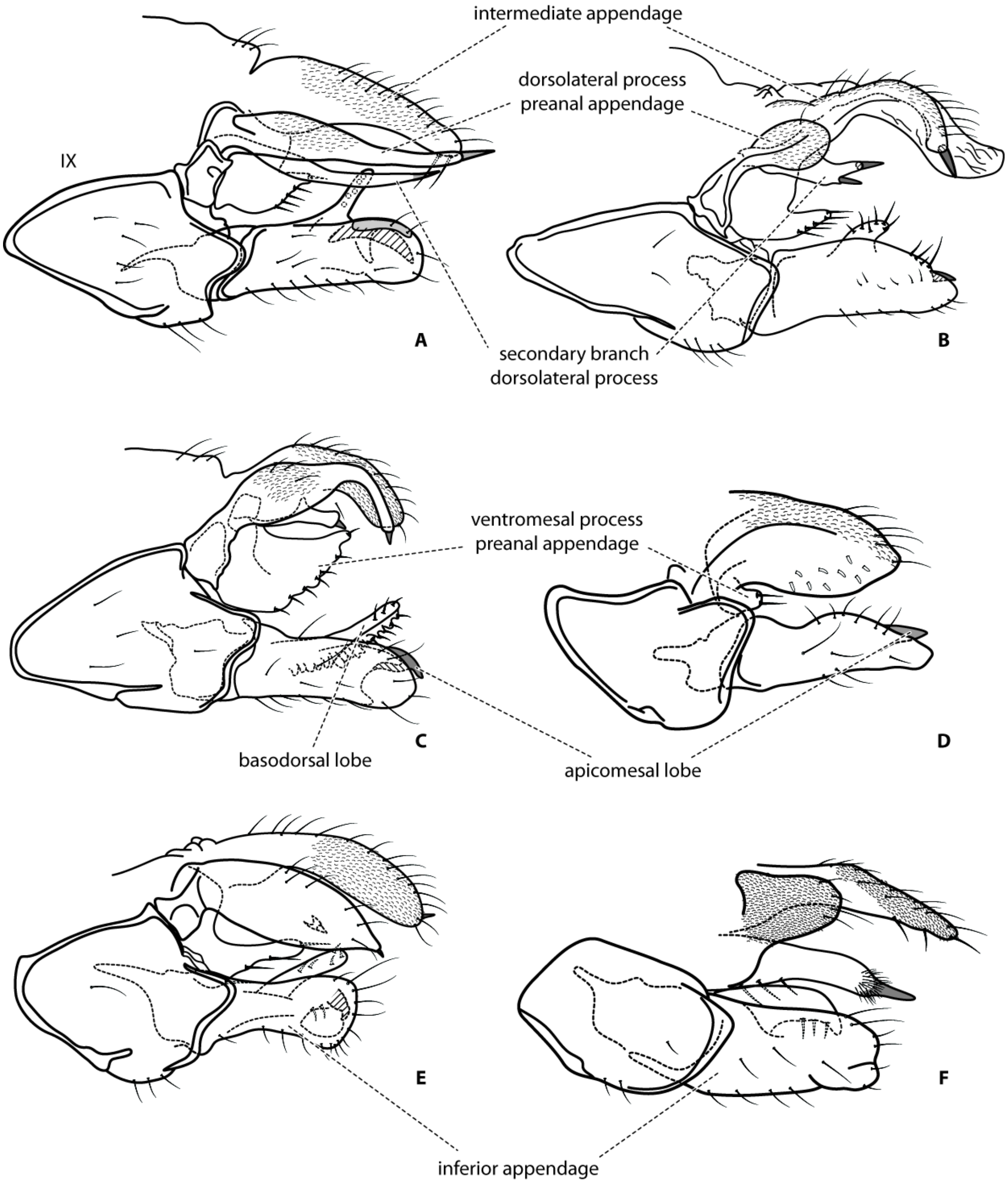

Figure 4. Male genitalia of *Cernotina* in lateral view: A – *C. anhanguera*; B – *C. falcata*; C – *C. cygnea*; D – *C. cystophora*; E – *C. carbonelli*; F – *C. aruma*.

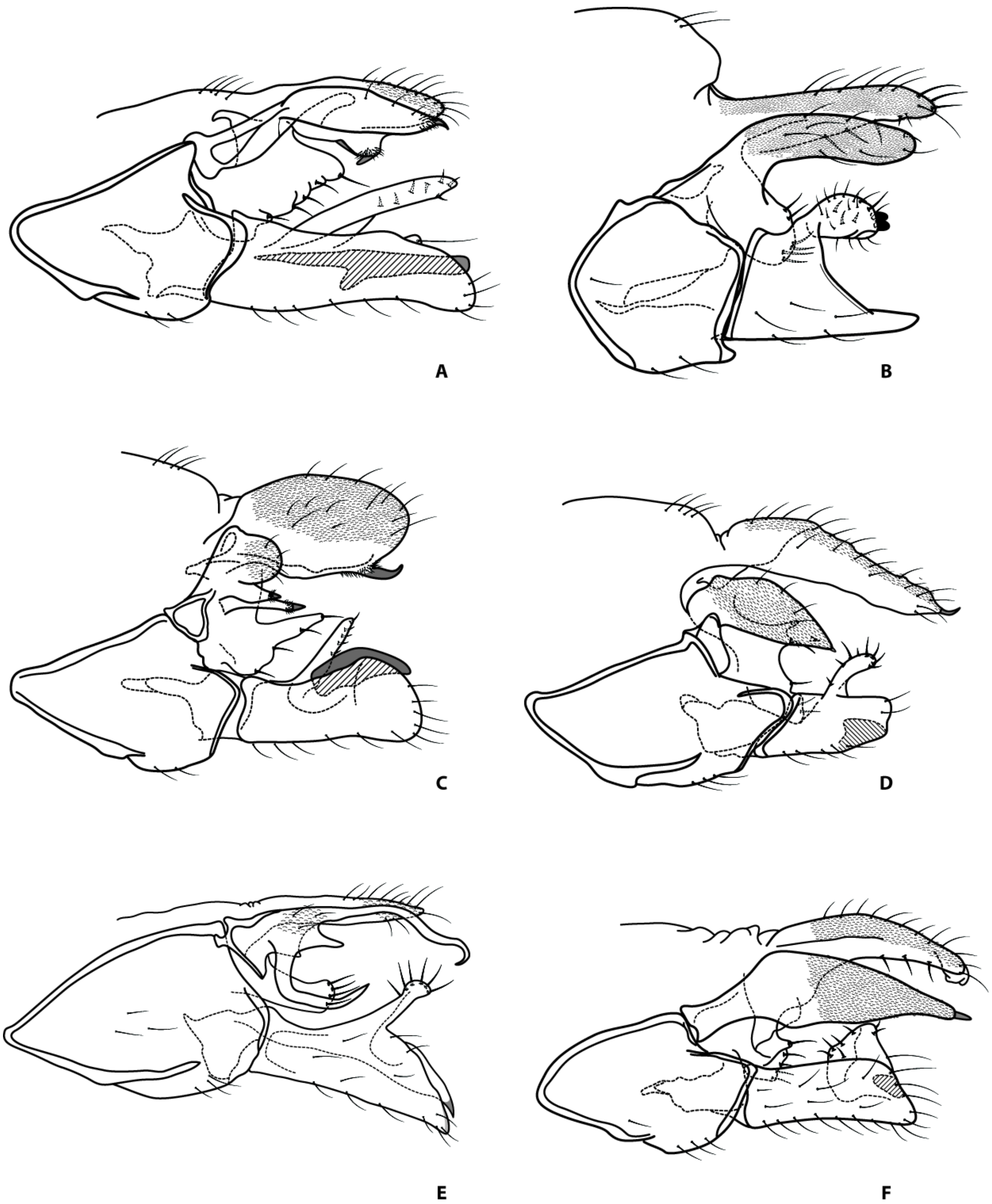

Figure 5. Male genitalia of *Cernotina* in lateral view: A – *C. hastilis*; B – *C. obliqua*; C – *C. lazzarii*; D – *C. perpendicularis*; E – *C. lutea*; F – *C. sexspinosa*.

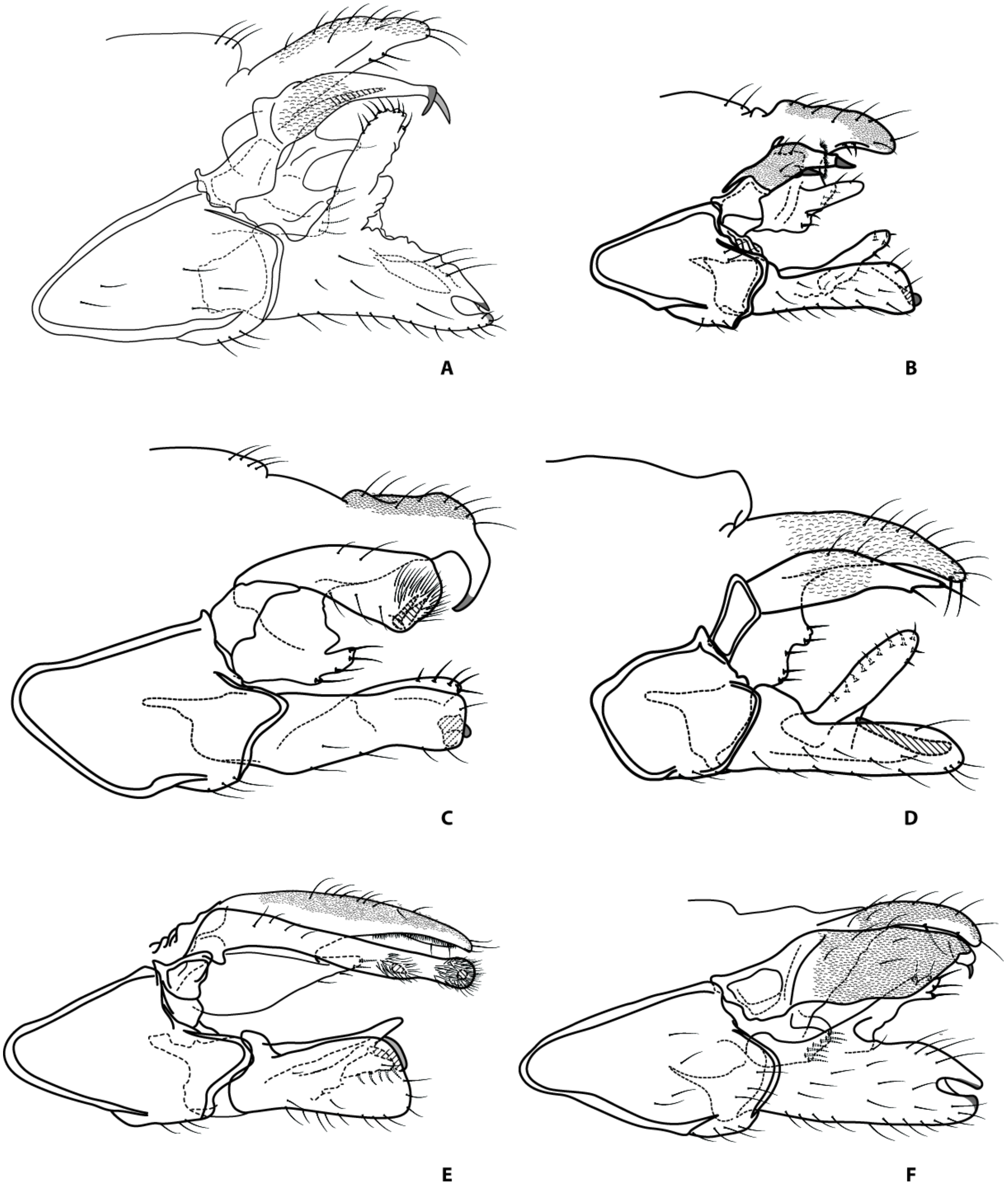

Figure 6. Male genitalia of *Cernotina* in lateral view: A – *C. spicata*; B – *C. trispina*; C – *C. unguiculata*; D – *C. cacha*; E – *C. antonina*; F – *C. oklahoma*.

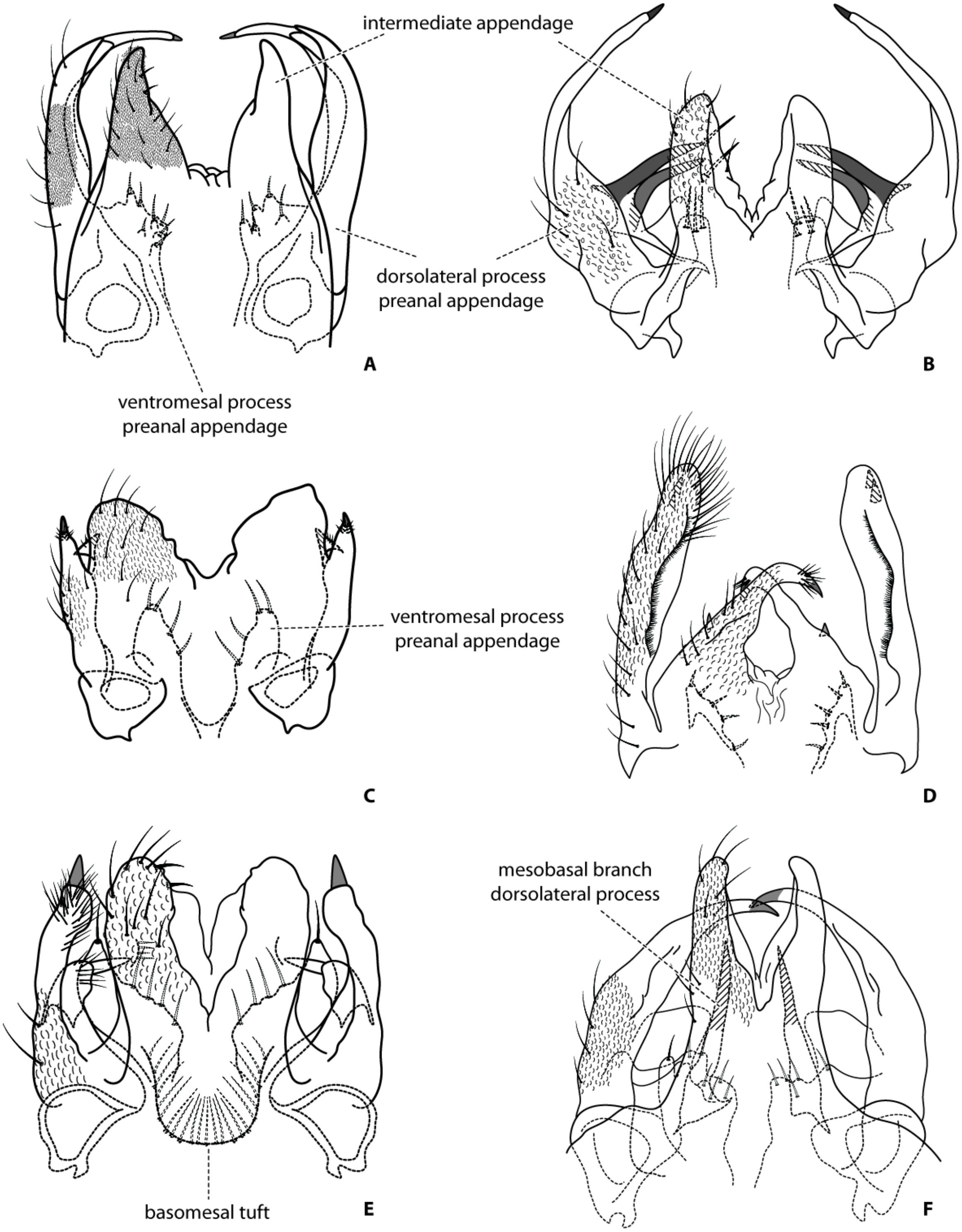

Figure 7. Male genitalia of *Cernotina* in dorsal view: A – *C. zanclana*; B – *C. calcea*; C – *C. chelifera*; D – *C. cingulata*; E – *C. decumbens*; F – *C. spicata*.

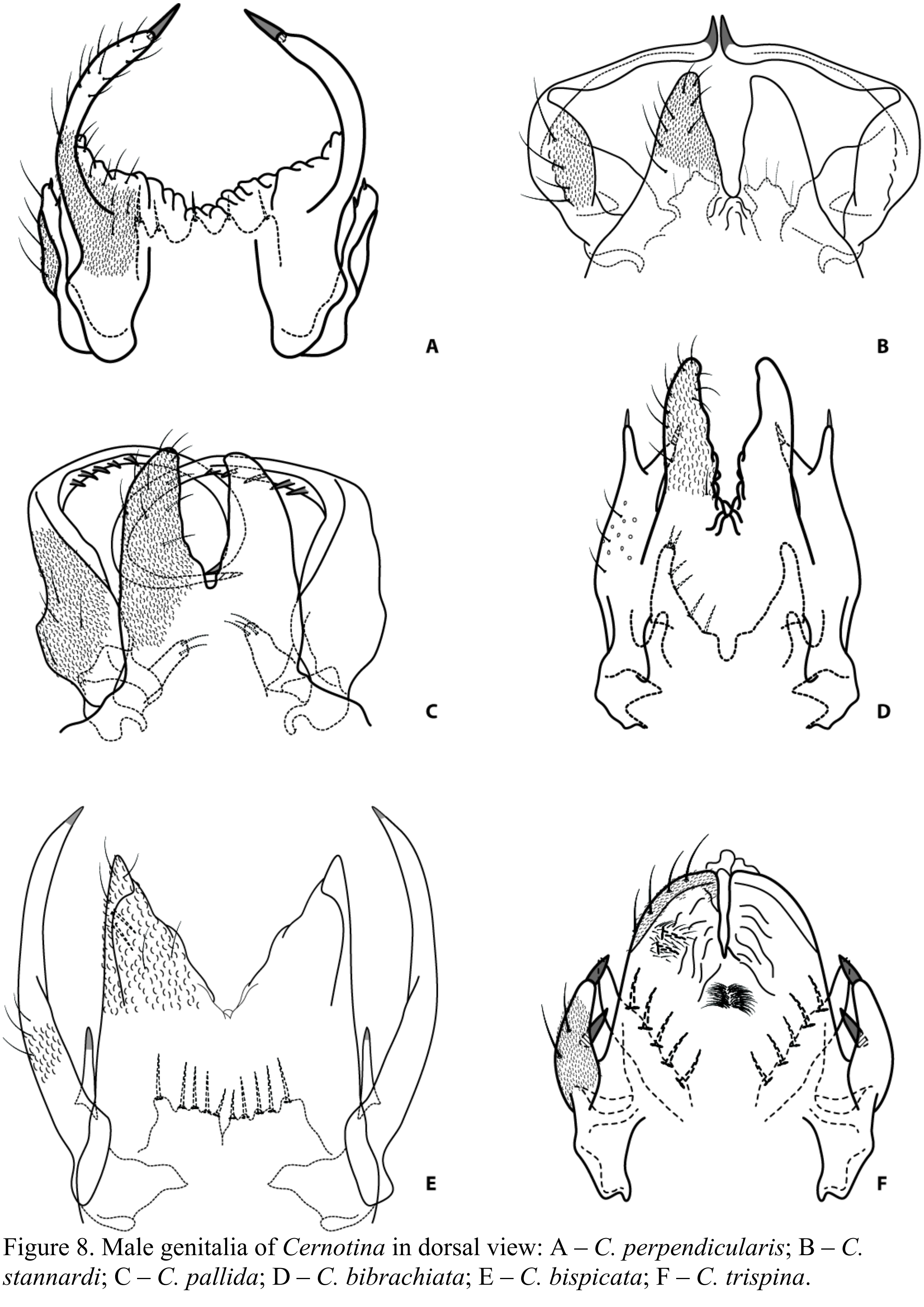

Figure 8. Male genitalia of *Cernotina* in dorsal view: A – *C. perpendicularis*; B – *C. stannardi*; C – *C. pallida*; D – *C. bibrachiata*; E – *C. bispicata*; F – *C. trispina*.

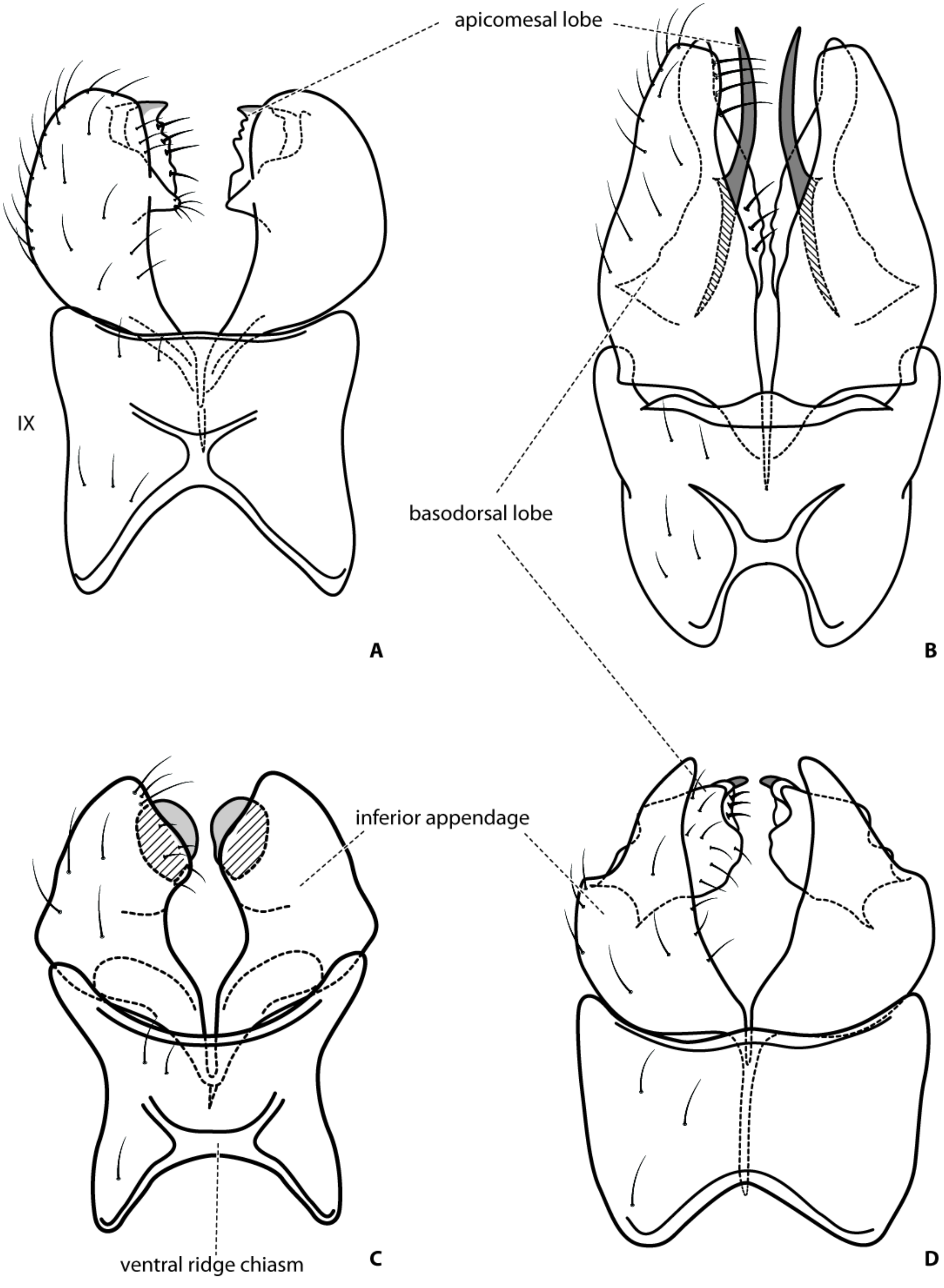

Figure 9. Male genitalia of *Cernotina* in ventral view: A – *C. sexspinosa*; B – *C. hastilis*; C – *C. acalyptra*; D – *C. obliqua*.

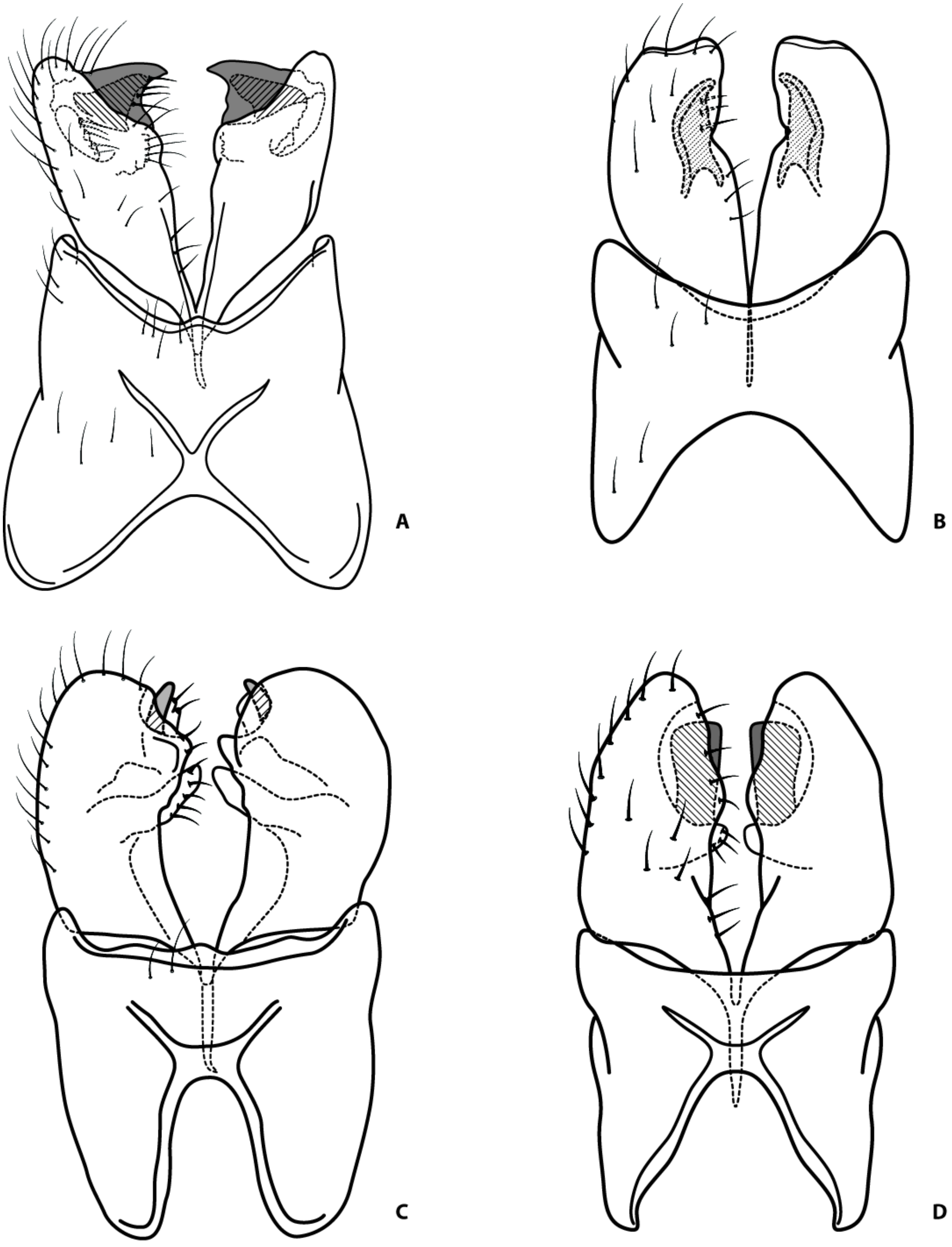

Figure 10. Male genitalia of *Cernotina* in ventral view: A – *C. puri*; B – *C. aruma*; C – *C. anhanguera*; D – *C. encrypta*.

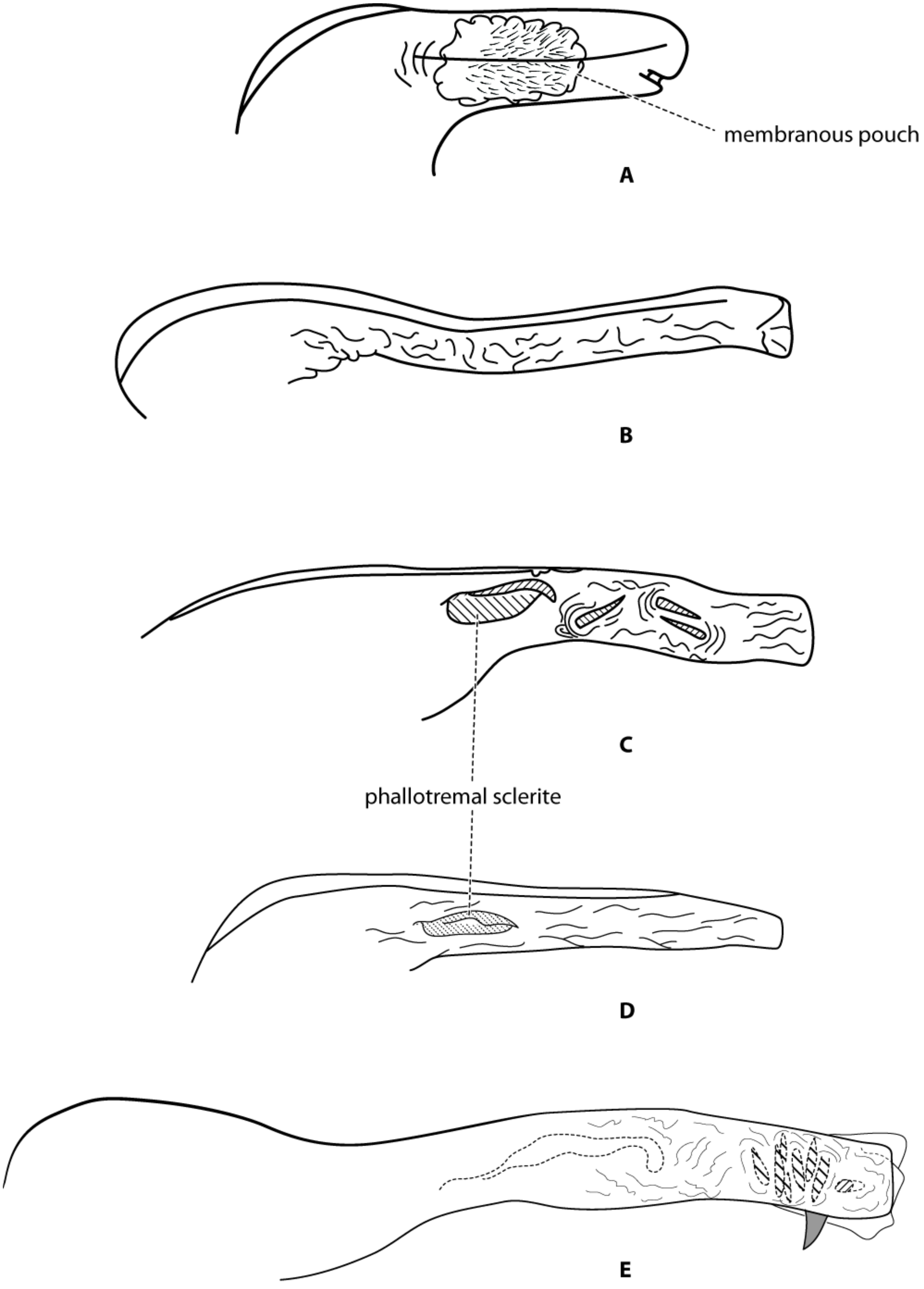

Figure 11. Phallus of *Cernotina* in lateral view: A – *C. cystophora*; B – *C. cadeti*; C – *C. antonina*; D – *C. riosanjuanensis*; E – *C. waorani*.

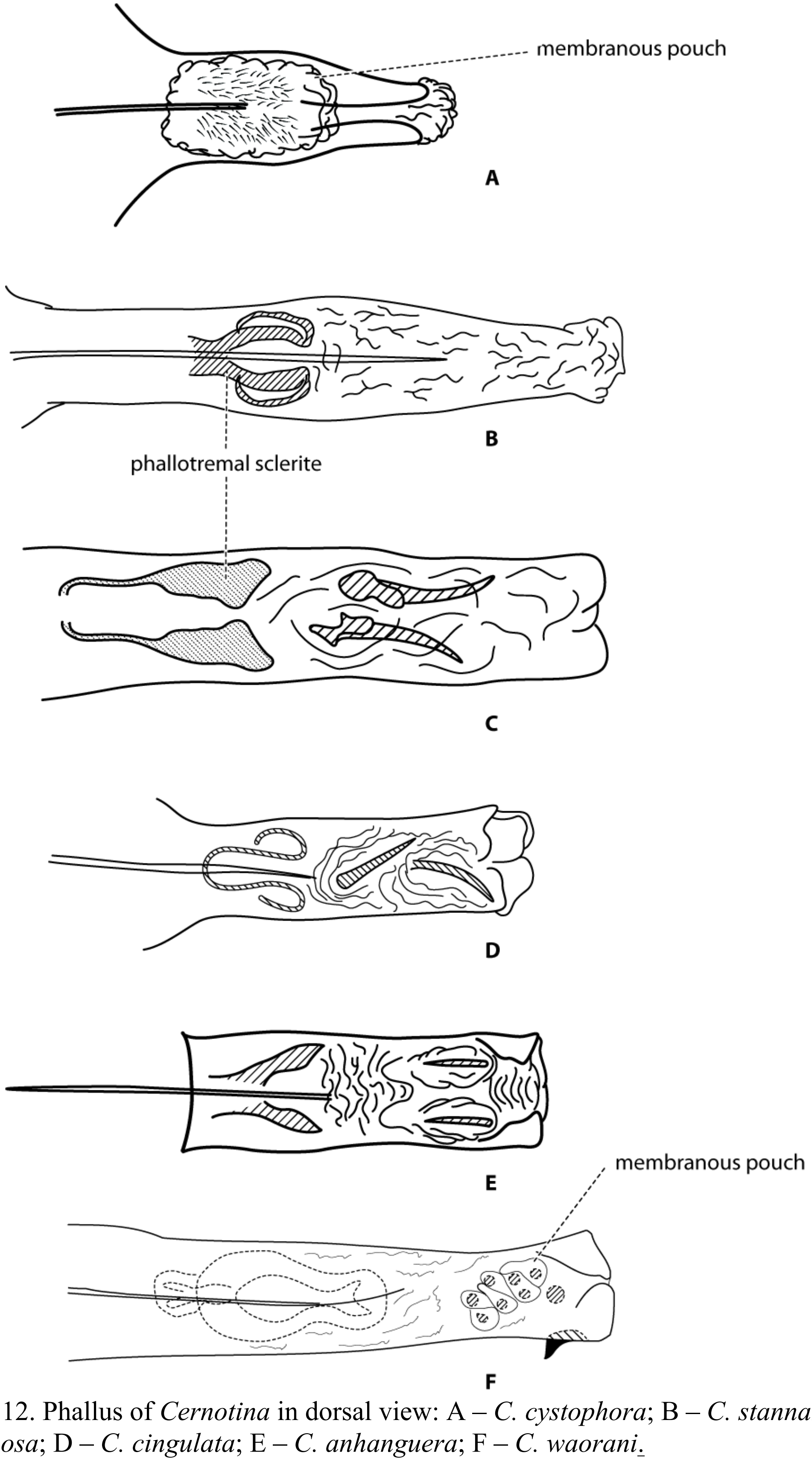

Figure 12. Phallus of *Cernotina* in dorsal view: A – *C. cystophora*; B – *C. stannardi*; C – *C. sinuosa*; D – *C. cingulata*; E – *C. anhanguera*; F – *C. waorani*.

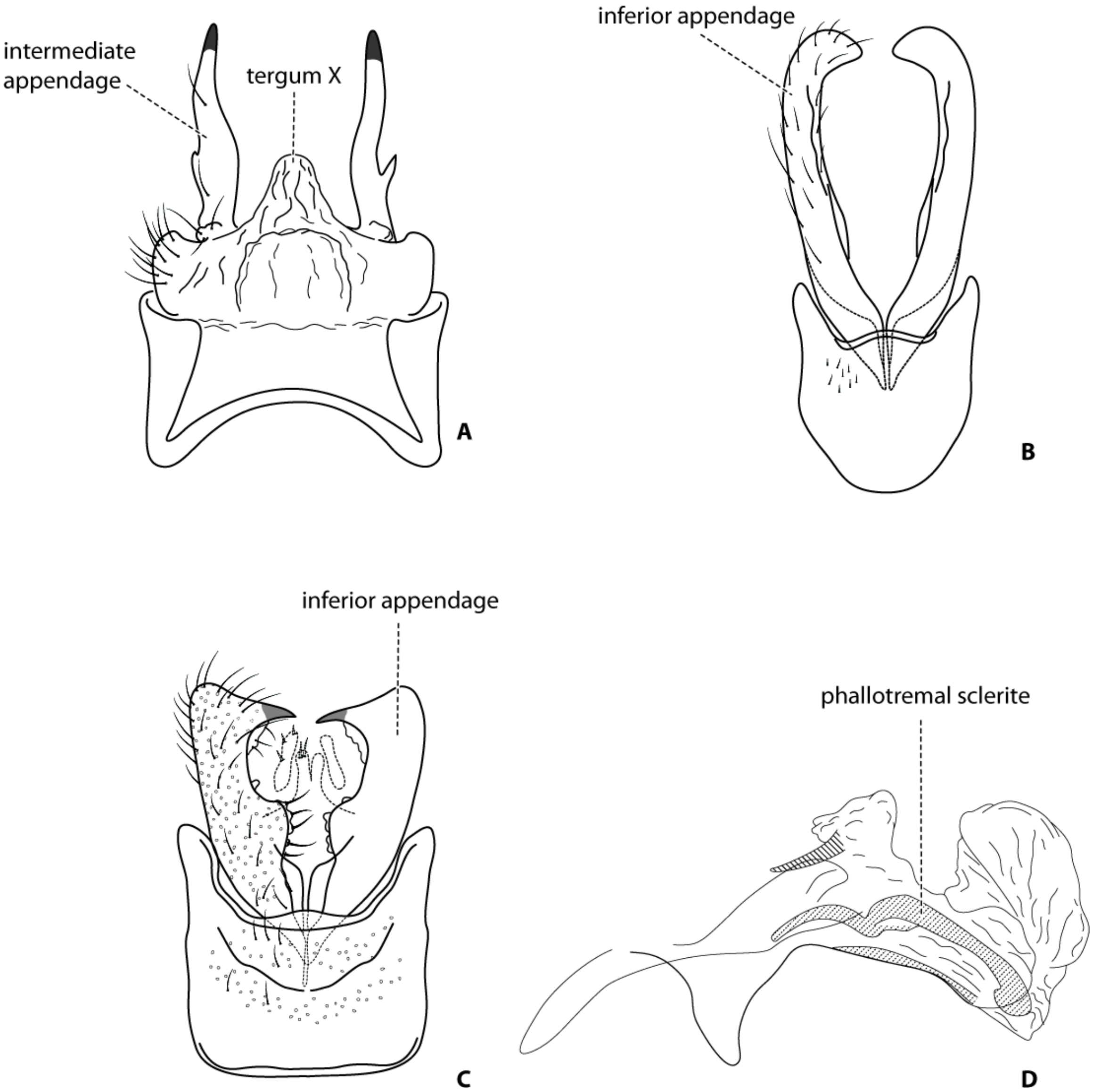

Figure 13. Male genitalia of outgroup species: A – *Polyplectropus alleni*, dorsal view (modified from Chamorro and Holzenthal 2010); B – *Pahamunaya joda*, ventra viewl; C – *Cyrnellus zapatariensis*, ventral view; D – *Pahamunaya joda*, phallus in lateral view.

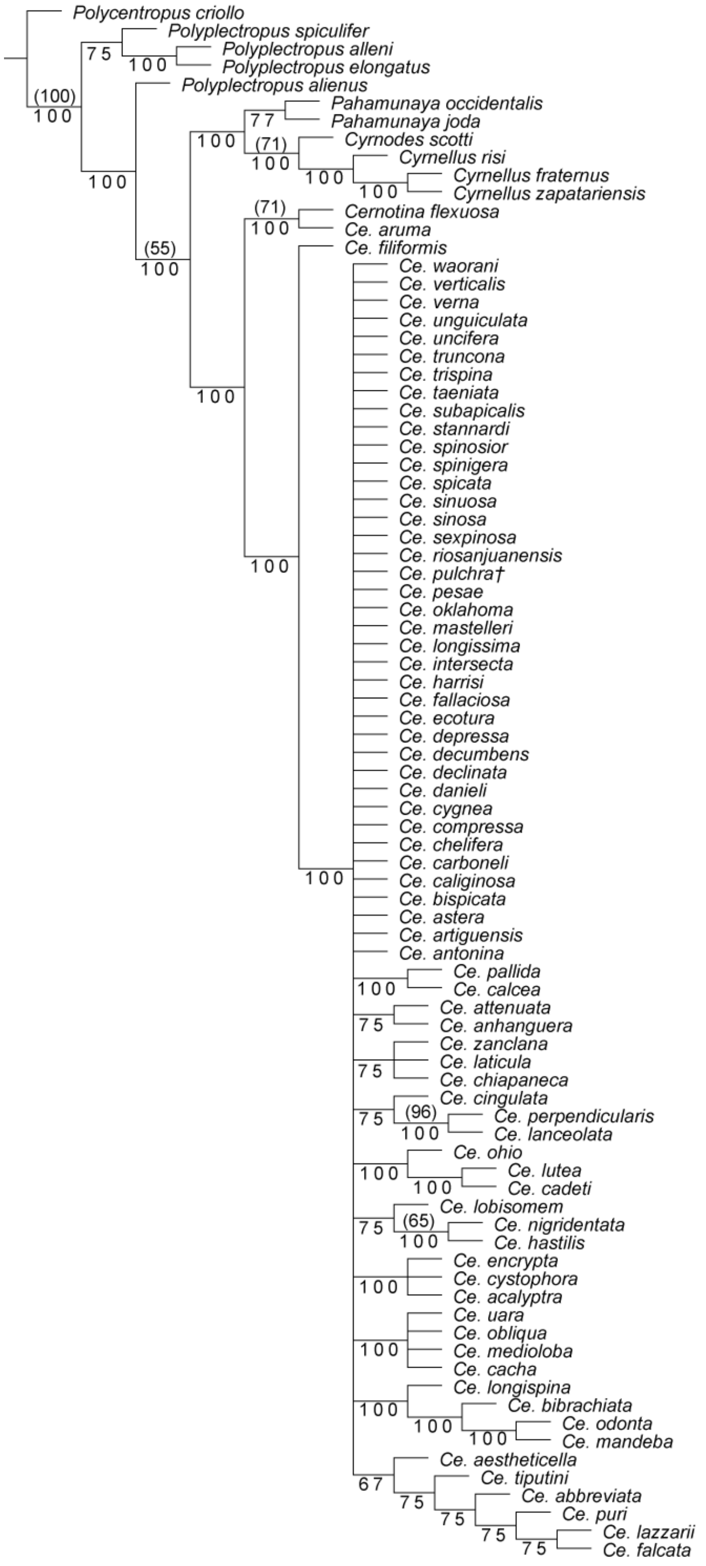

Figure 14. Phylogeny of *Cernotina* species based on equally weighted maximum parsimony analysis of morphological dataset (86 taxa, 79 characters; L: 865; CI: 0.138; RI: 0.33). Majority rule consensus of 40 trees (50% cut). Numbers in parenthesis on internodes indicate bootstrap support higher than 50.

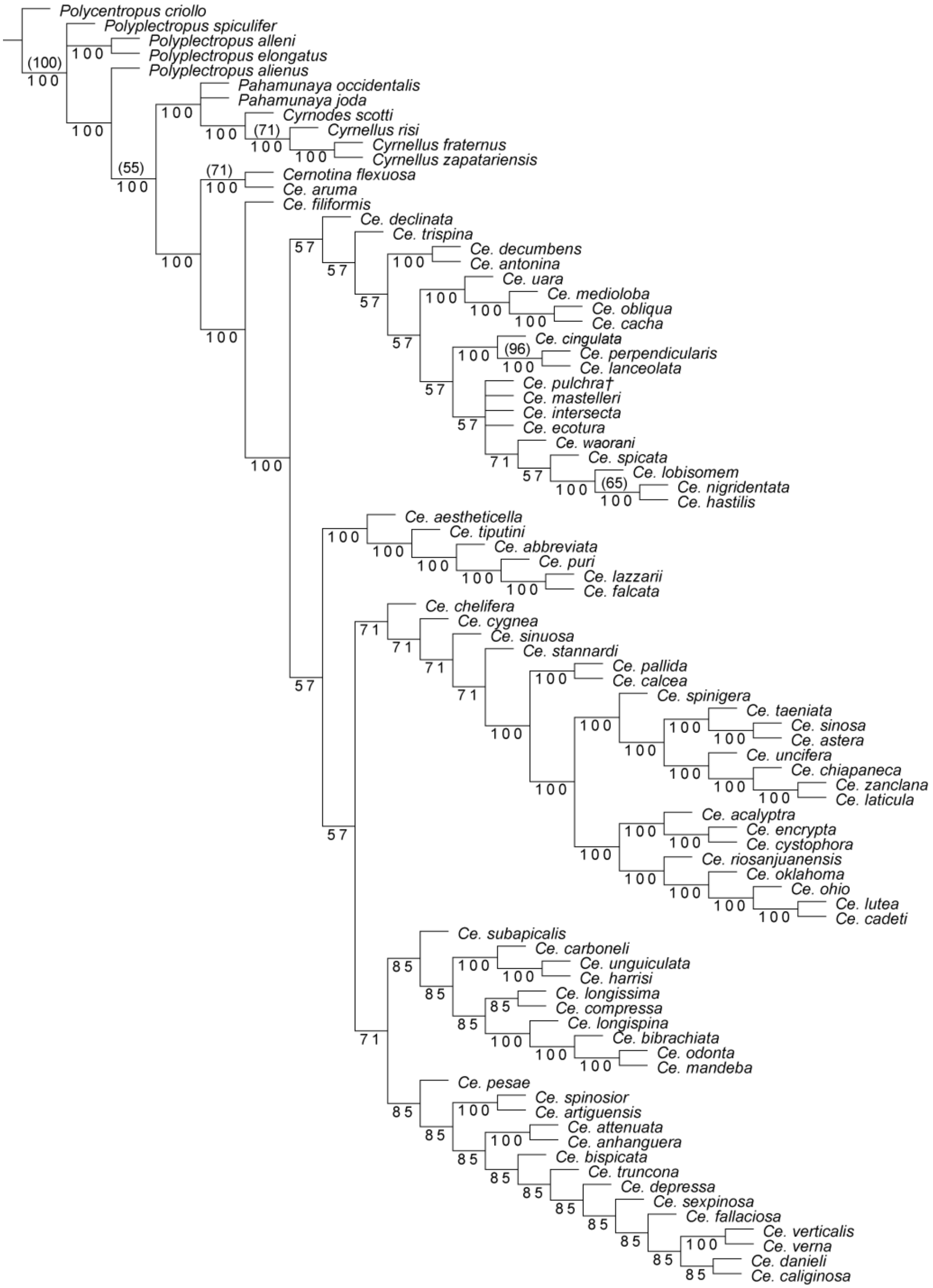

Figure 15. Phylogeny of *Cernotina* species based on equally weighted maximum parsimony analysis of morphological dataset (86 taxa, 79 characters; L: 637; CI: 0.187; RI: 0.535) with successive runs using sub-optimal trees. Majority rule consensus of 28 trees (50% cut). Numbers in parenthesis on internodes indicate bootstrap support higher than 50.

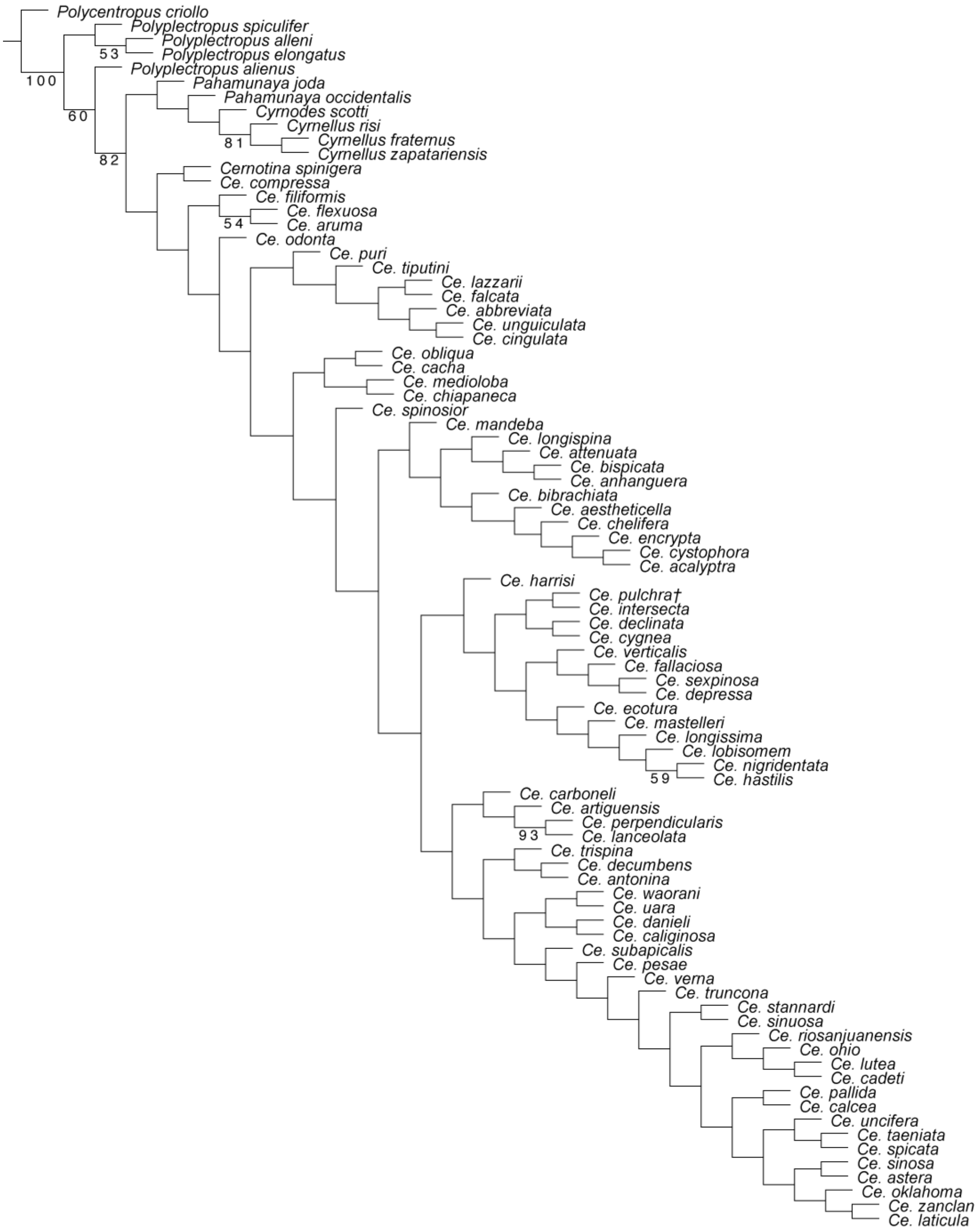

Figure 16. Phylogeny of *Cernotina* species based on implied-weighting maximum parsimony analysis of morphological dataset (86 taxa, 79 characters; L: 659; CI: 0.181; RI: 0.513; fit value: 18.79). Most parsimonious tree. Numbers on internodes indicate bootstrap support higher than 50.

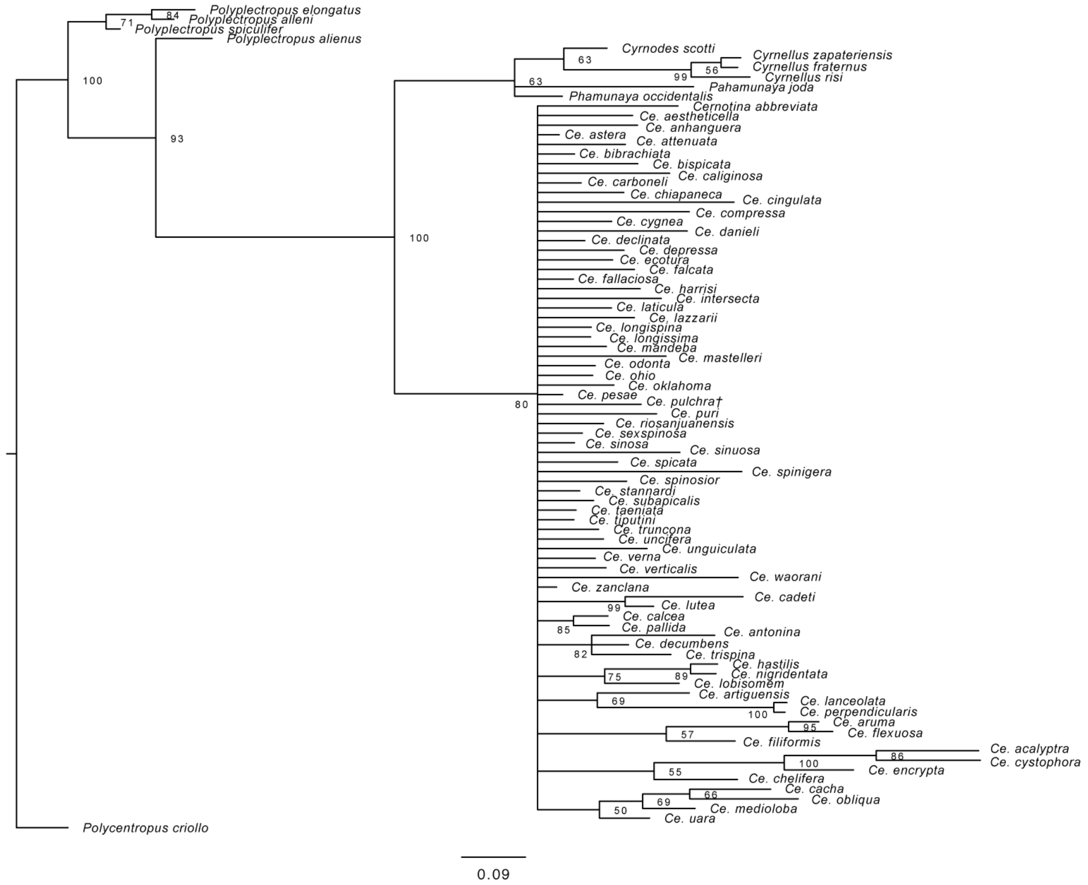

Figure 17. Phylogeny of *Cernotina* species based on Bayesian analysis of morphological dataset (86 taxa, 79 characters) under an Mk + lognormal model. Majority rule consensus (50% cut). Numbers on internodes indicate posterior probabilities.

Table 1. Material examined. The letters mean which kind of specimen was observed: "H" means the holotype, "P" means at least one paratype, "L" means lectotype, "O" means only non-type specimens were directly observed; "Literature" means the specimen has its characters coded by a literature review, including the original description and additional illustrations and descriptions.

Genus	**species**	**Author**	**Source**
Cernotina	*abbreviata*	Flint	H
Ce.	*acalyptra*	Flint	H
Ce.	*aestheticella*	Sykora	Literature
Ce.	*anhanguera*	Camargos, Barcelos-Silva & Pes	H
Ce.	*antonina*	Holzenthal & Almeida	P
Ce.	*aruma*	Santos & Nessimian	P
Ce.	*artiguensis*	Angrisano	Literature
Ce.	*astera*	Ross	H
Ce.	*attenuata*	Flint	H
Ce.	*bibrachiata*	Flint	H
Ce.	*bispicata*	Camargos, Barcelos-Silva & Pes	H
Ce.	*cacha*	Flint	H
Ce.	*cadeti*	Flint	H
Ce.	*calcea*	Flint	H
Ce.	*caliginosa*	Flint	H
Ce.	*carbonelli*	Flint	H
Ce.	*chelifera*	Flint	H
Ce.	*chiapaneca*	Bueno-Soria	Literature
Ce.	*cingulata*	Flint	H
Ce.	*compressa*	Flint	H
Ce.	*cygnea*	Flint	H
Ce.	*cystophora*	Flint	H
Ce.	*danieli*	Flint & Sykora	P
Ce.	*declinata*	Flint	H
Ce.	*decumbens*	Flint	H
Ce.	*depressa*	Flint	H
Ce.	*ecotura*	Sykora	Literature
Ce.	*encrypta*	Flint	H
Ce.	*falcata*	Camargos, Barcelos-Silva & Pes	H
Ce.	*fallaciosa*	Flint	H
Ce.	*filiformis*	Flint	H
Ce.	*flexuosa*	Santos & Nessimian	P
Ce.	*harrisi*	Sykora	Literature
Ce.	*hastilis*	Flint	H
Ce.	*intersecta*	Flint	P
Ce.	*lanceolata*	Barcelos-Silva, Camargos & Pes	H

Ce.	*laticula*	Flint	H
Ce.	*lazzarii*	Holzenthal & Almeida	P
Ce.	*lobisomem*	Santos & Nessimian	H
Ce.	*longispina*	Barcelos-Silva, Camargos & Pes	P
Ce.	*longissima*	Flint	P
Ce.	*lutea*	Flint	P
Ce.	*mandeba*	Flint	P
Ce.	*mastelleri*	Flint	P
Ce.	*medioloba*	Flint	H
Ce.	*nigridentata*	Sykora	O
Ce.	*obliqua*	Flint	H
Ce.	*odonta*	Santos & Nessimian	O
Ce.	*ohio*	Ross	H
Ce.	*oklahoma*	Ross	H
Ce.	*pallida*	(Banks)	L
Ce.	*perpendicularis*	Flint	H
Ce.	*pesae*	Santos & Nessimian	H
Ce.	*pulchra†*	Wichard	Literature
Ce.	*puri*	Dumas & Nessimian	P
Ce.	*riosanjuanensis*	Chamorro	H
Ce.	*sexspinosa*	Flint	H
Ce.	*sinosa*	Ross	H
Ce.	*sinuosa*	Barcelos-Silva, Camargos & Pes	P
Ce.	*spicata*	Ross	H
Ce.	*spinigera*	Flint	H
Ce.	*spinosior*	Flint	H
Ce.	*stannardi*	Ross	H
Ce.	*subapicalis*	Flint	H
Ce.	*taeniata*	Ross	H
Ce.	*tiputini*	Camargos, Ríos-Touma & Holzenthal	H
Ce.	*trispina*	Flint	H
Ce.	*truncona*	Ross	Literature
Ce.	*uara*	Flint	H
Ce.	*uncifera*	Ross	H
Ce.	*unguiculata*	Flint	H
Ce.	*verna*	Flint	H
Ce.	*verticalis*	Flint	H
Ce.	*waorani*	Camargos, Ríos-Touma & Holzenthal	H
Ce.	*zanclana*	Ross	H
Cyrnellus	*fraternus*	(Banks)	O
Cyrnellus	*risi*	(Ulmer)	L
Cyrnellus	*zapatariensis*	Chamorro	H

Cyrnodes	*scotti*	Ulmer	Litarature and specimen photograph
Pahamunaya	*joda*	Malicky & Chantaramongkol	O
Pahamunaya	*occidentalis*	Kjaerandsen & Netland	Literature
Polycentropus	*criollo*	Botosaneanu	Literature
Polyplectropus	*alienus*	Bueno-Soria	Literature
Polyplectropus	*alleni*	(Yamamoto)	Literature
Polyplectropus	*elongatus*	(Yamamoto)	Literature
Polyplectropus	*spiculifer*	Flint	Literature

Table 2. Values of k and tree metrics for weigthed parsimony analysis. Ci: consistency index; Ri: retention index.

K	**Length**	**Ci**	**Ri**	**#trees**
0	632	0.188291139	0.539497307	40
1	721	0.165048544	0.459605027	1
2	706	0.168555241	0.473070018	3
3	704	0.169034091	0.47486535	1
4	702	0.16951567	0.476660682	1
5	691	0.172214182	0.486535009	1
6	693	0.171717172	0.484739677	3
7	687	0.173216885	0.490125673	5
8	671	0.177347243	0.50448833	1
9	668	0.178143713	0.507181329	1
10	670	0.17761194	0.505385996	1
11	664	0.179216867	0.510771993	3
12	661	0.180030257	0.513464991	1
13	663	0.179487179	0.511669659	3
14	659	0.180576631	0.515260323	1
15	661	0.180030257	0.513464991	1
16	659	0.180576631	0.515260323	1
17	659	0.180576631	0.515260323	1
18	653	0.182235835	0.52064632	1
19	653	0.182235835	0.52064632	1
20	654	0.181957187	0.519748654	1

Chapter 2. Revision of *Cernotina* Ross 1938 (Trichoptera, Polycentropodidae)

Introduction

The genus *Cernotina* (Fig. 18) is a diverse group in the family Polycentropodidae. Along with *Cyrnellus*, the 70 extant species of this genus are only found in the New World, mostly in the Neotropics (Morse 2020, Holzental and Calor 2017, Camargos et al. 2017). The genus is monophyletic (Chapter 1), and is the sister taxon to the group containing *Pahamunaya* and *Cyrnodes*, a result also found in the family level phylogeny by Chamorro and Holzenthal (2011).

As previously stated, most *Cernotina* species occur in the Neotropics, with only 7 present in the Nearctic (Ross 1938a, 1938b, 1939, 1941, 1947). Within the Neotropical species, 36 occur in the Amazon forest biome. Despite this number, the genus in the area is largely unknown (Stork 2018). Many more species of *Cernotina* may occur in taxonomically unexplored areas, especially because Neotropical representatives of this genus usually have small distributional ranges (Flint 1971). Evidence from fossil records show presence of the genus in the Miocene (15-20 million years ago) from Dominican Amber (Wichard 2007). At this moment, there is no research on molecular clock to determine the time of divergence of *Cernotina* from their sister taxa.

Despite the high diversity of the genus in South America, no species occur in the Chilean sub-region of the Neotropics (Holzenthal and Calor 2017). The zoogeographical pattern of a closer affinity between the Chilean sub-region to Australasian than to the Brazilian sub-region is observed in many other Trichoptera families (de Moor and Ivanov 2008), and in other insect groups too (Brundin 1966).

A putative larva for *Cernotina* was described as “Genus C” (Flint 1964), later being identified as *Polyplectropus* (Flint 1968a). The first unequivocal designation of an immature of the genus was *C. spicata* (Hudson et al. 1981), with larva, pupa and biological remarks described.

The morphology of larval *Cernotina* resembles that of *Polycentropus* by the presence of the dorsal sclerite of the anal proleg shaped in the letter X. The two genera differ mainly by size– *Cernotina* being considerably smaller – and by the frontoclypeus ecdisial lines with a median constriction in *Polycentropus* and without a clear constriction in *Cernotina* (Fig. 1) (Pes et al. 2018). The pupae have about 10 abdominal spines, protarsal swimming setae, long setae on the anterior portion of the labrum, and no setae basolaterally on the mandibles (Hudson et al. 1981).

Larval retreats of *Cernotina* resemble those of *Nyctiophylax* and *Cyrnellus*. The larvae use small depressions in rock or wood substrates and cover it with a silken roof and silken threads on both expanded ends, which alert them to prey touching the silk nearby (Hudson et al. 1981). They can be found in slow-flowing waters, a common habitat in the Amazon, with some species being found even in lentic environments (Wiggins 1996). In North America, there is evidence of invertebrate body parts in their gut content (Wiggins 1996), but such studies were not made with Neotropical species. Little is known about the biology of the adults, other than their attraction to light traps.

Taxonomic History

Described by Herbert Ross in 1938, the species in this genus are particularly distinct from the other genera in Polycentropodidae by having only 2 tibial spurs on the front leg instead of 3, and by the narrow shape of the hind wing (Ross 1938a). At the time, Ross considered *Cernotina* to be "a very interesting connecting link between Polycentropidae and Psychomiidae," advocating for a single family that would encompass both groups, as it was for many years (Ross 1941, 1944, Flint 1992).

This supposed proximity of *Cernotina* with Psychomyiidae was due do the lack of the preapical tibial spur on the front legs in members of the latter group, as well as some similarities in wing venations. Many recent phylogenetic studies contest this point of view, and such characters merely contribute to the uniqueness of *Cernotina* among the other genera of Polycentropodidae, not being inherited from the same common ancestor with Psychomiidae genera (Chamorro and Holzenthal 2011, Johanson et al. 2012, Ross 1941).

In the aforementioned paper, Ross described three species: *C. calcea*, *C. oklahoma*, and *C. spicata*, the first being the type species of the genus, and all of them collected in the central United States (Michigan, Illinois and Oklahoma). For many years, most specimens continued being collected from those regions, in addition to the East

Coast – Maryland (Ross 1938) – and the South – Texas (Ross 1941), and Florida (Ross 1947), with a handful of new species.

During the same period, *Cernotina pallida*, originally described as *Cyrnus pallidus* by Banks (1904), was transferred to *Cernotina*, with a lectotype from Maryland (Ross 1938b). In this paper, Ross mentioned that this species should be placed in the subfamily Psychomyiinae, not "Polycentropinae" as it formerly was. In the following year Ross described a new species, *C. ohio*, from the state with the same name (Ross 1939). From southern United States, the species *C. astera* and *C. truncona* were described (Ross 1941, 1947), respectively from Texas and Florida.

Finally, Ross described 6 species - *C. stannardi*, *C. taeniata*, *C. zanclana*, *C. sinosa*, *C. laticula*, *C. uncifera* - from Mexico and updated the distribution of *C. astera* (Ross 1951). This work presented the first records of the genus in the Neotropics, and outside the United States. By that time, Dr. Ross already mentioned the hidden diversity that could be present in the southern portions of the Neotropical region.

By the late 1960s, the late Dr. Oliver Flint, Jr. ventured in to the Caribbean and described many caddisfly species from the West Indies (Flint 1968b, 1968c). It was in 1971 after analyzing the extensive material collected by Ernst Fittkau and Georges Marlier in the Central Amazon, when he described 21 species of *Cernotina* (Flint 1971). The described species were, in the order in which they appear in the paper, *C. acalyptra*, *C. encrypta*, *C. cystophora*, *C. subapicalis*, *C. cacha*, *C. uara*, *C. attenuata*, *C. declinata*, *C. bibrachiata*, *C. cygnea*, *C. decumbens*, *C. trispina*, *C. spinigera*, *C. verticalis*, *C. compressa*, *C. filiformis*, *C. obliqua*, *C. abbreviata*, *C. perpendicularis*, *C. cingulata*, and *C. unguiculata*. Surprisingly at the time, this genus first collected in North America, with a few representatives in Central America, suddenly had its known species diversity rise drastically due to the populations collected in the Amazon Forest. In the words of Dr. Flint: "The bewildering variety of species discovered in the Amazon Basin was therefore completely unexpected".

On the following year, Flint (1972) collected many specimens from two areas in Argentina: the lowlands around the province of Santa Fé, and the low mountains of Misiones. There he described *C. medioloba* and *C. chelifera* from the two respective areas, and hypothesized a zoogeographical pattern of wide range lowland species and restricted range high elevation species. His hypothesis gained strength with later studies (Malicky 1983, de Moor and Ivanov 2008).

In 1974, Flint published a study on the caddisflies from Suriname, collected by Dr. D. C. Geijskes from 1939 to 1971. This work elevated the number of known Trichoptera in the country from one to 124, of which, 10 were *Cernotina*, 4 of them – *C. mandeba*, *C. longissima*, *C. intersecta*, *C. depressa* – being new. He mentioned different distribution patterns, one of lowland species with wide distribution throughout South America that extended to Argentina, a Circumcaribbean pattern of species from northern South America to Central America and the Antilles, and a pattern of endemic Guianan species (Flint 1974).

Working on a large project to describe Argentinian freshwater animal diversity, Dr. Flint and colleagues from the National Museum of Natural History collected a considerable amount of specimens from austral South America over 10 years (Flint 1983). In 1983 he published the new species observed in that material in a separate article, elucidating the diversity and distribution of Trichoptera in Argentina, Chile, Uruguay, Paraguay and southern Brazil. Four species of *Cernotina* are described in this paper, from Argentina, Brazil and Uruguay. He described two major zoogeographic subregions for caddisflies in the Neotropics, which are still used today by trichopterologists: the Brazilian and Chilean subregions. From his many collecting trips to Puerto Rico, he later described one new species, *C. mastelleri* with a very interesting inconspicuous preapical protibial spur, unique in the genus thus far (Flint 1992).

Afterwards, various articles with fewer descriptions of new *Cernotina* were published. Also in austral South America, Dr. Elisa Angrisano described *C. artiguensis* from Uruguay, and elevated the number of species known in the country from 10 to 22 (Angrisano 1994). Two years later, Dr. Flint described *C. hastilis* and recorded *C. mandeba* from Trinidad and Tobago (Flint 1996). The first species of *Cernotina* described in the new millennium was *C. riosanjuanensis*, in a paper by Dr. Maria Lourdes Chamorro, from her collecting trips to Nicaragua (Chamorro 2003). Flint and Sykora (2004) described 32 new species of caddisflies from Hispaniola in Dominican Republic, of which one was *C. danieli*. A few years later, Wichard (2007) described *C. pulchra* from Dominican Amber, the first fossil species of the genus (15 – 20 million years ago). Bueno-Soria (2010) describes a new species, *C. chipaneca* from the state of Chiapas in Mexico. Dumas and Nessimian (2011) describe the new species *C. puri* from the Atlantic Forest in Brazil, a biome, by the time, underrepresented in records of the genus.

Sykora (1998) described *C. harrisi*, *C. nigridentata*, *C. aestheticella*, and *C. ecotura* from northeastern Peru and northern Brazil, in the Amazon forest. In this work, it is mentioned how *Cernotina* was the dominant macrocaddisfly genus on the samples, which is commonly observed in many surveys in that region. In Sykora's paper, the distributions of 4 described species were updated and *C. spinigera* was re-illustrated.

Afterwards, Holzenthal and Almeida (2003) described *C. antonina* and *C. lazzari* from southern Brazil. This work was part of a large project called Profaupar, and consisted of a surveying the state of Paraná for multiple insect orders.

In another collecting effort in the Brazilian Central Amazon, Santos and Nessimian (2008) described *C. odonta*, *C. lobisomem*, *C. pesae*, *C. aruma*, and *C. flexuosa*. The authors also mentioned how samples in the Amazon tend to have a large number of *Cernotina* individuals, especially females.

Barcelos-Silva et al. (2013) described six new species of *Cernotina* in a combined paper using specimens from the Cerrado and Atlantic Forest biomes in Brazil. From the Cerrado, *C. anhanguera*, *C. bispicata*, and *C. falcata* were described, and from the Atlantic Forest *C. lanceolata*, *C. longispina*, and *C. sinuosa*. In the article, *C. spinigera*, a species found in Central Amazon and in the Amazonian savannah was recorded in Cerrado region, making it one of the species with an unusually wide range of distribution.

Recently, Camargos et al. (2017) described *C. tiputini* and *C. woarani*, from the Amazonian Ecuador. In this paper, the authors also discuss the homology of complex genitalic characters of the genus, especially the intermediate appendage, which has led to many different interpretations and a lack of consistency throughout morphological descriptions over the years.

Many researchers have updated distribution records of *Cernotina* species of the second half of the 20th Century. An increasing professional training of Latin American scientists was observed, leading to more frequent regional checklists and record updates (Paprocki et al. 2004, Ríos-Touma et al. 2017, Dumas and Nessimian 2012).

Additionally, two comprehensive catalogs of Neotropical species were written in the past few years (Flint et al. 1999, Holzenthal and Calor 2017).

This study is the first revision of *Cernotina*, including re-descriptions of 63 described species, and 15 new species. Due to the low support for internal branches in the phylogenetic analysis (Chapter 1), no species groups are delimited. However, the phylogeny supported the monophyly of the genus, as well as some decisions to synonymize species.

Checklist of *Cernotina* species

Cernotina abbreviata Flint, 1971
Cernotina acalyptra Flint, 1971
Cernotina aestethicella Sykora, 1998
Cernotina anhanguera Camargos, Barcelos-Silva & Pes, 2013
Cernotina antonina Holzenthal & Almeida, 2003
Cernotina artiguensis Angrisano, 1994
Cernotina aruma Santos & Nessimian, 2008
Cernotina astera Ross, 1941
Cernotina attenuata Flint, 1971
Cernotina bibrachiata Flint, 1971
Cernotina bispicata Camargos, Barcelos-Silva & Pes, 2013
Cernotina cacha Flint, 1971
Cernotina cadeti Flint, 1968
Cernotina calcea Ross, 1938
Cernotina caliginosa Flint, 1968
Cernotina carbonelli Flint, 1983
Cernotina chelifera Flint, 1972
Cernotina chiapaneca Bueno-Soria, 2010
Cernotina cingulata Flint, 1971
Cernotina compressa Flint, 1971
Cernotina cygnea Flint, 1971
Cernotina cystophora Flint, 1971

Cernotina danieli Flint & Sykora, 2004

Cernotina declinata Flint, 1971

Cernotina decumbens Flint, 1971

Cernotina depressa Flint, 1974

Cernotina ecotura Sykora, 1998

Cernotina encrypta Flint, 1971

Cernotin falcata Camargos, Barcelos-Silva & Pes, 2013

Cernotina fallaciosa Flint, 1983

Cernotina filiformis Flint, 1971

Cernotina flexuosa Santos & Nessimian, 2008

Cernotina harrisi Sykora, 1998

Cenotina hastilis Flint, 1996

Cernotina intersecta Flint, 1974

Cernotina lanceolata Barcelos-Silva, Camargos & Pes, 2013 (= *C. perpendicularis*, **new synonym**)

Cernotina laticula Ross, 1951

Cernotina lazzarii Holzenthal & Almeida, 2003

Cernotina lobisomem Santos & Nessimian, 2008

Cernotina longispina Barcelos-Silva, Camargos & Pes, 2013

Cernotina longissima Flint, 1974

Cernotina lutea Flint, 1968

Cenotina mandeba Flint, 1974

Cernotina mastelleri Flint, 1992

Cernotina medioloba Flint, 1972

Cernotina nigridentata Sykora, 1998 (= *C. hastilis*, **new synonym**)

Cernotina obliqua Flint, 1971

Cernotina odonta Santos & Nessimian, 2008

Cernotina ohio Ross, 1939

Cernotina oklahoma Ross, 1938

Cernotina pallida (Banks, 1904)

Cernotina perpendicularis Flint, 1971

Cernotina pesae Santos & Nessimian, 2008

† *Cernotina pulchra* Wichard, 2007

Cernotina puri Dumas & Nessimian 2011

Cernotina riosanjuanensis Chamorro-Lacayo, 2003

Cernotina sexspinosa Flint, 1983

Cernotina sinosa Ross, 1951

Cernotina sinuosa Barcelos-Silva, Camargos & Pes, 2013

Cernotina spicata Ross, 1938

Cernotina spinigera Flint, 1971

Cernotina spinosior Flint, 1992

Cernotina stannardi Ross, 1951

Cernotina subapicalis Flint, 1971

Cernotina taeniata Ross, 1951

Cernotina tiputini Camargos, Ríos-Touma & Holzenthal 2017

Cernotina trispina Flint, 1971

Cernotina truncona Ross, 1947

Cernotina uara Flint, 1971

Cernotina uncifera Ross, 1951

Cernotina unguiculata Flint, 1971

Cernotina verna Flint, 1983

Cernotina verticalis Flint, 1971

Cernotia waorani Camargos, Ríos-Touma & Holzenthal 2017

Cernotina zanclana Ross, 1951

Cernotina n. sp. 1 **New species**

Cernotina n. sp. 2 **New species**

Cernotina n. sp. 3 **New species**

Cernotina n. sp. 4 **New species**

Cernotina n. sp. 5 **New species**

Cernotina n. sp. 6 **New species**

Cernotina n. sp. 7 **New species**

Cernotina n. sp. 8 **New species**

Cernotina n. sp. 9 **New species**

Cernotina n. sp. 10 **New species**

Cernotina n. sp. 11 **New species**

Cernotina n. sp. 12 **New species**

Cernotina n. sp. 13 **New species**

Cernotina n. sp. 14 **New species**

Cernotina n. sp. 15 **New species**

Cernotina n. sp. 16 **New species**

Methods

Species delimitation

In this study, characters of the male genitalia were the main source of variation used to discriminate species. Such morphological characters had non-variable states within the taxon, while characters with continuous variation were not used as the main source of species delimitation, albeit they were still described. Variation in sclerotized shapes was rarely observed, and they were usually congruent across long geographical distances.

Morphological terminology

For head and wing terminology used on the genus description, Chamorro (2010) was followed. Terminology for male genitalia was adapted from Chamorro (2010) and Camargos et al. (2017). Bilaterally symmetrical structures are referred to in the singular.

Specimen dissection

Abdomens of male specimens were removed from the thorax and "cleared" following the methods described by Blahnik et al. (2007) with warm 85% lactic acid. Clearing causes sclerotized internal and external cuticular structures of the male genitalia to become semi-transparent, thus presenting a clear view of internal and external morphology. While still warm from the lactic acid, a stream of water propelled by a syringe inserted inside the abdomen was used to flush out macerated non-cuticular tissues obscuring the view.

For a few specimens, especially those collected decades ago and where the soft tissue became hardened, an overnight bath in 10-12% KOH solution was also used for better clearing. After KOH treatment, specimens were bathed in 10% acetic acid in 70% ethanol to halt the clearing process by neutralizing the KOH. Some specimens also needed Chlorazole Black E (Fischer Scientific Int., Inc.) stain to observe structures that became overly transparent with the use of KOH.

To prepare wings of pinned specimens, the procedure described by Prather (2003) was used. For specimens stored in alcohol, the wings were removed, observed with the microscope, then were placed in a microvial with the remainder of the specimen(s).

Illustrations

All genitalic structures were done using a drawing tube, often referred to as *camera lucida*, coupled to an Olympus BX 41 compound microscope. Wings were phographed on a dissecting microscope coupled with a Leica camera, and processed in application Leica Acquire. Head and thorax were illustrated using a dissecting microscope fitted with an ocular grid and grid paper. All the drawings and photographs were finally digitized using Adobe Illustrator (CS 5, Adobe Systems, Inc.), tracing scanned pencil sketches obtained with the drawing tube with digital vectors.

With some exceptions noted in the text, all illustrations are from the holotype. In a few species, illustrations of additional species are also provided to show intra-specific variation or different disposition of membranous structures. For the species not available to examine in this study, images from the original publications were used to guide the digital vectors.

To compare illustrations of different species, the figures have standardized letterings corresponding to each view of the male genitalia as follows: A –lateral view, abdominal segments IX and X, and appendages; B – dorsal view, segment X-intermediate appendage complex and preanal appendages; C – ventral view, segment sternum IX and inferior appendages; D – lateral view of the phallus; E – dorsal view of the phallus; F – G – details of specific structures when needed.

Species descriptions

To standardize and format consistent descriptions across all species of such a large genus, the software DELTA (DEscription Language for TAxonomy, Dallwitz et al., 1999 onwards) was used, following the steps described by Holzenthal and Andersen (2004). To generate natural language descriptions, the following directives of the Delta Editor's "Action Sets" were used: "layout for natural language descriptions" and "translate into natural language – RTF, single file for all taxa." Then the resulting file was edited in Microsoft® Word for fine adjustments of font and punctuation.

To simplify the prose of the diagnoses, the following acronyms were used to represent the respective structures:

DLP = dorsolateral process of the preanal appendage
VMP = ventromesal process of the preanal appendage
BDL = basodorsal lobe of the inferior appendage
AML = apicomesal lobe of the inferior appendage.

Material examined and specimen management

More than 345 specimens were observed in this study. All pinned specimens, or lot of specimens in alcohol, deposited in the University of Minnesota Insect Collection have a unique alphanumeric identification with data readable in the software Specify 6.

Types of the species described in this work, additional material examined and borrowed specimens from different institutions were deposited in different institutions as indicated in the species descriptions. Those institutions are the following:

NMNH	National Museum of National History, Washington, DC, USA
UMSP	University of Minnesota Insect Collection, Saint Paul, Minnesota, USA
DZRJ	Coleção Entomológica Professor José Alfredo Pinheiro Dutra, Departamento de Zoologia, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil
INPA	Coleção de Invertebrados do Instituto Nacional de Pesquisas da Amazônia Collection, Manaus, Brazil
INHS	Illinois Natural History Survey, Champaign, Illinois, USA
MCZ	Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA

MECN Museo Ecuatoriano de Ciencias Naturales, Quito, Ecuador
USFQ Museo de Ecología Acuática de la Universidad San Francisco de Quito, Ecuador

Results

Homology of the male genitalia of *Cernotina*

The male genitalia of *Cernotina* are extremely variable among the different species, making the taxa easy to differentiate, but at the same time making homology statements difficult. On top of that, the genus has many genitalic structures, compared to the closely related genus *Cyrnellus*. A third obstacle in the morphological understanding of the genus is the lack of consensual terminology among the many species descriptions, a problem shared by other genera in Polycentropodidae (Chamorro 2010, Camargos et al. 2017). In this paper I followed Chamorro and Holzenthal (2010) and Camargos et al. (2017), and adapted other terms to what I interpreted at the moment of the morphological observation of the studied species.

Tibial spurs

The lack of a protibial preapical spur in the adult is often cited as a synapomorphy for all *Cernotina*. In a family with most of its representatives very similar to each other, as is Polycentropodidae, the lack of such a spur can be a useful and quick way to identify large numbers of individuals, including females, without further need to observe the genitalia. However, *C. mastelleri* and three unidentified specimens deposited in the Trichoptera collection at the Smithsonian Institution show an interesting combination of typical *Cernotina* genitalia with the presence of a very short protibial preapical spur. The unidentified specimens are not described in this work, but I advise caution in using only the spurs as an identifying character for the genus.

Male genitalia

Sternum IX

The ninth sternum (sternum IX) in *Cernotina*, as in other polycentropodid genera contains a lot of interspecific variability. The sheer size of it in comparison with the rest of the genitalic complex can vary to really narrow in *Cernotina* n. sp. 11 (Fig. 104A) to covering most of the complex laterally as in *C. cadeti* (Fig. 31A). The depth and breadth of the anterior ventral notch, this being a characteristic present in *Cernotina*, can differ greatly, from broad and wide in *C. falcata* (Fig. 48C) to narrow and deep as in *C. pesae* (Fig. 71C). Lastly, a few species in the genus lack the x-shaped ventral ridge on sternum IX, which can be a defining character for them.

Segment X and intermediate appendage complex

Segment X in most *Cernotina* is reduced and fused partially or entirely to the intermediate appendages. This is also seen in some *Polyplectropus* such as *P. alleni* and *P. clauseni* (Chamorro 2010). The lack of a conspicuous separate intermediate appendage has led to confusion in the interpretation of the homologies of preanal, tenth tergum and intermediate appendages (such as in Holzenthal and Almeida 2003). As discussed in Chamorro (2010) and Camargos et al. (2017), the intermediate appendage in *Cernotina* is always setose, partially sclerotized and paired, and mostly fused with the tenth tergum, with the exception of a few species such as *C. perpendicularis* (Fig. 70B).

The intermediate appendages (fused with tergum X) hold variable characters such their shape and size in comparison to tergum IX, the presence, position and number of spines, and the presence of stout spine-like setae apically and ventrally. This structure complex can be entirely separate from the preanal appendage or have some degree of continuity, such as in *C. chelifera* (Fig. 36A, B), but in a few species, it can also be fused with the dorsolateral process of the preanal appendages, forming a globular structure with peg-like setae on its ventrolateral surface, such as *C. acalyptra* (Fig. 20A), *C. cystophora* (Fig. 41A) and *C. encrypta* (Fig. 47A). *Cernotina decumbens* (Fig. 44A, B) and *C. trispina* (Fig. 85A, B) also have a densely setose mesobasal structure on the ventral surface of the intermediate appendages.

Preanal appendages

The preanal appendages in *Cernotina* are always divided between dorsolateral process and ventromesal process, with the exception of species with the aforementioned fusion of the dorsolateral process with the intermediate appendage complex. The dorsolateral is arguably the most complex structure in the genus in terms of morphological diversity among different species. General shape, relative length, presence, number and position of spines, and curvature are all extremely variable. In addition, the presence, number, shape, and position of secondary branches to the dorsolateral process offer another layer of complexity to the structure, since those branches can also bear spines of their own. The ventromesal process on the other hand tend to stay more morphologically conserved, with small differences in shape and size in relation to the sternum IX and dorsolateral process. One characteristic that can look distinct in different species is how the halves of the process can be fused or not anteroventrally, as it is also seen in *Polyplectropus*, with varying distances. A few species can have spines on this structure, such as *C. filiformis* (Fig. 50A) or *C. puri* (Fig. 73A), which can differentiate them easily from most of the other species of the genus.

Inferior appendages

The inferior appendages offer another degree of complexity to the morphology of *Cernotina* and can account for many variable characters throughout the genus. The shape of the main body of the appendage and the relative size compared to segment IX are examples of variability. In addition, the presence, shape and orientation of the basodorsal lobe are very diverse. The presence of an apical notch on the appendage is shared among many North American species. The size and shape of the anterior basal plate of the inferior appendage can also vary, although being more morphologically stable than in *Polyplectropus*. Perhaps the most complex character in this structure is the apicomesal lobe, with different overall shapes, sclerotization, positions along the appendage, and presence of secondary lips. Those lobes are very important in determining species in the morphologically simpler genus *Cyrnellus*, and they can also offer some insights on species delimitation and grouping in *Cernotina*.

Phallus

Finally, the phallus is a structure traditionally used in Trichoptera taxonomy due to its species-specific characters. Although this is true in many genera, including polycentropodids such as *Polyplectropus*, the structure is not as useful for species delimitation in genera such as *Cernotina* and *Cyrnellus*. However, there are patterns that can still be useful to group different species, such as the relative width of the phallus, the curvature, and the presence and size of many phallic spines. The spines can be elongate, or broad and more numerous, or even hair-like and even more numerous. In any case, the position of the spines in the phallic membrane is variable in the specimen, with very few being everted from the phalloteca after heated in lactic acid solution. In addition to the spines, the phallotremal sclerite can have different shapes, such as curved hooks, parallel linear sclerites, or a cordate structure.

Genus *Cernotina* Ross, 1938

Cernotina Ross, 1938a:136 [Type species: *Cernotina calcea* Ross, 1938a, original designation]. — Flint, 1971:33 [key, Amazonian species]. — Wichard, 2007:32 [fossil species, diagnosis].

Generic description

General. Length of forewing: 2.5 – 5.0 mm. General body color from stramineous with brown or gray setae to entirely brown, may have transverse band of white setae on forewings.

Head. Antennae with roughly same length of body, scape broad, setose (Fig. 18A). Maxilary palps with third article arising subapically from second article (Fig. 18B). Labial palps 3-segmented. Head subquadrate, without ocelli (Fig. 18A). Central setal area occupying most of head dorsally; frontal-, antennal-, and preocellar setal wart somewhat indistinguishable from each other, tapered laterally and round posteriorly; ocellar setal wart slightly oval, fused with transversal postocellar setal wart by slight constriction at midlength of fused setal area; occipital setal warts large, each slightly smaller than half central setal area (Fig. 18A).

Thorax. Forelegs typically with 2 apical tibial spurs. Pronotum short, about 3 times shorter than head, with a pair of median rectangular and horizontal pronotal setal warts, lateral pronotal setal wart either absent or fused with median (Fig. 18A).

Midlegs with 4 tibial spurs, 2 apical and 2 preapical at midlength of segment. Mesonotum about as long as head, with mesoscutal setal warts oval, almost touching each other medially, and mesoscutellar setal wart rounded, large, about 3 times larger than mesoscutal setal wart (Fig. 18A).

Hind legs with 4 tibial spurs, 2 apical and 2 preapical at midlength of segment. Metanotum shorter than head, without setal warts.

Wings. Forewing venation (Fig. 18C, D): forks 2, 4 and 5 present; fork 2 rooted or sessile, fork 4 always petiolate, fork 5 rooted, sessile or petiolate with respect to median-cubital (m-cu) crossvein; discoidal cell closed, median cell open, thyridial cell open or closed. Hind wing venation (Fig. 18D): forks 2 and 5 present.

Abdomen. Without remarkable structures.

Male genitalia. Sternum IX in lateral view rounded, quadrate, or deltoid, in ventral view with varying shapes, from trapezoidal to rectangular, with anterior median concavity of varying length and width, and smooth posterior concavity; may possess sclerotized chiasm at mid length. Tergum X membranous, fused or partially fused with intermediate appendage forming a complex structure, laterally sclerotized and setose. Intermediate appendage complex with varying shapes and sizes relative to segment IX. Preanal appendage bipartite; dorsolateral process with varying lengths, shapes, with or without spines or secondary branches; ventromesal process less setose, less sclerotized, with stout setae, usually without spines and shorter than dorsolateral process. Inferior appendage setose, in lateral view with apex round, tapered, oblique, or truncate, may possess notch; ventrally with varying shapes of apex and curvatures; basodorsal lobe of the inferior appendage usually present, elongate or rounded, usually bearing a row of stout setae; apicomesal lobe usually present, with sclerotized structure with varying shapes, usually bearing stout setae. Phallus usually elongate, sometimes broad; phallic sclerite usually present and distinct, variously shaped; endothecal membrane with or without spines of varying numbers, lengths, shapes and robustness.

Species descriptions

Cernotina abbreviata Flint 1971

(Fig. 19)

Flint, 1971:40 [Type locality: Brazil [Edo. Pará, headwaters of Rio Paru], Igarapé Aepuku Äku; NMNH; ♂]. − Paprocki et al., 2004:15 [checklist]. − Paprocki and França, 2014:79 [checklist].

This species seems unique within the genus, due to the combination of characters such as the triangular DLP pointing ventrad, with two posteriad spines, the apical spine on the arched intermediate appendage, and the clavate inferior appendage. *Cernotina lazzari* bears resemblance to *C. abbreviata*, but the DLP on that species is oriented posteriad, and the intermediate appendage, despite also having an apical spine, is rounded, rather than curved.

Adult. Length of forewing 3.5 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 19A, C) height about 3/4ths of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 19A, B) membranous, shorter than segment IX, divided mid-dorsally, with apical spine; dorsal surface with microsetae; in lateral view slightly curved ventrad, basally broad, with ventral margin membranous, with abrupt constriction at mid-length, tapering to round apex. Preanal appendage (Fig. 19A, B) composed of two lobes; dorsolateral process shorter than segment IX, and 2 subapical spines, with no apical spines; in lateral view lanceolate; ventromesal process longer than dorsolateral process, produced dorsolaterally, with stout setae, basally fused medially. Inferior appendage (Fig. 19A, C) shorter than segment IX; in lateral view hatchet-shaped, apically rounded dorsally, with ventral margin straight; in ventral view, internal margin of appendage directed posteriad, and apex round, with sclerotized apicoventral margin; anterior basal plate barely surpassing posterior margin of sternum IX; apicomesal lobe small, truncate, laterally overlapped with main body of appendage, bearing 2 stout setae, fused with sclerotized process; basodorsal lobe oblong in lateral view, with about half length of body of appendage, directed posterodorsad, bearing row of setae. Phallus (Fig.

19D, E) narrow, straight, with 2 elongate phallic spines, free in phallic membrane; phallotremal sclerite anterodorsal, ovate, with 2 apparent lateral processes in dorsal view.

Material examined: Brazil: Igarapé Aepuku Aku, bei A-367 (A-367: Bach ausgetrocknet 2-3 m. breit, grobsandiger Boden. Vereinzelt Pfutzen mit auch mit Wasserpflanzen), 15-16.iv.1963, lichtfang, E.J. Fittkau (A-368) – holotype male [alcohol] (NMNH).

Distribution: Brazil.

Cernotina acalyptra Flint 1971

(Fig. 20)

Flint, 1971:34 [Type locality: Brazil [Edo. Amazonas], Rio Marauiá, Cachoeira Rio Irapirapí; NMNH; ♂]. − Flint, 1974:43 [♂; distribution]. − Paprocki et al., 2004:15 [checklist]. − Paprocki and França, 2014:79 [checklist].

This species is similar to *C. cystophora* and *C. encrypta* by the fusion of the DLP with the intermediate appendage complex, forming an auricular structure with peg-like setae on its ventromesal surface. It differs from *C. cystophora* mostly by the lack of spines in the phallic membrane in *C. acalyptra*, while the other species has many minute hair-like spines. The difference with *C. encrypta* is the shape of the inferior appendage in ventral aspect, being curved mesad with mesal concavity in *C. acalyptra* and straight in *C. encrypta*.

Adult. Length of forewing 3.0 mm, n = 2. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 20A, C) height about 3/4ths of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with shallow, broad concavity. Intermediate appendage (Fig. 20A, B) semi-membranous, fused with dorsolateral lobe of preanal appendage, longer than segment IX, divided mid-dorsally; dorsal surface with microsetae and lateroventral surface with peg-like setae; in lateral view slightly curved ventrad, basally narrow, broad at mid-length, with round apex. Preanal appendage (Fig. 20A, B) not divided in two lobes; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, with stout setae, basally fused medially. Inferior appendage (Fig. 20A, C) longer than segment IX; in lateral view oblong, apically rounded, with ventral margin straight; in ventral view, internal margin of appendage curved mesad, and apex acute; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe small, round, laterally overlapped with main body of appendage, glabrous; basodorsal lobe absent. Phallus (Fig. 20D, E) narrow, straight, with no spines; phallotremal sclerite absent.

Material examined: Brazil: Rio Maruiá, Cachoeira Rio Irapirapí, 4 Jan. 1963 E.J. Fittkau (A-456) – holotype male [alcohol] and 1 paratype male (NMNH); Rio Marauiá, Cachoeira Tucumã bei Regenwetter, 1 Jan. 1963, Lichtfang (A-450) – 1 paratype male (NMNH).

Distribution: Brazil, Suriname.

Cernotina aestheticella Sykora 1998

(Fig. 21)

Sykora, 1998:99 [Type locality: Peru, Departemento Loreto, bank of Yanomono Creek just below Explorama Lodge; CMNH; ♂].

This species bears some resemblance to *C. declinata* by the shape of the DLP, with apical spine and a ventral branch also produced into an apical spine, and the arched intermediate appendage. They differ by the size of the ventral branch of the DLP, being short and apical in *C. aestheticella*, seeming as a bifid apex of the DLP, and basal and long in *C. declinata*. They also differ by the presence of a lateral serrated branch of the VMP in this species.

Material examined: No specimens examined. Diagnosis from Sykora (1996).

Distribution: Peru.

Cernotina anhanguera Camargos, Barcelos-Silva and Pes 2013

(Fig. 22)

Camargos, Barcelos-Silva and Pes in Barcelos-Silva et al., 2013:117 [Type locality: Brazil, Goiás, Niquelândia, Pires stream, Anglo American/Codemin, 14º11'0.59"S, 48º21'4.40"W; INPA; ♂]. − Paprocki and França, 2014:79 [checklist].

This species is somewhat similar to *C. spicata* and *Cernotina* n. sp. 8, especially due to the apical spine on the main body of the DLP and another apical spine on its secondary process. However, *C. anhanguera* has its secondary branch of the DLP about as long as the main body of the dorsolateral process, while the other two species have that structure half as long.

Adult. Length of forewing 3.5 – 3.9 mm, n = 3. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 22A, C) height ca. half of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with deep, narrow concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 22A, B) membranous, about as long as segment IX, divided mid-dorsally, setose; dorsal surface with microsetae; in lateral view slightly curved ventrad, basally broad, tapering from anterior quarter to round apex, with strong apical setae. Preanal appendage (Fig. 22A, B) each composed of two lobes; dorsolateral process longer than segment IX, with 1 apical spine, secondary branch on dorsolateral process present, ventral, each with 1 apical spine; in lateral view linear; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, produced dorsolaterally, with stout setae, in row on posterior margin, not fused on medially. Inferior appendage (Fig. 22A, C) about as long as segment IX; in lateral view oblong, apically rounded, with ventral margin straight; in ventral view, internal margin of appendage curved mesad, and apex round; anterior basal plate almost reaching anterior margin of sternum IX; truncate, laterally exposed, bearing 2 stout setae, with hooked sclerotized process, curved posteromesad; basodorsal lobe oblong in lateral view, with apex rounded, shorter than half of body of appendage, directed dorsad. Phallus (Fig. 22D, E) broad, straight, with 2 elongate phallic spines, free in phallic membrane; phallotremal sclerite anterodorsal, small, ovate, with 2 apparent lateral processes in dorsal view.

Material examined: Brazil: Goiás, Niquelândia: Pires stream, Anglo American/Codemin, 14º11'0.59"S, 48º21'4.40"W, 11-12.ix.2012, L.M. Camargos, M.C. Almeida, and C.E.K. de Oliveira, Pennsylvania trap – 1 holotype male and 1 paratype male [alcohol] (INPA); 1 paratype male (MZSP).

Distribution: Brazil.

Cernotina antonina Holzenthal and Almeida 2003

(Fig. 23)

Holzenthal and Almeida, 2003:23 [Type locality: Brazil, Paraná, Atonina, Reserva de Sapitanduva, 25° 28'S, 48° 50'W, el. 60 m; DZUP; ♂]. − Paprocki et al., 2004:15 [checklist]. − Barcelos-Silva et al., 2012:1279 [distribution]. − Souza et al., 2013:8 [distribution]. — Paprocki and França, 2014:79 [checklist].

This species bears similarities with *C. decumbens*, *C. trispina* and *Cernotina* n. sp. 5. The presence of the setose posterodorsal structure in *C. antonina* is similar to that of *C. decumbens*. However, the DLP in *C. antonina* lacks a secondary process such as in *C. decumbens*, having both the apical and preapical spine in the main body of the DLP. Such process and spine pattern is more similar to that of *C. trispina*. But this species does not have the setose posterodorsal structure and its DLP and intermediate appendage are relatively shorter, while the VMP is much longer than that of *C. antonina*. Lastly, the species is more similar to *Cernotina* n. sp. 5, with similar pattern of spines on the DLP, even with elongate hair-like setae around the spines, although the DLP of this species broadens at the apex, while the process in *C. antonina* is continuously elongate.

Adult. Length of forewing 4.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 23A, C) height about 3/4ths of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with shallow, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 23A, B) membranous, longer than segment IX, divided mid-dorsally, setose, bearing densely setose basomesal tuft; dorsal surface with microsetae; in lateral view slightly curved ventrad, basally broad, tapering apically, with strong apical setae. Preanal appendage (Fig. 23A, B) each composed of two lobes; dorsolateral process longer than segment IX, with 1 apical spine, and 1 subapical spine; in lateral view linear; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, produced dorsolaterally, with stout setae, not fused on medially. Inferior appendage (Fig. 23A, C) shorter than segment IX; in lateral view rectangular, apically truncate, with ventral margin straight; in ventral view, internal margin of appendage straight, and apex oblique, with sclerotized apicoventral margin; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe large, truncate, laterally exposed, bearing 5 stout setae, fused with sclerotized process; basodorsal lobe oblong in lateral view, with apex rounded, with about same length of body of appendage, directed posteriad, bearing setae. Phallus (Fig. 23D, E) narrow, straight, with 3 elongate phallic spines, free in phallic membrane; phallotremal sclerite anterodorsal, small, ovate, with 2 apparent lateral processes in dorsal view.

Material examined: Brazil: Minas Gerais: Rio Santo Antônio, downstream from Morro do Pilar, 19º08.134'S, 43º21.256'W, el. 530 m, 17.x.2000, Paprocki & Ferreira – 1 paratype male [alcohol] (UMSP000100635) (UMSP); Rio Cipó (Cachoeira Baixo), Cardeal Mota, Serra do Cipó, LAT -19.342550, Long -43.642180, el. 750 m, 10.xi.2001, Holzenthal, Amarante, Blahnik & Paprocki – 1 male [alcohol] (UMSP000092877) (UMSP); 1 male [alcohol] (UMSP000093136) and 1 female [alcohol] (UMSP000093136) (UMSP); Rio Paraúna, 3km S Santana do Riacho, Lat -19.183100, long -43.724750, el. 650 m, 11.xi.2001, Holzenthal, Amarante, Blahnik & Paprocki – 2 males [alcohol] (UMSP).

Distribution: Brazil.

***Cernotina artiguensis* Angrisano 1994**

(Fig. 24)

Angrisano, 1994:135 [Type locality: Uruguay, Depto. Artigas, Sepulturas, Picada del Negro Muerto, orilla río Cuareim; FHCU; ♂].

This species bear similarities with *C. carbonelli* on the presence of apical spine on the intermediate appendage, as well as preapiacal and apical spines on the DLP. They can be differentiated by the fusion of the DLP with the intermediate appendage complex in *C. artiguensis*, while such structures are separated in the other species, as well as the inferior appendage, large and not curving mesad in ventral aspect as in *C. carbonelli*.

Material examined: No specimens examined. Diagnosis from Angrisano 1994.

Distribution: Uruguay.

Cernotina aruma Santos and Nessimian 2008

(Fig. 25)

Santos and Nessimian, 2008:30 [Type locality: Brazil, Amazonas, Manaus, Igarapé Arumã, tributary to Rio Cuieiras, 02º30'55.2"S, 60º15'44.4"W; INPA; ♂]. − Paprocki and França, 2014:79 [checklist].

This species bears resemblance with *C. filiformis* and *C. flexuosa*, due to the long VMP with apical spine, while the DLP is short and broad. *C. aruma* differs from the *C. filiformis* and *C. flexuosa* by having the VMP somewhat broad and straight, instead of slender and sinuous as in the other species.

Adult. Length of forewing 2.7 – 3.0 mm, n = 2. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 25A, C) height about half of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with deep, broad concavity, without sclerotized ventral ridge. Tergum X fused with intermediate appendage. Intermediate appendage (Fig. 25A, B) membranous, longer than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view linear, tapering to round apex, with strong apicoventral setae. Preanal appendage (Fig. 25A, B) each composed of two processes; dorsolateral process shorter than segment IX; in lateral view oblong, straight; in dorsal view straight; ventromesal process longer than dorsolateral process, ventromesal process longer than inferior appendage, elongate, with stout setae, in row on mesal margin, bearing apical spine, broadly separated at mid line. Inferior appendage (Fig. 25A, C) about as long as segment IX; in lateral view subrectangular, apically truncate, with ventral margin straight; in ventral view, internal margin of appendage sinuous, and apex truncate; anterior basal plate almost reaching anterior margin of sternum IX; apicomesal lobe large, elongate, laterally exposed, bearing stout setae, entirely sclerotized; basodorsal lobe absent. Phallus (Fig. 25 D, E) broad, slightly bent at mid-length, with 3 elongate phallic spines, free in phallic membrane; phallotremal sclerite anterodorsal, large, as 2 parallel arms with anterior third enlarged.

Material examined: Brazil: Amazonas, Manaus, tributary to Rio Cuieiras, 02°04’13.9”S 60°23’01.4”W, 19.viii.2004, J.L.Nessimian & L.Fidelis, light trap – 1 paratype male [alcohol] (INPA).

Distribution: Brazil.

***Cernotina astera* Ross 1941**

(Fig. 26)

Ross, 1941:76 [Type locality: United States, Texas, San Felipe Springs, Del Rio; INHS; ♂]. − Bueno-Soria and Flint, 1978:198 [distribution]. − Maes and Flint, 1988:3 [distribution]. − Maes, 1999:1188 [checklist]. − Bowles et al., 2007:23 [distribution; biology]. — Chamorro-Lacayo et al., 2007:46 [checklist]. –Bueno-Soria, 2010:28 [male illustrated].

This species is similar to *C. chiapaneca*, especially due to the shape of the inferior appendage and the apical third of the DLP abruptly constricted. The two species differ by the deep cleft between the main body of the DLP and the apical third, which originates subapically, similar to a mesal process. *C. astera* is also similar to *C. zanclana* in many structures, such as the VMP broadly separated, the general shape of the inferior appendage, the numerous spines in the phallotremal membrane and the abrupt constriction in the DLP. They differ by the shape of such constriction, being more rounded and smooth in *C. zanclana*, and more truncate in *C. astera*, being visible also in dorsal view. The VMP of the preanal appendage in *C. astera* is also truncate in lateral view, while it is more dorsally produced in the other species.

Adult. Length of forewing 4.5 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 26A, C) height about 3/4ths of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Tergum X fused with intermediate appendage. Intermediate appendage (Fig. 26A, B) membranous, shorter than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view digitate, with strong apicoventral setae. Preanal appendage (Fig. 26A, B) each composed of two processes; dorsolateral process about as long as semgment IX; in lateral view caudate, abruplty constricted on apical third, apically tapered into spine, straight; in dorsal view strongly curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, laterally truncate, mesally produced dorsad, with stout setae, in row on mesal margin, broadly separated at mid line. Inferior appendage (Fig. 26A, C) longer than segment IX; in lateral view lanceolate, apically notched, with ventral margin straight; in ventral view, internal margin of appendage curved mesad, and apex oblique, with sclerotized apicoventral margin; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe large, mesobasally auricular, apically triangular, laterally merged with with notched apex, bearing several stout setae, with triangular portion sclerotized; basodorsal lobe clavate in lateral view, with apex rounded, with about 3/4 length of body of appendage, directed dorsad, and mesad, bearing tuft of setae apically. Phallus (Fig. 26D, E) narrow, slightly bent at mid-length, with more than 15 elongate phallic spines, free in phallic membrane; phallotremal sclerite anterodorsal, small, as 2 symmetrical hooks in dorsal view.

Material examined: United States: San Felipe Springs, Del Rio, Texas, 19.iv.1939, H.H. & J.A. Ross – holotype male [alcohol] and 1 paratype male [alcohol] (INHS); **Mexico:** Tamaulipas, Río Frio at La Poza Azul nr. Gomez Farias, 18.v.1989, S.C. Harris, A. Contreras, det. S.W. Hamilton 1991 – 1 male [alcohol] (UMSP); Nuevo Leon, Río Ramos, at Las Adjuntas, 4.5 km SE Puerto Genovevo, Mpis de Santiago, 25º18'N, 100º08'26"W, 12.v.1989, S.C. Harris, A. Contreras, det. S.W. Hamilton 1991 – 3 males [alcohol] (UMSP); **Nicaragua:** Jinotega, Cerro Muzú, lat 14.550000, long -85.116670, el. 220 m, 7-10.ix.1997, Maes & Hernandez – 1 male [alcohol] (UMSP000063776) (UMSP).

Distribution: Mexico, Nicaragua, U.S.A.

Cernotina attenuata Flint 1971

(Fig. 27)

Flint, 1971:36 [Type locality: Brazil [Edo. Amazonas], Igarapé, Barro branco; NMNH; ♂]. − Paprocki et al., 2004:15 [checklist]. − Paprocki and França, 2014:79 [checklist].

This species is similar to *C. bispicata*, *Cernotina* n. sp. 14 and *C. declinata*, by having a short mesobasal secondary process on the DLP. It differs from *C. bispicata* by the shape of the VMP, being laterally bifid in *C. attenuata* and truncate in the other species, and by the number of spines, being two elongate apical spines and 4 shorter basal spines in *C. attenuata* and only two elongate spines in *C. bispicata*. *C. attenuata* differ from *Cernotina* n. sp. 14 by the ventral curvatures of the intermediate appendage complex and the main body of the DLP, the lack of the aforementioned shorter basal phallic spines, and the very elongate and curving apicomesal process of the inferior appendage in *Cernotina* n. sp. 14. Finally, the species also differs from *C. declinata* especially by its strong ventral curvature of the indermediate appendage complex and the truncate apex of the inferior appendage, while *C. attenuata* has such apex rounded.

Adult. Length of forewing 3 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 27A, C) height about half of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Tergum X fused with intermediate appendage. Intermediate appendage (Fig. 27A, B) membranous, about as long as segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view linear, with round apex. Preanal appendage (Fig. 27A, B) each composed of two processes; dorsolateral process longer than segment IX, bearing 1 apical spine, secondary branch on dorsolateral process present, ventral, acute, short, with 1 apical spine; in lateral view linear, slender, tapered from base, straight; in dorsal view slightly curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, produced dorsolaterally and ventromesally, with stout setae, on apex, basally fused at mid line. Inferior appendages (Fig. 27A, C) longer than segment IX; in lateral view oblong, apically rounded, with ventral margin slightly concave; in ventral view, internal margin of appendage straight, and apex oblique; anterior basal plate almost reaching anterior margin of sternum IX; apicomesal lobe small, auricular, laterally overlapped with main body of appendage, bearing 6 stout setae, entirely sclerotized; basodorsal lobe oblong in lateral view, with apex rounded, surpassing body of appendage, directed posterodorsad, bearing row of setae. Phallus (Fig. 27D, E) broad, straight, with 2 elongate phallic spines, free in phallic membrane, and 4 stout conical spines, in single membranous pouch; phallotremal sclerite anterodorsal, small, as 2 parallel sinuous lines in dorsal view.

Material examined: Brazil: Igarapé Barro Branco, 8-9.v.1961, E.J. Fittkau (A-175-1) – holotype male [alcohol] (NMNH); Rio Branquinho, bei Cachoeira, 21.vii.1961, 1961 Lichtfang 18.30 Uhr – 19.30 Uh (A-209-a) – 1 paratype male [alcohol] (NMNH); Rio Branquinho, Lager Tapirí, 22.vii.1961, Lichtfang (A-213) – 6 male paratypes [alcohol] (NMNH).

Distribution: Brazil.

Cernotina bibrachiata Flint 1971

(Fig. 28)

Flint, 1971:37 [Type locality: Brazil [Edo. Amazonas], Manaus, Cachoeira do Gigante; NMNH; ♂]. − Sykora, 1998:102 [distribution]. − Paprocki et al., 2004:15 [checklist]. −Paprocki and França, 2014:80 [checklist].

This species is easily characterized by the bifid apex of the DLP, with apical spines at each point. Differently than *C. attenuata*, *C. bispicata* and other species with two processes ending in apical spines, *C. bibrachiata* has a bifurcation subapically, and each point has equal length, making it difficult to determine which is the secondary process and which is the main body of the DLP. Some species such as *C. chelifera* and *C. subapicalis* have two bifid spines at the apex of the DLP, but both species lack the bifid process that *C. bibrachiata* possess.

Adult. Length of forewing 3.5 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 28A, C) height about half of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with deep, narrow concavity, with sclerotized ventral ridge. Tergum X fused with intermediate appendage. Intermediate appendage (Fig. 28A, B) membranous, about as long as segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view curved ventrad, basally broad, tapering to oblique apex directed ventrad, with strong apicoventral setae. Preanal appendage (Fig. 28A, B) each composed of two processes; dorsolateral process longer than segment IX, bearing 2 apical spines, 1 on each apical arm; in lateral view lanceolate, with apex bifid, straight; in dorsal view straight; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, produced dorsolaterally, with stout setae, in row on mesal margin, basally fused at mid line. Inferior appendage (Fig. 28A, C) longer than segment IX; in lateral view oblong, apically rounded, with ventral margin straight; in ventral view, internal margin of appendage slightly curved mesad, and apex sub-truncate; anterior basal plate barely surpassing posterior margin of sternum IX; apicomesal lobe small, truncate, laterally overlapped with main body of appendage, bearing 2 stout setae, entirely sclerotized; basodorsal lobe subtriangular in lateral view, with apex rounded, with about 3/4 length of body of appendage, directed posterodorsad, bearing row of setae. Phallus (Fig. 28D, E) tapering apically, curved ventrad, with 3 elongate phallic spines, free in phallic membrane; phallotremal sclerite anterodorsal, small, as 2 parallel sinuous lines in dorsal view.

Material examined: Brazil: Manaus, Cachoeira do Gigante, 3.vii.1961, E.J. Fittkau, Lichtfang (A-200) – holotype male [alcohol] (NMNH).

Distribution: Brazil, Peru.

Cernotina bispicata Camargos, Barcelos-Silva and Pes 2013

(Fig. 29)

Camargos, Barcelos-Silva and Pes in Barcelos-Silva et al., 2013:120 [Type locality: Brazil, Goiás, Niquelândia, Fazenda Horto Aranha, Anglo American/Codemin, 14º25'12.00"S, 48º44'9.00"W; INPA; ♂]. − Paprocki and França, 2014:80 [checklist].

This species bears similarities with *C. anhanguera* and *C. attenuata*, especially by the roughly straight DLP with a basoventral secondary process, both with spines. It differs from *C. anhanguera* especially by the length of that secondary process, being about half as long as the main body of the appendage in *C. bispicata*, not as long as the main body such as in the other species. The difference from *C. bispicata* and *C. attenuata* is greater in the shape of the VMP in lateral view, as it is truncate, and not bifid as the other species.

Adult. Length of forewing 3.5 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 29A, C) height about 3/4ths of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with shallow, broad concavity, with sclerotized ventral ridge. Tergum X fused with intermediate appendage. Intermediate appendage (Fig. 29A, B) membranous, longer than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view clavate, with base narrow, enlarging at apex, with strong apicoventral setae. Preanal appendage (Fig. 29A, B) each composed of two processes; dorsolateral process longer than segment IX, bearing 1 apical spine, secondary branch on dorsolateral process present, mesal, acute, short, with 1 apical spine; in lateral view linear, slender, tapered from base, slightly curved dorsad; in dorsal view slightly curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, with stout setae, in row on posterior margin, basally fused at mid line. Inferior appendage (Fig. 29A, C) longer than segment IX; in lateral view rectangular, apically truncate, with ventral margin slightly concave; in ventral view, internal margin of appendage slightly curved mesad, and apex with mesal margin slightly excavated, with mesal lobe-like glabous structure; anterior basal plate almost reaching anterior margin of sternum IX; apicomesal lobe large, auricular, laterally exposed, bearing 7 stout setae, entirely sclerotized; basodorsal lobe oblong in lateral view, with apex rounded, with about 3/4 length of body of appendage, directed dorsad, bearing row of setae. Phallus (Fig. 29D, E) broad, straight, with 2 elongate phallic spines, each in membranous pouch; phallotremal sclerite anterodorsal, small, ovate, with 2 apparent lateral processes in dorsal view.

Material examined: Brazil: Goiás, Niquelândia, Fazenda Horto Aranha, Anglo American/Codemin, 14º25'12.00"S, 48º44'9.00"W, [el. 554 m] 18-19.i.2013, L.M. Camargos, M.C. Almeida, and C.E.K. de Oliveira, Pennsylvania trap – holotype male [alcohol] (INPA).

Distribution: Brazil.

Cernotina cacha Flint 1971

(Fig. 30)

Flint, 1971:35 [Type locality: Brazil [Edo. Amazonas], Rio Marauiá, Endstation vor larger Cachoeira; NMNH; ♂]. − Blahnik et al., 2004:5 [distribution]. − Paprocki et al., 2004:15 [checklist]. − Angrisano and Sganga, 2007:15 [♂; distribution]. − Paprocki and França, 2014:80 [checklist].

This species bears similarities with *C. uara* by the general shape of the intermediate appendage complex, the VMP, the inferior appendage and the relative length of the sternum IX in lateral. However, *C. cacha* lacks the subapical elongate branch in the DLP that *C. uara* has. In addition, that process is more attenuate in *C. cacha*.

Adult. Length of forewing 2.5 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 30A, C) height about half of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with shallow, broad concavity, with sclerotized ventral ridge. Tergum X fused with intermediate appendage. Intermediate appendage (Fig. 30A, B) membranous, longer than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view slightly curved ventrad, tapering to round apex, with strong apicoventral setae. Preanal appendage (Fig. 30A, B) each composed of two processes; dorsolateral process longer than segment IX, bearing apical and subapical stout setae; in lateral view lanceolate, straight; in dorsal view straight; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, with stout setae, in row on posterior margin, basally fused at mid line. Inferior appendage (Fig. 30A, C) longer than segment IX; in lateral view lanceolate, smoothly tapered to round apex, with ventral margin straight; in ventral view, internal margin of appendage sinuous, and apex round; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe large, elongate, laterally almost entirely overlapped with main body of appendage, with sclerotized tip exposed, glabrous, entirely sclerotized, curved posteromesad; basodorsal lobe oblong in lateral view, with apex rounded, with about 3/4 length of body of appendage, directed posterodorsad, bearing row of setae. Phallus (Fig. 30D, E) broad, slightly bent at mid-length, with elongate phallic spine, free in phallic membrane; phallotremal sclerite anterodorsal, small, as 2 parallel sinuous lines in dorsal view.

Material examined: Brazil: Rio Marauiá, Endstation vor langer Cachoeira, Fluß tritt hier aus dem Gebirge mit starkem Gefälle, 24.i.1963, E.J. Fittkau, Lichtfang (A-496) – 1 holotype male [alcohol] (NMNH); Minas Gerais, Rio Santo Antônio, downstream from Morro do Pilar, lat -19.135570, long -43.354270, el. 530 m, 17.x.2000, Paprocki & Ferreira – 1 male [alcohol] (UMSP000200418) and 11 females [alcohol] (UMSP000200418F) (UMSP).

Distribution: Argentina, Brazil.

Cernotina cadeti **Flint 1968**

(Fig. 31)

Flint, 1968b:20 [Type locality: St. Lucia, Vergallier R, Marquis; NMNH; ♂]. − Flint and Sykora, 1993:49 [checklist]. − Botosaneanu, 2002:95 [checklist].

This species is similar to the other Caribbean species *C. lutea*, in their branched DLP with dorsal and ventral long hooks. They differ by the lack of the lateral spiny third branch on the DLP in *C. cadeti*, while the other species possesses it.

Adult. Length of forewing 3.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 31A, C) height about 3/4ths of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, with smooth lateral concavity, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Tergum X fused with intermediate appendage. Intermediate appendage (Fig. 31A, B) membranous, shorter than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view linear, with round apex. Preanal appendage (Fig. 31A, B) each composed of two processes; dorsolateral process shorter than segment IX, bearing 1 apical spine, secondary branch on dorsolateral process present, ventral, linear, short, tapered into spine apically; in lateral view round at base, constricting into filiform process tapered into spine, strongly curved ventrad; in dorsal view strongly curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, oblong, with stout setae, on apex, broadly separated at mid line. Inferior appendage (Fig. 31A, C) about as long as segment IX; in lateral view elongate, broader subapically, with obliquely round apex, with ventral margin straight; in ventral view, internal margin of appendage slightly curved mesad, and apex oblique; anterior basal plate barely surpassing posterior margin of sternum IX; apicomesal lobe small, auricular, with sclerotized hook apically, laterally exposed, bearing 2 stout setae, curved anteromesad; basodorsal lobe subtriangular in lateral view, with apex rounded, shorter than half of body of appendage, directed posterodorsad, bearing tuft of setae apically. Phallus (Fig. 31D, E) narrow, straight, with no spines; phallotremal sclerite absent.

Material examined: St. Lucia: Vergallier River, near Marquis, 31.vii.1963, Flint and Cadet – holotype male [alcohol] (Type 69886) (NMNH).

Distribution: St. Lucia.

Cernotina calcea Ross 1938

(Fig. 32, 33)

Ross, 1938a:137 [Type locality: United States, Illinois, Kankakee; INHS; ♂]. − Bueno-Soria and Flint, 1978:198 [distribution]. − Maes and Flint, 1988:3 [distribution]. − Maes, 1999:1188 [checklist]. − Bowles et al., 2007:23 [distribution; biology]. − Chamorro-Lacayo et al., 2007:46 [checklist]. –DeWalt et al., 2016:53 [checklist]. –Denson et al., 2016:7 [checklist].

This species is the genotype of *Cernotina*, and it is unique in its male morphology. The DLP curved postero-obliquely, with three to five stout internal stacked spines at the mid-length of that process is only observed in *C. calcea*.

Adult. Length of forewing 4.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 32A, C, 33A) height about 3/4ths of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Tergum X fused with intermediate appendage. Intermediate appendage (Fig. 32A, B, 33A, B) membranous, shorter than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view directed posterodorsad, linear, with round apex, with strong apicoventral setae. Preanal appendage (Fig. 32A, B, 33A, B) each composed of two processes; dorsolateral process about as long as semgment IX, bearing 1 apical spine, with 3 long stout spines at midlength, secondary branch on dorsolateral process present, mesal, triangular, short; in lateral view lanceolate, slender, slightly curved ventrad, then apically directed straight; in dorsal view strongly curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, with stout setae, in row on posterior margin, not fused at mid line. Inferior appendage (Fig. 32A, C, 33A) shorter than segment IX; in lateral view oblong, with base narrower than apex, slighly enlarged at mid length, apically notched, with ventral margin straight; in ventral view, internal margin of appendage sinuous, and apex obliquely subtruncate, with sclerotized apicoventral margin; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe large, gobular, with mid mesal concavity, laterally merged with with notched apex, bearing stout setae, with apex sclerotized; basodorsal lobe oblong in lateral view, with apex narrowed, shorter than half of body of appendage, directed dorsad, bearing row of setae. Phallus (Fig. 32D, E, 33C, D) narrow, straight, with no spines; phallotremal sclerite anterodorsal, small, as 2 parellel sinuous lines, constricted at mid lenght and laterally curved anteriad at apex.

Material examined: United States: Illinois, Kankakee, along Kankakee River, 21.vii.1935, Ross & Mohr – holotype male [alcohol] (INHS); Oklahoma, Turner Falls State Park, along Honey Creek, 2.vi.1937, H.H. Ross – 1 paratype male [alcohol]

(INHS); **Mexico:** Nuevo Leon, Spring along road above Cola de Caballo, 27.v.1991, Harris & Contreras, det. S.W. Hamilton 1991 – 1 male [alcohol] (UMSP).

Distribution: Mexico, Nicaragua, U.S.A.

Cernotina caliginosa **Flint 1968**

(Fig. 34)

Flint, 1968a:24 [Type locality: Jamaica, St. Andrew, Hardwar Gap, Dicks Pond Trail; NMNH; ♂]. − Flint, 1968b:80 [checklist]. − Botosaneanu, 2002:95 [checklist].

The male genitalia of this species is similar to that of *C. danieli*, *C. mastelleri*, and *C. waorani* by the lack of BDL, and the apex of the inferior appendage is strongly directed mediad. *C. caliginosa* differ from *C. danieli* by the lack of a secondary branch on the VMP. It differs from *C. mastelleri* by the shape of the DLP, which has a cleft at mid-length, while *C. caliginosa* has the process without any cleft in dorsal view. Finally, it differs from *C. waorani* by having a shallow and broad anterior concavity on segment IX, and by lacking the basomesal flap-like secondary branch of the DLP.

Adult. Length of forewing 4.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 34A, C) height about half of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, with smooth lateral concavity, anteroventral margin with shallow, broad concavity, with sclerotized ventral ridge. Tergum X fused with intermediate appendage. Intermediate appendage (Fig. 34A, B) membranous, about as long as segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view slightly curved ventrad, apically pointed posterioad, broad at base, slightly tapered to round apex. Preanal appendage (Fig. 34A, B) each composed of two processes; dorsolateral process about as long as semgment IX, bearing 1 apical spine; in lateral view lanceolate, slightly broader at mid length, smoothly tapered apically; in dorsal view slightly curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, with stout setae, in row on posterior margin, entirely fused at mid line. Inferior appendage (Fig. 34A, C) longer than segment IX; in lateral view rectangular, apically truncate, with ventral margin slightly curved dorsad; in ventral view, internal margin of appendage curved mesad, and apex truncate, projecting mesad, with sclerotized apicoventral margin; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe small, round, with broad sclerotized hook apically, curved mesad, laterally exposed, bearing 3 stout setae; basodorsal lobe globular in lateral view, shorter than half of body of appendage, displaced subapically to main body of inferior appendage, bearing row of setae. Phallus (Fig. 34D, E) narrow, slightly bent at mid-length, with elongate phallic spine, and several minute hair-like spines free in membranous apex; phallotremal sclerite absent.

Material examined: Jamaica: St. Andrew Parish, Hardwar Gap, Dicks Ponds Trail, July 25, 1962, Farr, O. & R. Flint – holotype male [pinned] (NMNH).

Distribution: Jamaica.

Cernotina carbonelli **Flint 1983**

(Fig. 35)

Flint, 1983:32 [Type locality: Uruguay, Dpto. Artigas, Río Cuareim, Sepulturas; NMNH; ♂]. − Angrisano, 1994:137 [distribution].

This species is similar to *C. perpendicularis*, by the presence of apical spine on the intermediate appendage complex, the preapical spine of the DLP, and the three elongate spines in the phallic membrane. They differ especially by the position of the subapical spine in *C. carbonelli*, apically in a short stub-like mesal branch of the DLP, rather than a sessile spine, by the shape of the VMP elongated laterally, rather than truncate with a dorsal and a ventral projection, and by the spine of the AML being shaped as a single cone, instead of a bifid teeth.

Adult. Length of forewing 3.5 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 35A, C) height about 3/4ths of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, with smooth lateral concavity, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Tergum X fused with intermediate appendage. Intermediate appendage (Fig. 35A, B) membranous, longer than segment IX, divided mid-dorsally, setose, with apical spine pointing posterodorsad; with microsetae on dorsal surface; in lateral view curved ventrad, narrow at apex, slowly broadening at round apex. Preanal appendage (Fig. 35A, B) each composed of two processes; dorsolateral process about as long as semgment IX, bearing 1 apical spine, secondary branch on dorsolateral process present, mesal, truncate, short, stub-like, with 1 apical spine; in lateral view fusiform; in dorsal view straight; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, produced dorsolaterally, with stout setae, in row on mesal margin, basally fused at mid line. Inferior appendage (Fig. 35A, C) about as long as segment IX; in lateral view rectangular, apically truncate, with ventral margin slightly concave; in ventral view, internal margin of appendage slightly curved mesad, and apex truncate; anterior basal plate almost reaching anterior margin of sternum IX; apicomesal lobe small, auricular, laterally overlapped with main body of appendage, bearing 3 stout setae, with sclerotized elongate apical spine; basodorsal lobe oblong in lateral view, with apex rounded, with about 3/4 length of body of appendage, directed posterodorsad, bearing row of setae. Phallus (Fig. 35D, E) tapering apically, slightly bent at mid-length, with 3 elongate phallic spines; phallotremal sclerite anterodorsal, small, as 2 symmetrical hooks in dorsal view.

Material examined: Uruguay: Artigas, Río Cuareim, Sepulturas, 15.xii.1952, C.S. Carbonell – holotype male [alcohol] (Type 100497) (NMNH).

Distribution: Uruguay.

Cernotina chelifera Flint 1972

(Fig. 36)

Flint, 1972:231 [Type locality: Argentina, Prov. Misiones, Capioví; NMNH; ♂].

The presence of two apical spines in the DLP in this species bear similarities with *C. subapicalis*, *Cernotina* n. sp. 1, and especially *C. tiputini*. It differs from all the three species by the fusion of most of the mesal margin of the DLP with the lateral margin of the intermediate appendage complex. The number of elongate phallic spines also differ between the species, being 1 in *C. chelifera*, 2 in *C. tiputini* and *Cernotina* n. sp. 1, and 3 spines in *C. subapicalis*.

Adult. Length of forewing 3.5 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 36A, C) height about 3/4ths of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Tergum X fused with intermediate appendage. Intermediate appendage (Fig. 36A, B) semi-membranous, partially fused with dorsolateral lobe of preanal appendage, about as long as segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view broad, apex round, pointing slightly ventrad. Preanal appendage (Fig. 36A, B) each composed of two processes; dorsolateral process shorter than segment IX, bearing 2 apical spines; in lateral view rectangular, dorsally fused with intermediate appendage and segment X complex, with apex bifid, slightly curved ventrad; in dorsal view straight; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, produced dorsolaterally, with stout setae, in row on mesal margin, not fused at mid line. Inferior appendage (Fig. 36A, C) longer than segment IX; in lateral view oblong, apically rounded, with ventral margin straight; in ventral view, internal margin of appendage sinuous, and apex round; anterior basal plate almost reaching anterior margin of sternum IX; apicomesal lobe small, truncate, laterally exposed, bearing several stout setae, entirely sclerotized; basodorsal lobe oblong in lateral view, with apex rounded, with about 3/4 length of body of appendage, directed posterodorsad, bearing row of setae. Phallus (Fig. 36D, E) tapering apically, slightly bent at mid-length, with 1 very long elongate phallic spine; phallotremal sclerite anterodorsal, small, cordate.

Material examined: Argentina: Misiones, Capioví, 5.iv.1971, C.M. & O.S. Flint, Jr. – holotype male [pinned] (Type 72162) and 1 paratype male [alcohol] (NMNH).

Distribution: Argentina.

***Cernotina chiapaneca* Bueno-Soria 2010**

(Fig. 37)

Bueno-Soria, 2010:30 [Type locality: Mexico, Chiapas, Colón El Lagartero,
15º50’303.47”N, 91º52’32.78”W, el. 640 m; CNIN; ♂].

This species is very similar to *C. astera* and *C. zanclana*, in the shape of their inferior appendage in lateral and ventral view, and the DLP curving mesad with a truncate constriction at midlength. They differ however by the presence of a strong cleft in the constriction of the DLP in *C. chiapaneca*, which is absent in the other species.

Material examined: No specimens examined. Diagnosis from Bueno-Soria 2010.

Distribution: Mexico.

Cernotina cingulata Flint 1971

(Fig. 38)

Flint, 1971:41 [Type locality: Brazil [Edo. Amazonas], Rio Branquinho, Lager Tapirí; NMNH; ♂]. − Paprocki et al., 2004:15 [checklist]. − Paprocki and França, 2014:80 [checklist].

This species has a unique combination of characters. It has the intermediate appendage complex with the apex hooked, such as in *C. unguiculata*, however, in *C. cingulata*, those appendages cross apicomedially, and possess a ventral spine at mid-length. This species also bear a densely setose, long rectangular DLP, with a truncate apex bearing two spines ventrally.

Adult. Length of forewing 2.5 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 38A, C) height about half of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Tergum X fused with intermediate appendage. Intermediate appendage (Fig. 38A, B) semi-membranous, shorter than segment IX, divided mid-dorsally, setose, with apical spine, and preapical ventrolateral spine on midlength; with microsetae on dorsal surface; in lateral view linear, with apex tapering to hook-shaped spine. Preanal appendage (Fig. 38A, B) each composed of two processes; dorsolateral process longer than segment IX, bearing 2 apical spines, with numerous slender setae around each spine; In lateral view rectangular, slightly curved ventrad; in dorsal view slightly curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, produced ventrolaterally, with stout setae, in row on mesal margin, not fused at mid line. Inferior appendage (Fig. 38A, C) shorter than segment IX; in lateral view subrectangular, apically subtruncate, with ventral margin deeply excavated; in ventral view, internal margin of appendage curved mesad, and apex oblique; anterior basal plate barely surpassing posterior margin of sternum IX; apicomesal lobe small, auricular, laterally overlapped with main body of appendage, bearing several stout setae, with hooked sclerotized process, curved anteromesad; basodorsal lobe oblong in lateral view, with apex rounded, shorter than half of body of appendage, directed posterodorsad, bearing row of setae. Phallus (Fig. 38D, E) narrow, straight, with 2 elongate phallic spines; phallotremal sclerite anterodorsal, small, as 2 parellel sinuous lines, laterally curved anteriad at apex.

Material examined: Brazil: Rio Branquinho, Lager Tapirí, 22.vii.1961, E.J. Fittkau, Lichtfang, 21.00 – 21.20 Uhr (A-213-4) – holotype male [alcohol] (NMNH); 19.00 – 20.00 Uhr (A-213-2) – 2 male paratypes [alcohol] (NMNH);

Cernotina compressa Flint 1971

(Fig. 39)

Flint, 1971:39 [Type locality: Brazil [Edo. Amazonas], Rio Marauiá, eine Tagesreise unterhalb der Mission S. Antonio; NMNH; ♂]. − Paprocki et al., 2004:15 [checklist]. −Paprocki and França, 2014:80 [checklist].

This species is not similar to any other *Cernotina* species. The combination of characters that make *C. compressa* unique is the processes of the preanal appendage fused in a single appendage, the inferior appendage strongly concave ventrally and recurved dorsally and the presence of curved nail-shaped on the apex of the phallic membrane.

Adult. Length of forewing 3.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 39A, C) height about half of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with shallow, broad concavity, without sclerotized ventral ridge. Tergum X fused with intermediate appendage. Intermediate appendage (Fig. 39A, B) membranous, shorter than segment IX, setose; with microsetae on dorsal surface; in lateral view basally broad, slowly tapering to round apex, with strong apicoventral setae. Preanal appendage (Fig. 39A, B) each composed of two processes; dorsolateral process longer than segment IX, bearing 1 apical spine; in lateral view linear, smootlhy tapering to apex, slightly curved ventrad; in dorsal view curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, merging with dorsolateral process, with stout setae, in row on mesal margin, not fused at mid line. Inferior appendage (Fig. 39A, C) about as long as segment IX; in lateral view oblong, directed posterodorsad, with apex truncate on apicodorsally and round apicoventrally, with ventral margin deeply excavated; in ventral view, internal margin of appendage strongly curved mesad, and apex round; anterior basal plate barely surpassing posterior margin of sternum IX; apicomesal lobe absent; basodorsal lobe appressed to surface of ventral body, with apex slightly sclerotized, with about half length of body of appendage, directed posteriad, bearing setae. Phallus (Fig. 39D, E) broad, slightly bent at mid-length, with elongate phallic spine, and 2 smaller apical spines with perpendicular flatten base; phallotremal sclerite absent.

Material examined: Brazil: Rio Marauiá, eine Tagereise unterhalb der Mission S. Antonio, linkes Ufer, Hütte an einem Schwarzwasserbach, 2.ii.1963, E.J. Fittkau (A-506) – holotype male [alcohol] (NMNH); Igarapé S. Antônio (Cachoeira), 8 Jan. 1963, E.J. Fittkau, Lichtfang (A-470) – 1 paratype male [alcohol] (NMNH).

Distribution: Brazil.

***Cernotina cygnea* Flint 1971**

(Fig. 40)

Flint, 1971:37 [Type locality: Brazil [Edo. Amazonas], Rio Solimões, Ilha Juçara; NMNH; ♂]. − Sykora, 1998:102 [distribution]. − Paprocki et al., 2004:15 [checklist]. −Paprocki and França, 2014:80 [checklist]. –Ríos-Touma et al., 2017:14 [distribution]. –Holzenthal and Calor, 2017:413 [catalog]. – Camargos et al., 2017:7 [distribution].

This species bear similarities with *C. decumbens* and *Cernotina* n. sp. 14, especially by the aspect of intermediate appendage complex, and DLP, with secondary mesal branch and main body of the process both with apical spines. *C. cygnea* differs from *C.*

decumbens most easily by the strong ventral curvature of the main body of the DLP, while such structure in the other species is only slightly sinuous. This species can be separated from *Cernotina* n. sp. 14 by having the main body of the DLP strongly curved mesad, while in the other species, such process is directed posteriad. They also differ on the shape of the sclerotized process on the AML, being truncate in *C. cygnea* and slightly clavate in *Cernotina* n. sp. 14.

Adult. Length of forewing 3.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 40A, C) height about 3/4ths of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Tergum X fused with intermediate appendage. Intermediate appendage (Fig. 40A, B) membranous, shorter than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view linear, curved ventrad, with truncate apex, with strong apicoventral setae. Preanal appendage (Fig. 40A, B) each composed of two processes; dorsolateral process about as long as semgment IX, bearing 1 apical spine, secondary branch on dorsolateral process present, mesoventral, truncate, short, with 1 apical spine; in lateral view round at base, tapering to mid length, with apical half linear, strongly curved ventrad; in dorsal view strongly curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, obliquely truncate, with stout setae, in row on posterior margin, not fused at mid line. Inferior appendage (Fig. 40A, C) about as long as segment IX; in lateral view oblong, apically rounded, with ventral margin straight; in ventral view, internal margin of appendage straight, and apex roundly tapered; anterior basal plate barely surpassing posterior margin of sternum IX; apicomesal lobe small, triangular, laterally exposed, bearing stout setae, entirely sclerotized; basodorsal lobe oblong in lateral view, with apex rounded, with about 3/4 length of body of appendage, directed posterodorsad, bearing row of setae. Phallus (Fig. 40D, E) narrow, curved ventrad, with 2 elongate phallic spines; phallotremal sclerite anterodorsal, small, cordate, with 2 lobes projecting posteriad in dorsal view.

Material examined: Brazil: Rio Solimões, Ilha Juçara, etwa 300 m. entfernt eine Bachmundung (schwarzes Wasser), 3.ix.1961, Lichtfang, E.J. Fittkau (A-255) – holotype male [alcohol] (NMNH); Rio Solimões, etwa 15 km unterhalb Coarí, 13.ix.1961, Lichtfang, E.J. Fittkau (A-261) – 1 paratype male [alcohol] (NMNH); **Ecuador:** Orellana, Reserva de Biodiversidad Tiputini, river slough, Numa trail, lat -0.639540, long -76.148360, el. 260 m, 23.x.2011, Hozenthal & Ríos – 1 male [pinned] (UMSP000098446) (UMSP); Napo, Limoncocha, #126, 14.vi.1977, P.J. Spangler & D.R. Givens – 1 male [alcohol] (NMNH).

Distribution: Brazil, Ecuador, Peru.

Cernotina cystophora Flint 1971

(Fig. 41)

Flint, 1971:35 [Type locality: Brazil [Edo. Amazonas], Rio Branquinho, etwa 2 1/2 Stunden oberhalb Tapirí-Lager; NMNH; ♂]. − Paprocki et al., 2004:15 [checklist]. −Paprocki and França, 2014:80 [checklist].

This species is very similar to *C. acalyptra* and *C. encrypta*, especially by the fusion of the DLP with the intermediate appendage complex, bearing peg-like setae on its ventrolateral margin. *C. cystophora* can be separated from *C. acalyptra* by having the AML expanding beyond the main body of the inferior appendage in lateral view, and it differs from both species by having numerous minute hair-like spines in a single membranous pouch in the phallic membrane.

Adult. Length of forewing 3.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 41A, C) height about 3/4ths of entire male genital complex; anteroventral margin with shallow, broad concavity. Intermediate appendage (Fig. 41A, B) semi-membranous, fused with dorsolateral lobe of preanal appendage, about as long as segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface and lateroventral surface with peg-like setae; in lateral view slightly curved ventrad, basally narrow, broad at mid-length, with round apex. Preanal appendage (Fig. 41A, B) reduced to ventromesal process; in lateral view completely fused with intermediate appendage-tergum X complex; ventromesal process shorter than inferior appendage, truncate, with stout setae, on apex, basally fused at mid line. Inferior appendage (Fig. 41A, C) longer than segment IX; in lateral view lanceolate, apically rounded, with ventral margin slightly concave; in ventral view, internal margin of appendage straight, and apex round; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe large, round, laterally exposed, bearing several stout setae, with hooked sclerotized process, curved posteromesad; basodorsal lobe absent. Phallus (Fig. 41D, E) broad, straight, with no elongate spines, and several minute hair-like spines basal in single membranous pouch; phallotremal sclerite absent.

Material examined: Brazil: Rio Branquinho, etwa 2 ½ Stunden oberhalb Tapirí-Lager, 23.iv.1961, E.J. Fittkau, Zucht der larven aus dem Abschaum (A-169-1) – holotype male [alcohol] (NMNH).

Distribution: Brazil.

Cernotina danieli Flint and Sykora 2004

(Fig. 42)

Flint and Sykora, 2004:52 [Type locality: Dominican Republic, Pedernales Province, Río Mulito, 13 km N Pedernales, 18° 09'N, 71° 46'W, el. 230 m; ♂; ♀]. − Pérez-Gelabert, 2008:302 [checklist]. − Cernotina sp. Flint and Pérez-Gelabert, 1999:43 [erroneously listed as ♂; recte ♀].

This species is similar to *C. caliginosa*, especially by the shape of the inferior appendage in ventral view. However, such appendage in *C. danieli* is longer than the segment IX, while those structures have about the same length in *C. caliginosa*. In addition, *C. danieli* possess a more attenuate DLP, bearing a line of short setae from its base to the apex, and it also possess a ventral branch on the ventromesal lobe of the same appendage.

Adult. Length of forewing 4.5 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 42A, C) height about 3/4ths of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with shallow, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 42A, B) membranous, about as long as segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view slightly curved ventrad, broad at base, tapering to round apex. Preanal appendage (Fig. 42A, B) each composed of two processes; dorsolateral process longer than segment IX, bearing 1 apical spine; in lateral view caudate, slightly curved ventrad; in dorsal view slightly curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, produced dorsolaterally, bearing ventromesal process, with stout setae, entirely fused at mid line. Inferior appendage (Fig. 42A, C) longer than segment IX; in lateral view oblong, apically rounded, with ventral margin slightly curved dorsad; in ventral view, internal margin of appendage strongly curved mesad, and apex truncate, projecting mesad, with mesal lobe-like setous structure; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe small, round, laterally exposed, bearing 3 stout setae, with hooked sclerotized process, curved anteromesad; basodorsal lobe absent. Phallus (Fig. 42D, E) narrow, straight, with no elongate spines, free in phallic membrane; phallotremal sclerite anterodorsal, large, as 2 parallel sinuous lines in dorsal view.

Material examined: Dominican Republic: Pedernales Province, Río Mulito, 13 km N Pedernales, 18º09'N, 71º46'W, el. 230 m, 17.vii.1992, Rawlins et al. – 1 paratype male [alcohol] (NMNH).

Distribution: Dominican Republic.

Cernotina declinata Flint 1971

(Fig. 43)

Flint, 1971:36 [Type locality: Brazil [Edo. Para], Rio Paru, Mission Tiriyós; NMNH; ♂]. − Flint, 1974:48 [♂; distribution]. − Paprocki et al., 2004:15 [checklist]. − Paprocki and França, 2014:80 [checklist].

This species bears similarities with *C. attenuata* and *Cernotina* n. sp. 14, due to the DLP bearing a secondary ventral branch with an apical setae, just as the appendage main body. *C. declinata* differs from the other two species by its intermediate appendage complex strongly curved ventrad, and the apex of the inferior appendage being truncate instead of round. It also differs from *C. attenuata* by the relative length of the main body of the

DLP, being much shorter in *C. declinata*. This species also differs from *Cernotina* n. sp. 14 by the main body of the DLP not being arched in lateral view, and by having the AML enveloped by the inferior appendage in lateral view, not projected dorsally as it is in the other species.

Adult. Length of forewing 3.5 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 43A, C) height about 3/4ths of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 43A, B) membranous, longer than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view perpendicularly curved ventrad, broad at base, tapering to round apex, with strong apicoventral setae. Preanal appendage (Fig. 43A, B) each composed of two processes; dorsolateral process shorter than segment IX, bearing 1 apical spine, secondary branch on dorsolateral process present, mesoventral, elongate, with 1 apical spine; in lateral view lanceolate; in dorsal view slightly curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, produced dorsolaterally, with stout setae, in row on posterior margin, not fused at mid line. Inferior appendage (Fig. 43A, C) about as long as segment IX; in lateral view rectangular, apically truncate, with ventral margin straight; in ventral view, internal margin of appendage straight, and apex round; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe small, elongate, laterally almost entirely overlapped with main body of appendage, with sclerotized tip exposed, bearing 3 stout setae, fused with sclerotized process, curved posteromesad; basodorsal lobe oblong in lateral view, surpassing body of appendage, directed dorsad, bearing row of setae. Phallus (Fig. 43D, E) narrow, slightly bent at mid-length, with no elongate spines, and 2 stout conical spines; phallotremal sclerite anterodorsal, small, with 2 anterior lobes in dorsal view.

Material examined: Brazil: Rio Parú, Mission Tiriyós, 23.iii.1962, E.J. Fittkau, Lichtfang (A-361-2) – holotype male [alcohol] (NMNH); **Venezuela:** Bolívar, Campamento Río Aro, Río Aro, lat 7.624050, Long -64.138733, el. 90 m, 10-11.vii.2010, Holzenthal & Thomson – 1 male [pinned] (UMSP000138010) (UMSP)

Distribution: Brazil, Suriname, Venezuela.

Cernotina decumbens Flint 1971

(Fig. 44)

Flint, 1971:37 [Type locality: Brazil [Edo. Amazonas], Rio Aripuana, Beneficente; NMNH; ♂; as decembens, lapsus calami]. − Paprocki et al., 2004:15 [checklist]. −Paprocki and França, 2014:81 [checklist].

This species resembles *C. bispicata* and *C. trispina* by the presence of straight DLP bearing apical setae, just as its secondary branch. *C. decumbens* differs from *C. bispicata* by the presence of densely setose structure midventrally at the base of the intermediate appendage complex, the relatively shorter main body of the DLP, the presence of elongate slender setae subapically on that process, and the long BDL, surpassing the length of the main body of the appendage, directed posteriad. It differs from *C. trispina* by the presence of a conspicuous secondary medial branch on the DLP, while the other species has the subapical spine originating directly from the mid-length of the main body of the process, the elongate slender setae subapically around the same process and the elongate BDL.

Adult. Length of forewing 3.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 44A, C) height about 3/4ths of entire male genital complex, or height about half of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 44A, B) membranous, about as long as segment IX, divided mid-dorsally, setose, bearing densely setose basomesal tuft; with microsetae on dorsal surface; in lateral view slightly curved ventrad, linear, slowly tapering to round apex, with strong apicoventral setae. Preanal appendage (Fig. 44A, B) each composed of two processes; dorsolateral process about as long as semgment IX, bearing 1 apical spine, secondary branch on dorsolateral process present, mesal, truncate, with 1 apical spine; in lateral view linear, slightly directed ventrad then recurved posteriad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, produced ventrally, with stout setae, in row on posterior margin, not fused at mid line. Inferior appendage (Fig. 44A, C) longer than segment IX; in lateral view rectangular, apically truncate, with ventral margin slightly curved dorsad; in ventral view, internal margin of appendage straight, and apex truncate; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe small, round, laterally almost entirely overlapped with main body of appendage, with sclerotized tip exposed, bearing stout setae, with hooked sclerotized process, curved posteromesad; basodorsal lobe oblong in lateral view, surpassing body of appendage, directed posteriad, bearing row of setae. Phallus (Fig. 44D, E) narrow, slightly curved ventrad then slightly recurved dorsad, with 2 elongate phallic spines; phallotremal sclerite anterodorsal, as 2 symmetrical hooks in dorsal view.

Material examined: Brazil: Rio Aripuanã, Beneficente, 15.i.1962, Lichtfang (A-318), E.J. Fittkau – holotype male [alcohol] (NMNH); Amazonas, Manaus, Sokagakai, Praia Rio Negro, Malaise, 3°06'54.70"S, 59°54'20.47"W, el. 35 m, 10.ix.2010, J. O. Silva, G. P. S. Dantas – 1 male [alcohol] (INPA); Amazonas, Manaus, RPPN Sokagakai, Beira do Rio Amazonas, 3°06'54.70"S, 59°54'20.47"W, el. 35 m, 01-02.ii.2010, L.C. Pinho, J. O. Silva, G. P. S. Dantas – 1 male [alcohol] (INPA).

Distribution: Brazil.

Cernotina depressa Flint 1974

(Fig. 45)

Flint, 1974:49 [Type locality: Suriname, Lawa River, Anapaike; RNH; ♂].

This species is unique, in the shape of the DLP, with a lower arm laterally surpassing the inferior appendage ventrad.

Material examined: No specimens examined. Diagnosis from Flint 1974c.

Distribution: Suriname.

Cernotina ecotura Sykora 1998

(Fig. 46)

Sykora, 1998:99 [Type locality: Brazil, Estado Roraima, Boa Vista, Rio Branco; CMNH; ♂]. —Paprocki et al., 2004:15 [checklist]. —Paprocki and França, 2014:81 [checklist].

This species is unique in the genus, mainly due to the hooked shape of the DLP in lateral view, strongly curving dorsad, unlike those of other species in the genus.

Material examined: No specimens examined. Diagnosis from Sykora 1998.

Distribution: Brazil.

Cernotina encrypta Flint 1971

(Fig. 47)

Flint, 1971:35 [Type locality: Brazil [Edo. Amazonas], Rio Negro, Ponta Negra; NMNH; ♂]. − Paprocki et al., 2004:15 [checklist]. − Paprocki and França, 2014:81 [checklist].

This species is similar to *C. acalyptra* and *C. cystophora*, mainly due to the fusion of the DLP to the intermediate appendage complex, forming an auriculate structure with peg-like setae on its ventrolateral surface. It differs from *C. acalyptra* by the shape of the inferior appendage in ventral view, being straight in *C. encrypta*, and being curved mesad in the other species. It can be separated from *C. cystophora* by the lack of spines in the phallic membrane, while the other species has numerous hair-like minute setae in a single membranous pouch.

Adult. Length of forewing 3.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 47A, C) height about 3/4ths of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 47A, B) semi-membranous, fused with dorsolateral lobe of preanal appendage, longer than segment IX, divided mid-dorsally; with microsetae on dorsal surface and lateroventral surface with peg-like setae; in lateral view slightly curved ventrad, basally narrow, broad at mid-length, with round apex. Preanal appendage (Fig. 47A, B) reduced to ventromesal process; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, with stout setae, basally fused at mid line. Inferior appendage (Fig. 47A, C) longer than segment IX; in lateral view oblong, apically rounded, with ventral margin straight; in ventral view, internal margin of appendage straight, and apex round; anterior basal plate surpassing anterior margin of sternum IX; apicomesal lobe small, round, laterally exposed, glabrous; basodorsal lobe absent. Phallus (Fig. 47D, E) narrow, straight, with elongate phallic spine; phallotremal sclerite anterodorsal, as 2 parallel sinuous lines in dorsal view.

Material examined: Brazil: Rio Negro, Ponta Negra (A-397), 18.vii.1962, E.J. Fittkau – holotype male [alcohol] (Type No 74131) and 6 male paratypes [alcohol] (NMNH).

Distributio: Brazil.

Cernotina falcata Camargos, Barcelos-Silva and Pes 2013

(Fig. 48)

Camargos, Barcelos-Silva and Pes in Barcelos-Silva et al., 2013:120 [Type locality: Brazil, Goiás, Niquelândia, Fazenda Horto Aranha, Anglo American/Codemin, 14º24'8.28"S, 48º43'40.19"W; INPA; ♂]. − Paprocki and França, 2014:81 [checklist].

This species bears similarities with *C. abbreviata*, *C. lazzarii* and *C. perperndicularis*, with its intermediate appendage conspicuous not entirely membranous and fused with tergum X, bearing a spine, and the DLP bearing 2 spines. However, this species differs from *C. abbreviata* and *C. perpendicularis* by the spine in the intermediate appendage being lateral to the structure complex, not apical, and by having the spines on the DLP on a mesoventral secondary branch, while its main body is short and round. In the other species, those spines originate directly from the main body of the appendage, without secondary branches. *C. falcata* can also be separated from *C. lazzarii* by the position of the spine on the preanal appendage, being lateral and sub-apical, rather than apicoventral, and by the general shape of this structure being elongate, not auricular. They also differ in the number of elongate phallic spines, one in *C. falcata* and 4 in *C. lazzarii*.

In the original description, the intermediate appendage was mistaken for a branch of the dorsolateral process of the preanal appendage.

Adult. Length of forewing 3.0 – 3.2 mm, n = 3. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 48A, C) height about half of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with shallow, narrow concavity, with fading sclerotized ventral ridge. Intermediate appendage (Fig. 48A, B) semi-membranous, about as long as segment IX, divided mid-dorsally, setose, with preapical spine; with microsetae on dorsal surface; in lateral view strongly curved ventrad, elongate, with membranous portion extending beyond sclerotized structure and recurved posteriad. Preanal appendage (Fig. 48A, B) each composed of two processes; dorsolateral process shorter than segment IX, secondary branch on dorsolateral process present, mesoventral, elongate, longer than main setous body of appendage, with 1 apical spine, and 1 subapical spine; in lateral view rounded; ventromesal process about as long as dorsolateral process, ventromesal process shorter than inferior appendage, produced ventrally, with stout setae, in row on posterior margin, broadly separated at mid line. Inferior appendage (Fig. 48A, C) shorter than segment IX; in lateral view lanceolate, apically tapered, with ventral margin slightly concave; in ventral view, internal margin of appendage slightly curved mesad, and apex round; anterior basal plate barely surpassing posterior margin of sternum IX; apicomesal lobe small, round, laterally almost entirely overlapped with main body of appendage, with sclerotized tip exposed, bearing stout setae, with hooked sclerotized process, curved mesad; basodorsal lobe subtriangular in lateral view, shorter than half of body of appendage, directed posteriad, bearing row of setae. Phallus (Fig. 48D, E) tapering apically, slightly bent at mid-length, with elongate phallic spine; phallotremal sclerite anterodorsal, with 2 medially curved arms in dorsal view.

Material examined: Brazil: Goiás, Niquelândia, Fazenda Horto Aranha, Anglo American/Codemin, 14º24'8.28"S, 48º43'40.19"W, 15-16.ix.2012, Pennsylvania trap, L.M. Camargos, M.C. Almeida, and C.E.K. de Oliveira – male holotype [alcohol] and 1 paratype male [alcohol] (INPA); 1 paratype male [alcohol] (MZSP).

Distribution: Brazil.

Cernotina fallaciosa Flint 1983

(Fig. 49)

Flint, 1983:30 [Type locality: Argentina, Pcia. Misiones, Arroyo Coatí, 15 km E San José; NMNH; ♂]. − Angrisano, 1994:137 [distribution]. − Angrisano and Sganga, 2007:15 [♂; distribution].

This species resembles very closely *C. verna*, also from Argentina. The similarities are mostly on the overall shape of the DLP and the auricular BDL, gradually grading to the apex. They differ by the shape of the VMP, having an obliquely truncate posterior surface in *C. fallaciosa* and having two elongate posterior projections in *C. verna*. In addition, the AML is narrower and more elongate in *C. fallaciosa*. The species also bears resemblance with *C. truncona* in the position of the BDL, but the latter species possess a longer dorsad projection on that lobe, as well as a more slender DLP.

Adult. Length of forewing 3.5 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 49A, C) height almost covering entire genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 49A, B) membranous, about as long as segment IX, divided mid-dorsally, setose, without spines; with microsetae on dorsal surface; in lateral view slightly curved ventrad, tapering to round apex. Preanal appendage (Fig. 49A, B) each composed of two processes; dorsolateral process longer than segment IX, bearing 1 apical spine; in lateral view lanceolate; in dorsal view curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, with stout setae, in row on mesal margin, basally fused at mid line. Inferior appendage (Fig. 49A, C) longer than segment IX; in lateral view subrectangular, apically truncate, with ventral margin slightly curved dorsad; in ventral view, internal margin of appendage strongly curved mesad, and apex round, with sclerotized apicoventral margin; anterior basal plate almost reaching anterior margin of sternum IX; apicomesal lobe large, round, laterally overlapped with main body of appendage, bearing stout setae, fused with sclerotized process, curved mesad; basodorsal lobe absent. Phallus with 5 elongate phallic spines; phallotremal sclerite large, with 2 posterior lobes in dorsal view.

Material examined: Argentina: Misiones, Arroyo Coatí, 15 km E San José, 18-19.xi. 1973, O.S. Flint, Jr. – holotype male [alcohol] (Type 100495) (NMNH).

Distribution: Argentina, Uruguay.

Cernotina filiformis **Flint 1971**

(Fig. 50)

Flint, 1971:39 [Type locality: Brazil [Edo. Amazonas], Rio Branquinho, Lager Tapirí; NMNH; ♂; as Cernotino filiformiss on p. 39, a printers error]. − Flint, 1974:48 [♂; distribution]. − Paprocki et al., 2004:15 [checklist]. − Paprocki and França, 2014:81 [checklist].

This species bears resemblance with *C. aruma* and *C. flexuosa* by the very elongate VMP, with an apical spine. *C. filiformis* differs from *C. aruma* by the slender and sinuous shape of the VMP with apex curving laterally, while on the other species, the process is somewhat straight, and, albeit elongate, very broader than *C. filiformis*. The species differs from *C. flexuosa* by the shape and size of the AML, being short and hooked in *C. filiformis* and as a laterally exposed long bar with expanded apex in the other species.

Adult. Length of forewing 2.5 – 3.0 mm, n = 2. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 50A, C) height about 3/4ths of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 50A, B) membranous, about as long as segment IX, divided mid-dorsally, setose, without spines; with microsetae on dorsal surface; in lateral view slightly curved ventrad, linear, slowly tapering to round apex, with strong apicoventral setae. Preanal appendage (Fig. 50A, B) each composed of two processes; dorsolateral process shorter than segment IX, bearing 1 apical spine; in lateral view lanceolate; ventromesal process longer than dorsolateral process, ventromesal process longer than inferior appendage, elongate, very thin from mid-length, with stout and slender setae, with several stout setae ventromesally, curved laterally, broadly separated at mid line.

Inferior appendage (Fig. 50A, C) shorter than segment IX; in lateral view oblong, apically rounded, with ventral margin slightly curved dorsad; in ventral view, internal margin of appendage straight, and apex round; anterior basal plate almost reaching anterior margin of sternum IX; apicomesal lobe large, round, laterally overlapped with main body of appendage, bearing stout setae, with hooked sclerotized process, curved posteromesad; basodorsal lobe absent. Phallus (Fig. 50D, E) broad, curved ventrad, with no elongate spines, and 2 stout conical spines, free in phallic membrane; phallotremal sclerite large, ovate, with 2 apparent lateral processes in dorsal view.

Material examined: Brazil: Rio Branquinho, Lager Tapirí, 22.vii.1961, Lichtfang 19.00 Uhr – 20.00 Uhr (A-213-2), E.J. Fittkau – holotype male [alcohol] (NMNH); 20.00 Uhr – 21.00 Uhr (A-213-3), E.J. Fittkau – 2 paratype males [alcohol] (NMNH); **Guyana:** Dubulay, Ranch Warniabo, Malaise trap night collection, 5º39.8’N, 57º53.4’W, 14-19.iv.1995, O. Flint – 1 male [pinned] (NMNH).

Distribution: Brazil, Guyana, Suriname.

Cernotina flexuosa Santos and Nessimian 2008

(Fig. 51)

Santos and Nessimian, 2008:31 [Type locality: Brazil, Amazonas, Rio Preto da Eva municipality, tributary to Rio Preto da Eva, 02º41'28.7"S, 59º42'01.3"W; INPA; ♂]. −Paprocki and França, 2014:81 [checklist].

This species resembles *C. aruma* and *C. filiformis* by the elongate VMP, with an apical spine. *C. flexuosa* differs from *C. aruma* by having a slender and sinuous VMP, with the apex slightly curving laterally, white the other species possess the VMP more broad and straight. This species differs from *C. filiformis* by the shape and size of the AML, being laterally exposed, elongate, broad, with an expanded apex in *C. flexuosa*, and laterally overlapped with inferior appendages, short and hooked in the other species.

Adult. Length of forewing 2.5 – 3.0 mm, n = 3. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 51A, C) height about 3/4ths of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with deep, broad concavity, without sclerotized ventral ridge. Tergum X fused with intermediate appendage. Intermediate appendage (Fig. 51A, B) membranous, longer than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view linear, smoothly broadening at mid-length, tapering apically, with strong apicoventral setae. Preanal appendage (Fig. 51A, B) each composed of two processes; dorsolateral process shorter than segment IX; in lateral view oval; in dorsal view straight; ventromesal process very long, surpassing other genitalic structures, elongate, broad at base, slightly sinuous in lateral view, with stout setae, basally, bearing apical spine, curved laterally, broadly separated at mid line. Inferior appendage (Fig. 51A, C) about as long as segment IX; in lateral view subrectangular, apically subtruncate, with ventral margin slightly curved dorsad at apex; in ventral view, internal margin of appendage straight, and apex round, with sclerotized apicoventral margin; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe large, elongate, laterally exposed, bearing stout setae, entirely sclerotized; basodorsal lobe absent. Phallus (Fig. 51D, E) narrow, straight, with 2 elongate phallic spines; phallotremal sclerite anterodorsal, small, subround, with 2 lobes projecting posterolaterad in dorsal view.

Material examined: Guyana: Mazaruni-Potaro District, Kartabo Point, Malaise trap, 24-26.xii.1982, W.E. Steiner – 3 males [alcohol] (NMNH); **Brazil:** Amazonas: Rio Preto da Eva municipality, tributary to Rio Preto da Eva, 02°41'28.7"S 59°42'01.3"W, 24.iv.2004, J.L.Nessimian, light trap – holotype male [alcohol] (INPA) and 1 paratype male [alcohol] (INPA).

Distribution: Brazil, Guyana.

***Cernotina harrisi* Sykora 1998**

(Fig. 52)

Sykora, 1998:96 [Type locality: Peru, Departemento Loreto, bank of Río Yanomono just below Explorama Lodge; CMNH; ♂].

This species bears similarities with *C. hastilis* in the short DLP with an apical spine and a mesal branch produced into an apical spine. The two species can be distinguished by the of a subapical spine on the secondary branch of the DLP in *C. harrisi*, by the shape of the inferior appendages in ventral view, being tapered into a round apex in this species and having the apicomesal margin excavated and exposing the AML in *C. hastilis*, and by the shape of the BDL, being curved posteriad at mid-length instead of straight posterodorsad as in the other species.

Material examined: No specimens examined. Diagnosis from Sykora 1998.

Distribution: Peru.

Cernotina hastilis Flint 1996

(Fig. 53)

Flint, 1996a:75 [Type locality: Tobago, Bridge B1/5, 6.5 km N Roxborough, 11° 17'N, 60° 35'W; NMNH; ♂]. −Botosaneanu, 2002:95 [checklist]. –Holzenthal and Calor, 2017:415 [catalog]. –Camargos et al., 2017:6 [distribution].

Cernotina nigridentata Sykora, 1998:96 [Type locality: Peru, Departmento Loreto, banks of Yanomono Creek just below Explorama Lodge; CMNH; ♂]. **NEW SYNONYM**

This species is somewhat similar to *C. harrisi* in the shape and position of spines in the DLP. However, *C. hastilis* has a very elongate AML, more than half the length of the inferior appendage, while on the other species, such lobe is shaped as a short spine. This species is herein synonymized with *C. nigridentata* due to their extreme similarity and the corroboration by the phylogenetic analysis in Chapter 1.

Adult. Length of forewing 3.0 – 3.5 mm, n = 2. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 53A, C) height about 3/4ths of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with deep, narrow concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 53A, B) membranous, shorter than segment IX, divided mid-dorsally, setose, without spines; with microsetae on dorsal surface; in lateral view digitate. Preanal appendage (Fig. 53A, B) each composed of two processes; dorsolateral process longer than segment IX, bearing 1 apical spine, with 1 ventral spine at midlength, secondary branch on dorsolateral process present, mesal, truncate, with 1 apical spine; in lateral view lanceolate; in dorsal view curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, with stout setae, in row on posterior margin, basally fused at mid line. Inferior appendage (Fig. 53A, C) longer than segment IX; in lateral view rectangular, apically rounded, with ventral margin slightly concave; and apex truncate, with mesal margin excavated; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe very long, elongate, laterally almost entirely overlapped with main body of appendage, with sclerotized tip exposed, glabrous, fused with sclerotized process; basodorsal lobe oblong in lateral view, with about same length of body of appendage, directed posterodorsad. Phallus (Fig. 53D, E) tapering apically, curved ventrad, with no spines; phallotremal sclerite anterodorsal, with 2 posterior lobes in dorsal view.

Material examined: Tobago: Bridge B1/5, 6.5 km N Roxborough, 11º17’ N, 60º35’ W, el. 390 m, 15-16.vi.1993, [O.S. Flint, Jr., W.N. Mathis, N.E. Adams] – holotype male [pinned] (NMNH); **Ecuador:** Orellana, Reserva de Biodiversidad Tiputini, small stream, Harpia trail, 00.63496ºS, 76.14602ºW, el. 240 m, 22.x.2011, Holzenthal and Ríos – 2 males [pinned] (UMSP000098912, UMSP000098913) (UMSP); Past. Tzapino, 1200 ft, 1º19’S, 77º28’W, 25.v.1976, Sergio Figueroa – 1 male [alcohol]; **Peru:** Madre de Dios, Manu, Pakitza, trail 2 1st stream, 12º7’S, 70º58’W, el. 250 m, Malaise trap, night collection, 14-23.ix.1988, O. Flint & N. Adams – 1 male [pinned] (NMNH); Pakitza Biological Station, trail 2, marker 15, Quebrada Trompetero, 11º56.65’S, 71º16.98’W, el. 350 m, 3.vii.1993, R. Blahnik & M. Pescador – 1 male [alcohol] (NMNH)

Distribution: Ecuador, Peru, Tobago.

***Cernotina intersecta* Flint 1974**

(Fig. 54)

Flint, 1974:48 [Type locality: Suriname, Wilhelmina Mountains, trail I km 8, small stony creek; RNH; ♂].

This species has a unique combination of characters, although it bears overall resemblance with *C. verticalis*, especially in the shape of the inferior appendage. They differ however by the strong perpendicular curvature of the intermediate appendage in *C. intersecta* and the fusion of the DLP with the VMP in *C. verticalis*.

Adult. Length of forewing 3.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 54A, C) height about half of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with shallow, narrow concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 54A, B) membranous, shorter than segment IX, divided mid-dorsally, setose, without spines; with microsetae on dorsal surface; in lateral view strongly curved ventrad, linear, with truncate apex, with strong apicoventral setae. Preanal appendage (Fig. 54A, B) each composed of two processes; dorsolateral process shorter than segment IX, bearing 1 apical spine; in lateral view oblong; in dorsal view strongly curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, with stout setae, on apex, not fused at mid line. Inferior appendage (Fig. 54A, C) shorter than segment IX; in lateral view hatchet-shaped, apically truncate, with ventral margin straight; in ventral view, internal margin of appendage curved mesad, and apex round; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe large, round, laterally overlapped with main body of appendage, glabrous, with hooked sclerotized process, curved mesad; basodorsal lobe absent. Phallus (Fig. 54D, E) narrow, slightly bent at mid-length, with no spines; phallotremal sclerite small, with 2 medially curved arms in dorsal view.

Material examined: Suriname: Wilhelmina Mountains, trail 1 km 8, small stony creek, 31.viii.1943, D.C. Geijskes – 1 male paratype [alcohol] (NMNH).

Distribution: Suriname.

Cernotina laticula Ross 1951

(Fig. 55)

Ross, 1951:348 [Type locality: Mexico, Campeche, Salto Grande; INHS; ♂]. − Bueno-Soria and Flint, 1978:198 [distribution].

This species is similar to other species from North America, especially *C. astera*, *C. sinosa*, and *C. zanclana*. The very wide and truncate apical margin of the inferior appendage in ventral view differ *C. laticula* from the other 3 species. The apex of the DLP curving oriented anteriad differs the species even more from *C. astera* and *C. zanclana*, where that point is oriented mesad.

Adult. Length of forewing 4.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 55A, C) height about 3/4ths of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with shallow, narrow concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 55A, B) membranous, about as long as segment IX, divided mid-dorsally, setose, without spines; with microsetae on dorsal surface; in lateral view broad at base, tapering to round apex, with strong apicoventral setae. Preanal appendage (Fig. 55A, B) each composed of two processes; dorsolateral process about as long as semgment IX, bearing 1 apical spine; in lateral view caudate; in dorsal view strongly curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, with stout setae, in row on posterior margin, broadly separated at mid line. Inferior appendage (Fig. 55A, C) longer than segment IX; in lateral view oblong, apically rounded, with ventral margin straight; in ventral view, internal margin of appendage curved mesad, and apex round, with sclerotized apicoventral margin; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe small, laterally exposed; basodorsal lobe subtriangular in lateral view, with apex rounded, with about 3/4 length of body of appendage, directed dorsad, bearing row of setae. Phallus (Fig. 55D, E) narrow, straight, with 12 elongate phallic spines, free in phallic membrane; phallotremal sclerite anterodorsal, large, ovate, with 2 apparent lateral processes in dorsal view.

Material examined: Mexico: Salto Grande, Camp., 11.i.1939, at light, A. Dampf – holotype male [alcohol] (MF8325) (INHS); Tabasco, Camino de Reforma a Tiradero, 4.i.1939, at light, A. Dampf – 1 male paratype [alcohol] (INHS).

Distribution: Mexico.

Cernotina lazzarii Holzenthal and Almeida 2003

(Fig. 56, 57)

Holzenthal and Almeida, 2003:24 [Type locality: Brazil, Paraná, município de Corbélia, Rio Novo headwaters, 24º53.886'S, 53º14.895'W, el. 700 m; MZUSP; ♂; ♀]. − Paprocki et al., 2004:15 [checklist]. − Paprocki and França, 2014:81 [checklist].

This species resembles *C. abbreviate* and *C. falcata*, mostly due to the presence of an apical spine on the intermediate appendage, and the DLP bearing 2 spines. However, this species differs from *C. abbreviata* by the spines of the DLP orientation being posteriad, rather than posteroventrad, by the position of such spines on a mesoventral secondary branch, while its main body is short and round. In the other species, those spines originate directly from the main body of the appendage, without secondary branches. *C. lazzarii* can also be separated from *C. falcata* by the position of the spine on the preanal appendage, being apicoventral rather than, lateral and sub-apical, and by the general shape of this structure being auricular, not elongate. They also differ in the number of elongate phallic spines, 4 in *C. lazzarii* and one in *C. falcata*.

Adult. Length of forewing 3.5 – 3.7 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 56A, C) height about half of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 56A, B) semi-membranous, shorter than segment IX, divided mid-dorsally, setose, with preapical ventral spine; with microsetae on dorsal surface; in lateral view round. Preanal appendage (Fig. 56A, B) each composed of two processes; dorsolateral process shorter than segment IX, secondary branch on dorsolateral process present, mesoventral, linear, longer than main setous body of appendage, with 1 apical spine, and 1 spine at midlength; in lateral view rounded; ventromesal process longer than dorsolateral process, ventromesal process shorter than inferior appendage, produced dorsolaterally, with stout setae, in row on posterior margin, basally fused at mid line. Inferior appendage (Fig. 56A, C) about as long as segment IX; in lateral view oblong, apically rounded, with ventral margin slightly concave; in ventral view, internal margin of appendage straight, and apex round; anterior basal plate almost reaching anterior margin of sternum IX; apicomesal lobe large, conical, laterally exposed, bearing 3 stout setae, fused with sclerotized process; basodorsal lobe oblong in lateral view, with about half length of body of appendage, directed posterodorsad, bearing row of setae. Phallus (Fig. 56D, E, 57) narrow, straight, with 4 elongate phallic spines, each in membranous pouch; phallotremal sclerite anterodorsal, large, as 2 symmetrical hooks in dorsal view.

Material examined: Brazil: Paraná, Município de Corbélia, Rio Novo headwaters, 24º53.886'S, 53º14.895'W, el. 700 m, 4-7.iv.1998, Holzenthal & Huisman – 3 male paratypes [pinned] (UMSP000033048, UMSP000033049, UMSP000033050) (UMSP); 5 female paratypes [pinned] (UMSP000033054, UMSP000033055, UMSP000033056, UMSP000033057, UMSP000033058) (UMSP); São Paulo, Pedregulho, Ribeirão São Pedro, Lat -20.151880, Long -47.510430, el. 617 m, 16.xi.2003, Holzenthal, Paprocki & Calor – 11 males [alcohol] (UMSP000093142) (UMSP).

Distribution: Brazil.

Cernotina lobisomem Santos and Nessimian 2008

(Fig. 58)

Santos and Nessimian, 2008:27 [Type locality: Brazil, Amazonas, Manaus, tributary to Igarapé do Lobisomem, basin of Rio Cuieiras, 2º33'46.4"S, 60º19'03.4"W; INPA; ♂]. −Paprocki and França, 2014:82 [checklist]. –Ríos-Touma et al., 2017:14 [distribution]. –Holzenthal and Calor, 2017:415 [catalog]. – Camargos et al., 2017:8 [distribution].

This species is remarkable due to its very long and slender DLP. It bears similarities with *C. longissima*, which also has such elongate process, with apical spine and another spine at mid length, and by the shape of the inferior appendage, with apex subtruncate. They differ however in the shape of the inferior appendage in ventral view, having a mid cleft at the apex in *C. lobisomem*, by the phallus having 2 internal spines instead of 3 like in the other species. In addition, the DLP of *C. lobisomem* is less slender, with stouter spines surrounded by setae while *C. longissima* is more slender, with very elongate spines.

Adult. Length of forewing 2.8 – 3.0 mm, n = 3. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 58A, C) height about half of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 58A, B) membranous, longer than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view linear, narrow, tapering at apex, with strong apicoventral setae. Preanal appendage (Fig. 58A, B) each composed of two processes; dorsolateral process longer than segment IX, bearing 1 apical spine, with 1 spine at midlength; in lateral view filiform, slightly curved dorsad; in dorsal view slightly curved mesad then recurved posteriad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, with stout setae, in row on posterior margin, basally fused at mid line. Inferior appendage (Fig. 58A, C) about as long as segment IX; in lateral view rectangular, apically rounded, with ventral margin slightly concave; in ventral view, internal margin of appendage slightly curved mesad, and apex truncate, with mesal margin excavated, with sclerotized apicoventral margin; apicomesal lobe large, triangular, bearing stout setae, fused with sclerotized process, curved laterad, pointed in ventral view; basodorsal lobe elongate in lateral view, with apex rounded, with about 3/4 length of body of appendage, directed posterodorsad, bearing row of setae. Phallus (Fig. 58D, E) narrow, slightly bent at mid-length, with 2 elongate phallic spines, each in membranous pouch; phallotremal sclerite anterodorsal, large, with 2 laterally curved arms in dorsal view.

Material examined: Brazil: Amazonas, Manaus, tributary to Igarapé do Lobisomem, basin of Rio Cuieiras, 2º33’46.4”S, 60º19’03.4”W, el. 34 m, 22.viii.2004, light trap, J.L. Nessimian & L. Fidelis – 1 holotype male [alcohol] and 1 paratype male [alcohol] (INPA); **Ecuador:** Orellana, Reserva de Biodiversidad Tiputini, small stream, Harpia trail, lat -0.634960, long -76.146020, el. 240 m, 22.x.2011, Holzenthal & Ríos – 1 male [alcohol] (UMSP000138269) (UMSP).

Distribution: Brazil.

Cernotina longispina Barcelos-Silva, Camargos and Pes 2013

(Fig. 59)

Barcelos-Silva, Camargos and Pes in Barcelos-Silva et al., 2013:124 [Type locality: Brazil, Espírito Santo, Pinheiros, stream Água Limpa, 18º22'04.1"S, 40º08'23.8"W; CZNC; ♂]. − Barcelos-Silva et al., 2012:1279 [as Cernotina sp. 1]. − Paprocki and França, 2014:82 [checklist].

This species bears resemblance with *C. attenuata* by the shape of the DLP with ventral secondary branch bearing apical spine, just as the main body of the appendage. They differ mainly by the shape of the VMP, bearing a single lateral projection in *C. longispina* and being laterally bifid in the other species. In addition, *C. longispina* has a single very long spine in the phallic membrane, while *C. attenuata* has 2 elongate spines and 4 basal short spines.

Adult. Length of forewing 3.3 – 3.6 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 59A, C) height about 3/4ths of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 59A, B) membranous, longer than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view broad at base, constricting subapically, with apex enlarged and round, with strong apicoventral setae. Preanal appendage (Fig. 59A, B) each composed of two processes; dorsolateral process longer than segment IX, bearing 1 apical spine, secondary branch on dorsolateral process present, ventral, acute, with 1 apical spine; in lateral view linear; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, produced dorsolaterally, with stout setae, in row on posterior margin, basally fused at mid line. Inferior appendage (Fig. 59A, C) about as long as segment IX; in lateral view rectangular, apically truncate; and apex truncate, with mesal margin excavated; apicomesal lobe small, round or auricular, bearing stout setae, fused with sclerotized process; basodorsal lobe oblong in lateral view, with about half length of body of appendage, directed posterodorsad, bearing row of setae. Phallus (Fig. 59D, E) narrow, slightly bent at mid-length, with 1 very long elongate phallic spine; phallotremal sclerite anterodorsal, large, with 2 laterally curved arms in dorsal view.

Material examined: Brazil: Espírito Santo, Nova Venécia, Patrimônio do Bis, 18º33'27.5"S, 40º20'6.5"W, el. 37 m, 25-26.vii.2012, Pennsylvania trap, K.A. Batista – 1 paratype male [alcohol] (INPA); Minas Gerais, Rio Mainarte, bridge on Cibrão road, lat -20.454300, long -43.401570, el. 700 m, 18.viii.1998, Paprocki & Amarante – 4 males [pinned] (UMSP000047557 – UMSP000047560) and 4 females [pinned] (UMSP000047561 – UMSP000047564) (UMSP); Parque Estadual do Rio Doce, Rio Turvo, NE of airstrip, lat -19.746950, long -42.624550, el. 335 m, 8.xi.2001, Holzenthal, Amarante, Blahnik & Paprocki – 4 males [pinned] (UMSP000080807 – UMSP000080810) and 4 females [pinned] (UMSP000080811 – UMSP000080814) (UMSP); São Paulo, Estação Biológica de Boracéia, lat -23.650030, long -45.914820, el. 815 m, 19.ix.2002, Blahnik, Prather, Melo, Silva – 1 male [pinned] (UMSP000088091) and 1 female [pinned] (UMSP000088092) (UMSP).

Distribution: Brazil.

Cernotina longissima **Flint 1974**

(Fig. 60)

Flint, 1974:46 [Type locality: Suriname, Brownsberg, mountain creek near Golddiggers camp; RNH; ♂].

This species is remarkable due to its very long and slender DLP. It bears similarities with *C. lobisomem*, which also has such elongate process, with apical spine and another spine at mid length, and by the shape of the inferior appendage in lateral view, with apex subtruncate. They differ however in the shape of the inferior appendage in ventral view, having a mid cleft at the apex in *C. lobisomem*, by the phallus having 3 internal spines in *C. longissima* and 2 in the other species. In addition, the dorsolateral process of *C. longissima* is more slender, with very thin spines, while the spines in *C. lobisomem* are stouter, similar to those from other species.

Adult. Length of forewing 3.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 60A, C) height about 3/4ths of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 60A, B) membranous, longer than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view slightly curved, linear, with slightly truncate apex, with strong apicoventral setae. Preanal appendage (Fig. 60A, B) each composed of two processes; dorsolateral process longer than segment IX, bearing 1 apical spine, with 1 spine at midlength; in lateral view linear, curved dorsad; in dorsal view curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, produced dorsolaterally, with stout setae, in row on posterior margin, basally fused at mid line. Inferior appendage (Fig. 60A, C) about as long as segment IX; in lateral view oblong, apically rounded, with ventral margin straight; in ventral view, internal margin of appendage slightly curved mesad, and apex truncate; anterior basal plate barely surpassing posterior margin of sternum IX; apicomesal lobe small, conical, laterally overlapped with main body of appendage, glabrous, fused with sclerotized process, pointed in ventral view; basodorsal lobe oblong in lateral view, with apex rounded, with about half length of body of appendage, directed posterodorsad, bearing row of setae. Phallus (Fig. 60D, E) narrow, slightly bent at mid-length, with 3 elongate phallic spines, each in membranous pouch; phallotremal sclerite with 2 medially curved arms in dorsal view.

Material examined: Suriname: Brownsberg, Bergkreek, by Gonddelvers Kamp, 10.viii.1958, D.C. Geijskes – 4 male paratypes [alcohol] (NMNH); **Venezuela:** Bolívar, Gran Sabana, E. Pauji, “Rio Curvita”, lat 4.520617, long -61.526517, el. 869 m, 15-16.vii.2010, Holzenthal, Thomson, Cressa - 9 males [pinned] (UMSP000137977 – UMSP000137985) and 11 females [pinned] (UMSP000137986 – UMSP000137996) (UMSP).

Distribution: Suriname, Venezuela.

Cernotina lutea Flint 1968

(Fig. 61)

Flint, 1968b:19 [Type locality: Dominica, Pont Casse, 1.3 miles E; NMNH; ♂; ♀]. − Flint and Sykora, 1993:49 [checklist]. − Botosaneanu, 1994a:51 [distribution]. − Botosaneanu, 2002:95 [checklist]. − Botosaneanu and Thomas, 2005:51 [probable distribution].

This species is similar to the other Caribbean species *C. cadeti* in their branched DLP, with dorsal and ventral long hooks. They differ however by the presence of the lateral spiny third branch on the DLP in *C. lutea*, while *C. cadeti* lacks such branch.

Adult. Length of forewing 3.5 – 4.0 mm, n = 2. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 61A, C) height almost covering entire genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 61A, B) membranous, shorter than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view linear, narrow, tapering at apex, with strong apicoventral setae. Preanal appendage (Fig. 61A, B) each composed of two processes; dorsolateral process longer than segment IX, bearing 1 apical spine, secondary branches on dorsolateral process present, mesal and ventral, each elongate, with no apical spines; in lateral view filiform, strongly curved ventrad; in dorsal view curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, oblong, with stout setae, on apex, broadly separated at mid line. Inferior appendage (Fig. 61A, C) shorter than segment IX; in lateral view lanceolate, apically notched, with ventral margin straight; in ventral view, internal margin of appendage slightly curved mesad, and apex acute, with mesal lobe-like setous structure; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe small, truncate, laterally exposed, bearing stout setae, with hooked sclerotized dorsal process, curved mesad; basodorsal lobe clavate in lateral view, with apex rounded, shorter than half of body of appendage, directed posterodorsad, bearing tuft of setae apically. Phallus (Fig. 61D, E) narrow, straight, with no spines; phallotremal sclerite anterodorsal, small, with 2 laterally curved arms in dorsal view.

Material examined: Dominica: Pont Casse, 1.3 miles east, 18.v.1964, O.S. Flint, Jr. – holotype male [pinned] (Type 69885) (NMNH); Cabrit Swamp, 23 Feb. 1965, light trap, W.W. Wirth, Brendin Archbold Smithsonian Biological Survey Dominica – 1 paratype male [pinned] (NMNH).

Distribution: Dominica, Guadeloupe, Martinique.

Cernotina mandeba **Flint 1974**

(Fig. 62)

Flint, 1974:45 [Type locality: Suriname, Nickerie River, Blanche Marie, falls in creek; RNH; ♂]. − Botosaneanu and Alkins-Koo, 1993:31 [♂; distribution]. − Flint, 1996a:74 [distribution]. − Botosaneanu, 2002:95 [checklist].

This species is similar to *C. subapicalis* and *Cernotina* n. sp. 1, especially in lateral view, due to the cuspidate shape of the DLP with one or more apical spines. They differ however by the shape of the inferior appendage in ventral view, with the apex bearing a mesal concavity in *C. mandeba*, leaving the AML separated from the body of the appendage, while the apex in the other two species does not possess such mesal concavity. The VMP also differs, being truncate in dorsal view, while being laterally projected in *C. subapicalis* and *Cernotina* n. sp. 1. In addition, the other two species bear 2 apical spines at the apex of the DLP, while in *C. mandeba* there is typically one spine, with one paratype from the type series bearing 2 spines. The number of phallic spines also differs between this species and *C. subapicalis*, bearing 2 versus 3 elongate spines respectively.

Adult. Length of forewing 3.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 62A, C) height about half of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with shallow, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 62A, B) membranous, about as long as segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view linear, curved ventrad, with truncate apex, with strong apicoventral setae. Preanal appendage (Fig. 62A, B) each composed of two processes; dorsolateral process about as long as semgment IX, bearing 1 apical spine; in lateral view lanceolate; in dorsal view slightly curved mesad then recurved posteriad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, with stout setae, in row on posterior margin, basally fused at mid line. Inferior appendage (Fig. 62A, C) longer than segment IX; in lateral view oblong, apically rounded, with ventral margin straight; in ventral view, internal margin of appendage slightly curved mesad, and apex with mesal margin excavated; anterior basal plate barely surpassing posterior margin of sternum IX; apicomesal lobe large, truncate, laterally overlapped with main body of appendage, bearing stout setae, fused with sclerotized process; basodorsal lobe subtriangular in lateral view, with apex rounded, with about half length of body of appendage, directed posterodorsad, bearing setae. Phallus (Fig. 62D, E) narrow, straight, with 2 elongate phallic spines, each in membranous pouch; phallotremal sclerite anterodorsal, large, as 2 parallel sinuous lines in dorsal view.

Material examined: Surinam: Nickerie River, Blanche Marie, 14.ii.1971, op licht, D.C. Geijskes – 1 paratype male [pinned] (NMNH).

Distribution: Suriname, Tobago, Trinidad.

***Cernotina mastelleri* Flint 1992**

(Fig. 63)

Flint, 1992:382 [Type locality: Puerto Rico, El Verde Field Station, Quebrada Prieta; NMNH; ♂; ♀]. − Botosaneanu, 2002:95 [checklist]. — Subfamily Polycentropodinae species Flint, 1964a:34 [larva; pupa]. —Flint, 1992:382 [to synonymy].

This species has a small preapical spur on the foretibia, making it distinct from all other species of the genus. In addition, the DLP very low, “depressed” laterally, with apex curved dorsad is unique to this species.

Adult. Length of forewing 3.5 – 4.0 mm, n = 2. Head typical for the genus; foretibia with 1 short preapical spur.

Male genitalia. Sternum IX (Fig. 63A) height about half of entire male genital complex. Intermediate appendage (Fig. 63A, B) membranous, about as long as segment IX, divided mid-dorsally, without spines; in lateral view digitate, laterally sinuous, slightly curved dorsad then recurved posteriad. Preanal appendage (Fig. 63A, B) each composed of two processes; dorsolateral process about as long as semgment IX, bearing 1 apical spine, secondary branch on dorsolateral process present, lateral, short, stub-like; in lateral view lanceolate, slightly curved ventrad, then apically curved dorsad; in dorsal view curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, with stout setae, in row on posterior margin. Inferior appendage (Fig. 63A, C) shorter than segment IX; in lateral view rectangular, apically truncate, with ventral margin slightly curved dorsad; in ventral view, internal margin of appendage strongly curved mesad, and apex truncate, projecting mesad, with sclerotized apicoventral margin; apicomesal lobe large, round, fused with sclerotized process; basodorsal lobe absent or appressed to surface of ventral body. Phallus (Fig. 63A, B) narrow, slightly bent at mid-length, with 3 elongate phallic spines; phallotremal sclerite anterodorsal, small.

Material examined: Puerto Rico: El Yunque, trail to pool, 650 m, 22.ii.1989, light trap, E.C. Masteller – 1 paratype male [alcohol] (NMNH).

Distribution: Puerto Rico.

***Cernotina medioloba* Flint 1972**

(Fig. 64)

Flint, 1972:231 [Type locality: Argentina, Pcia. Santa Fe, Arroyo Saladillo, near Santa Fé; NMNH; ♂].

This species bears some resemblance *C. subapicalis* by the general shape of its appendages and processes in lateral view. They differ however by the absence of apical spines in the DLP of *C. medioloba*, bearing only 2 stout setae, in the number of phallic spines, 5 in this species versus 3 in *C. subapicalis*, and in the elongate shape of the apicomesal lobe, instead of auricular like in the other species.

Adult. Length of forewing 3.5 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 64A, C) height about half of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with shallow, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 64A, B) membranous, about as long as segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view slightly curved ventrad, slightly broad at base, slowly tapering to truncate apex, with strong apicoventral setae. Preanal appendage (Fig. 64A, B) each composed of two processes; dorsolateral process about as long as semgment IX, with stout apical setae; in lateral view oblong; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, produced dorsolaterally, with stout setae, in row on posterior margin, basally fused at mid line. Inferior appendage (Fig. 64A, C) longer than segment IX; in lateral view rectangular, apically truncate, with ventral margin straight; ventral view, internal margin of appendage straight, and apex round; anterior basal plate almost reaching anterior margin of sternum IX; apicomesal lobe large, conical, laterally almost entirely overlapped with main body of appendage, with sclerotized tip exposed, bearing 2 stout setae, fused with sclerotized process, pointed in ventral view; basodorsal lobe subtriangular in lateral view, with apex rounded, with about 3/4 length of body of appendage, directed dorsad, bearing row of setae. Phallus (Fig. 64D, E) broad, curved ventrad, with 5 elongate phallic spines; phallotremal sclerite anterodorsal, large, with 2 posterior lobes in dorsal view.

Material examined: Argentina: Santa Fe, Arroyo Saladillo, near Santa Fé, 2.iv.1971, C.M. & O.S. Flint, Jr. – holotype male [pinned] (NMNH).

Distribution: Argentina.

Cernotina obliqua **Flint 1971**

(Fig. 65)

Flint, 1971:40 [Type locality: Brazil [Edo. Amazonas], Rio Branquinho, bei der Mündung des Rio Cuieiras; NMNH; ♂]. − Paprocki et al., 2004:15 [checklist]. − Paprocki and França, 2014:82 [checklist].

This species can be easily distinguished from all the other species by the strongly oblique apex of the inferior appendage, with the BDL globular widely separated from the main body of the appendage in lateral view. The presence of the as small sclerotized lobes at the BDL is also uncommon in the genus and present in *C. obliqua*.

Adult. Length of forewing 3.5 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 65A, C) height about half of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with shallow, broad concavity, without sclerotized ventral ridge. Intermediate appendage (Fig. 65A, B) membranous, longer than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view basally broad, slowly tapering to round apex, with strong apicoventral setae. Preanal appendage (Fig. 65A, B) each composed of two processes; dorsolateral process longer than segment IX, with stout apical setae; in lateral view oblong; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, with stout setae, in row on posterior margin, broadly separated at mid line. Inferior appendage (Fig. 65A, C) longer than segment IX; in lateral view oblique, apically deeply excavated, with ventral margin straight; in ventral view, internal margin of appendage slightly curved mesad, and apex acute, with lateral margin excavated; anterior basal plate surpassing anterior margin of sternum IX; apicomesal lobe small, round, positioned on posterior margin of basodorsal lobe, laterally exposed, bearing stout setae, with hooked sclerotized dorsal process, curved mesad; basodorsal lobe globular in lateral view, shorter than half of body of appendage, directed posteriad, and mesad, bearing tuft of setae apically. Phallus (Fig. 65D, E) broad, curved ventrad, with 2 elongate phallic spines; phallotremal sclerite anterodorsal, large, hourglass-shaped in dorsal view.

Material examined: Brazil: [Amazonas] Rio Branquinho, bei der Mundung des Rio Cuieiras, 23.vii.1961, Lichtfang, 19.00 Uhr (A-218-1), E.J. Fittkau – holotype male [alcohol] (NMNH).

Distribution: Brazil.

Cernotina odonta Santos and Nessimian 2008

(Fig. 66)

Santos and Nessimian, 2008:26 [Type locality: Brazil, Amazonas, Manaus, tributary to Igarapé do Lobisomem, basin of Rio Cuieiras, 2º33'46.4"S, 60º19'03.4"W; INPA; ♂]. −Paprocki and França, 2014:82 [checklist].

This species resembles *Cernotina* n. sp. 16, by the shape of the inferior appendage, with deep median excavation, with lateral horns, and by their lack of ventral ridge chiasm on sternum IX. They differ mainly by the lack of a mesal branch of the DLP in *C. odonta*.

Material examined: No specimens examined. Diagnosis from Santos & Nessimian 2008.

Distribution: Brazil.

Cernotina ohio Ross 1939

(Fig. 67)

Ross, 1939:628 [Type locality: [USA], Put-in-Bay, Ohio; INHS; male]. – Morse, 1993:84 [checklist].

This species resembles *C. spicata* in the elongate shape of the DLP, with a mesobasal branch bearing apical spine, and the simplicity of the phallus. They differ however in the lack of the ventral oblong process in *C. ohio*, and by the apex of the inferior appendage, having a dorsal branch protruding beyond the posterior margin of the body of the appendage in this species and being narrow with an apical notch in *C. spicata*.

Adult. Length of forewing 5.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 67A, C) height about 3/4ths of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 67A, B) membranous, shorter than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view slightly curved ventrad, broad at base, tapering to round apex, with strong apicoventral setae. Preanal appendage (Fig. 67A, B) each composed of two processes; dorsolateral process about as long as semgment IX, bearing 1 apical spine, secondary branch on dorsolateral process present, mesobasal, acute, with 1 apical spine; in lateral view elongate, strongly curved ventrad; in dorsal view strongly curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, in row on posterior margin, basally fused at mid line. Inferior appendage (Fig. 67A, C) longer than segment IX; in lateral view lanceolate, apically notched, with ventral margin straight; in ventral view, internal margin of appendage curved mesad, and apex truncate, with sclerotized apicoventral margin; anterior basal plate almost reaching anterior margin of sternum IX; apicomesal lobe large, round, laterally merged with with notched apex, bearing stout setae, with elongate sclerotized process; basodorsal lobe clavate in lateral view, with apex rounded, with about half length of body of appendage, directed posterodorsad, bearing setae. Phallus (Fig. 67D, E) narrow, slightly bent at mid-length, with no spines; phallotremal sclerite anterodorsal, large, with 2 posterior lobes in dorsal view.

Material examined: United States: Ohio, Put in Bay, 19.vii.1937, D.M. DeLong – holotype male [alcohol] (INHS Trichopt #22804) (INHS).

Distribution: U.S.A.

Cernotina oklahoma Ross 1938

(Fig. 68)

Ross, 1938:137, [Type locality: [U.S.A.], Turner Falls State Park, Oklahoma: along Honey Creek; INHS; male]. – Morse, 1993:84 [checklist].

This species bears slight resemblance with *C. sinosa* and *Cernotina* n. sp. 12, by the shape of the DLP curved mesad, with apical spine. They differ however by the shape of the inferior appendage in lateral view being more subquadrate and wide in *C. oklahoma*, elongate with narrow apex in *C. sinosa*, and broad, with a strong apical notch and a very large AML in *Cernotina* n. sp. 12. *C. oklahoma* also differs from the other two species by having the each side of the VMP touching medially, not broadly separated as in the other species.

Adult. Length of forewing 4.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 68A, C) height about 3/4ths of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with deep, narrow concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 68A, B) membranous, shorter than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view slightly curved ventrad, broad at base, tapering to round apex, with strong apicoventral setae. Preanal appendage (Fig. 68A, B) each composed of two processes; dorsolateral process about as long as semgment IX, bearing 1 apical spine; in lateral view lanceolate, apically curved ventrad; in dorsal view strongly curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, with stout setae, in row on posterior margin, basally fused at mid line. Inferior appendage (Fig. 68A, C) about as long as segment IX; in lateral view oblong, apically notched, with ventral margin straight; in ventral view, internal margin of appendage curved mesad, and apex truncate, projecting mesad; anterior basal plate almost reaching anterior margin of sternum IX; apicomesal lobe large, round, laterally merged with with notched apex, bearing stout setae, fused with sclerotized process; basodorsal lobe clavate in lateral view, with apex rounded, with about half length of body of appendage, directed posterodorsad, bearing tuft of setae apically. Phallus (Fig. 68D, E) narrrow, very long, straight, with no spines; phallotremal sclerite anterodorsal, large, with 2 laterally curved arms in dorsal view.

Material examined: United States: Oklahoma, Turner Falls State Park, along Honey Creek, 2.vi.1937, H.H. Ross – holotype male [alcohol] (INHS Trichop #22806) and 1 paratype male (INHS).

Distribution: U.S.A.

***Cernotina pallida* (Banks 1904)**

(Fig. 69)

Banks, 1904 :214 [Type locality: [U.S.A.], Washington, D.C.; Banks collection; as Cyrnus pallidus]. — Maes, 1999:1188 [checklist]. — Chamorro-Lacayo et al., 2007:46 [checklist].

This species has a unique shape of the DLP, which is strongly curved, with apex pointing laterally, making the process curling into hook in dorsal view. Another remarkable species such as *C. stannardi*, which has an inferior appendage with similar shape, broad on its mid-length, also does not possess the same shape of the DLP, and also does not bear a series of inner spines on the same process, like those of *C. pallida*.

Adult. Length of forewing 4.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 69A, C) height about 3/4ths of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with deep, narrow concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 69A, B) membranous, shorter than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view broad at base, tapering at apex, with strong apicoventral setae. Preanal appendage (Fig. 69A, B) each composed of two processes; dorsolateral process longer than segment IX, bearing 1 apical spine, with row of 5 short spines at mid length; in lateral view linear, strongly curved ventrad; in dorsal view strongly curved mesad, curling on 1 turn; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, globular, with stout setae, in row on posterior margin, broadly separated at mid line. Inferior appendage (Fig. 69A, C) longer than segment IX; in lateral view hatchet-shaped, apically notched, with ventral margin straight; in ventral view, internal margin of appendage sinuous, and apex truncate, with lateral margin excavated; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe large, round, laterally exposed, bearing stout setae, with hooked sclerotized process, curved mesad; basodorsal lobe oblong in lateral view, with apex rounded, shorter than half of body of appendage, directed dorsad, bearing row of setae. Phallus (Fig. 69D, E) narrow, straight, with no spines; phallotremal sclerite anterodorsal, large, with 2 medially curved arms in dorsal view.

Material examined: United States: Maryland, High Island, 17 June, collection N. Banks – lectotype male [pinned] (type 11539) (MCZ).

Distribution: Nicaragua, U.S.A.

Cernotina perpendicularis **Flint 1971**

(Fig. 70)

Flint, 1971:40 [Type locality: Brazil [Edo. Amazonas], Rio Negro, etwa 20-30 km. oberhalb von A-31 [A-31=80 km above Manaus]. NMNH; ♂]. − Flint, 1974:49 [♂; distribution]. − Angrisano, 1994:137 [distribution]. − Blahnik et al., 2004:5 [distribution]. − Paprocki et al., 2004:15 [checklist]. − Angrisano and Sganga, 2007:16 [♂; distribution]. − Paprocki and França, 2014:82 [checklist].

Cernotina lanceolata Barcelos-Silva, Camargos and Pes in Barcelos-Silva et al., 2013:122 [Type locality: Brazil, Espírito Santo, Linhares, Praia do Minotauro, 19 ° 19'05.8"S, 40° 05'11.9"W; CZNC; ♂]. −Barcelos-Silva et al., 2012:1279 [as Cernotina sp. 3]. −Paprocki and França, 2014:81 [checklist]. **NEW SYNONYM**

This species bears similarities with *C. carbonelli* by the presence of an apical spine on the intermediate appendage complex, and by the shape of the DLP, with an apical and a sub-apical spine. They differ mainly by the shape of the VMP, bifid, with dorsal and ventral projections, slightly truncate and broadly fused in *C. perpendicularis* from a dorsal view, while laterally produced and basally fused in *C. carbonelli*. The inferior appendage in ventral view is also different, with the AML and the apex of the main body of the appendage forming a bifid mesal point in *C. perpendicularis*, while the other species has a single oblong AML. This species is herein synonymized with *C. lanceolata* due to their extremely similar morphology and the corroboration of the phylogenetic analysis in Chapter 1.

Adult. Length of forewing 3.0 – 3.6 mm, n = 3. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 70A, C) height about half of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with shallow, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 70A, B) sclerotized, about as long as segment IX, divided mid-dorsally, setose, with apical spine; with microsetae on dorsal surface; in lateral view slightly

pointed ventrad, tapering at apex. Preanal appendage (Fig. 70A, B) each composed of two processes; dorsolateral process shorter than segment IX, bearing 1 apical spine, with 1 subapical spine; in lateral view lanceolate; ventromesal process about as long as dorsolateral process, ventromesal process shorter than inferior appendage, produced dorsolaterally, bearing ventromesal process, with stout setae, in row on posterior margin, entirely fused at mid line. Inferior appendage (Fig. 70A, C) shorter than segment IX; in lateral view subrectangular, apically truncate, with ventral margin straight; in ventral view, internal margin of appendage sinuous, and apex truncate, with mesal margin excavated, with sclerotized apicoventral margin; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe small, triangular, laterally overlapped with main body of appendage, glabrous, fused with sclerotized process, curved posteromesad, pointed in ventral view; basodorsal lobe clavate in lateral view, with apex rounded, with about half length of body of appendage, directed dorsad. Phallus (Fig. 70D, E) tapering apically, slightly bent at mid-length, with 3 elongate phallic spines, each in membranous pouch; phallotremal sclerite anterodorsal, large, with 2 posterior lobes in dorsal view.
Material examined: Brazil: Rio Negro, etwa 20-30 km oberhalb von A-31 (A-31: etwa 80km oberhalb von Manaus), Lichtfang (A-32), 7.x.1960, E.J. Fittkau – holotype male [alcohol] (NMNH); Espírito Santo, Pedro Canário, Cachoeira da Mata, 18º12’10.8”S, 40º04’37.9”W, 29.iii.2011, E. A. Raimundi, F. C. Massariol, K. D. C. Bertazo, and P. V. A. Brito – 1 male paratype of *Ce. lanceolata* [alcohol] (INPA).
Distribution: Argentina, Brazil, Suriname, Uruguay.

Cernotina pesae Santos and Nessimian 2008

(Fig. 71)

Santos and Nessimian, 2008:28 [Type locality: Brazil, Amazonas, Manaus, tributary to Igarapé Cachoeira, basin of Rio Cuieiras, 02º41'45.4"S 60º17'42.7"W; INPA; ♂].
‒Paprocki and França, 2014:82 [checklist].

This species bears some resemblance with *C. subapicalis* by the general shape of the DLP and the inferior appendage in lateral aspect, especially the BDL being short and displaced subapically. They differ by the slenderness of the DLP in *C. pesae*, instead of more fusiform in *C. subapicalis*, and by the number of apical spines in the same structure, being 1 in this species and 2 in the other one. The number of phallic spines is also different, being 2 in *C. pesae* and 3 in the other species.

Adult. Length of forewing 2.8 – 3.5 mm, n = 5. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 71A, C) height about half of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with deep, narrow concavity, with sclerotized ventral ridge. Tergum X fused with intermediate appendage. Intermediate appendage (Fig. 71A, B) membranous, about as long as segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view digitate, with strong apicoventral setae. Preanal appendage (Fig. 71A, B) each composed of two processes; dorsolateral process about as long as semgment IX, bearing 1 apical spine; in lateral view lanceolate, slender, with scale-like setae along entire length of process, straight; in dorsal view directed slightly laterad, than slightly curving mesad at apex; ventromesal process shorter than dorsolateral process, shorter than inferior appendage, laterally with broad base, constricted at midlength, and olbiquely truncate apex, laterally produced, with stout setae, in row on posterior margin, basally fused at mid line. Inferior appendage (Fig. 71A, C) about as long as segment IX; in lateral view oblong, apically rounded, with ventral margin straight; in ventral view, internal margin of appendage slightly curved mesad, and apex sub-truncate; anterior basal plate almost reaching anterior margin of sternum IX; apicomesal lobe small, auricular, laterally almost entirely overlapped with main body of appendage, with sclerotized tip exposed, bearing stout setae, entirely sclerotized; basodorsal lobe digitate in lateral view, with apex rounded, very short, barely protruding dorsally from main body of appendage in lateral view, directed posterodorsad, bearing row of setae. Phallus (Fig. 71D, E) narrow, slightly bent at mid-length, with 2 elongate phallic spines; phallothremal sclerite anterodorsal, large, as 2 parallel arms united mesally in sub-round structure, with posterior ends enlarged.

Material examined: Brazil: Amazonas, tributary to Igarapé Cachoeira, basin of Rio Cuieiras, 02º41’45.4”S, 60º17’42.7”W, 20.viii.2004, light trap, J.L. Nessimian & L. Fidelis – holotype male [alcohol] and 7 male paratypes [alcohol] (INPA).
Distribution: Brazil.

† *Cernotina pulchra* Wichard 2007

(Fig. 72)

Wichard, 2007:32 [Type locality: Dominican Republic; SMNS; ♂; in amber].

This species bears similarities with *C. caliginosa* and *C. danieli*, mainly in the apicomesal face of the inferior appendage projecting mesad. *C. pulchra* differs from *C. caliginosa* by the shape of the intermediate appendage complex, being slender and elongate instead of broad and obtuse, and by the DLP, slender and elongate instead of apically tapered as in the other species. The species can be distinguished by *C. danieli* by the shape of the DLP, which has a broad oblong base and a subapical constriction ending in an elongate apex, while *C. pulchra* has the same structure simply linear.
Material examined: No specimens examined. Diagnosis from Wichard 2007
Distribution: Domincan Republic.

Cernotina puri Dumas and Nessimian 2011

(Fig. 73)

Dumas and Nessimian, 2011:32 [Type locality: Brazil, Rio de Janeiro, Itatiaia (Penedo, tributary of Rio Palmital, 22º25'40.0"S, 44º32'46.0"W, el. 584 m; DZRJ; ♂; ♀]. − Dumas and Nessimian, 2012:23 [checklist]. − Paprocki and França, 2014:82 [checklist].

This species is somewhat similar to *C. falcata*, *C. lazzarii* and *Cernotina* n. sp. 7, by having the DLP globular, bearing a mesal secondary branch longer than the main body of the process. They differ by the relative length, shape and curvature of said branch, being more than 5 times longer than the main body of the process, elongate, strongly curved ventrolaterally, bearing a single apical spine in *C. puri*, 2 times longer than the globular process, slightly broad with apical and subapical spines in *C. falcata*, slightly longer than the globular process, subapically bifid with a subapical and an apical spine in *C. lazzarii*, and 2 times longer than the subtriangular process, elongate, divided in dorsal and ventral branches each with apical spine in *Cernotina* n. sp. 7. The VMP of *C. puri* is auricular, bearing an apical spine pointing ventrad, unique in the genus.

Adult. Length of forewing 4.0 – 4.3 mm, n = 5. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 73A, C) height about half of entire male genital complex; in ventral view, with anterior margin wider than posterior margin, anteroventral margin with shallow, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 73A, B) membranous, shorter than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view digitate, with strong apicoventral setae. Preanal appendage (Fig. 73A, B) each composed of two processes; dorsolateral process shorter than segment IX, secondary branch on dorsolateral process present, mesal, linear, longer than main setous body of appendage, with 1 apical spine; in lateral view rounded; ventromesal process shorter than dorsolateral process, shorter than inferior appendage, auricular, with stout setae, in row on posterior margin, bearing spine directed ventrad, basally fused at mid line. Inferior appendage (Fig. 73A, C) shorter than segment IX; in lateral view subrectangular, apically rounded with truncate apex, with ventral margin slightly curved dorsad; in ventral view, internal margin of appendage straight, and apex with mesal margin excavated; anterior basal plate barely surpassing posterior margin of sternum IX; apicomesal lobe large, conical, laterally exposed, bearing stout setae, with hooked sclerotized process, curved posteromesad, pointed in ventral view; basodorsal lobe globular in lateral view, with apex rounded and sclerotized, with about half length of body of appendage, bearing setae. Phallus (Fig. 73D, E) broad, straight, with no elongate spines, and 2 stout conical spines; phallotremal sclerite anterodorsal, large, with 2 posterior lobes in dorsal view.

Material examined: Brazil: Rio de Janeiro, Itatiaia, Penedo, tributary of Rio Palmital, 22º25’40.0”S, 44º32’46.0”W, el. 584 m, 7.iii.2008, L.L. Dumas & J.L. Nessimia –

holotype male [alcohol] (DZRJ 2369) and 1 paratype male [alcohol] (DZRJ 2372) (DZRJ).

Distribution: Brazil.

Cernotina riosanjuanensis Chamorro-Lacayo 2003

(Fig. 74)

Chamorro-Lacayo, 2003:485 [Type locality: Nicaragua, Río San Juan, Refugio Bartola, small creek, 300 m NW of station, 10º58'N, 84º21'W, el. 35 m; UMSP; ♂]. − Chamorro-Lacayo et al., 2007:46 [checklist].

This species bears small resemblances with *C. verticalis* by the vertical disposition of the DLP. However, *C. riosanjuanensis* has a basal auricular branch on the said process, not present in the other species, while it also does not possess a stub-like mesal branch with an apical spine such as in *C. verticalis*. This species also has a very broad BDL, while the *C. verticalis* lacks the basodorsal lobe. The simple phallus with no spines also differs it from the other species.

Adult. Length of forewing 4.5 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 74A, C) height about half of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with shallow, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 74A, B) membranous, shorter than segment IX, divided mid-dorsally, setose, without spines; with microsetae on dorsal surface; in lateral view slightly curved ventrad, pointing posteriad, linear, with round apex, with strong apicoventral setae. Preanal appendage (Fig. 74A, B) each composed of two processes; dorsolateral process shorter than segment IX, bearing 1 apical spine; in lateral view caudate, curved pointing posteriad; in dorsal view curved mesad; ventromesal process shorter than dorsolateral process, shorter than inferior appendage, truncate, with stout setae, in row on posterior margin, basally fused at mid line. Inferior appendage (Fig. 74A, C) about as long as segment IX; in lateral view oblong, apically rounded, with ventral margin straight; in ventral view, internal margin of appendage curved mesad, and apex round, with mesal margin excavated, with dorsal lobe auricular; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe small, triangular, laterally overlapped with main body of appendage, bearing stout setae, fused with sclerotized process, curved posteromesad; basodorsal lobe clavate in lateral view, with apex rounded, with about half length of body of appendage, directed dorsad, bearing setae. Phallus (Fig.74D, E) narrow, straight, with no spines; phallotremal sclerite anterodorsal, large, with 2 posterior lobes in dorsal view.

Material examined: Nicaragua: Dpto. Rio San Juan, Refugio Bartola, small creek 300 m NW of station, 10º58'N, 84º21'W, el. 35 m, 7.viii.2000, Chamorro, Dobbins – holotype male [alcohol] (UMSP000066732) (UMSP).

Distribution: Nicaragua.

Cernotina sexspinosa Flint 1983

(Fig. 75)

Flint, 1983:32 [Type locality: Brazil, Edo. Santa Catarina, Nova Teutonia (27º11'S, 52º23'W); NMNH; ♂]. − Angrisano, 1994:137 [distribution]. − Paprocki et al., 2004:15 [checklist]. − Paprocki and França, 2014:82 [checklist].

This species is similar to those described by Flint in 1983, from surrounding localities, *C. fallaciosa* and *C. verna*, by the lanceolate shape of the DLP with an apical spine, by the auricular BDL displaced to the apical portion of the main body of the inferior appendage, and the presence of 5 to 6 spines in the phallic membrane. *C. sexspinosa* does not have a hooked AML such as the previous species.

Adult. Length of forewing 4.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 75A, C) height about half of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 75A, B) membranous, about as long as segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view slightly curved ventrad, broad at base, tapering to round apex, with strong apicoventral setae. Preanal appendage (Fig. 75A, B) each composed of two processes; dorsolateral process longer than segment IX, bearing 1 apical spine; in lateral view lanceolate; in dorsal view curved mesad; ventromesal process shorter than dorsolateral process, shorter than inferior appendage, truncate, with stout setae, in row on posterior margin, basally fused at mid line. Inferior appendage (Fig. 75A, C) about as long as segment IX; in lateral view rectangular, apically olbiquely truncate, with ventral margin straight; in ventral view, internal margin of appendage slightly curved mesad, and apex round; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe reduced, sclerotized, indistinctly fused with body of the appendage, laterally overlapped with main body of appendage; basodorsal lobe globular in lateral view, shorter than half of body of appendage, bearing setae. Phallus (Fig. 75D, E) broad, straight, with 6 elongate phallic spines; phallotremal sclerite anterodorsal, large, with 2 laterally curved arms in dorsal view.

Material examined: Brazil: Santa Catarna, Nova Teutônia, 22º11'S, 52º23'W, 300-500 m, x.1963, F. Plaumann – holotype male [alcohol] (UNSM Type 100496) (NMNH).

Distribution: Brazil, Uruguay.

Cernotina sinosa **Ross 1951**

(Fig. 76)

Ross, 1951:346 [Type locality: Mexico, Chiapas, Salto de Agua; INHS; ♂]. − Bueno-Soria and Flint, 1978:198 [distribution]. − Bueno-Soria and Barba-Álvarez, 2011:360 [checklist].

This species is similar to *C. astera* and *C. laticula* by the shape of the DLP, curved mesad, with an apical spine, having and abrupt truncate constriction on its apical third, by the VMP broadly separated from the other half, and by the general shape of the inferior appendage, with a long and basal BDL. This species differs from *C. astera* by the lower apical lip of the inferior appendage, extending beyond the upper lip of the apical notch formed by the AML, not of the same size as the upper lip, and by having only 6 phallic spines versus more than 15 in *C. astera*. *C. sinosa* differs from *C. laticula* by the inferior appendage apex, notched in lateral view and tapered in ventral view in this species, while rounded and broad in the respective perspectives in the other species.

Adult. Length of forewing 4.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 76A, C) height about 3/4ths of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with shallow, narrow concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 76A, B) membranous, shorter than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view digitate, with strong apicoventral setae. Preanal appendage (Fig. 76A, B) each composed of two processes; dorsolateral process about as long as semgment IX, bearing 1 apical spine; in lateral view caudate, apically curved ventrad; in dorsal view strongly curved mesad, with apex pointing posteromesad; ventromesal process shorter than dorsolateral process, than inferior appendage, truncate, with stout setae, in row on posterior margin, broadly separated at mid line. Inferior appendage (Fig. 76A, C) longer than segment IX; in lateral view oblong, apically notched, with ventral margin straight; in ventral view, internal margin of appendage strongly curved mesad, and apex truncate, projecting mesad; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe large, truncate, laterally merged with with notched apex, bearing stout setae, with hooked sclerotized dorsal process; basodorsal lobe subtriangular in lateral view, with apex rounded, shorter than half of body of appendage, directed dorsad, bearing setae. Phallus (Fig. 76D, E) narrow, slightly bent at mid-length, with 6 elongate phallic spines, free in phallic membrane; phallotremal sclerite anterodorsal, large, as 2 symmetrical hooks in dorsal view.

Material examined: Mexico: Chiapas, Salto de Água, 28.iv.1938, A. Dampf – holotype male [alcohol] (INHS Tricop #22816) and 1 paratype male (INHS); Chiapas, #9, stream 5.0 – 5.5 mi S. of Palenque on Mex 199, u.v. light, 20.xii.1983, Hamilton, Holzenthal, Kovac, det S.W. Hamilton 1984 – 1 male [alcohol] and 1 female [alcohol] (UMSP).

Distribution: Mexico.

Cernotina sinuosa Barcelos-Silva, Camargos and Pes 2013

(Fig. 77)

Barcelos-Silva, Camargos and Pes in Barcelos-Silva et al., 2013:124 [Type locality: Brazil, Espírito Santo, Fundão, Hotel Fazenda Lua Nova; 19º56'02.0"S, 40º24'45.0"W; CZNC; ♂]. − Barcelos-Silva et al., 2012:1279 [as Cernotina sp. 2]. − Paprocki and França, 2014:83 [checklist].

This species is unique among all species of *Cernotina*. The DLP is curved laterad, then recurved straight such as in *C. stannardi*, although the structure is elongate along all its length in *C. sinuosa*, and the curves are smoother, rather than the abrupt apical curve of the other species. In addition, the intermediate appendage not entirely fused with the segment X, and bears a lateral spine on each side.

Adult. Length of forewing 2.9 mm, n = 3. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 77A, C) height about 3/4ths of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with deep, narrow concavity, with sclerotized ventral ridge. Tergum X partially fused with intermediate appendage. Intermediate appendage (Fig. 77A, C) membranous, shorter than segment IX divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view bifid, with apicolateral spine. Preanal appendage (Fig. 77A, B) each composed of two processes; dorsolateral process shorter than segment IX, bearing 1 apical spine; in lateral view linear, twisted, slightly directed ventrad; in dorsal view curved laterad then recurved posteriad; ventromesal process shorter than dorsolateral process, shorter than inferior appendage, truncate, with stout setae, in row on posterior margin, bearing apical spine, broadly separated at mid line. Inferior appendage shorter than segment IX; in lateral view hatchet-shaped, apically ventrally acute, with ventral margin straight; in ventral view, internal margin of appendage curved mesad, and apex oblique; apicomesal lobe small, elongate, bearing stout setae, with hooked sclerotized dorsal process; basodorsal lobe oblong in lateral view, shorter than half of body of appendage, directed posterodorsad, bearing row of setae. Phallus (Fig. 77D, E) narrow, slightly curved ventrad then slightly recurved dorsad, with 2 elongate phallic spines with broad base; phallotremal sclerite anterodorsal, large, with 2 posterior lobes in dorsal view.

Material examined: Brazil: Espírito Santo, Fundão, Hotel Fazenda Lua Nova, 19º56'02.0"S, 40º24'45.0"W, 02.xii.2010, Pennsylvania trap, E.A. Raimundi, F.F. Salles, F.C. Massariol, P. Barcelos-Silva, and Y.S. Feitosa – 1 paratype male [alcohol] (INPA).
Distribution: Brazil.

Cernotina spicata **Flint 1938**

(Fig.78)

Ross, 1938:138 [Type locality: [U.S.A], Turner Falls State Park, Oklahoma: along Honey Creek; INHS; male]. – Morse 1993:84 [checklist]. – Huryn and Harris, 2000:194 [distribution]. – Stocks, 2010:165 [wing coupling structure and function]. Houghton et al. 2011:7 [phenology, distribution]. – Wright et al., 2013:467 [biology]. – Simon et al., 2015:20 [distribution]. – Denson et al., 2016:7 [checklist]. – Houghton et al., 2018:67 [checklist].

This species is similar to *C. ohio* by the elongate shape of the DLP, curving mesad, bearing apical spine and a basal acute branch with apical spine. They differ by the curvature of the DLP, being mesad in *C. spicata* and ventromesad in *C. ohio*, by the presence of a truncate VMP in *C. spicata* and by its inferior appendage slightly broad and fusiform, with a very broad BDL oriented dorsad, while the orther species has an elongate inferior appendage, with a slightly slender BDL oriented posterodorsad.

Adult. Length of forewing 5.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 78A, C) height about half of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with deep, narrow concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 78A, B) membranous, shorter than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view broad, pointing slightly anteriad, posteriorly tapered to round apex, with strong apicoventral setae. Preanal appendage (Fig. 78A, B) each composed of two processes; dorsolateral process shorter than segment IX, bearing 1 apical spine, secondary branch on dorsolateral process present, mesobasal, acute, with 1 apical spine; in lateral view lanceolate, curved pointing posteriad; in dorsal view curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, with stout setae, in row on posterior margin, not fused at mid line. Inferior appendage (Fig. 78A, C) about as long as segment IX; in lateral view oblique, apically notched, with ventral margin slightly concave; in ventral view, internal margin of appendage slightly curved mesad, and apex truncate, projecting mesad; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe large, auricular, laterally merged with with notched apex, bearing stout setae, fused with sclerotized process; basodorsal lobe oblong in lateral view, with apex rounded, with about 3/4 length of body of appendage, directed dorsad, bearing setae. Phallus (Fig. 78D, E) narrow, slightly bent at mid-length, with no spines; phallotremal sclerite anterodorsal, large, with 2 medially curved arms in dorsal view.

Material examined: United States: Oklahoma, Turner Falls State Park, along Honey Creek, 2.vi.1937, H.H. Ross – holotype male [alcohol] (INHS).

Distribution: U.S.A.

Cernotina spinigera Flint 1971

(Fig. 79)

Flint, 1971:38 [Type locality: Brazil [Edo. Pará], Tapajós, dicht unterhalb des Zusammenflusses von Rio Juruena mit Rio São Manuel; NMNH; ♂]. − Angrisano, 1994:137 [distribution]. − Sykora, 1998:102 [♂; distribution]. − Paprocki et al., 2004:15 [checklist]. — Barcelos-Silva et al., 2013:124 [distribution]. — Paprocki and França, 2014:83 [checklist].

This species is very unique on its combinations of characters. It has a mesal acute branch on the DLP similar to that of *C. spicata*, but lacks apical spines on the said process. The elongate, sinuously curved dorsad, yet short VMP is not shared with other species. The defining character that gives *C. spinigera* its name is the presence of very stout spine-like setae on the apicomesal margin of a clavate BDL, resembling a medieval mace.

Adult. Length of forewing 2.5 – 2.7 mm, n = 2. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 79A, C) height about 3/4ths of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Tergum X fused with intermediate appendage. Intermediate appendage (Fig. 79A, B, D) membranous, longer than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view slightly curved ventrad, elontate, with round apex, with strong apicoventral setae. Preanal appendage (Fig. 79A, B, D) each composed of two processes; dorsolateral process longer than segment IX, secondary branch on dorsolateral process present, mesobasal, acute, short, with 1 apical spine; in lateral view linear, smootlhy tapering to apex, directed slightly dorsad up to anterior third, then directed slightly ventrad, then apically curved dorsad; in dorsal view with apex strongly curved mesad; ventromesal process shorter than dorsolateral process, shorter than inferior appendage, elongate, with stout setae, on apex, broadly separated at mid line. Inferior appendage (Fig. 79A, C) longer than segment IX; in lateral view subtriangular, apically with round lobe, with ventral margin slightly curved dorsad at apex; in ventral view, internal margin of appendage curved mesad, and apex obliquely subtruncate; anterior basal plate surpassing anterior margin of sternum IX; apicomesal lobe absent; basodorsal lobe clavate in lateral view, with apex rounded, with about 3/4 length of body of appendage, directed posterodorsad, and mesad, bearing tuft of setae apically. Phallus (Fig. 79E) broad, straight, with 3 elongate phallic spines, and numerous stout short spines; phallothremal sclerite absent.

Material examined: Venezuela: Bolívar, Ciudad Guayana, Parque Llovizna, Rio Caroni, 13.ii.1976, C.M. & O.S. Flint, Jr. – 1 male [pinned] (NMNH); **Brazil:** Tapajós, dicht unterhalb des Zusammenflusses von Rio Juruena, mit Rio São Manuel, 13.i.1961, Lichtfang be idem Ort Barra (A-89), E.J. Fittkau – holotype male [alcohol] and 2 male paratypes [alcohol] (NMNH).

Distribution: Brazil, Uruguay, Venezuela.

Cernotina spinosior Flint 1992

(Fig. 80)

Flint, 1992b:65 [Type locality: Venezuela, Bolivar State, Rio Cuyuni, El Dorado; NMNH; ♂]. − Paprocki et al., 2004:15 [checklist]. − Paprocki and França, 2014:83 [checklist].

This species bears some resemblance with *C. intersecta* by the shape of the DLP in lateral aspect with a spine on the blunt apex, and by the lack of BDL on the inferior appendage. They differ by the shape of the DLP in dorsal view, subrectangular directed posteriad in *C. spionsior*, and elongate, strongly curved mesad in *C. intersecta*. This species also bears 8 spines in the phallic membrane, while the other species lacks phallic spines altogether.

Adult. Length of forewing 2.0 – 2.5 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 80A, C) height about half of entire male genital complex; in ventral view, with anterior margin wider than posterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 80A, B) membranous, about as long as segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view digitate, with slight ventral protrusion at midlength. Preanal appendage (Fig. 80A, B) each composed of two processes; dorsolateral process about as long as semgment IX, bearing 1 apical spine; in lateral view rectangular; ventromesal process shorter than dorsolateral process, shorter than inferior appendage, oblong, with stout setae, on apex, basally fused at mid line. Inferior appendage (Fig. 80A, C) longer than segment IX; in lateral view subrectangular, apically truncate, with ventral margin slightly curved dorsad at apex; in ventral view, internal margin of appendage straight, and apex round; anterior basal plate surpassing anterior margin of sternum IX; apicomesal lobe small, auricular, laterally exposed, bearing stout setae, with hooked sclerotized dorsal process, pointed in ventral view; basodorsal lobe appressed to surface of ventral body, shorter than half of body of appendage. Phallus (Fig. 80D, E) broad, slightly bent at mid-length, with 8 elongate phallic spines; phallotremal sclerite anterodorsal, large, as 2 parallel sinuous lines in dorsal view.

Material examined: Venezuela: Bolivar, Rio Cuyuni, El Dorado, 10.ii.1976, C.M. & O.S. Flint, Jr. – holotype male [pinned] (NMNH).

Distribution: Brazil, Venezuela.

Cernotina stannardi Ross 1951

(Fig. 81)

Ross, 1951:343 [Type locality: Mexico, Chiapas, Ocosingo Valley, along Rio Santa Cruz, Finca el Real; INHS; ♂]. − Bueno-Soria and Flint, 1978:198 [distribution]. − Bueno-Soria and Barba-Álvarez, 2011:360 [checklist].

This species is very distinctive, with the DLP strongly curving mesad at its midlength, then abruptly curving posteroventrad subapically.

Adult. Length of forewing 4.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 81A, C) height about 3/4ths of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 81A, B) membranous, shorter than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view broad at base, tapering at apex, with strong apicoventral setae. Preanal appendage (Fig. 81A, B) each composed of two processes; dorsolateral process shorter than segment IX, bearing 1 apical spine; in lateral view linear, twisted, strongly curved ventrad; in dorsal view strongly curved mesad, then apically recurved posteriad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, with stout setae, in row on posterior margin, broadly separated at mid line. Inferior appendage (Fig. 81A, C) about as long as segment IX; in lateral view fusiform, apically notched, with ventral margin slightly curved dorsad at apex; in ventral view, internal margin of appendage sinuous, and apex oblique, with acute projection laterally; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe large, round, laterally merged with with notched apex, bearing stout setae, fused with sclerotized process; basodorsal lobe oblong in lateral view, shorter than half of body of appendage, directed dorsad, bearing setae. Phallus (Fig. 81D, E) narrow, slightly bent at mid-length, with no spines; phallotremal sclerite anterodorsal, large, with 2 laterally curved arms in dorsal view.

Material examined: Mexico: Chiapas, Ocosingo Valley, along Rio Santa Cruz, Finca el Real, 1.vii.1950, at light, L.J. Stannard and C. & M. Goodnight – holotype male [alcohol] (INHS) and 1 male paratype [alcohol] (INHS).

Distribution: Mexico.

Cernotina subapicalis Flint 1971

(Fig. 82)

Flint, 1971:35 [Type locality: Brazil [Edo. Amazonas], Rio Marauiá, Endstation vor larger Cachoeira; NMNH; ♂]. − Flint, 1974:43 [♂; distribution]. − Paprocki et al., 2004:15 [checklist]. − Paprocki and França, 2014:83 [checklist].

This species resembles *C. mandeba* and *Cernotina* n. sp. 1 by the cuspidate shape of the DLP in lateral view, bearing 1 or 2 apical spines. *C. subapicalis* differs from *C. mandeba* by the shape of the VMP in dorsal view, laterally produced versus truncate in the other species. The inferior appendage in ventral view is also different, with a round blunt apex in this species and bearing an apicomesal concavity in *C. mandeba*. *C. subapicalis* differs from *Cernotina* n. sp. 1 by the apex of the inferior appendage in lateral view, round in *C. subapicalis* and tapered obliquely in the other species, by the length of the BDL, shorter than a third of the main body of the appendage versus as long as half the length of the main body of the appendage, respectively. The number of phallic spines is also different, being 3 in *C. subapicalis* and 2 in *Cernotina* n. sp. 1.

Adult. Length of forewing 3.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 82A, C) height about 3/4ths of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 82A, B) membranous, about as long as segment IX, divided

mid-dorsally, setose; with microsetae on dorsal surface; in lateral view slightly curved, linear, with slightly truncate apex, with strong apicoventral setae. Preanal appendage (Fig. 82A, B) each composed of two processes; dorsolateral process about as long as semgment IX, bearing 2 apical spines; in lateral view acuminate; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, produced dorsolaterally, with stout setae, in row on posterior margin, basally fused at mid line. Inferior appendage (Fig. 82A, C) about as long as segment IX; in lateral view oblong, apically rounded, with ventral margin straight; in ventral view, internal margin of appendage sinuous, and apex truncate; anterior basal plate almost reaching anterior margin of sternum IX; apicomesal lobe small, auricular, laterally exposed, bearing stout setae, with hooked sclerotized dorsal process, curved mesad, pointed in ventral view; basodorsal lobe subtriangular in lateral view, with apex rounded, shorter than half of body of appendage, directed posterodorsad, bearing setae. Phallus (Fig. 82D, E) slightly broad, slightly bent at mid-length, with 3 elongate phallic spines, each in membranous pouch; phallotremal sclerite anterodorsal, large, with 2 posterior lobes in dorsal view.
Material examined: Brazil: Rio Marauiá, Endstation vor langer Cachoeira, Fluß tritt hier aus dem Gebirge mit starkem Gefälle, 24 Jan. 1963, Lichtfang (A-496), E.J. Fittkau – holotype male [alcohol] (NMNH).
Distribution: Brazil, Suriname.

Cernotina taeniata Ross 1951

(Fig. 83)

Ross, 1951:344 [Type locality: Mexico, Chiapas, Huehuetan; INHS; ♂]. − Bueno-Soria and Flint, 1978:198 [distribution]. − Holzenthal, 1988c:58 [distribution]. − Maes, 1999:1188 [checklist]. − Bueno-Soria et al., 2005:75 [distribution]. − Chamorro-Lacayo et al., 2007:46 [checklist]. — Bueno-Soria and Barba-Álvarez, 2011:360 [checklist]. – Armitage et al., 2016:5 [distribution].

This species resembles *C. spicata* by the elongate DLP, with an acute mesal branch, differing from that species by having the DLP strongly curved mesad, with its apex pointing anteriad, while in the other species, the process is slightly curved mesad. *C. taeniata* also resembles *Cernotina* n. sp. 4 in the overall shape of the DLP and inferior appendages. They differ by the curvature of the DLP being stronger in *C. taeniata*, by the presence of a basoventral branch on the DLP in *Cernotina* n. sp. 4, and by the VMP being subquadrate in *C. taeniata* and elongate in the other species. Lastly, *C. taeniata* resembles *Cernotina* n. sp. 12, in shape of the DLP, VMP and inferior appendages in lateral view, lacking a mid-length constriction in the DLP that the other species has. *Cernotina* n. sp. 12 also lacks the acute mesal branch of the DLP.

Adult. Length of forewing 4.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 83A, C) height about 3/4ths of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 83A, B) membranous, shorter than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view broad at base, tapering at apex, with strong apicoventral setae. Preanal appendage (Fig. 83A, B) each composed of two processes; dorsolateral process about as long as semgment IX, bearing 1 apical spine, secondary branch on dorsolateral process present, mesobasal, acute, with 1 apical spine; in lateral view linear; in dorsal view strongly curved mesad, with apex pointing anteriad, crossing medially; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, with stout setae, in row on posterior margin, broadly separated at mid line. Inferior appendage (Fig. 83A, C) longer than segment IX; in lateral view lanceolate, apically notched, with ventral margin straight; in ventral view, internal margin of appendage straight, and apex truncate; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe large, auricular, laterally merged with with notched apex, bearing stout setae, with hooked sclerotized process, pointed in ventral view; basodorsal lobe subtriangular in lateral view, with apex rounded, with about half length of body of appendage, directed dorsad, bearing setae. Phallus (Fig. 83D, E) narrow, straight, with 6 elongate phallic spines; phallotremal sclerite anterodorsal, as 2 parallel sinuous lines in dorsal view.

Material examined: Mexico: Chiapas, Huehuetan, at light, 9.xi.1932, A. Dampf – holotype male [alcohol] (INHS); **Costa Rica:** San José, Reserva Biológica Carara, Río

del Sur, 1.5 km (rd) S Carara, lat 9.769000, long -84.531000, el. 160 m, 13.iii.1991, Holzenthal, Muñoz & Huisman – 1 male [pinned] (UMSP000048532) (UMSP); Guanacaste, Río Tizate, 7.2 km NE Cañas Dulces, lat 10.773000, long -85.449000, 28.vi.1986, Holzenthal, Heyn & Armitage – 5 males [alcohol] (UMSP000102742) (UMSP); **Nicaragua:** Dpto. Río San Juan, Refugio Bartola, small creek 300 m NW of station, lat 10.966670, long -84.350000, el. 35 m, 7.viii.2000, Chamorro & Dobbins – 2 males [alcohol] (UMSP000063733) (UMSP); 1.5 km N. of station, Río Bartola, lat 10.966670, long -84.350000, el. 40 m, 8.viii.2000, Chamorro & Dobbins – 12 males [alcohol] (UMSP000063736) (UMSP); **Venezuela:** Zulia, Caño Carichuano, 3.4 km SE Carbones del Guasare, lat 11.002000, long -72.285000, el. 70 m, 12-13.i.1994, Hozenthal, Cressa & Rincón – 3 males [alcohol] (UMSP000102756) (UMSP).
Distribution: Costa Rica, Guatemala, Mexico, Nicaragua, Venezuela.

Cernotina tiputini Camargos, Ríos-Touma and Holzenthal 2017

(Fig. 84)

Camargos, Ríos-Touma and Holzenthal, 2017:4 [Type locality: Ecuador, Orellana, Reserva de Biodiversidad Tiputini: river slough, Numa trail, 00.63954ºS, 76.14836ºW, el. 260m; UMSP; male].

This species is very similar to *C. chelifera* from Argentina in the two apical spines of the DLP and the general shape of the appendage. It differs from the Argentinian species by the overall shape of tergum X and the intermediate appendage, its relative size shorter than the inferior appendage, a broader DLP in dorsal aspect, a narrower inferior appendage, and by having two internal spines instead of only one long spine in the phallus.

Adult. Length of forewing 3.5 mm, n = 2. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 84A, C) height about 3/4ths of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 84A, B) membranous, shorter than segment IX, divided mid-dorsally, setose, without spines; with microsetae on dorsal surface; in lateral view elongate, with dorsal surface arched, apex slightly rounded, with strong apicoventral setae. Preanal appendage (Fig. 84A, B) each composed of two processes; dorsolateral process shorter than segment IX, bearing 2 apical spines; in lateral view oblong; ventromesal process about as long as dorsolateral process, ventromesal process shorter than inferior appendage, produced dorsolaterally, with stout setae, in row on posterior margin, basally fused at mid line (Fig. 84F). Inferior appendage (Fig. 84A, C) about as long as segment IX; in lateral view lanceolate, apically rounded, with ventral margin straight; in ventral view, internal margin of appendage straight, with sclerotized apicoventral margin; anterior basal plate almost reaching anterior margin of sternum IX; laterally overlapped with main body of appendage, with hooked sclerotized process, pointed in ventral view; basodorsal lobe oblong in lateral view, with apex rounded, with about 3/4 length of body of appendage, directed posterodorsad, bearing row of setae. Phallus (Fig. 84D, E) narrow, slightly bent at mid-length, with 2 elongate phallic spines, free in phallic membrane; phallotremal sclerite anterodorsal, large, ovate, with 2 apparent lateral processes in dorsal view.

Material examined: Ecuador: Orellana, Reserva de Biodiversidad Tiputini, river slough, Numa trail, 00.63954°S, 76.14836°W, el. 260 m, 23.x.2011, Holzenthal and Ríos – holotype male [pinned] (UMSP000098447) (UMSP) and 1 paratype male [alcohol] (MECN).

Distribution: Ecuador.

Cernotina trispina **Flint 1971**

(Fig. 85)

Flint, 1971:38 [Type locality: Brazil [Edo. Amazonas], Rio Marauiá, Cachoeira, Rio Iripirapí; NMNH; ♂]. − Paprocki et al., 2004:15 [checklist]. − Paprocki and França, 2014:83 [checklist].

This species is very distinctive. It has the DLP short with apical spine and a spine at midlength, similar to that of *C. carbonelli*, but it lacks the spine at the apex of the intermediate appendage complex, and has the VMP longer than the DLP. Its ventromesal patch of setae on the tergum X is similar to that of *C. decumbens*, but *C. trispina* lacks the mesoventral branch of the DLP, and the other species also has a VMP shorter than the DLP, unlike *C. trispina*.

Adult. Length of forewing 3.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 85A, C) height about half of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 85A, B) membranous, about as long as segment IX, indistinctly divided mid-dorsally, setose, bearing densely setose basomesal tuft; with microsetae on dorsal surface; in lateral view broad at base, short, apically curved ventrad abruptly, slowly tapering to round apex, with strong apicoventral setae. Preanal appendage (Fig. 85A, B) each composed of two processes; dorsolateral process shorter than segment IX, bearing 1 apical spine, with 1 spine at midlength; in lateral view lanceolate; in dorsal view slightly curved mesad; ventromesal process about as long as dorsolateral process, ventromesal process shorter than inferior appendage, produced dorsolaterally, with stout setae, in row on posterior margin, broadly separated at mid line. Inferior appendage (Fig. 85A, C) longer than segment IX; in lateral view rectangular, apically truncate, with ventral margin slightly concave; in ventral view, internal margin of appendage straight, and apex truncate; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe small, auricular, laterally almost entirely overlapped with main body of appendage, with sclerotized tip exposed, bearing stout setae, with hooked sclerotized process; basodorsal lobe oblong in lateral view, with about same length of body of appendage, directed posterodorsad, bearing row of setae. Phallus (Fig. 85D, E) narrow, curved ventrad then recurved straight, with 3 elongate phallic spines, each in membranous pouch; phallotremal sclerite absent, absent.

Material examined: Brazil: Rio Marauiá, Cachoeira, Rio Irapirí, 4.i.1963 (A-456), E.J. Fittkau – holotype male [alcohol] (NMNH).

Distribution: Brazil.

Cernotina truncona Ross 1947

(Fig. 86)

Ross, 1947:137 [Type locality: [U.S.A.], Daytona Beach, Florida: collected in light trap at Welsh Hospital; INHS; male]. –Denson et al., 2016:7 [checklist].

This species resembles *C. fallaciosa* and *C. verna*, by the general shape of the DLP and the inferior appendage, with the BDL displaced to the apex, round, projected dorsad. They differ however by size of the BDL, projecting longer dorsad in a thumb-like shape in *C. truncona*, and only slightly projected dorsad in the other two species.

Material examined: No specimens examined. Diagnosis from Ross 1947.

Distribution: U.S.A.

Cernotina uara Flint 1971

(Fig. 87)

Flint, 1971:36 [Type locality: Brazil [Edo. Amazonas], Rio Marauiá, eine Tagesreise oberhalb A-490 [A-490: 2 days journey above Mission S. Antônio]; NMNH; ♂]. − Flint, 1974:43 [♂; distribution]. − Paprocki et al., 2004:15 [checklist]. − Paprocki and França, 2014:83 [checklist].

This species bears similarities with *C. cacha* by the general shape of the intermediate appendage complex, the truncate shape of the VMP, the inferior appendage and the relative length of the sternum IX in lateral. However, *C. uara* possesses a subapical elongate branch in the DLP, unlike the other species. In addition, the DLP is more attenuate in *C. cacha* than in *C. uara*.

Adult. Length of forewing 2.5 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 87A, C) height about half of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with shallow, broad concavity. Intermediate appendage (Fig. 87A, B) membranous, longer than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view slightly curved ventrad, broad at base, tapering to round apex, with strong apicoventral setae. Preanal appendage (Fig. 87A, B) each composed of two processes; dorsolateral process longer than segment IX, secondary branch on dorsolateral process present, mesal, subapical, oblong, short; in lateral view lanceolate; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, produced dorsolaterally, with stout setae, in row on posterior margin, not fused at mid line. Inferior appendage (Fig. 87A, C) longer than segment IX; in lateral view lanceolate, apically olbiquely truncate, with ventral margin straight; in ventral view, internal margin of appendage slightly curved mesad, and apex round, with dorsal lobe auricular; anterior basal plate surpassing anterior margin of sternum IX; apicomesal lobe small, auricular, laterally overlapped with main body of appendage, bearing stout setae, with hooked sclerotized dorsal process; basodorsal lobe subtriangular in lateral view, with apex rounded, with about half length of body of appendage, directed posterodorsad, bearing row of setae. Phallus (Fig. 87D, E) narrow, slightly bent at mid-length, with no elongate spines, and 2 stout conical spines; phallotremal sclerite anterodorsal, large, as 2 parallel sinous lines laterally curved in dorsal view.

Material examined: Brazil: Rio Marauiá, eine Tagesreise oberhalb A-490 (A-490 : 2 days journey above Mission S. Antônio), in der Nähe der Grenzebirge, Fluß mit Sandboden, 24.i.1963, Lichtfang (A-492), E.J. Fittkau – holotype male [alcohol] (NMNH).

Distribution: Brazil, Suriname.

Cernotina uncifera Ross 1951

(Fig. 88)

Ross, 1951:348 [Type locality: Mexico, Chiapas, Huehuetan; INHS; ♂]. − Bueno-Soria and Flint, 1978:198 [distribution]. − Aguila, 1992 :536 [distribution]. − Chamorro-Lacayo et al., 2007:46 [checklist]. − Bueno-Soria and Barba-Álvarez, 2011:360 [checklist]. −Armitage et al., 2015b:4 [checklist]. — Armitage and Cornejo, 2015:192 [checklist].

This species bears resemblance with *C. sinosa* in the curved DLP, with a constriction at midlength. They differ mainly by the presence of an inferior round lobe on where the DLP constricts into the curved apical half in *C. uncifera*, while the constriction in *C. sinosa* has a truncate margin.

Adult. Length of forewing 4.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 88A, C) height about 3/4ths of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 88A, B) membranous, about as long as segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view linear, with round apex, with strong apicoventral setae. Preanal appendage (Fig. 88A, B) each composed of two processes; dorsolateral process about as long as semgment IX, bearing 1 apical spine; in lateral view caudate, with apex divided in a dorsal curved hooked and a ventral short lobe, strongly curved ventrad; in dorsal view strongly curved mesad, with apex pointing anteriad, touching medially; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, with stout setae, in row on posterior margin, broadly separated at mid line. Inferior appendage (Fig. 88A, C) longer than segment IX; in lateral view lanceolate, apically rounded, with ventral margin straight; in ventral view, internal margin of appendage curved mesad, and apex round; anterior basal plate almost reaching anterior margin of sternum IX; apicomesal lobe large, auricular, laterally merged with with notched apex, bearing stout setae, fused with sclerotized process; basodorsal lobe subtriangular in lateral view, with apex rounded, shorter than half of body of appendage, directed dorsad, bearing tuft of setae apically. Phallus (Fig. 88D, E) broad, straight, with 8 elongate phallic spines; phallotremal sclerite anterodorsal, large, with 2 anterior lobes in dorsal view.

Material examined: Mexico: Chiapas, Huehuetan, 9.xi.1932, at light, A. Dampf – holotype male [alcohol] (INHS Trichop #22832) and 1 male paratype [alcohol] (INHS); **Costa Rica:** Puntarenas, roadside seep, route 2 just W km 234, Lat 8.976000, Long -83.299000, el. 100 m, 20.ii.1986, Holzenthal, Morse & Fasth – 1 male [pinned] (UMSP000048533) (UMSP); Límon, Río Telire and small trib., SE Suretka, Lat 9.554000, Long -82.892000, el. 48 m, 1.ii.1986, Holzenthal, Morse & Fasth – 1 male [alcohol] (UMSP000102744) (UMSP); Parque Nacional Tortuguero, Río Tortuguero, 3.5 km S Tortuguero, Lat 10.509000, long -83.504000, el. 5 m, 4.iv.1989, Holzenthal & Blahnik – 1 male [pinned] (UMSP000048534) and 4 males [alcohol] (UMSP000102749) (UMSP); **Nicaragua:** Río San Juan, Refugio Bartola, small creek, 300 m NW of station, lat 10.966670, long -84.350000, el. 35 m, 7.viii.2000, Chamorro & Dobbins – 5 males [alcohol] (UMSP000063766) (UMSP); small creek, 800 m W. of station, lat 10.966670, long -84.350000, el. 40 m, 9.viii.2000, Chamorro, M.L. – 1 male [alcohol] (UMSP000063734) (UMSP); Rivas, Río Las Lajas, 2 kms NW of El Genizaro, Lat. 11.358830, Long -85.792980, el. 47 m, 1.vii.2000, Chamorro & Lacayo – 2 males [alcohol] (UMSP000063883) (UMSP); **Panama:** Barro Colorado Island, Snyder – Molino trail, 9.ix-25.xii.1990, Wolda, H – 3 males [alcohol] (UMSP000102745) (UMSP); **Venezuela:** Zulia, Caño Carichuano, 3.4 km SE Carbones del Guasare, lat 11.0020000, long -72.285000, el. 70 m, 12-13.i.1994, Holzenthal, Cressa & Rincón – 1 male [pinned] (UMSP000048535) and 1 male [alcohol] (UMSP000102750) (UMSP); **Ecuador:** Pichincha; Manabi, Reserva Ecológica, Jama-Coaque, Rio Camarones, pan, trap, 0.11610ºS, 80.12450ºW, el. 610 m, 26.v.2017, A. Falconi, I. Tobes – 3 males [alcohol] (UMSP); Pichincha, Santo Domingo, 47 km S, 29.vii.1976, Jeffrey Cohen – 4 males [alcohol] (NMNH); CDC trap, 29.vii.1976, Jeffrey Cohen – 2 males [alcohol] (NMNH).

Distribution: Costa Rica, Ecuador, Mexico, Nicaragua, Panama, Venezuela.

***Cernotina unguiculata* Flint 1971**

(Fig. 89)

Flint, 1971:41 [Type locality: Brazil [Edo. Pará], Gebäude der Mission Cururú; NMNH; ♂]. − Paprocki et al., 2004:15 [checklist]. − Paprocki and França, 2014:83 [checklist].

This species has a unique combination of characters. Each intermediate appendage complex has a sclerotized hooked apex that cross the apex of the other half, unlike the crossed intermediate appendages in *C. cingulate*, that cross the whole appendage apicomesally, not just the sclerotized hook. *C. unguiculata* also differs from *C. cingulata* by having a short apicomesal branch with two apical spines surrounded by many thin hair-like setae, while the other species lacks such branch, having its two apical spines on the main body of the rectangular DLP.

Adult. Length of forewing 3.5 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 89A, C) height about half of entire male genital complex; in ventral view, with anterior margin wider than posterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 89A, B) semi-membranous, about as long as segment IX, divided mid-dorsally, setose, with apical spine; with microsetae on dorsal surface; in lateral view broad at base, tapering to truncate sub-apex and hooked apex, with strong apicoventral setae. Preanal appendage (Fig. 89A, B) each composed of two processes; dorsolateral process about as long as semgment IX, secondary branch on dorsolateral process present, mesal, elongate, short, with 2 apical spines; in lateral view oblong; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, produced ventrolaterally, with stout setae, in row on posterior margin, basally fused at mid line. Inferior appendage (Fig. 89A, C) about as long as segment IX; in lateral view rectangular, apically truncate, with ventral margin slightly concave; in ventral view, internal margin of appendage sinuous, and apex truncate; anterior basal plate almost reaching anterior margin of sternum IX; apicomesal lobe small, auricular, laterally almost entirely overlapped with main body of appendage, with sclerotized tip exposed, bearing stout setae, with hooked sclerotized process, curved mesad; basodorsal lobe appressed to surface of ventral body, with about half length of body of appendage, bearing row of setae. Phallus (Fig. 89D, E) narrow, slightly bent at mid-length, with 3 elongate phallic spines, each in membranous pouch; phallotremal sclerite anterodorsal, large, as 2 parallel sinuous lines in dorsal view.

Material examined: Brazil: Gebäude der Mission Cururú, 3-5.ii.1961, Lichtfang (A-88-10), E.J. Fittkau – holotype male [alcohol] (NMNH);

Distribution: Brazil.

Cernotina verna Flint 1983

(Fig. 90)

Flint, 1983:30 [Type locality: Argentina, Pcia. Entre Ríos, Arroyo P. Verne, 4 km N Villa San José; NMNH; ♂]. − Angrisano, 1994:137 [distribution].

This species is similar to the other described by Flint in 1983, *C. fallaciosa* and *C. sexspinosa*, by the general lanceolate shape of the DLP with an apical spine, and the auriculate BDL displaced to apical region of the inferior appendage. It differs from *C. sexspinosa* by having a hooked apicomesal lobe, and by the position of the highest point of the BDL being subapical instead of apical such as in the other species. *C. verna* and *C. fallaciosa* differ by the shape of the VMP, having two elongate posterior projections in *C. verna*, and an obliquely truncate posterior surface in the other species. In addition, the AML is broader and relatively shorter in *C. verna*.

Adult. Length of forewing 4.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 90A, C) height about 3/4ths of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with shallow, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 90A, B) membranous, about as long as segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view slightly curved ventrad, tapering to round apex, with strong apicoventral setae. Preanal appendage (Fig. 90A, B) each composed of two processes; dorsolateral process about as long as semgment IX, bearing 1 apical spine; in lateral view lanceolate, slightly directed ventrad then recurved posteriad; in dorsal view curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, produced dorsolaterally and ventromesally, with stout setae, in row on posterior margin, basally fused at mid line. Inferior appendage (Fig. 90A, C) about as long as segment IX; in lateral view oblong, apically truncate, with ventral margin slightly curved dorsad at apex; in ventral view, internal margin of appendage curved mesad, and apex round; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe large, auricular, bearing stout setae, fused with sclerotized process; basodorsal lobe globular in lateral view, with about half length of body of appendage, displaced apically to main body of inferior appendage. Phallus (Fig. 90D, E) narrow, slightly curved ventrad then slightly recurved dorsad, with 4 elongate phallic spines, each in membranous pouch; phallotremal sclerite anterodorsal, large, with 2 posterior lobes in dorsal view.

Material examined: Argentina: Entre Ríos, Arroyo P. Verne, 4 km N Villa San José, 15.xi.1973, O.S. Flint, Jr. – holotype male [pinned] (Type 100494) (NMNH).

Distribution: Argentina, Uruguay.

Cernotina verticalis Flint 1971

(Fig. 91)

Flint, 1971:39 [Type locality: Brazil [Edo. Amazonas], Gebeit Endstation Rio Marauiá, Bergbach II; NMNH; ♂]. − Paprocki et al., 2004:15 [checklist]. − Paprocki and França, 2014:83 [checklist].

This species bears small resemblances with *C. riosanjuanensis* by the vertical disposition of the DLP. However, *C. verticalis* has a stub-like mesal branch on the DLP with an apical spine, unlike *C. riosanjuanensis*, that has a basal auricular branch on said process. *C. verticalis* also has the BDL appressed to the surface of the main body of the appendage, while the other species has a very broad BDL.

Adult. Length of forewing 3.5 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 91A, C) height about half of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with shallow, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 91A, B) membranous, shorter than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view broad at base, slightly ventrally arched, tapered at apex, with strong apicoventral setae. Preanal appendage (Fig. 91A, B) each composed of two processes; dorsolateral process about as long as semgment IX, bearing 1 apical spine, secondary branch on dorsolateral process present, mesal, truncate, short, stub-like, with 1 apical spine; in lateral view lanceolate, curved ventrad; in dorsal view curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, with stout setae, in row on posterior margin, basally fused at mid line. Inferior appendage (Fig. 91A, C) about as long as segment IX; in lateral view rectangular, apically truncate, with ventral margin straight; in ventral view, internal margin of appendage curved mesad, and apex truncate; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe small, auricular, laterally overlapped with main body of appendage, bearing stout setae, with hooked sclerotized process, curved mesad; basodorsal lobe appressed to surface of ventral body. Phallus (Fig. 91D, E) broad, slightly bent at mid-length, with 2 elongate phallic spines, and numerous stout short spines, in apical membrane; phallotremal sclerite anterodorsal, large, with 2 laterally curved arms in dorsal view.

Material examined: Brazil: Gebiet Endstation Rio Marauiá, Berbach II, etwa 350 m. über dem Meeresspiegel, schattig, starkes, Gefälle über Granitblöcke, Lichtfang (A-498), 26.i.1963, E.J. Fittkau – holotype male [alcohol] (NMNH).

Distribution: Brazil.

Cernotina waorani Camargos, Ríos-Touma and Holzenthal 2017

(Fig. 92)

Camargos, Ríos-Touma and Holzenthal, 2017:6 [Type locality: Ecuador, Orellana, Reserva de Biodiversidad Tiputini: small stream, Harpia trail, 00.63496ºS, 76.14602ºW, el. 240m; UMSP; male].

This species has similarities with *C. fallaciosa* from Argentina in the bulbous apex of the inferior appendage in lateral aspect and the presence of multiple internal spines in the phallus. However, the absence of apical spines on the DLP, its shape, and the presence of a flap-like mesal, sub-basal branch renders this species distinct. It also bears resemblance with *Cernotina* n. sp. 11 in the elongate shape of the DLP in lateral view, but differ from it in the truncate shape of the non fused VMP, while the other species has this structure elongate and with bases of each side fused mesally. *Cernotina* n. sp. 11 also has only 2 spines in the phallic membrane, unlike the 9 spines in *C. waorani*.

Adult. Length of forewing 4.0 mm, n = 2. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 92A, C) height about half of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with deep, narrow concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 92A, B) membranous, shorter than segment IX, divided mid-dorsally, setose, without spines; with microsetae on dorsal surface; in lateral view broad at base, tapering at apex, with strong apicoventral setae. Preanal appendage (Fig. 92A, B) each composed of two processes; dorsolateral process longer than segment IX, secondary branch on dorsolateral process present, mesal, flap-like; in lateral view linear; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, with stout setae, in row on posterior margin, not fused at mid line. Inferior appendage (Fig. 92A, C) shorter than segment IX; in lateral view subtriangular or lanceolate, apically tapered, with ventral margin slightly curved dorsad; in ventral view, internal margin of appendage strongly curved mesad, with mesal process with sclerotized apex; anterior basal plate barely surpassing posterior margin of sternum IX; laterally overlapped with main body of appendage or laterally exposed, with hooked sclerotized process; basodorsal lobe appressed to surface of ventral body. Phallus (Fig. 92D, E) narrow, straight, with 2 elongate phallic spines, free in phallic membrane, and 7 stout conical spines, each in membranous pouch; phallotremal sclerite anterodorsal, large, hourglass-shaped in dorsal view.

Material examined: Ecuador: Orellana, Reserva de Biodiversidad Tiputini, small stream, Harpia trail, 00.63496°S, 76.14602°W, el. 240 m, 22.x.2011, Holzenthal & Ríos – holotype male [pinned] (UMSP000098911) (UMSP); 2 paratype males [alcohol] (USFQ); 2 paratype males [alcohol] (MECN); Reserva de Biodiversidad Tiputini, river slough, Numa trail, 00.63954°S, 76.14836°W, el. 260 m, 23.x.2011, Holzenthal & Ríos – 1 male [pinned] (UMSP).

Distribution: Ecuador.

Cernotina zanclana **Ross 1951**

(Fig. 93)

Ross, 1951:344 [Type locality: Mexico, Oaxaca, Rancho Monter; INHS; ♂]. − Bueno-Soria and Flint, 1978:198 [distribution]. − Bueno-Soria, 2010:30 [♂].

This species is similar to other North American species such as *C. astera* and *C. laticula*, especially in the shape of the DLP, curved mesad, constricted at mid-length, bearing a spine at the apex. *C. zanclana* however differ from *C. astera* in the shape of the DLP constriction, being rounded and smooth, not noticeable in dorsal view, and abrupt and truncate in *C. astera*. This species differs from *C. laticula* by the shape of the inferior appendage apex in ventral view, tapered in *C. zanclana* and broadly truncate in the other species. The orientation of the DLP is also slightly different, being directed mesad in *C. zanclana* and anteriad due to a strong curvature in *C. laticula*.

Adult. Length of forewing 4.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 93A, C) height about 3/4ths of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with shallow, narrow concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 93A, B) membranous, about as long as segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view linear, narrow, tapering at apex, with strong apicoventral setae. Preanal appendage (Fig. 93A, B) each composed of two processes; dorsolateral process about as long as semgment IX, bearing 1 apical spine; in lateral view lanceolate; in dorsal view strongly curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, produced dorsolaterally, with stout setae, in row on posterior margin, broadly separated at mid line. Inferior appendage (Fig. 93A, C) longer than segment IX; in lateral view lanceolate, apically tapered, with ventral margin straight; in ventral view, internal margin of appendage strongly curved mesad, and apex truncate, projecting mesad; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe large, auricular, laterally merged with with notched apex, bearing stout setae, with hooked sclerotized dorsal process, curved mesad; basodorsal lobe subtriangular in lateral view, with apex rounded, with about half length of body of appendage, directed posterodorsad, bearing tuft of setae apically. Phallus (Fig. 93D, E) narrow, straight, with 12 elongate phallic spines; phallotremal sclerite anterodorsal, small, as 2 parallel hooks in dorsal view.

Material examined: Mexico: Oaxaca, Rancho Monter, December 16, 1937, at light, A. Dampf – holotype male [alcohol] and 1 paratype male [alcohol] (INHS).

Distribution: Belize, Mexico.

New species

***Cernotina* n. sp. 1**

(Fig. 94)

This species is somewhat similar to *C. subapicalis* in the shape of the DLP, with 2 apical spines. They differ mainly on the inferior appendage, having an oblique apex in *Cernotina* n. sp. 1 instead of a round apex as in *C. subapicalis*, and on the inferior appendage being long and linear instead of short and subtriangular as in the other species.

Adult. Length of forewing 2.9 – 3.2 mm, n = 2. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 94A, C) height about half of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 94A, B) membranous, about as long as segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view slightly curved ventrad, broad at base, tapering to round apex, with strong apicoventral setae. Preanal appendage (Fig. 94A, B) each composed of two processes; dorsolateral process about as long as semgment IX, bearing 2 apical spines; in lateral view lanceolate; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, produced dorsolaterally, with stout setae, in row on posterior margin, basally fused at mid line (Fig. 94F). Inferior appendage (Fig. 94A, C) about as long as segment IX; in lateral view oblique, apically tapered, with ventral margin straight; in ventral view, internal margin of appendage sinuous, and apex round; anterior basal plate almost reaching anterior margin of sternum IX; apicomesal lobe large, auricular, bearing stout setae, without sclerotization; basodorsal lobe oblong in lateral view, with apex rounded, with about 3/4 length of body of appendage, directed posterodorsad, bearing row of setae. Phallus (Fig. 94D, E) broad, slightly bent at mid-length, with 2 elongate phallic spines; phallotremal sclerite anterodorsal, large.

Holotype male: Brazil: Pará, Parauapebas, Flona de Carajás, Buritizal II, 05.ix.2007, V.P. Alecrim, N. Ferreira, Jr. – [alcohol] (DZRJ); [CHECK MORE SPECM]

Paratype: same data as holotype, except: Flona dos Carajás, Serra Norte, [0595751 . 9327602] (sic), el. 698 m, Buritizal II, luz U.V., 20.ix.2007, V.P. Alecrim, N. Ferreira Jr. – 1 male [alcohol] (DZRJ).

Distribution: Brazil.

Cernotina n. sp. 2

(Fig. 95)

This species has a very distinct inferior appendage, with numerous thick and large apicolateral straight setae. In addition, the VMP being broad, almost round, with a ventral posteriad spine is unique in the genus is unique in the genus.

Adult. Length of forewing 3.5 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 95A, C) height almost covering entire genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with shallow, narrow concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 95A, C) membranous, shorter than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view linear, narrow, tapering at apex. Preanal appendage (Fig. 95A, C) each composed of two processes; dorsolateral process shorter than segment IX, secondary branch on dorsolateral process present, mesal, subapical, short, with 2 apical spines; in lateral view lanceolate; in dorsal view slightly curved mesad; ventromesal process about as long as dorsolateral process, ventromesal process shorter than inferior appendage, produced ventrolaterally, glabrous, bearing apical spine, basally fused at mid line. Inferior appendage (Fig. 95A, C) shorter than segment IX; in lateral view rectangular, apically truncate, with ventral margin straight, with very thick straight setae ventrolaterally,; in ventral view, internal margin of appendage sinuous, and apex truncate; anterior basal plate barely surpassing posterior margin of sternum IX; positioned on posterior margin of basodorsal lobe, laterally exposed, bearing stout setae, with hooked sclerotized process, curved mesad; basodorsal lobe globular in lateral view, with about half length of body of appendage, displaced apically to main body of inferior appendage, directed dorsad, bearing setae. Phallus (Fig. 95D, E) narrow, straight, with 3 elongate phallic spines, 1 of which is basal; phallotremal sclerite dorsally at mid-length, large, as 2 arched arms in dorsal view.

Holotype male: Venezuela: Territorio Federal Amazonas, Cerro de la Neblina, Basecamp, small stream at eastside at basecamp, 0º41'N, 66º10'W, el. 140 m, 20-24.iii.1984, O. Flint and J. Louton – [pinned] (NMNH).
Distribution: Venezuela.

Cernotina n. sp. 3

(Fig. 96)

This species is very distinct among different species of *Cernotina*. The DLP has numerous large spines on its ventral margin up to the apex, the secondary dorsal protrusion of the VMP, and the inferior appendage bears a BDL smoothly curved posteriad make a unique combination of characters in the genus.

Adult. Length of forewing 3.0 mm, n = 2. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 96A, C) height about half of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with deep, narrow concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 96A, B) membranous, shorter than segment IX, indistinctly divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view broad at base, tapering to round apex, with strong apicoventral setae. Preanal appendage (Fig. 96A, B) each composed of two processes; dorsolateral process about as long as semgment IX, bearing 1 apical spine, with multiple spines along body of appendage; in lateral view linear, curved dorsad; in dorsal view slightly curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, produced ventrolaterally, bearing dorsomesal process, with stout setae, on apex, basally fused at mid line. Inferior appendage (Fig. 96A, C) shorter than segment IX; in lateral view slightly fusiform, apically olbique, bearing apicoventral truncate projection, with ventral margin straight; in ventral view, internal margin of appendage sinuous, and apex oblique; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe large, elongate, laterally overlapped with main body of appendage or laterally exposed, bearing stout setae, with hooked sclerotized process, curved mesad; basodorsal lobe absent. Phallus (Fig. 96D, E) narrow, slightly bent at mid-length, with no spines; phallotremal sclerite anterodorsal, large, with 2 laterally curved arms in dorsal view.

Holotype male: Brazil: Paraná, Morretes, Sapitanduva, 25º26’55.8”S, 48º48’51.7”W, el. 14 m, 23.i.2011, L.L. Dumas, A.P.M. Santos – [alcohol] (9m V514) (DZRJ).

Paratype: same data as holotype, except: Paraná, Guaraqueçaba, Reserva Nacional de Salto Morato, Rio Morato, 25º10’07.1”S, 48º17’56.3”W; el. 36 m, (Tipo 3, V 526), 25.i.2011, L.L. Dumas and A.P.M. Santos – 1 male [alcohol] (DZRJ).

Distribution: Brazil.

Cernotina n. sp. 4

(Fig. 97)

This species bears resemblance with *C. taeniata* by the curved and elongate shape of the DLP, the shape of the inferior appendage with an elongated BDL, and by the numerous phallic spines. They differ however by the shape of the base of the DLP, being straight in *Cernotina* n. sp. 4 and arched in *C. taeniata*. The VMP is also different, being elongate in this species and truncate in *C. taeniata*.

Adult. Length of forewing 3.0 mm, n = 3. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 97A, C) height almost covering entire genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with shallow, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 97A, B) membranous, longer than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view linear, with round apex, with strong apicoventral setae. Preanal appendage (Fig. 97A, B) each composed of two processes; dorsolateral process longer than segment IX, bearing 1 apical spine, secondary branch on dorsolateral process present, mesobasal, acute, each with 1 apical spine; in lateral view linear; in dorsal view strongly curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, elongate, with truncate apex, with stout setae, in row on posterior margin, broadly separated at mid line. Inferior appendage (Fig. 97A, C) longer than segment IX; in lateral view lanceolate, apically notched, with ventral margin straight; in ventral view, internal margin of appendage sinuous, and apex truncate; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe large, auricular, laterally merged with with notched apex, bearing stout setae, with hooked sclerotized dorsal process; basodorsal lobe oblong in lateral view, with apex rounded, with about 3/4 length of body of appendage, directed posterodorsad, bearing row of setae. Phallus (Fig. 97D, E) narrow, straight, with 15 elongate phallic spines, free in phallic membrane; phallotremal sclerite anterodorsal, small, as 2 parallel lines.

Holotype male: Venezuela: Zulia, Caño Carichuano, 3.4 km, SE Carbones del Guasare, 11.002ºN, 72.285ºW, el. 70 m, 12-13.i.1994, Holzenthal, Cressa, Rincón – [pinned] (UMSP000048536) (UMSP).

Paratypes: same as holotype, except: 2 males [pinned] (UMSP000048537, UMSP000048538) (UMSP).

Distribution: Venezuela.

Cernotina n. sp. 5

(Fig. 98)

This species bears some resemblance with *C. antonina* by the presence of apical and subapical spines on the DLP. However, this same structure is remarkably different in shape and size, being elongate or filiform in *C. antonina*, and paddle-shaped, broad and very long in *Cernotina* n. sp. 5. The paddle shape of the DLP of this species bears similarities with that of *C. cingulata*. However, the DLP in this species has an apical constriction to a round apex, instead of a truncate apex, and the spines are apical and preapical instead of both being apical, as it is in the other species.

Adult. Length of forewing 2.9 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 98A, C) height about half of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with shallow, broad concavity, without sclerotized ventral ridge. Intermediate appendage (Fig. 98A, B) membranous, longer than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view linear, with truncate apex, with strong apicoventral setae. Preanal appendage (Fig. 98A, B) each composed of two processes; dorsolateral process longer than entire genitalic complex, bearing 1 apical spine, with 1 subapical spine; in lateral view rectangular, with apical round protrusion, slightly directed ventrad; in dorsal view curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process longer than inferior appendage, elongate, with stout setae, extending laterally, curved posteriad, with mesal area truncate, basally fused at mid line. Inferior appendage (Fig. 98A, C) about as long as segment IX; in lateral view oblong, apically rounded, with ventral margin straight; in ventral view, internal margin of appendage straight, and apex truncate; anterior basal plate barely surpassing posterior margin of sternum IX; apicomesal lobe small, inconspicuous, laterally almost entirely overlapped with main body of appendage, with sclerotized tip exposed, bearing stout setae, with hooked sclerotized process, curved mesad; basodorsal lobe subtriangular in lateral view, shorter than half of body of appendage, directed posterodorsad, bearing row of setae. Phallus (Fig. 98D, E) broad, curved ventrad, with 3 elongate phallic spines, each in membranous pouch; phallotremal sclerite anterodorsal, large, as 2 arched arms in dorsal view.

Holotype male: Brazil: Amazonas, Barcelos, Rio Jauarí, acampamento do Sr. Miranda, 00º48'06.05"N, 63º29'01.86"W, el. 59 m, 21-26.vii.2009, white sheet, N. Hamada, A. M. Pes, R. L. F. Keppler, C. A. Silva de Azevedo, C. Monteiro – [alcohol] (INPA).

Distribution: Brazil.

Cernotina n. sp. 6

(Fig. 99)

This remarkable species bears resemblance with *C. odonta* and *Cernotina* n. sp. 16 by the shape of the inferior appendage, excavated apicomesally, leaving lateral horn-like projections. However, the BDL of *Cernotina* n. sp. 6 is elongate, instead of short and stub-like in *C. odonta*, and absent in *Cernotina* n. sp. 16. The DLP of this species is also unique, bearing a dorsomesal- and a ventromesal branch, both covered with small spines on their surface.

Adult. Length of forewing 3.7 mm, n = 6. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 99A, C) height about half of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 99A, B) membranous, about as long as segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view digitate, with strong apicoventral setae. Preanal appendage (Fig. 99A, B) each composed of two processes;

dorsolateral process about as long as semgment IX, secondary branches on dorsolateral process present, mesal and ventral, each elongate; in lateral view oblong; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, with stout setae, in row on posterior margin, entirely fused at mid line (Fig. 99F). Inferior appendage (Fig. 99A, C) longer than segment IX; in lateral view elongate, apically rounded; in ventral view, internal margin of appendage curved mesad, and apex with mesal margin deeply excavated; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe large, auricular, laterally overlapped with main body of appendage, bearing stout setae, with sclerotized anterior margin, bearing hooked sclerotized dorsal process, curved mesad; basodorsal lobe oblong in lateral view, with apex rounded, shorter than half of body of appendage, directed posteriad, bearing row of setae. Phallus (Fig. 99D, E) broad, straight, with no elongate spines, and with around 15 stout conical spines; phallotremal sclerite anterodorsal, large, with 2 medially curved arms in dorsal view.

Holotype male: Venezuela: Lara, P.N. Terepaima, Quebrada San Antonio, 9º51.754'N, 69º13.098'W, el. 631 m, 17.vi.2001, Holzenthal, Blahnik, Paprocki, Cressa – [pinned] (UMSP00074015) (UMSP).

Paratypes: same as holotype, except: 5 males [pinned] (UMSP00074014, UMSP00074016 – UMSP00074019) (UMSP); 2 males [alcohol] (UMSP000093000) and 2 females [alcohol] (UMSP000093000F) (UMSP).

Distribution: Venezuela.

Cernotina n. sp. 7

(Fig. 100)

This species bears some resemblance with *C. falcata* by the DLP being short, and the mesal process being longer, with two spines. This species however possesses two mesal processes, each with an apical spine, instead of a single process with apical and preapical spine. In addition, the intermediate appendage of *Cernotina* n. sp. 7 does not bear spine, such as in the other species. Finally, the inferior appendage in this species is unique, with the apex enlarging greatly into an indistinct shape in lateral view.

Adult. Length of forewing 4.0 mm, n = 3. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 100A, C) height about half of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, with lateral concavity, anteroventral margin with deep, narrow concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 100A, B) membranous, shorter than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view slightly curved ventrad, slowly tapering to truncate apex, with strong apicoventral setae. Preanal appendage (Fig. 100A, B) each composed of two processes; secondary branches on dorsolateral process present, as 2 mesal acute branches with 1 apical spine each, dorsal branch longer than, and ventral branch about same length of main setose body; in lateral view auricular; ventromesal process about as long as dorsolateral process, ventromesal process about as long as inferior appendage, produced dorsolaterally, with stout setae, in row on posterior margin, basally fused at mid line. Inferior appendage (Fig. 100A, C) shorter than segment IX; in lateral view stunted, apically greatly enlarged to auricular shape with indistinct posterior margin, with ventral margin slightly curved dorsad at apex; in ventral view, internal margin of appendage curved mesad, and apex truncate, projecting mesad, with sclerotized apicoventral margin; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe large, auricular, laterally merged with with notched apex, bearing stout setae, with hooked sclerotized dorsal process, curved posteromesad; basodorsal lobe globular in lateral view, with about half length of body of appendage, bearing setae. Phallus (Fig. 100D, E, F) broad, slightly bent at mid-length, with 2 elongate phallic spines and 2 bifid slender spines with broad base; phallotremal sclerite anterodorsal, with 2 laterally curved arms in dorsal view.

Holotype male: Brazil: Minas Gerais, Parque Estadual do Itacolomi, Córrego Belchior, 20º25.041’S, 43º25.633’W, el. 725 m, 19.ix.1998, Paprocki, Amarante – [pinned] (UMSP000046961).

Paratypes: same as holotype: 1 male [pinned] (UMSP000046962) and 8 females [pinned] (UMSP000046963 – UMSP000046970) (UMSP); 20.xi.1998, Paprocki, Amarante – 1 male [pinned] (UMSP000046808) and 6 females [pinned]

(UMSP000046809 – UMSP000046814) (UMSP); Aldeia de Cachoeira das Pedras, Lat -20.113730, long -44.023530, el. 925 m, 28-29.ix.2000, Paprocki & Braga – 1 male [alcohol] (UMSP000200442) and 5 females [alcohol] (UMSP000200442F) (UMSP); Capão da Mata, Serra do Cipó, lat -19.322450, long -43.537480, el. 1170 m, 10.iii.1996, Holzenthal, Rochetti & Oliveira – 2 males [pinned] (UMSP000035813, UMSP000035814) (UMSP); 13-14.ii.1998, Holzenthal & Paprocki – 1 male [pinned] (UMSP000029593) (UMSP).

Distribution: Brazil.

***Cernotina* n. sp. 8**

(Fig. 101)

This species bears similarities with *C. sexspinosa*, due to the lanceolate shape of the dlp and sub-apical position of the BDL of the inferior appendages. The main difference and unique characteristic of *Cernotina* n. sp. 8 is the presence of a serrate ventral margin anteriad of the apical spine. Other differences can be noticed in the number of phallic spines, being only 2 in this species and 6 in *C. sexspinosa*.

Adult. Length of forewing 3.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 101A, C) height almost covering entire genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with deep, broad concavity, without sclerotized ventral ridge. Intermediate appendage (Fig. 101A, B) membranous, shorter than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view linear, with round apex, with strong apicoventral setae. Preanal appendage (Fig. 101A, B) each composed of two processes; dorsolateral process about as long as semgment IX, bearing 1 apical spine, secondary branch on dorsolateral process present, mesal, acute, with 1 apical spine; in lateral view lanceolate, straight directed ventrad, with apex directed posteriad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, with stout setae, in row on posterior margin, basally fused at mid line. Inferior appendage (Fig. 101A, C) shorter than segment IX; in lateral view oblong, apically rounded, with ventral margin slightly concave; in ventral view, internal margin of appendage curved mesad, and apex truncate; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe large, auricular, laterally exposed, bearing stout setae, with hooked sclerotized dorsal process, curved mesad; basodorsal lobe appressed to surface of ventral body, with about half length of body of appendage, bearing setae. Phallus (Fig. 101D, E) narrow, slightly bent at mid-length, with 2 elongate phallic spines; phallotremal sclerite anterodorsal, large, ovate, with laterally curved arms in dorsal view.

Holotype male: Brazil: Pará, Rio Xingu, Camp, ca. 60 km S. Altamira, 3.39'S, 52º22'W, 8-12.x.1986, P. Spangler and O. Flint – [alcohol] (NMNH).

Distribution: Brazil.

Cernotina n. sp. 9

(Fig. 102)

This species is unique among the species of *Cernotina*. Its DLP bears numerous short spines on its surface, unlike the large spines on the ventral margin in *Cernotina* n. sp. 3. The VMP is distinct, being very broad with a truncate apex in lateral view.

Adult. Length of forewing 3.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 102A, C) height almost covering entire genital complex; in ventral view, with anterior margin as wide as posterior margin, with smooth lateral concavity, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 102A, B) membranous, about as long as segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view clavate, with base narrow, enlarging at apex, with strong apicoventral setae. Preanal appendage (Fig. 102A, B) each composed of two processes; dorsolateral process about as long as semgment IX, bearing multiple apical spines, with multiple spines along body of appendage; in lateral view rectangular; in dorsal view curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, oblong, with stout setae, in row on posterior margin, basally fused at mid line. Inferior appendage (Fig. 102A, C) about as long as segment IX; in lateral view fusiform, apically olbiquely truncate, with ventral margin straight; in ventral view, internal margin of appendage curved mesad, and apex truncate; anterior basal plate barely surpassing posterior margin of sternum IX; apicomesal lobe small, inconspicuous, laterally overlapped with main body of appendage, bearing stout setae, with hooked sclerotized process; basodorsal lobe globular in lateral view, shorter than half of body of appendage, bearing setae. Phallus (Fig. 102D, E) narrow, slightly bent at mid-length, with 3 elongate phallic spines; phallotremal sclerite anterodorsal, small, with 2 posterior lobes in dorsal view.

Holotype male: Brazil: Mato Grosso, Amazônia Lodge, Crystal Stream, ca. 200 km N. Cuiabá, 13º32'23"S, 56º37'52"W, 31.iii.2004, Bo Gullefors – [alcohol] (NMNH).

Paratype: same data as holotype – 1 male [alcohol] (NMNH).

Distribution: Brazil.

Cernotina n. sp. 10

(Fig. 103)

This species has a remarkable DLP, with an apical spine, and a preapical spine on a truncate face, both covered by long slender hair-like setae. In addition, the indermediate appendage complex bears apical spine, and the AML is relatively large. Bears some resemblance with *C. trispina* in the number of spines on the DLP, but the shape of the DLP and the disposition of the spines are different, being apically extended on the ventral side, with the subapical spine dorsally in *Cernotina* n. sp. 10, and being apically extended on the dorsal side, with the subapical spine ventrally in the other species. They also differ by the presence of the apical spine of the intermediate appendage, which *C. trispina* lacks, and the shape of the inferior appendage, being subtriangular with an oblique apex in *Cernotina* n. sp. 10 rectangular in *C. trispina*.

Adult. Length of forewing 3.5 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 103A, C) height about half of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, anteroventral margin with shallow, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 103A, B) membranous, shorter than segment IX, divided mid-dorsally, setose, with apical spine; with microsetae on dorsal surface; in lateral view round. Preanal appendage (Fig. 103A, B) each composed of two processes; dorsolateral process shorter than segment IX, bearing 1 apical spine, with 1 subapical spine; in lateral view caudate, with ventral portion elongate, apically curved dorsad; in dorsal view slightly curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, oblong, with stout and slender setae, in row on posterior margin, basally fused at mid line. Inferior appendage (Fig. 103A, C) shorter than segment IX; in lateral view lanceolate, apically tapered, with ventral margin slightly curved dorsad at apex; in ventral view, internal margin of appendage curved mesad, and apex round; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe large, auricular, laterally exposed, bearing stout setae, with elongate hooked sclerotized dorsal process; basodorsal lobe oblong in lateral view, with apex rounded, with about half length of body of appendage, directed posterodorsad, bearing row of setae. Phallus (Fig. 103D, E) narrow, bent at mid-length, with 2 elongate phallic spines, each in membranous pouch; phallotremal sclerite anterodorsal, large, as 2 parallel sinuous lines in dorsal view.

Holotype male: Colombia: Valle, Rio Raposo, iii.1965, V.H. Lee – [alcohol] (NMNH).

Paratype: same data as holotype: 1 male [alcohol] (NMNH).

Distribution: Colombia.

***Cernotina* n. sp. 11**

(Fig. 104)

This species bears some resemblance with *C. spinigera* and *C. waorani* by the elongate shape of the DLP curving dorsad at the apex. The species differ from *C. spinigera* by the lack of a mesobasal branch on the DLP, and by the lack of a clavate BDL with spine-like mesal setae. *Cernotina* n. sp. 11 differs from *C. waorani* by the lack of a mesal flap-like branch on the DLP, and by the much rounder inferior appendage, rather than triangular shaped, in ventral view.

Adult. Length of forewing 3.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 104A, C) height about half of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with deep, narrow concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 104A, B) membranous, shorter than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view linear, narrow, tapering at apex, with strong apicoventral setae. Preanal appendage (Fig. 104A, B) each composed of two processes; dorsolateral process longer than segment IX, bearing 1 apical spine; in lateral view filiform, slightly curved dorsad; in dorsal view slightly curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, oblong, with stout setae, on apex, basally fused at mid line. Inferior appendage (Fig. 104A, C) shorter than segment IX; in lateral view oblong, apically olbiquely truncate, with ventral margin straight; in ventral view, internal margin of appendage curved mesad, and apex truncate, projecting mesad, with sclerotized apicoventral margin; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe large, auricular, laterally almost entirely overlapped with main body of appendage, with sclerotized tip exposed, bearing stout setae, fused with sclerotized process; basodorsal lobe absent. Phallus (Fig. 104D, E) narrrow, very long, straight, with 2 elongate phallic spines, each in membranous pouch; phallotremal sclerite anterodorsal, small, with 2 posterior lobes in dorsal view.

Holotype male: Venezuela: Territorio Federal Amazonas, Basecamp, Cerro de la Neblina, Malaise trap over small stream at east side of basecamp, 0º51'N, 66º10'W, el. 140 m, 13-15.iii.1984, O. Flint and J. Louton – [pinned] (NMNH).

Paratype: same as holotype, except: 10-20.ii.1985, Malaise trap in rainforest, P.J. & P.M. Spangler, R.A. Faitoute, W.E. Steiner – 1 male [pinned] (NMNH).

Distribution: Venezuela.

***Cernotina* n. sp. 12**

(Fig. 105)

This species has a simple tapered DLP, but a very distinct and enlarged inferior appendage, with a very large apical notch, and an also large AML that is almost as long as the exposed body of the appendage.

Adult. Length of forewing 3.5 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 105A, C) height almost covering entire genital complex; in ventral view, with posterior margin wider than anterior margin, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 105A, B) membranous, shorter than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view linear, narrow, tapering at apex, with strong apicoventral setae. Preanal appendage (Fig. 105A, B) each composed of two processes; dorsolateral process shorter than segment IX, bearing 1 apical spine; in lateral view linear; in dorsal view strongly curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, with stout setae, in row on posterior margin, broadly separated at mid line. Inferior appendages (Fig. 105A, C) longer than segment IX; in lateral view lanceolate, apically tapered, with ventral margin slightly curved dorsad at apex; in ventral view, internal margin of appendage sinuous, and apex acute, with sclerotized apicoventral margin; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe very long, elongate, laterally exposed, bearing stout setae, fused with sclerotized process; basodorsal lobe oblong in lateral view, with apex rounded, shorter than half of body of appendage, directed posterodorsad, and mesad, bearing row of setae. Phallus (Fig. 105D, E) narrrow, very long, straight, with no spines; phallotremal sclerite anterodorsal, small, as 2 parallel lines.

Holotype male: Costa Rica: Limón, Río Bitey, ca. 2.5 km S. Pandora, 9.725ºN, 82.963ºW, el. 15 m, 3.ii.1986, Holzenthal, Morse, Fasth – [pinned] (UMSP000091734).

Distribution: Costa Rica.

Cernotina n. sp. 13

(Fig. 106)

This species resembles *C. zanclana* by the curved and elongate shape of the DLP, as well as the numerous phallic spines. They differ however by the lateral aspect of the DLP, being oblong, only tapering near the apex in *C. zanclana*, while in *Cernotina* n. sp. 13, the process tapers strongly before the mid length.

Adult. Length of forewing 3.1 mm, n = 4. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 106A, C) height about 3/4ths of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin, with smooth lateral concavity, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 106A, B) membranous, shorter than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view basally broad, slowly tapering to round apex, with strong apicoventral setae.

Preanal appendage (Fig. 106A, B) each composed of two processes; dorsolateral process about as long as semgment IX, bearing 1 apical spine; in lateral view lanceolate; in dorsal view strongly curved mesad, with apex touching medially; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, with stout setae, in row on posterior margin, broadly separated at mid line. Inferior appendage (Fig. 106A, C) longer than segment IX; in lateral view lanceolate, apically notched, with ventral margin slightly concave; in ventral view, internal margin of appendage sinuous, and apex round, with sclerotized apicoventral margin; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe large, auricular, laterally merged with with notched apex, bearing stout setae, fused with sclerotized process or with hooked sclerotized dorsal process, curved mesad; basodorsal lobe subtriangular in lateral view, with apex rounded, shorter than half of body of appendage, directed posterodorsad, bearing row of setae. Phallus (Fig. 106D, E) narrow, straight, with 9 elongate phallic spines, free in phallic membrane; phallotremal sclerite anterodorsal, large, with 2 laterally curved arms in dorsal view.

Holotype male: Venezuela: Falcón, Río Ricoca near Dos Bocas, 11º17.321'N, 69º26.067'W, el. 157 m, 8.vi.2001, Holzenthal, Blahnik, Paprocki, Cressa – [alcohol] (UMSP000093143) (UMSP).

Paratypes: same as holotype: 3 males [alcohol] (UMSP000093143) (UMSP); 16 females (UMSP000093143F) (UMSP); Lara, Quebrada Santo Antonio, Parque Nacional Terepaima, lat 9.862570, long -69.218300, el. 631 m, 17.vi.2001, Holzenthal, Blahnik, Paprocki & Cressa – 1 male [alcohol] (UMSP000093001) and 1 female [alcohol] (UMSP000093001F) (UMSP).

Distribution: Venezuela.

Cernotina n. sp. 14

(Fig. 107)

This species bears a strong resemblance with *C. cygnea* by the shape of the DLP with a mid-constriction, bearing an apical spine and a ventromesal branch with another apical spine. They differ mainly by the very distinct inferior appendage of *Cernotina* n. sp. 14, with an AML exposed, elongate, and arched.

Adult. Length of forewing 3.3 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 107A, C) height about half of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, with smooth lateral concavity, anteroventral margin with shallow, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 107A, B) membranous, about as long as segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view slightly curved ventrad, slowly tapering to truncate apex, with strong apicoventral setae. Preanal appendage (Fig. 107A, B) each composed of two processes; dorsolateral process about as long as semgment IX, bearing 1 apical spine, secondary branch on dorsolateral process present, mesoventral, acute, with 1 apical spine; in lateral view caudate, slightly curved ventrad; in dorsal view slightly curved mesad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, produced dorsolaterally and ventromesally, with stout setae, in row on posterior margin, entirely fused at mid line. Inferior appendage (Fig. 107A, C) about as long as segment IX; in lateral view oblong, apically rounded, with ventral margin slightly curved dorsad at base; in ventral view, internal margin of appendage sinuous, and apex round; anterior basal plate barely surpassing posterior margin of sternum IX; apicomesal lobe large, elongate, strongly curved ventrally, laterally exposed, bearing stout setae, fused with sclerotized process, curved mesad; basodorsal lobe clavate in lateral view, with apex rounded, with about 3/4 length of body of appendage, directed posterodorsad, bearing tuft of setae apically. Phallus (Fig. 107D, E) narrow, slightly bent at mid-length, with 2 elongate phallic spines, each in membranous pouch; phallotremal sclerite anterodorsal, large, with 2 laterally curved arms in dorsal view.

Holotype male: Peru: Cuzco, Paucartambo to Pilcopata road, Quebrada Quitacalzón, 13º01.57'S, 71º29.97'W, el. 1050 m, 25-27.vi.1993, collected by U.V. and mercury vapor lights, R. Blahnik and M. Pescador – [pinned] (NMNH).

Distribution: Peru.

Cernotina n. sp. 15

(Fig. 108)

This species resembles *C. taeniata* by the shape of the DLP strongly curving anteriad with apical spine, and *C. riosanjuanensis* by the broad basodorsal lobe almost as broad as the main body inferior appendage. *Cernotina* n. sp. 15 differs from *C. taeniata* especially by the inferior appendages and the shape of the BDL, broad and directed dorsad in this species versus subtriangular directed posterodorsad on the other. This species differs from *C. riosanjuanensis* by the shape of the DLP, elongate, strongly curving anteriad, rather than vertical, with broad base, not curving so strongly medially.

Adult. Length of forewing 3.0 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 108A, C) height about 3/4ths of entire male genital complex; in ventral view, with posterior margin wider than anterior margin, with deep lateral concavity, anteroventral margin with deep, broad concavity, with sclerotized ventral ridge. Intermediate appendage (Fig. 108A, B) membranous, about as long as segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view broad at base, posteriorly tapered to round apex, with strong apicoventral setae. Preanal appendage (Fig. 108A, B) each composed of two processes; dorsolateral process longer than segment IX, bearing 1 apical spine, secondary branch on dorsolateral process present, mesal, truncate, short, stub-like; in lateral view linear, slightly directed ventrad; in dorsal view strongly curved mesad, with apex pointing anteriad, crossing medially; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, produced dorsolaterally, with stout setae, in row on posterior margin, basally fused at mid line. Inferior appendage (Fig. 108A, C) longer than segment IX; in lateral view fusiform, apically rounded, with ventral margin straight; in ventral view, internal margin of appendage sinuous; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe large, auricular, laterally overlapped with main body of appendage or laterally exposed, bearing stout setae, fused with sclerotized process or with hooked sclerotized dorsal process; basodorsal lobe oblong in lateral view, very broad, with apex rounded, with about 3/4 length of body of appendage, directed dorsad, bearing tuft of setae apically. Phallus narrow, slightly bent at mid-length, with no elongate spines, and numerous stout, short, transparent spines; phallotremal sclerite anterodorsal, large, as 2 parallel sinuous lines in dorsal view.

Holotype male: Peru: Madre de Dios, Manu, Pakitza, Tail 1, 1st stream, 12º7'S, 70º58'W, el. 250 m, 9-14.ix.1988, Malaise trap, night collection, O. Flint and N. Adams – [pinned] (NMNH).

Paratypes: same data, except: 11.ix.1988, U.V. light, O. Flint and N. Adams – 1 male [alcohol] (NMNH); trail 2, 1st stream, 12º7'S, 70º58'W, el. 250 m, 14-23.ix.1988, Malaise trap, Day & Night, O. Flint and N. Adams – 2 male [alcohol] (NMNH); Trail 1, 1st stream, 11º56'S, 71º18'W, 19-23.ix.1989, N. Adams et al. – 1 male [alcohol] (NMNH).

Distribution: Peru.

Cernotina n. sp. 16

(Fig. 109)

This species resembles *C. odonta* and *Cernotina* n. sp. 6 by the shape of the inferior appendage with excavated anteromesal margin, forming lateral horn-like structure. It differs however mainly by the shape of the DLP, bearing a large apicomesal process with an apical spine, and the phallus bearing ventral setae, unlike the other two species.

Adult. Length of forewing 3.5 mm, n = 2. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 109A, C) height about half of entire male genital complex; in ventral view, with anterior margin as wide as posterior margin or with posterior margin wider than anterior margin, anteroventral margin with shallow, broad concavity, without sclerotized ventral ridge. Intermediate appendage (Fig. 109A, B) membranous, shorter than segment IX, divided mid-dorsally, setose; with microsetae on dorsal surface; in lateral view linear, narrow, tapering at apex, with strong apicoventral setae. Preanal appendage (Fig. 109A, B) each composed of two processes; dorsolateral process shorter than segment IX, secondary branch on dorsolateral process present, mesal, clavate, as long as main setous body of appendage; in lateral view oblong, directed dorsad; ventromesal process shorter than dorsolateral process, ventromesal process shorter than inferior appendage, truncate, with stout setae, in row on posterior margin, entirely fused at mid line. Inferior appendage (Fig. 109A, C) shorter than segment IX; in lateral view oblique, with dorsal margin of the apex extended, apically tapered, with ventral margin slightly curved dorsad at apex; in ventral view, internal margin of appendage curved mesad, and apex with mesal margin deeply excavated; anterior basal plate not reaching anterior margin of sternum IX; apicomesal lobe large, auricular, laterally overlapped with main body of appendage, bearing stout setae, with hooked sclerotized process, curved mesad; basodorsal lobe absent. Phallus (Fig. 109D, E) narrow, slightly bent at mid-length, with 8 elongate phallic spines, free in phallic membrane; phallotremal sclerite posteroventral, large, with 2 posterior lobes in dorsal view.

Holotype male: Venezuela: Territorio Federal Amazonas, Cerro de la Neblina, Basecamp, at black light in rainforest clearing near Rio Baria, 0º50'N, 66º10'W, el. 140 m, 26-31.i.1985, P.J. and P.M. Spangler, R. Faitoute, W. Steiner – [pinned] (NMNH).

Paratype: Same as holotype: 1 male [pinned] (NMNH); 10-20.ii.1985, Malaise trap in rainforest, P.J & P.M. Spangler, R.A. Faitoute, W.E. Steiner – 1 male [pinned] (NMNH).

Distribution: Venezuela.

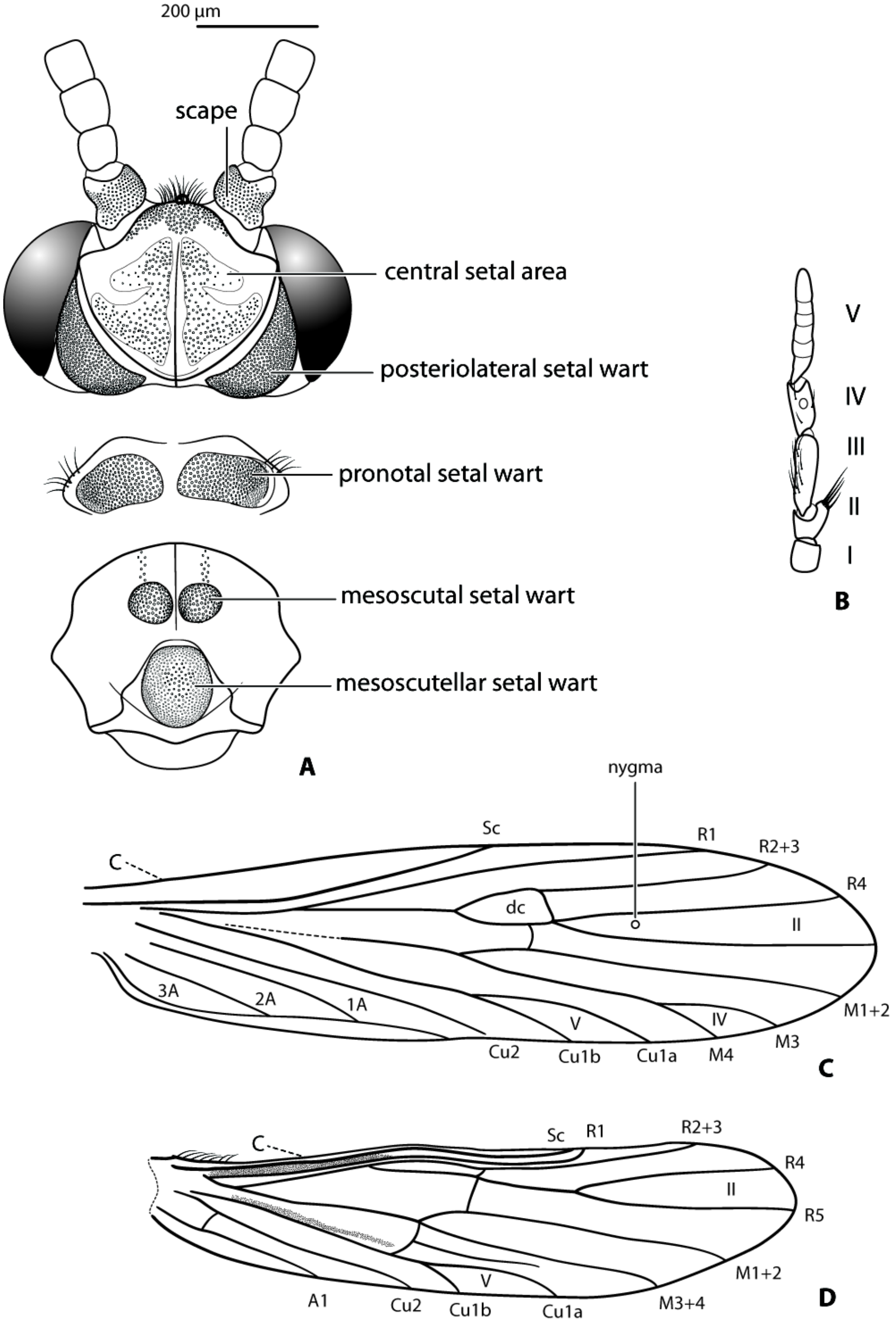

Figure 18. Morphology of adult *Cernotina*. *Cernotina flexuosa*: A – head and thorax; B – maxillary palp with enumerated palpomeres. *Cernotina calcea*: C – forewing; D – hind wing.

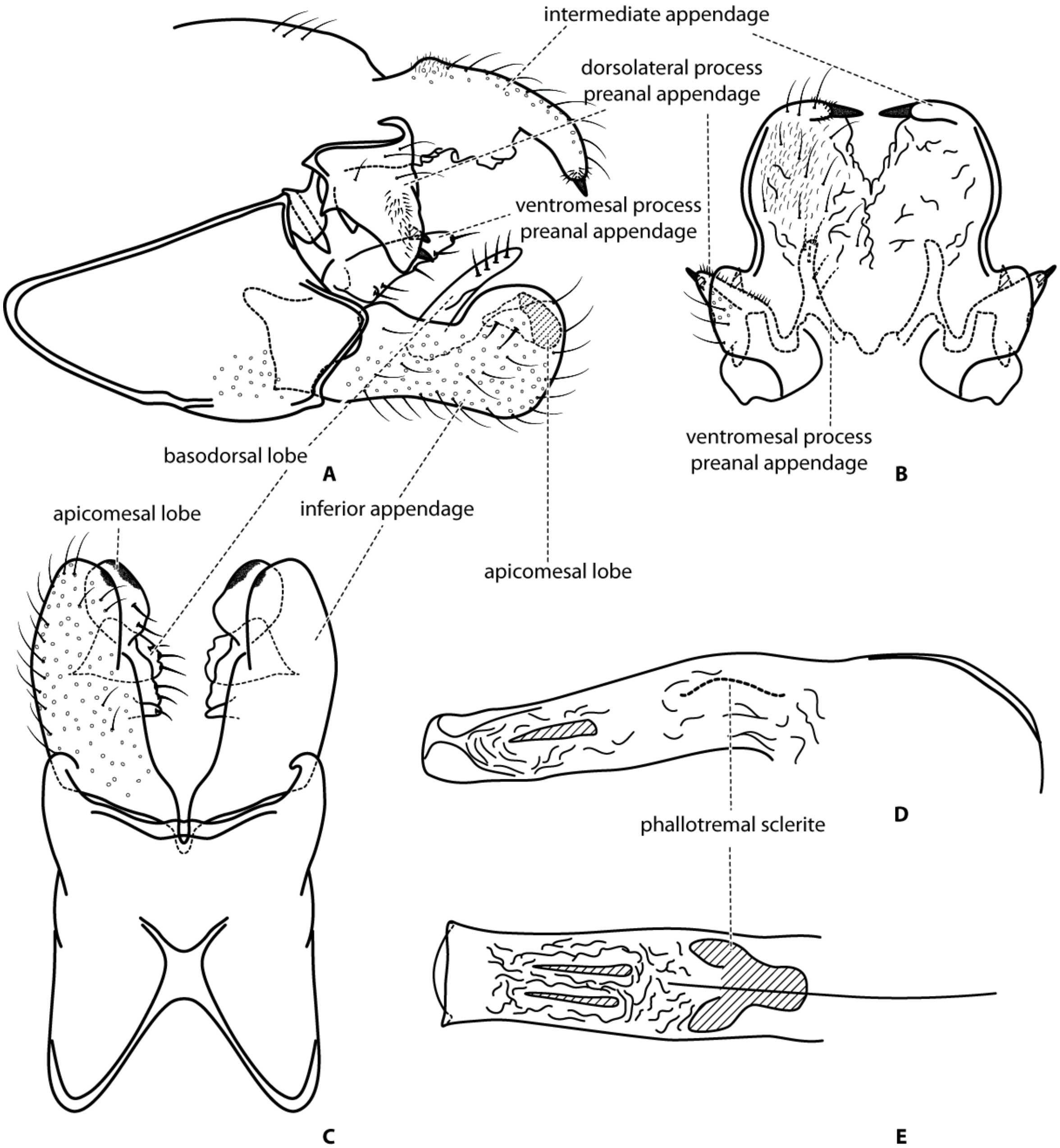

Figure 19. *Cernotina abbreviata* Flint 1971. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

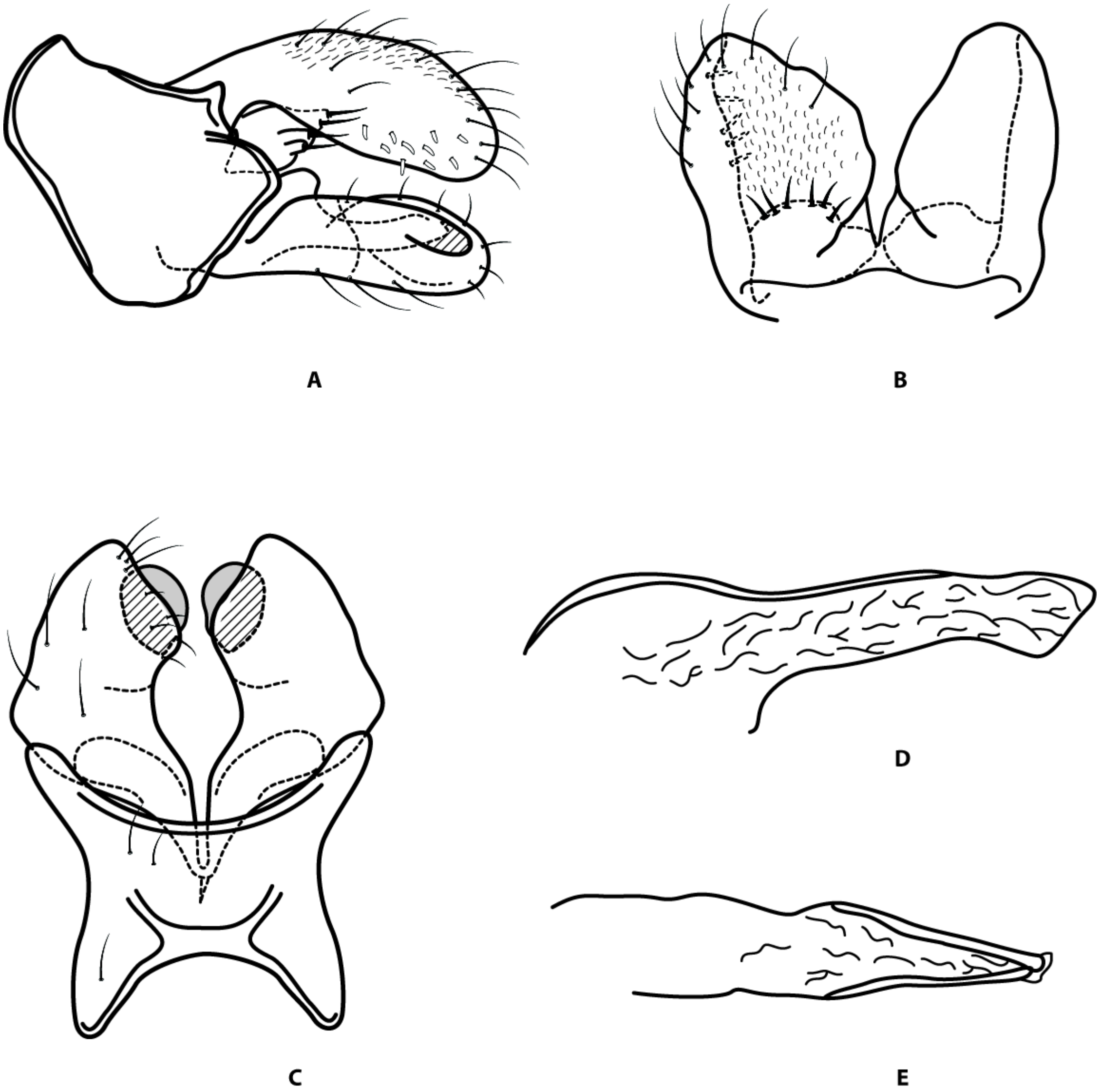

Figure 20. *Cernotina acalyptra* Flint 1971. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

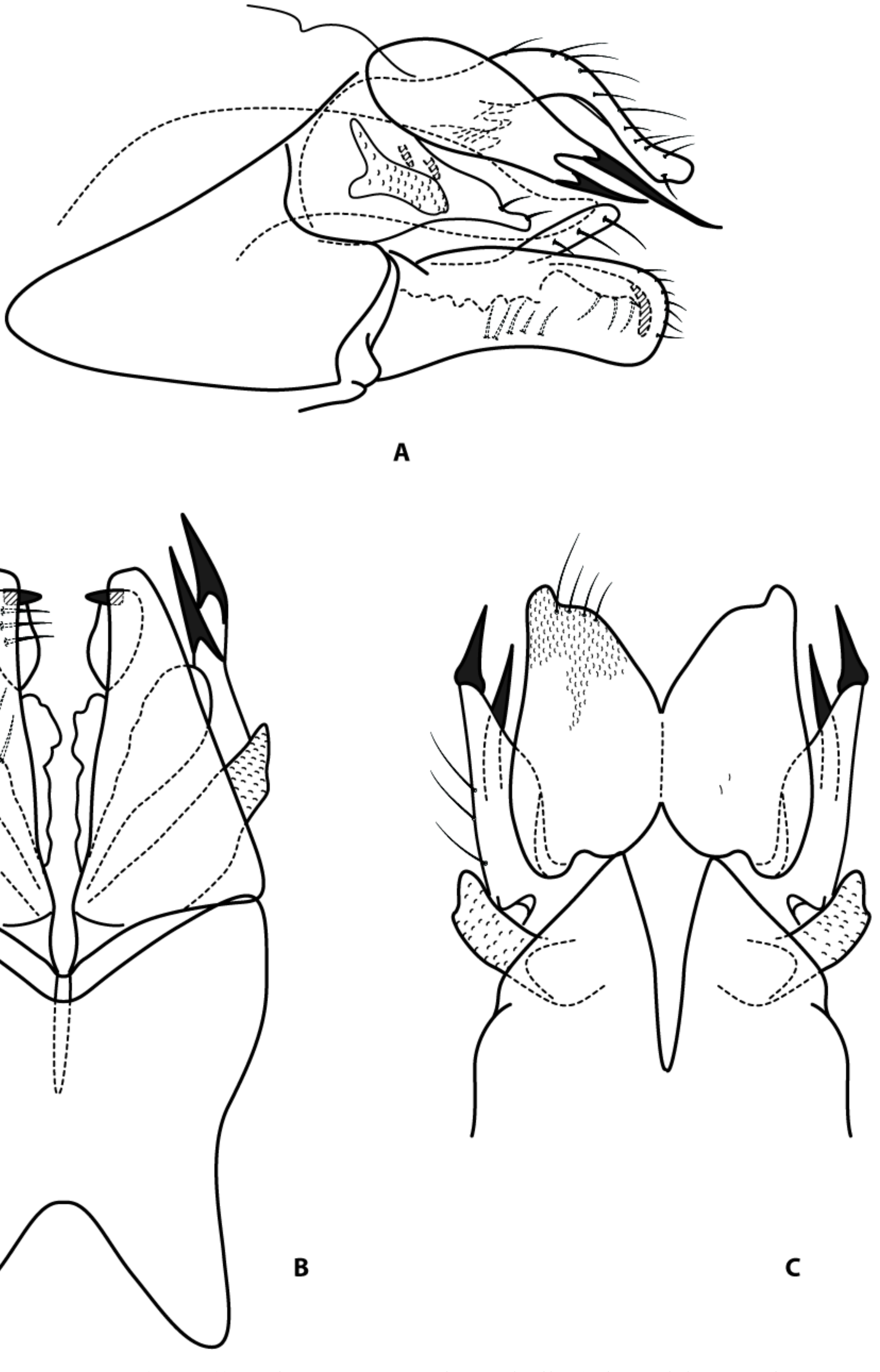

Figure 21. *Cernotina aestheticella* Sykora 1998. Male genitalia (adapted from Sykora 1998): A – lateral view; B – dorsal view; C – ventral view.

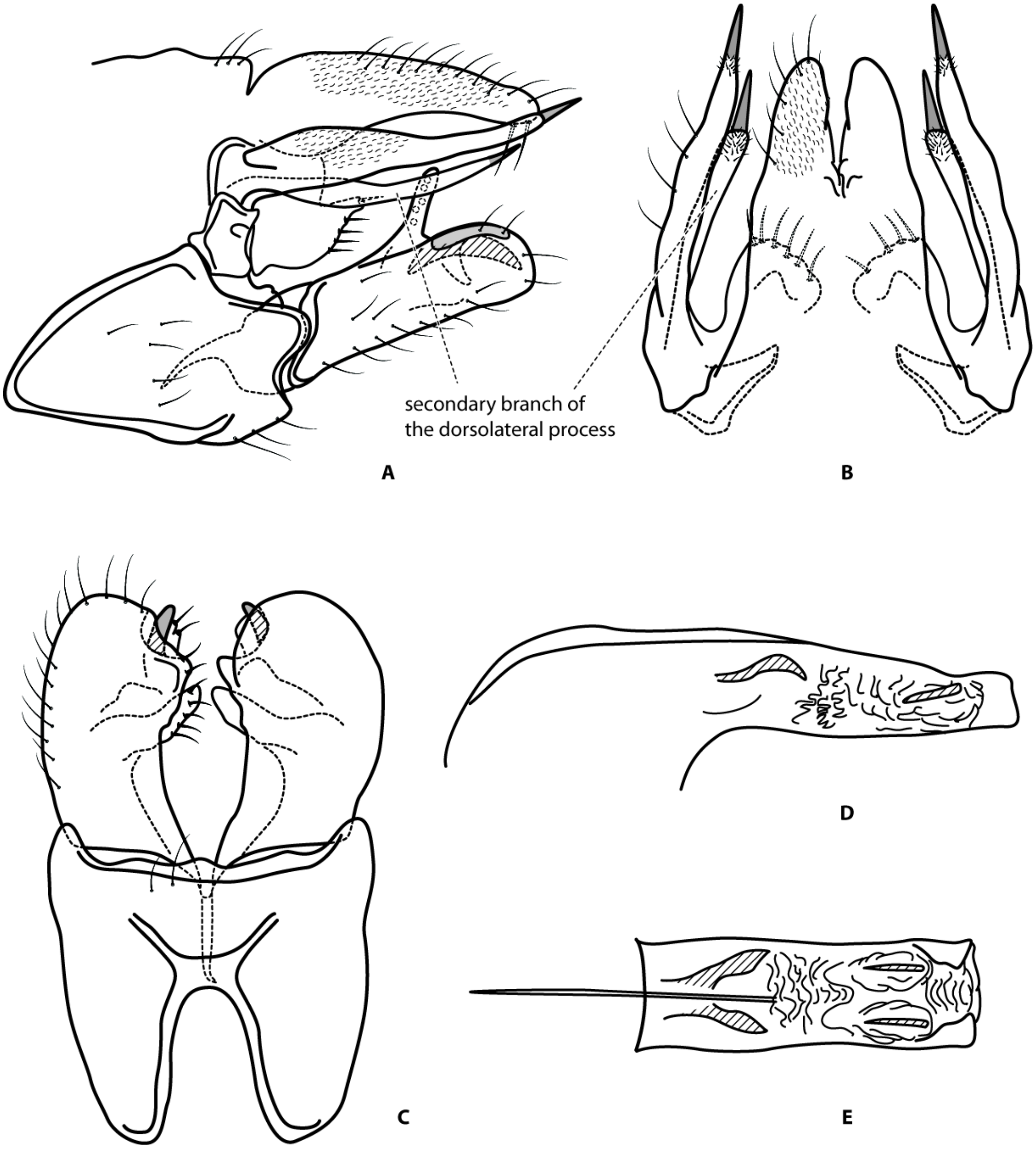

Figure 22. *Cernotina anhanguera* Camargos, Barcelos-Silva and Pes 2013. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

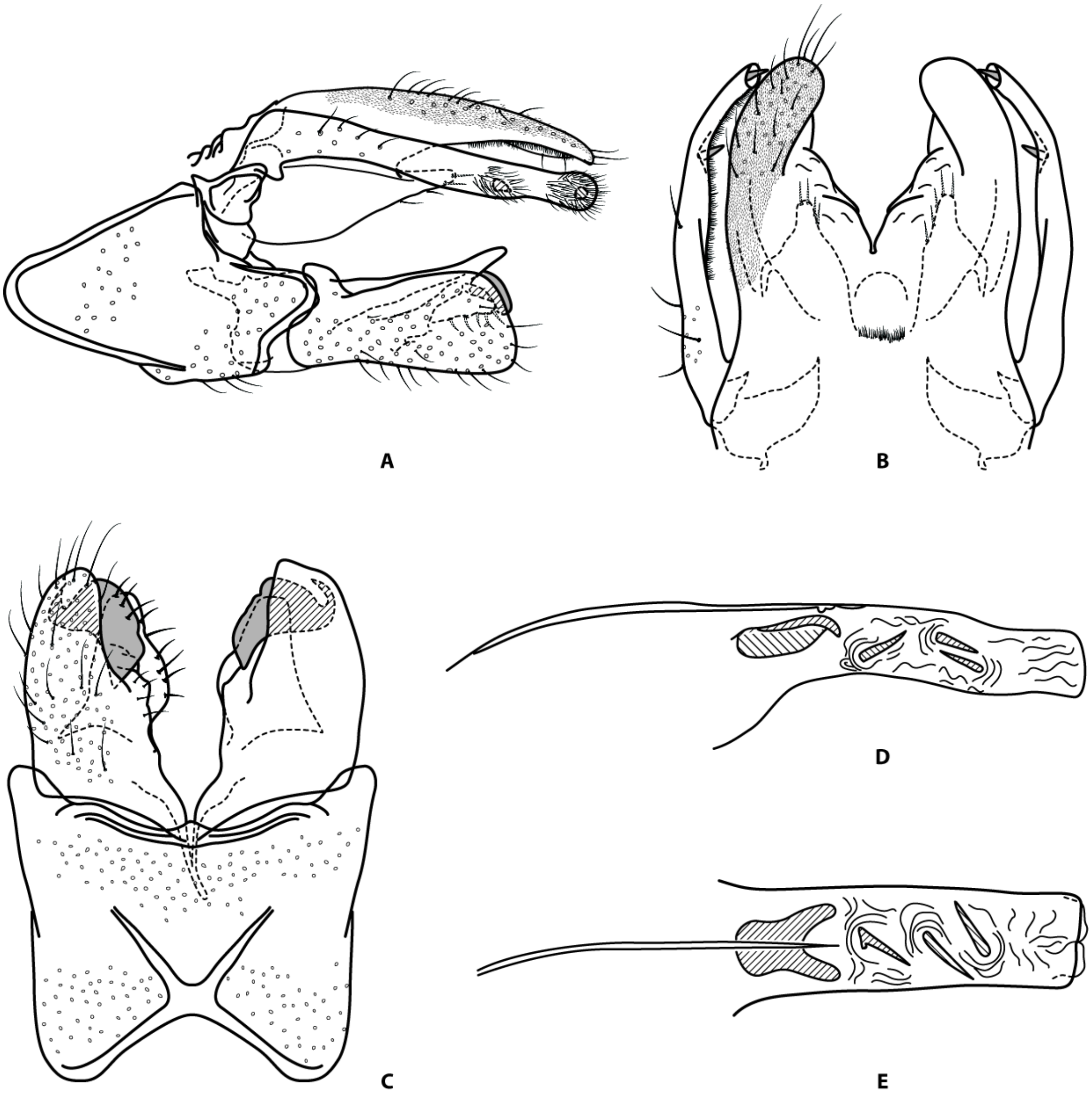

Figure 23. *Cernotina antonina* Holzenthal and Almeida 2003. Male genitalia (paratype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

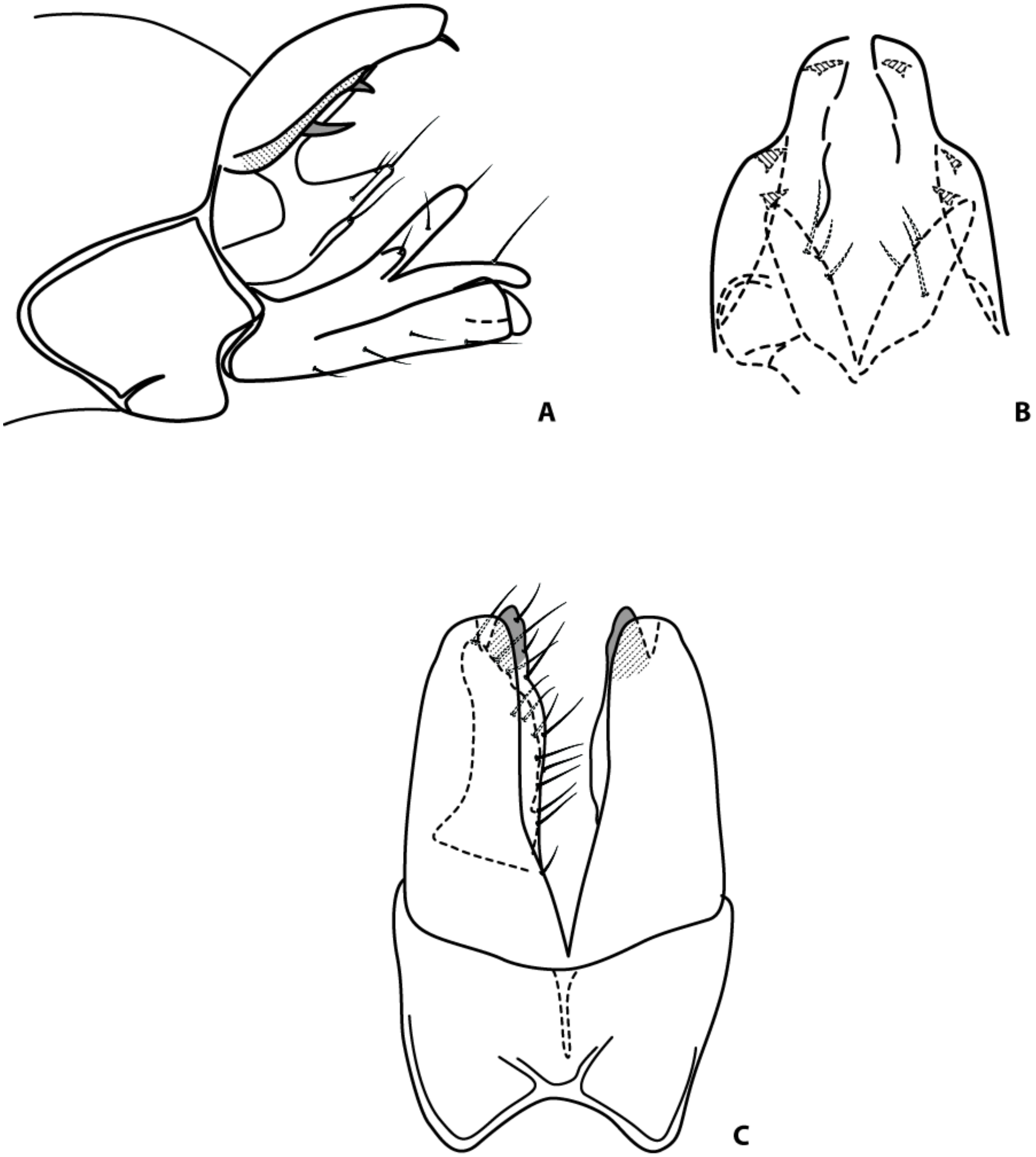

Figure 24. *Cernotina artiguensis* Angrisano 1994. Male genitalia (adapted from Angrisano 1994): A – lateral view; B – dorsal view; C – ventral view.

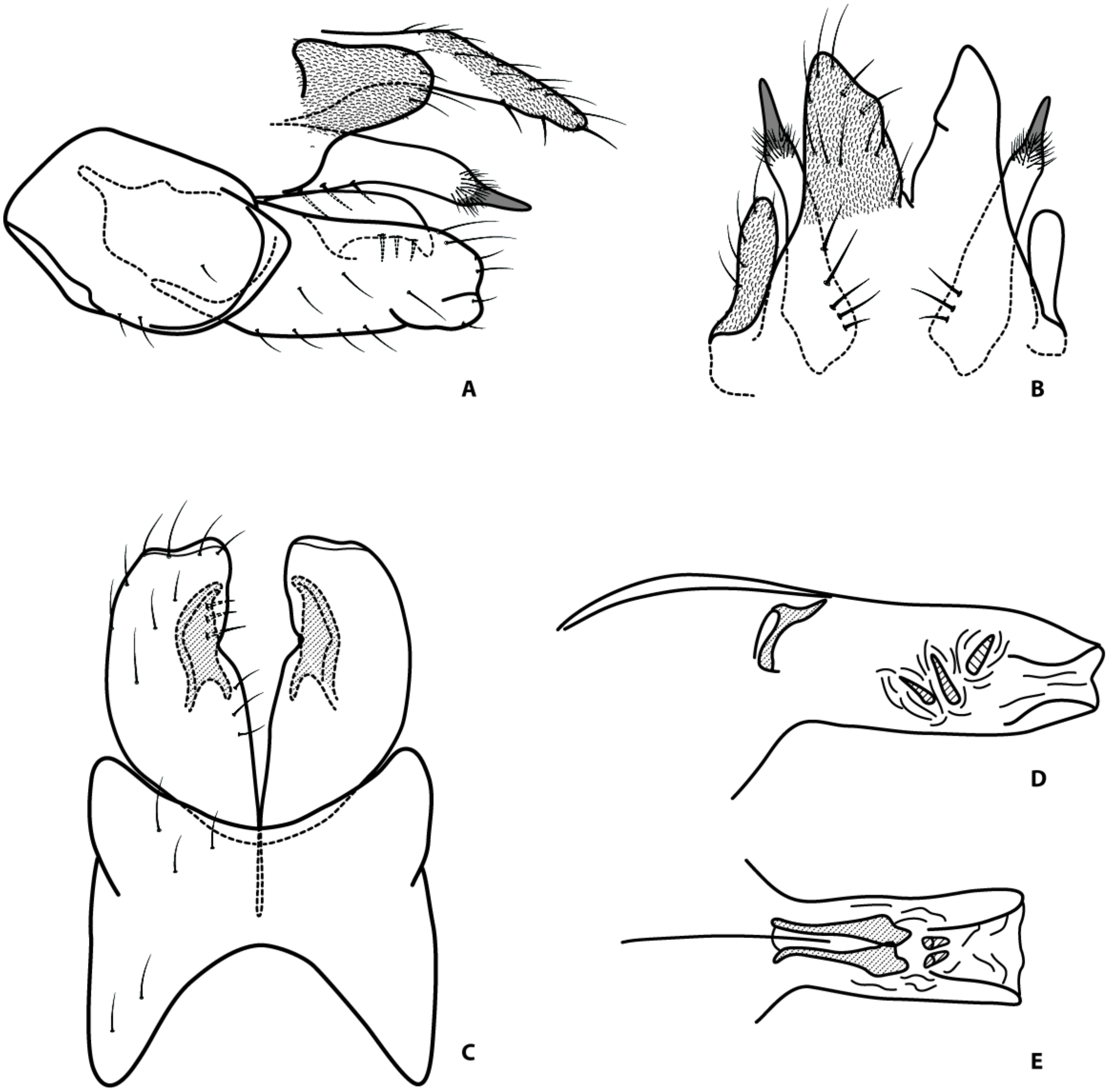

Figure 25. *Cernotina aruma* Santos and Nessimian 2008. Male genitalia (paratype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

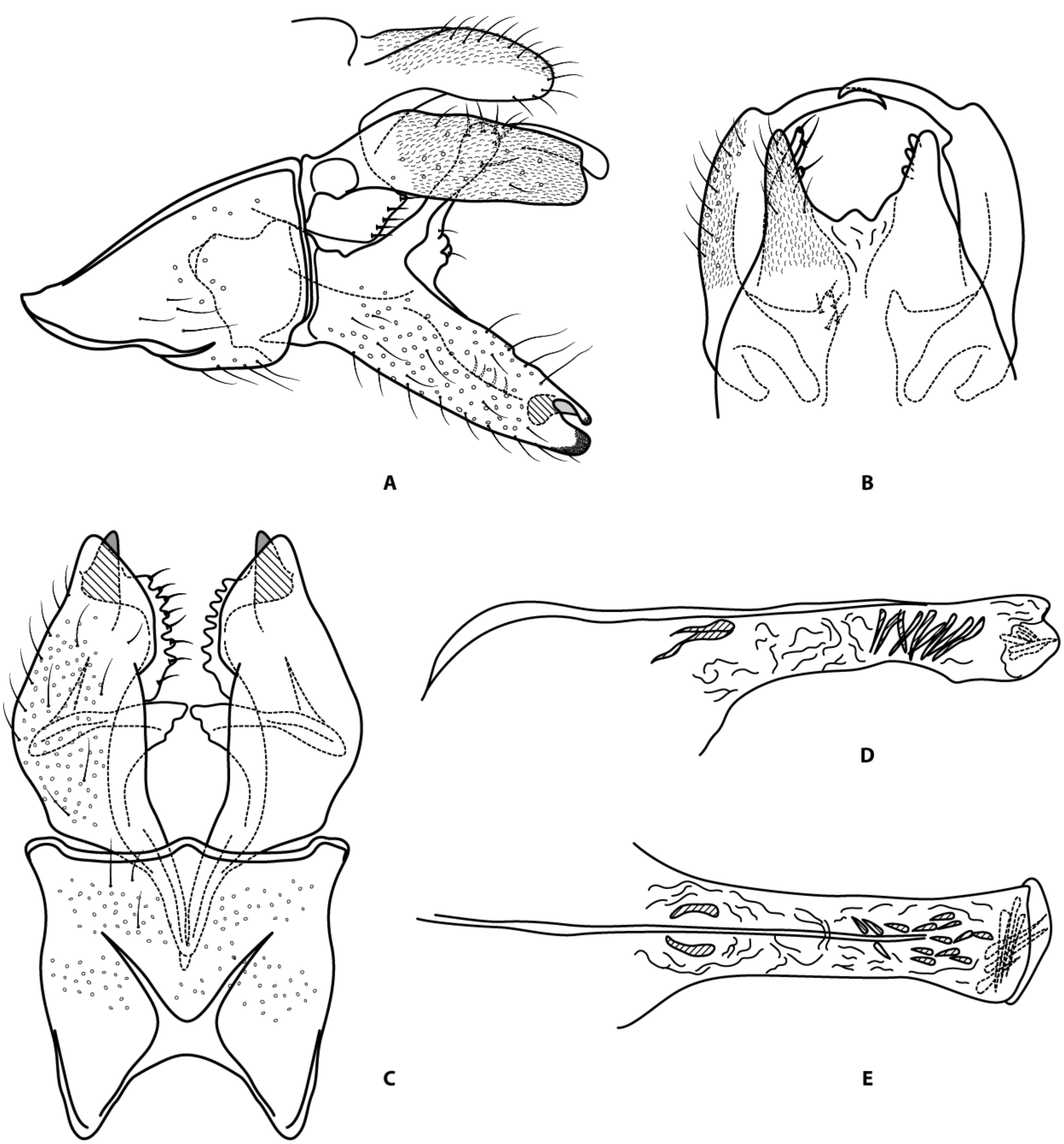

Figure 26. *Cernotina astera* Ross 1941. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

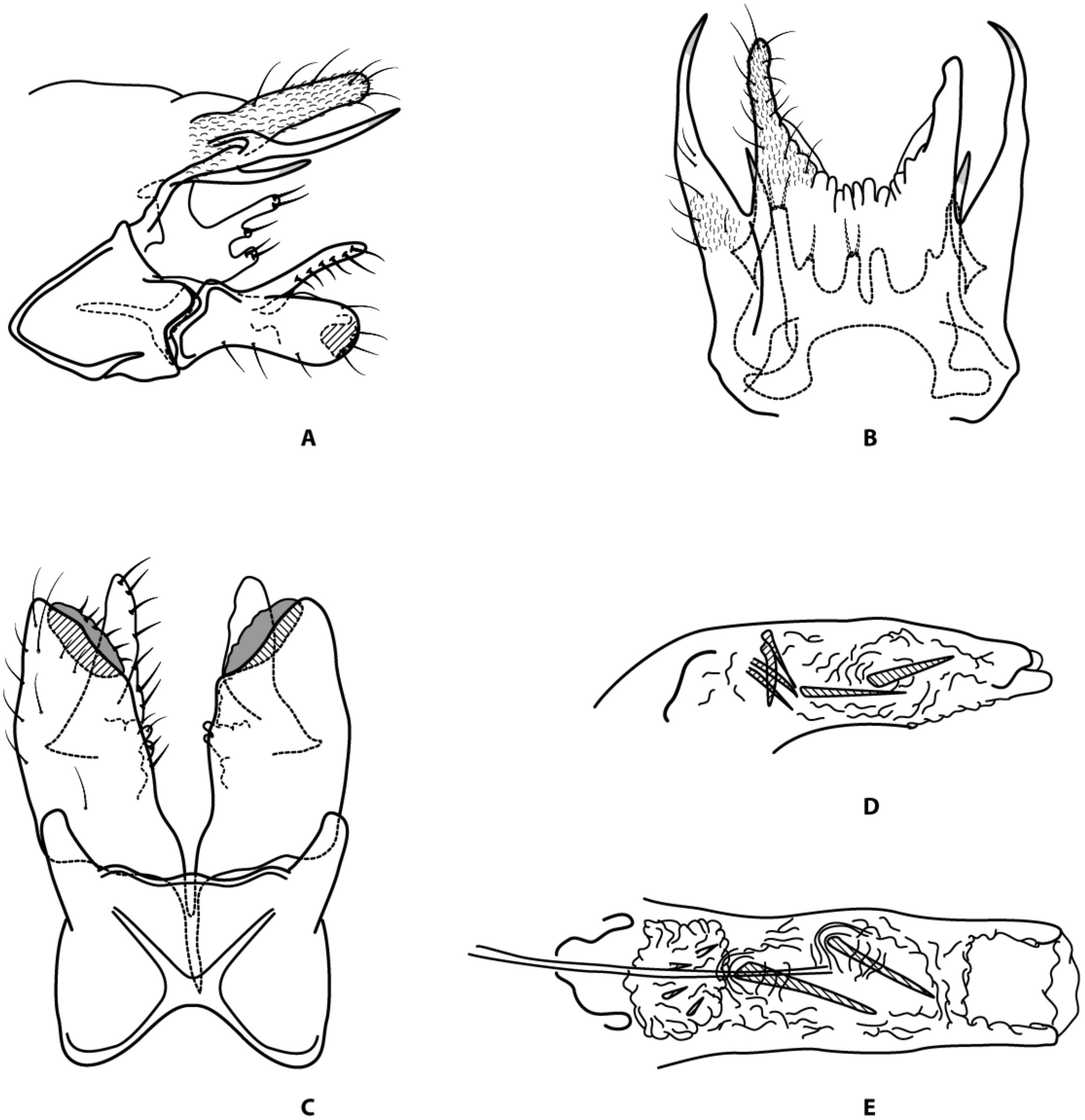

Figure 27. *Cernotina attenuata* Flint 1971. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

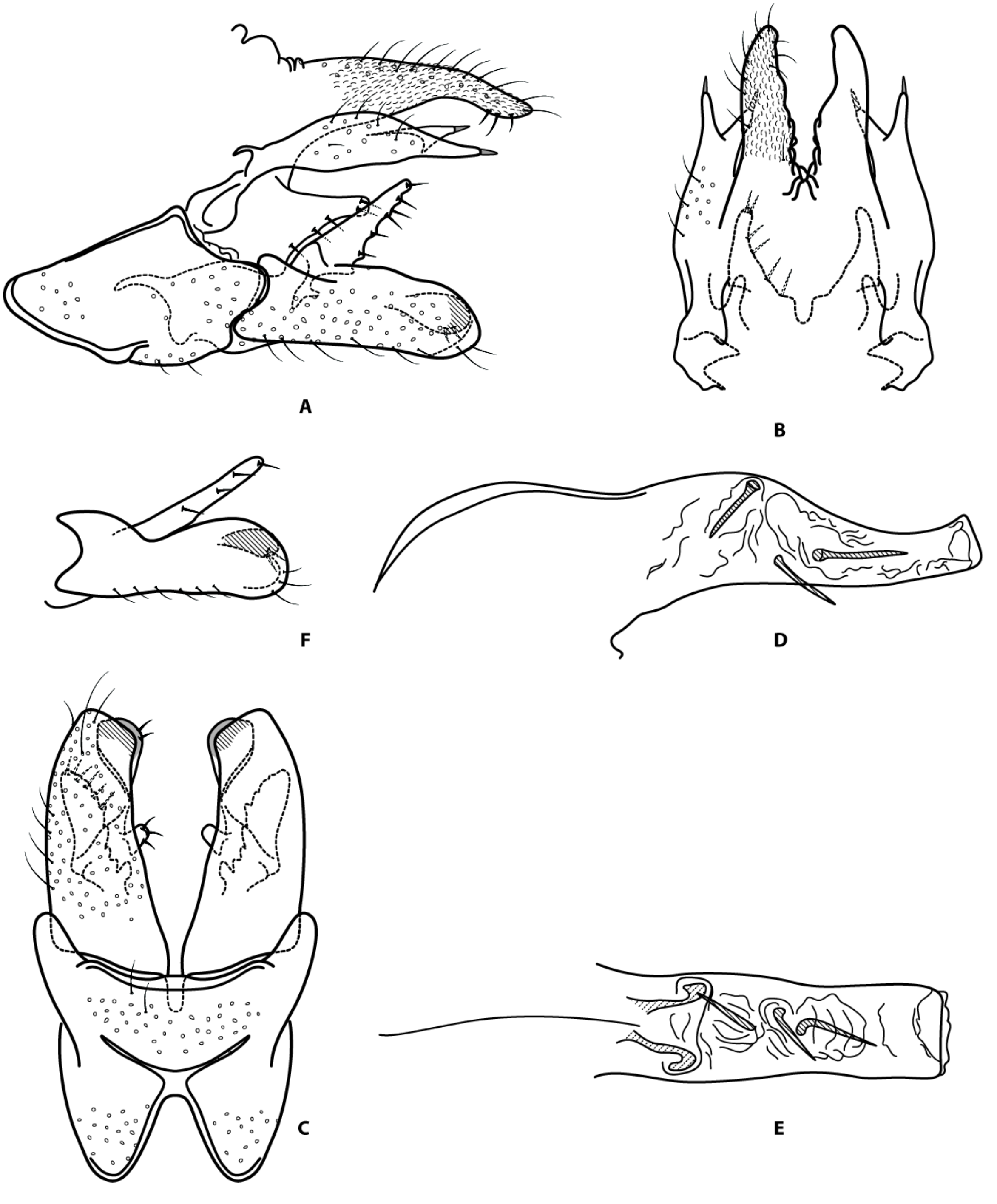

Figure 28. *Cernotina bibrachiata* Flint 1971. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view. F – inferior appendage (from another specimen).

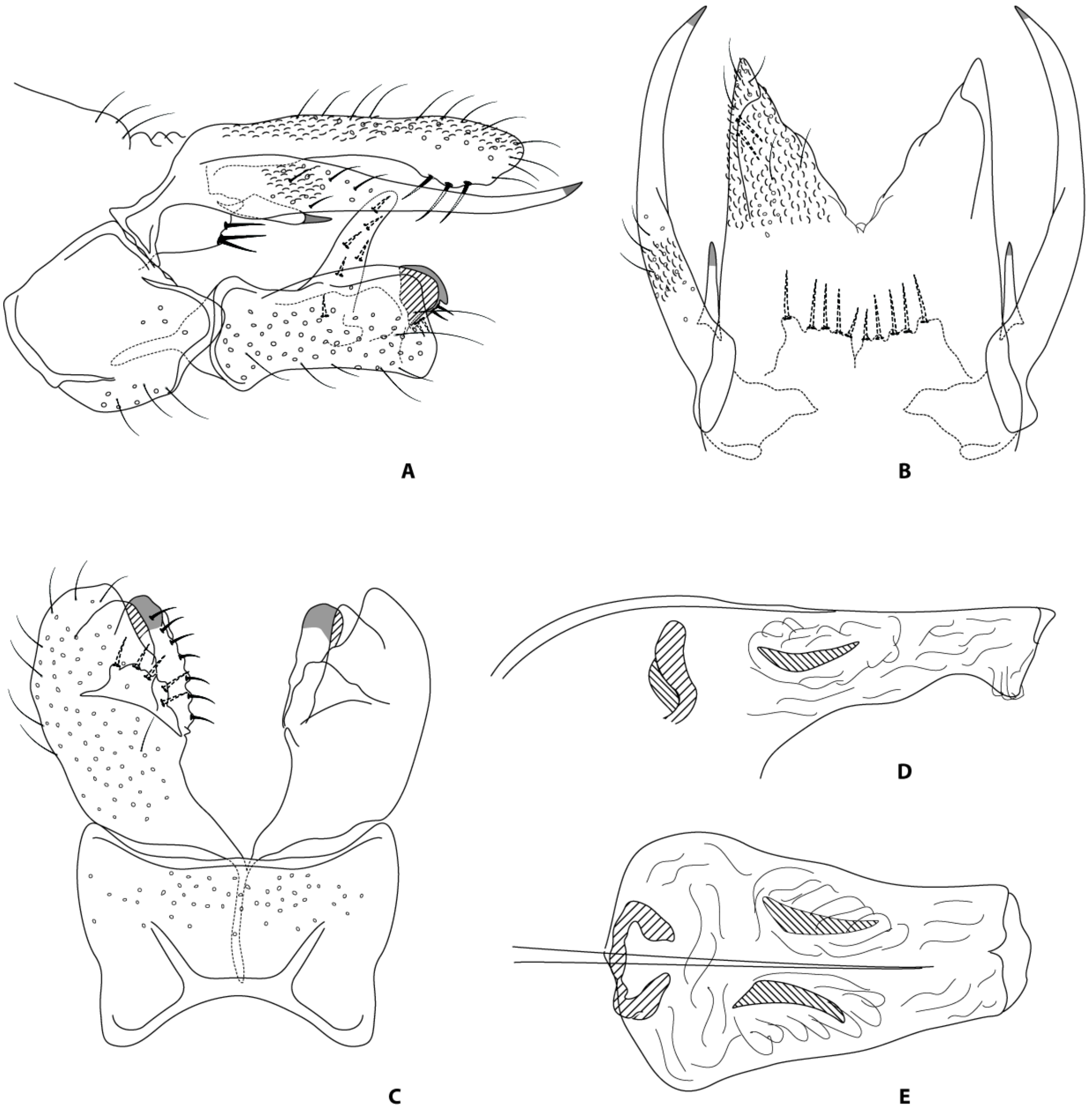

Figure 29. *Cernotina bispicata* Camargos, Barcelos-Silva and Pes 2013. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

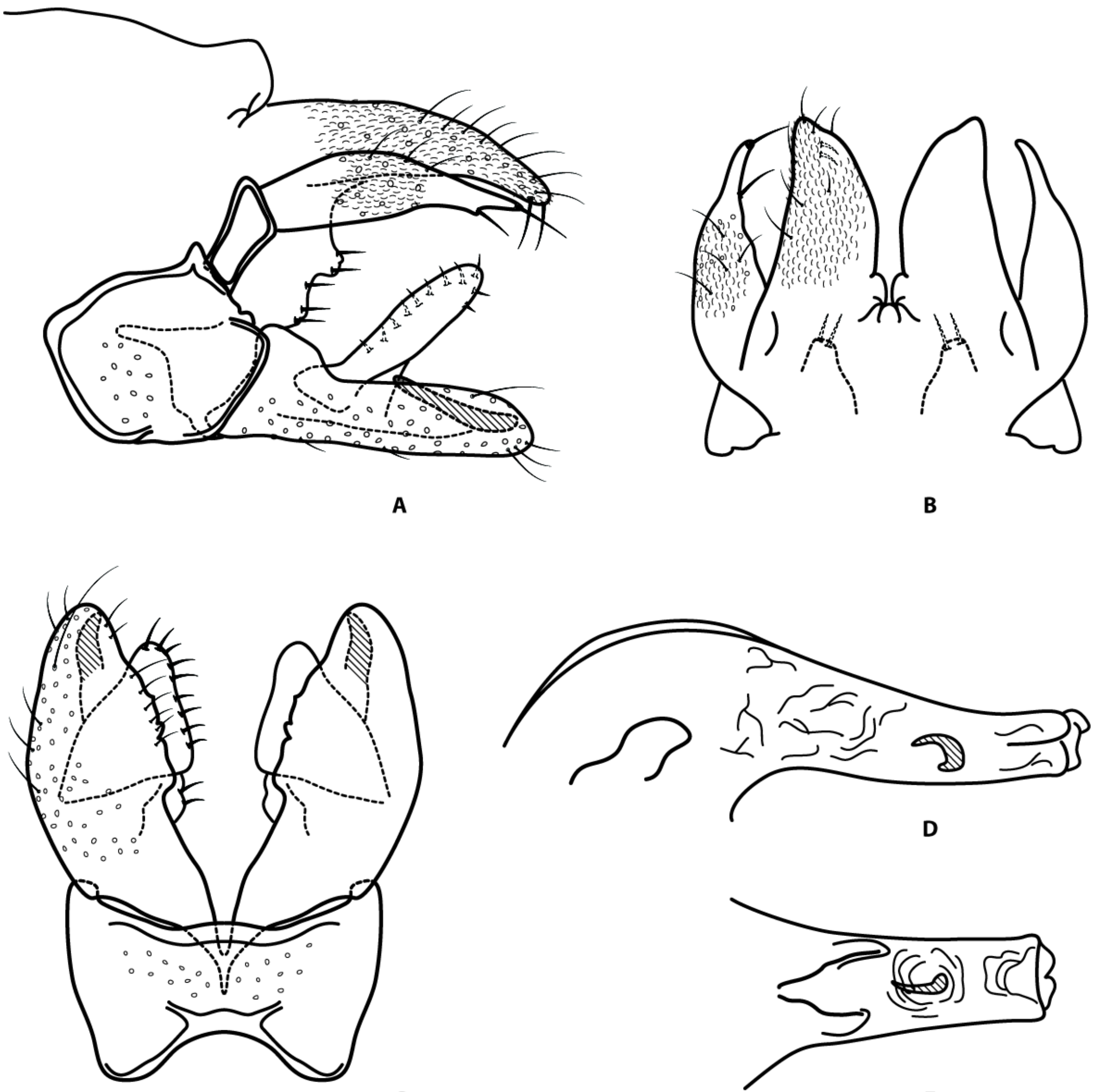

Figure 30. *Cernotina cacha* Flint 1971. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

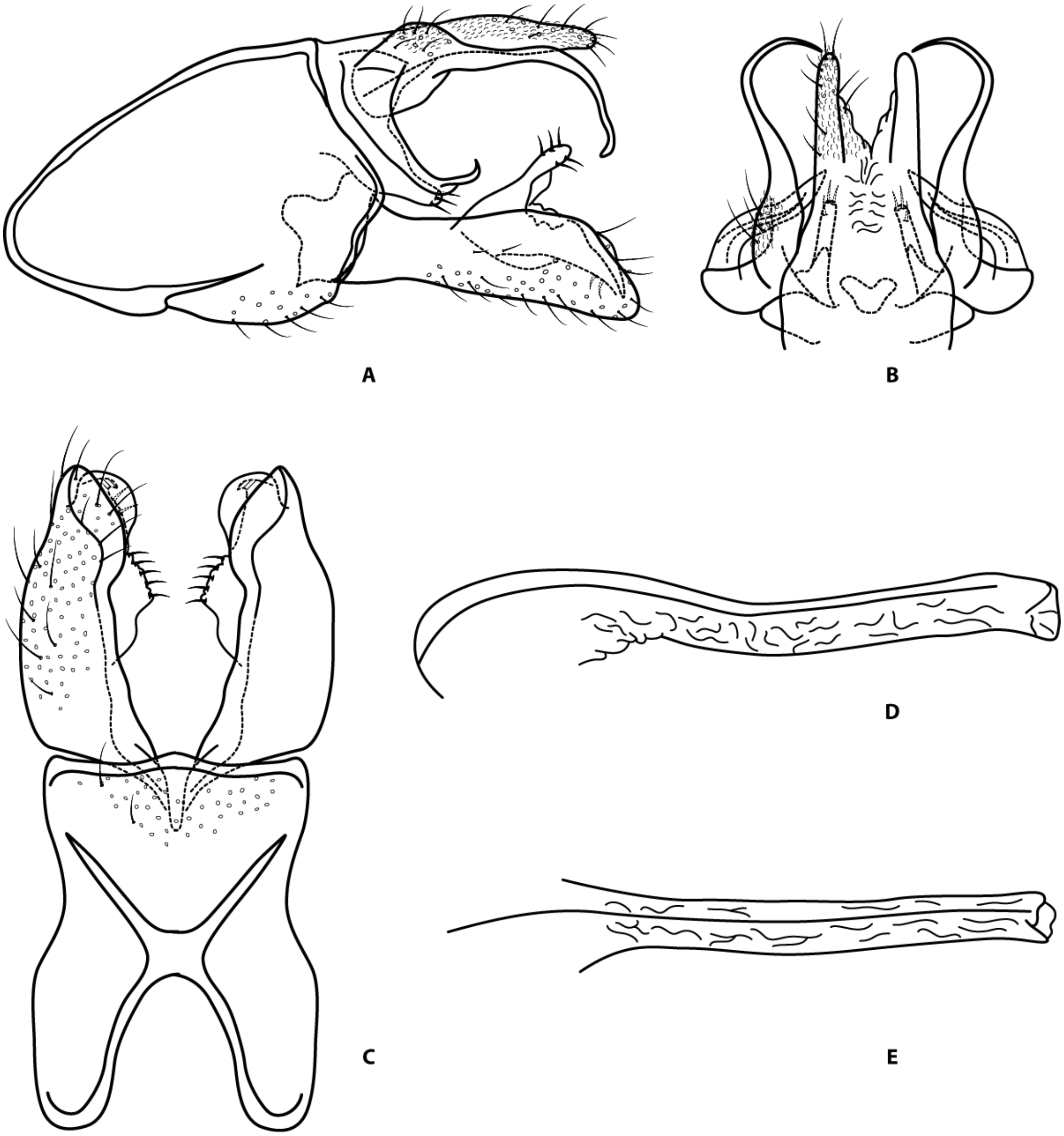

Figure 31. *Cernotina cadeti* Flint 1968. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

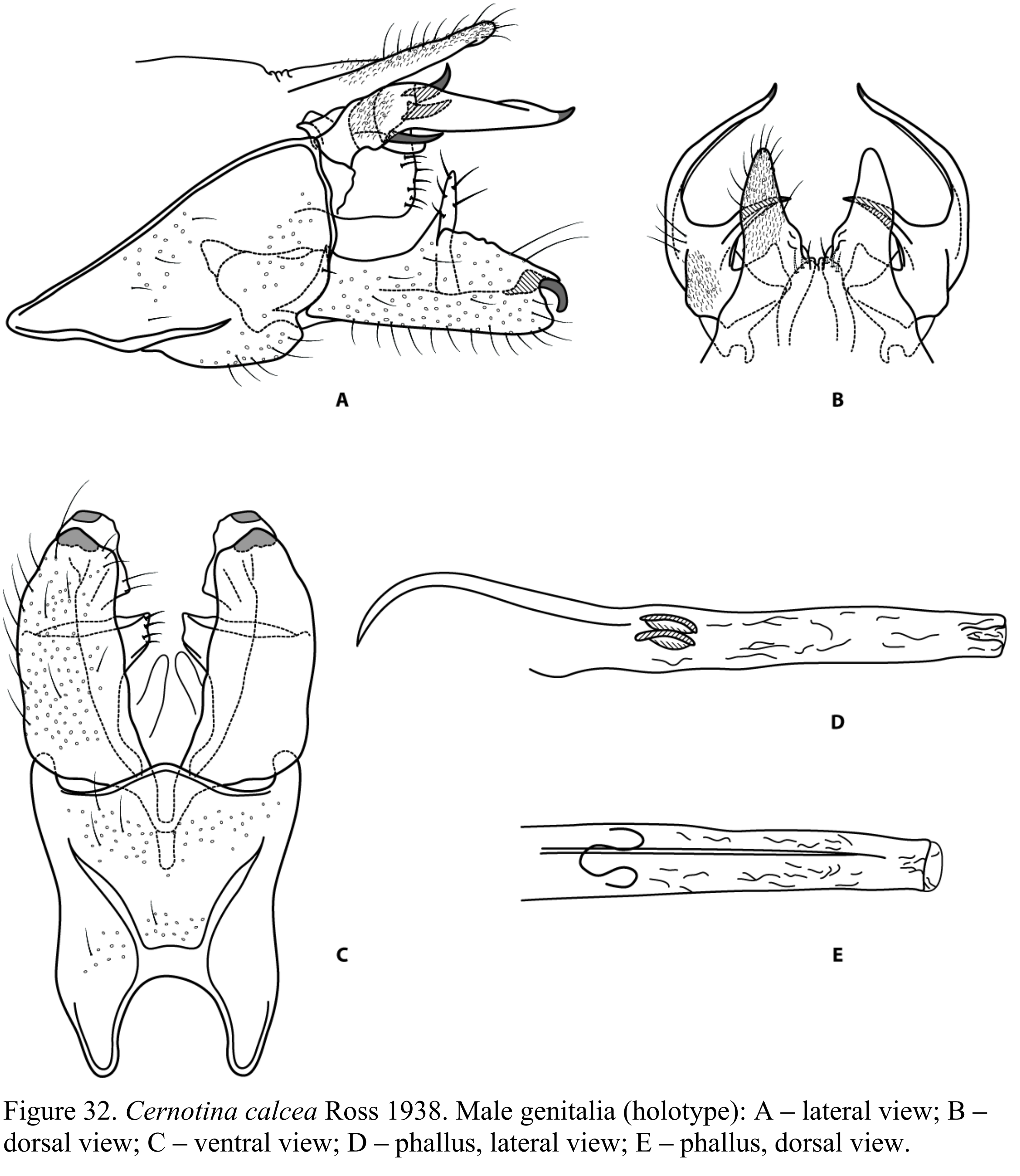

Figure 32. *Cernotina calcea* Ross 1938. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

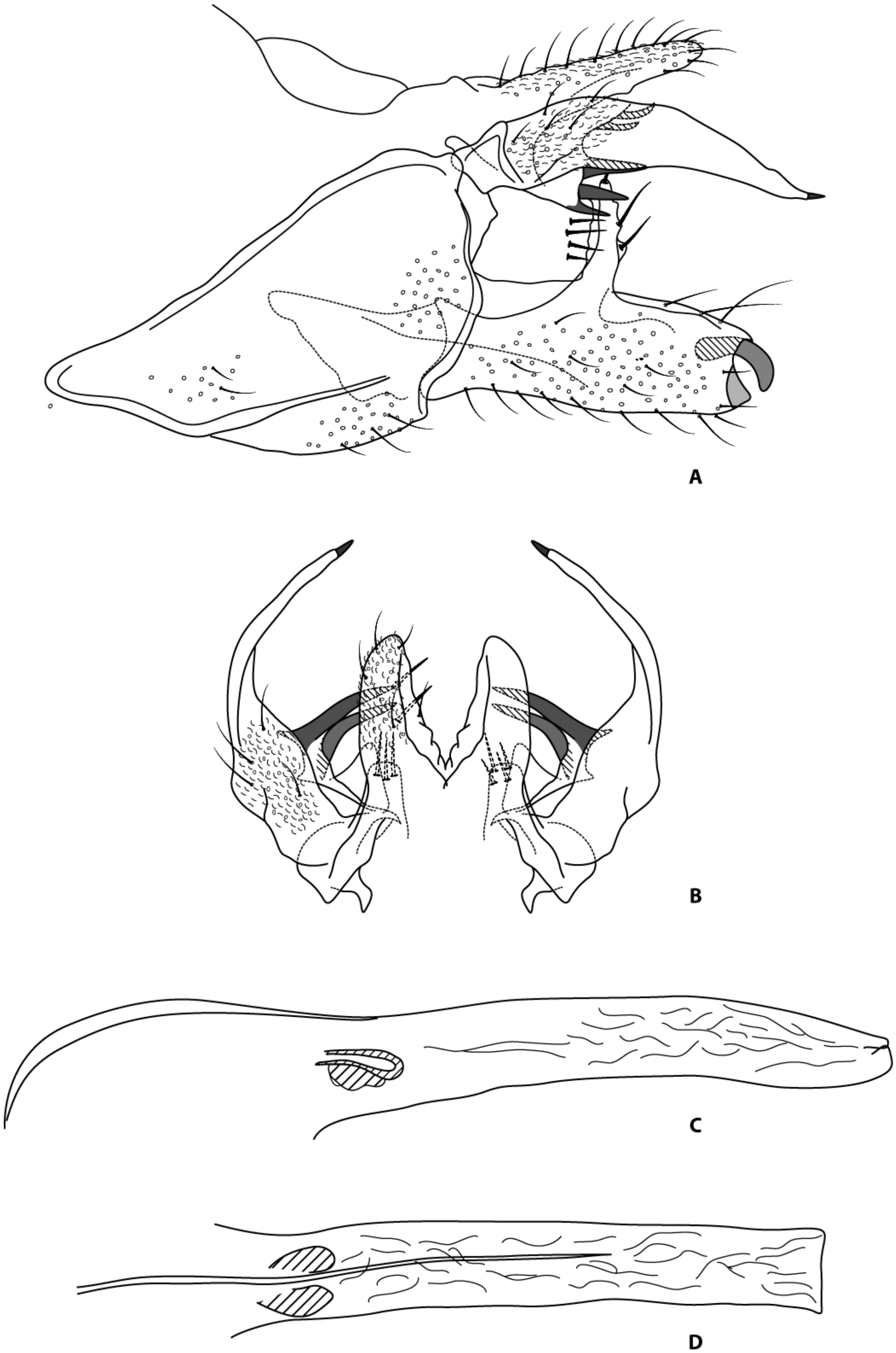

Figure 33. *Cernotina calcea* Ross 1938. Male genitalia (paratype): A – lateral view; B – dorsal view; C – phallus, lateral view; D – phallus, dorsal view.

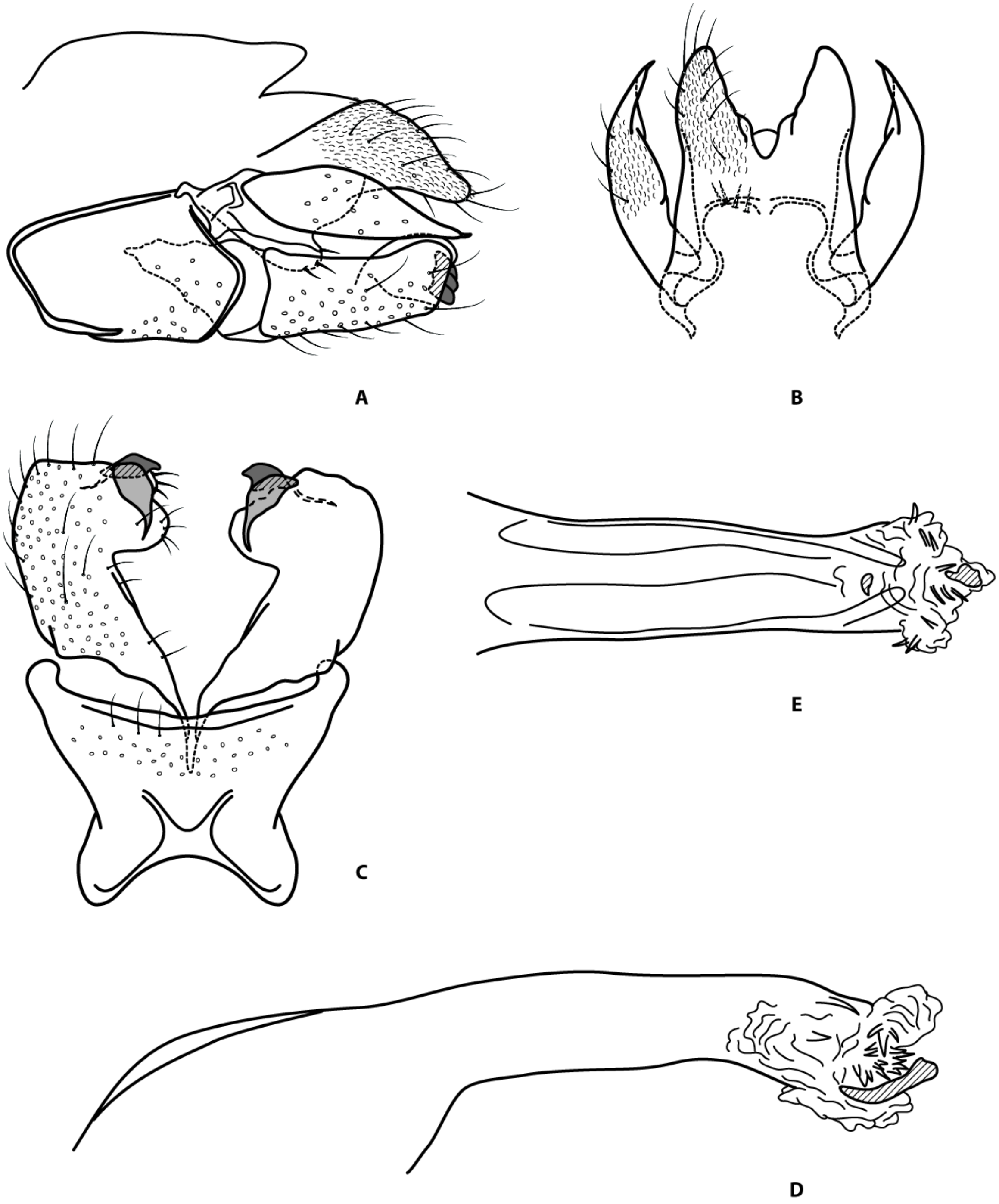

Figure 34. *Cernotina caliginosa* Flint 1968. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

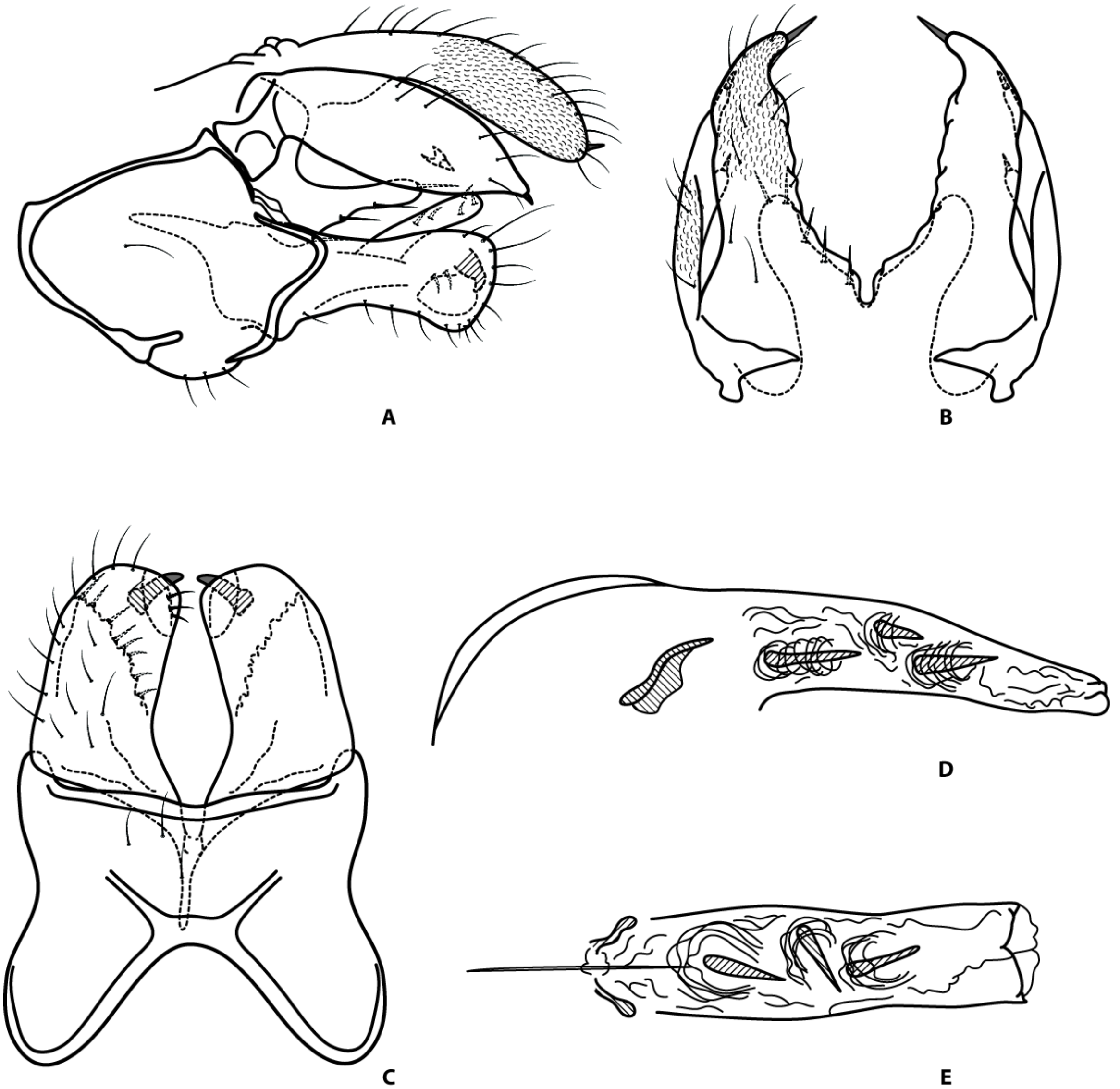

Figure 35. *Cernotina carbonelli* Flint 1983. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

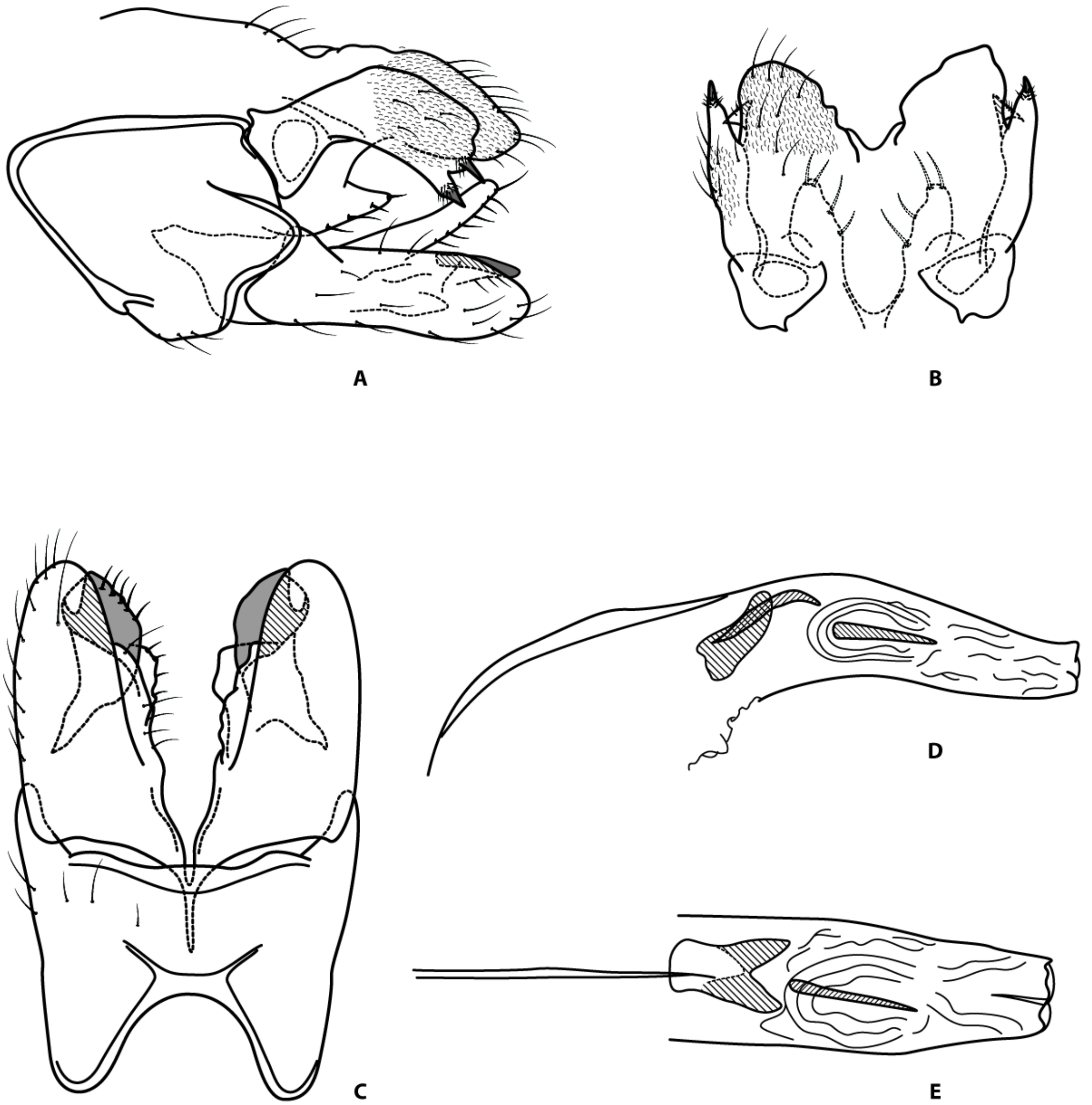

Figure 36. *Cernotina chelifera* Flint 1972. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

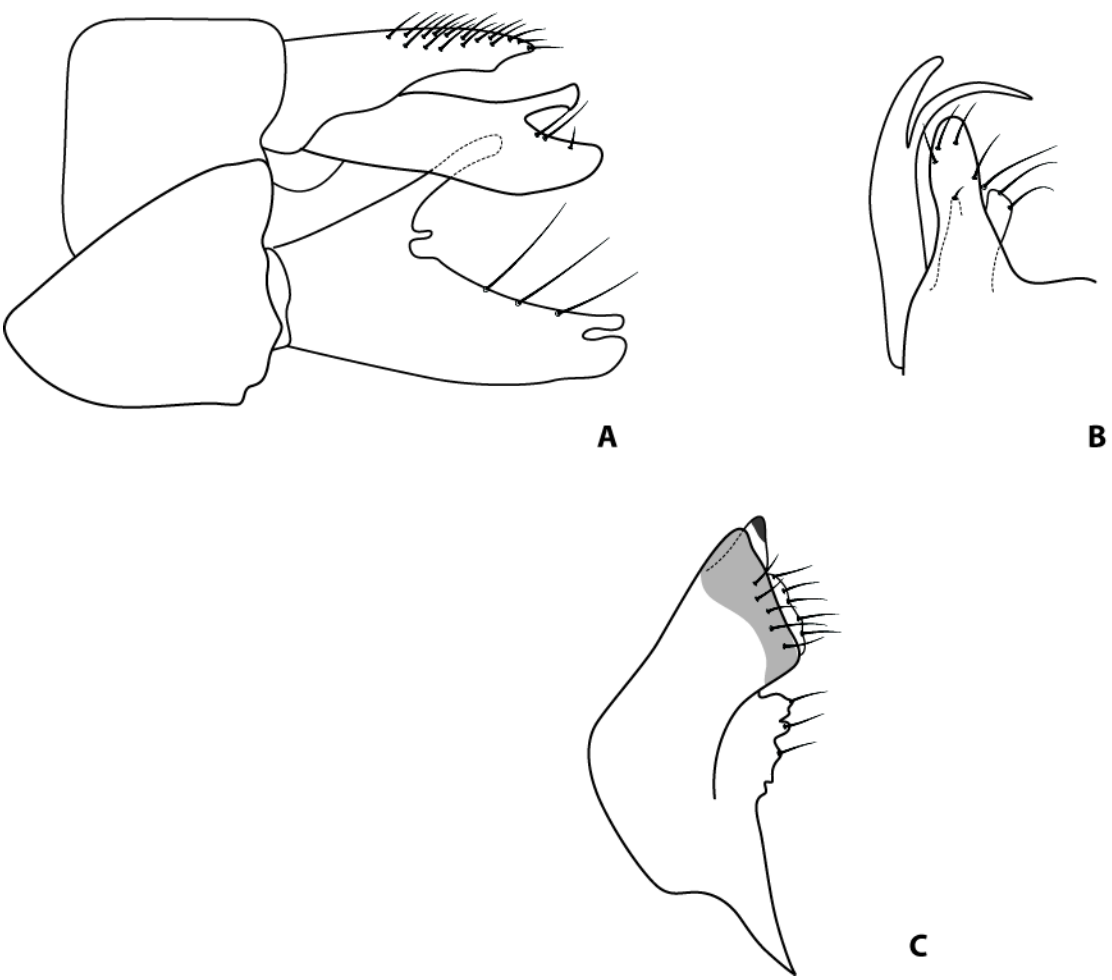

Figure 37. *Cernotina chiapaneca* Bueno-Soria 2010. Male genitalia (adapted from Bueno-Soria 2010): A – lateral view; B – dorsal view; C – ventral view.

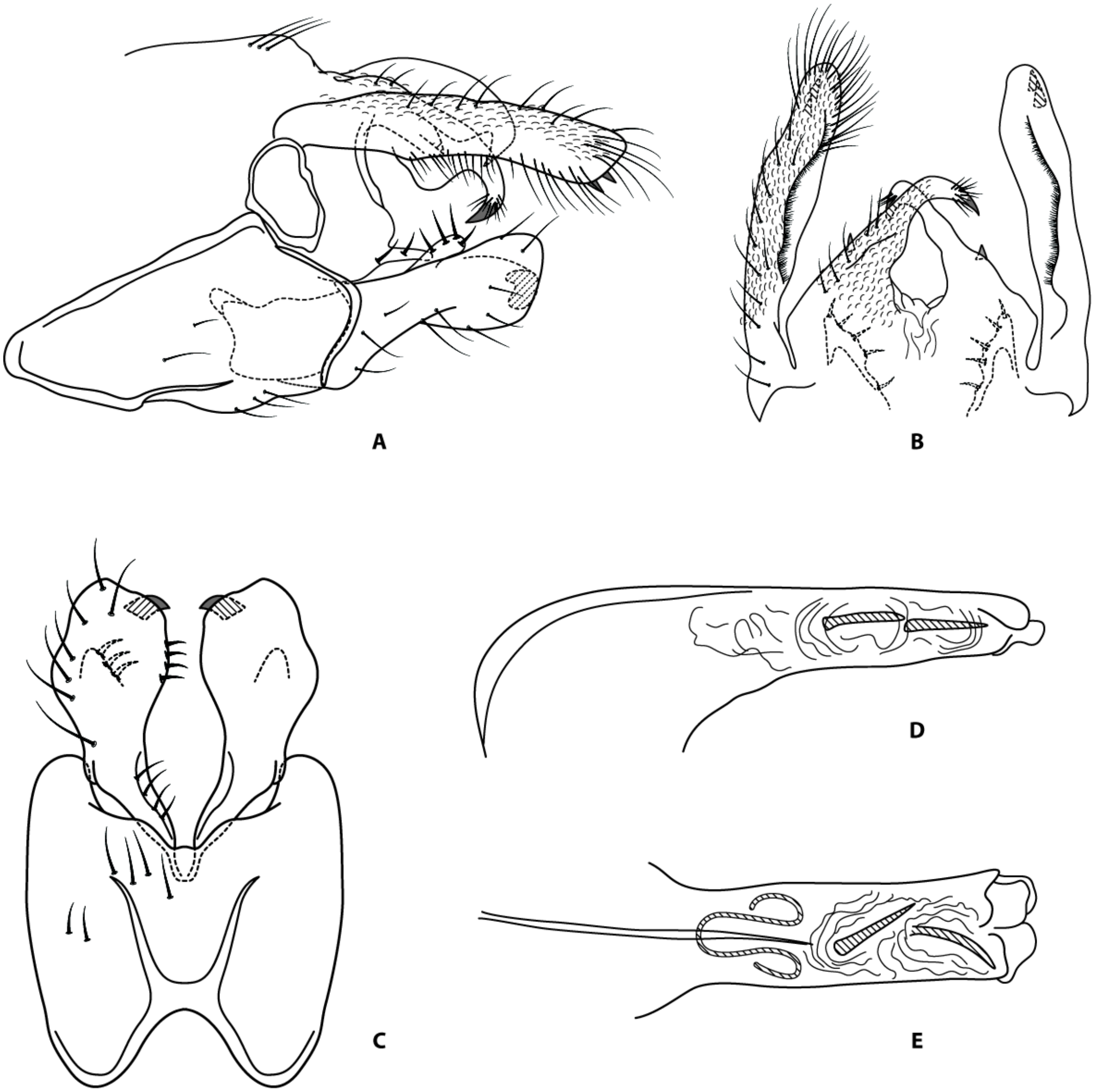

Figure 38. *Cernotina cingulata* Flint 1971. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

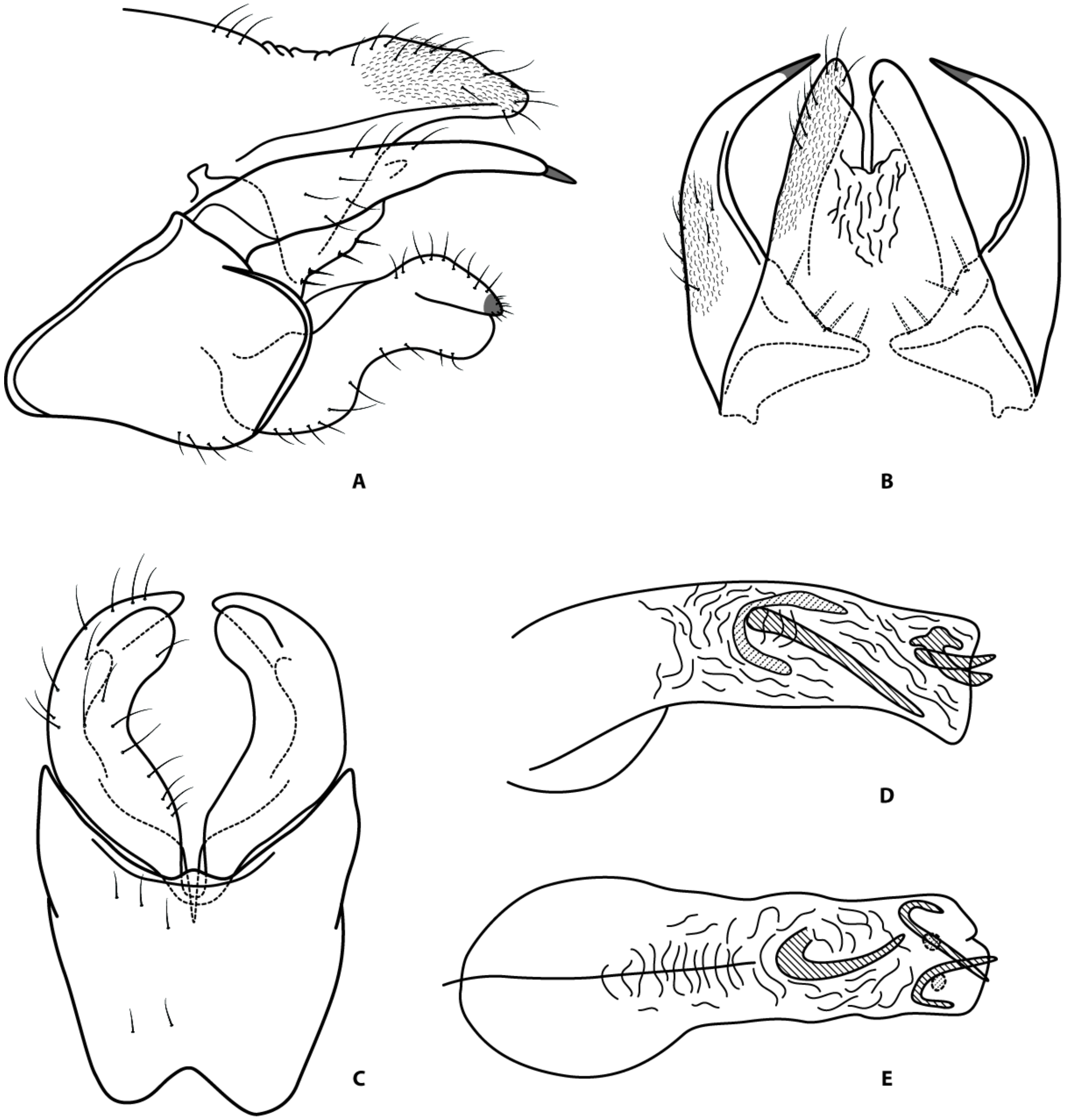

Figure 39. *Cernotina compressa* Flint 1971. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

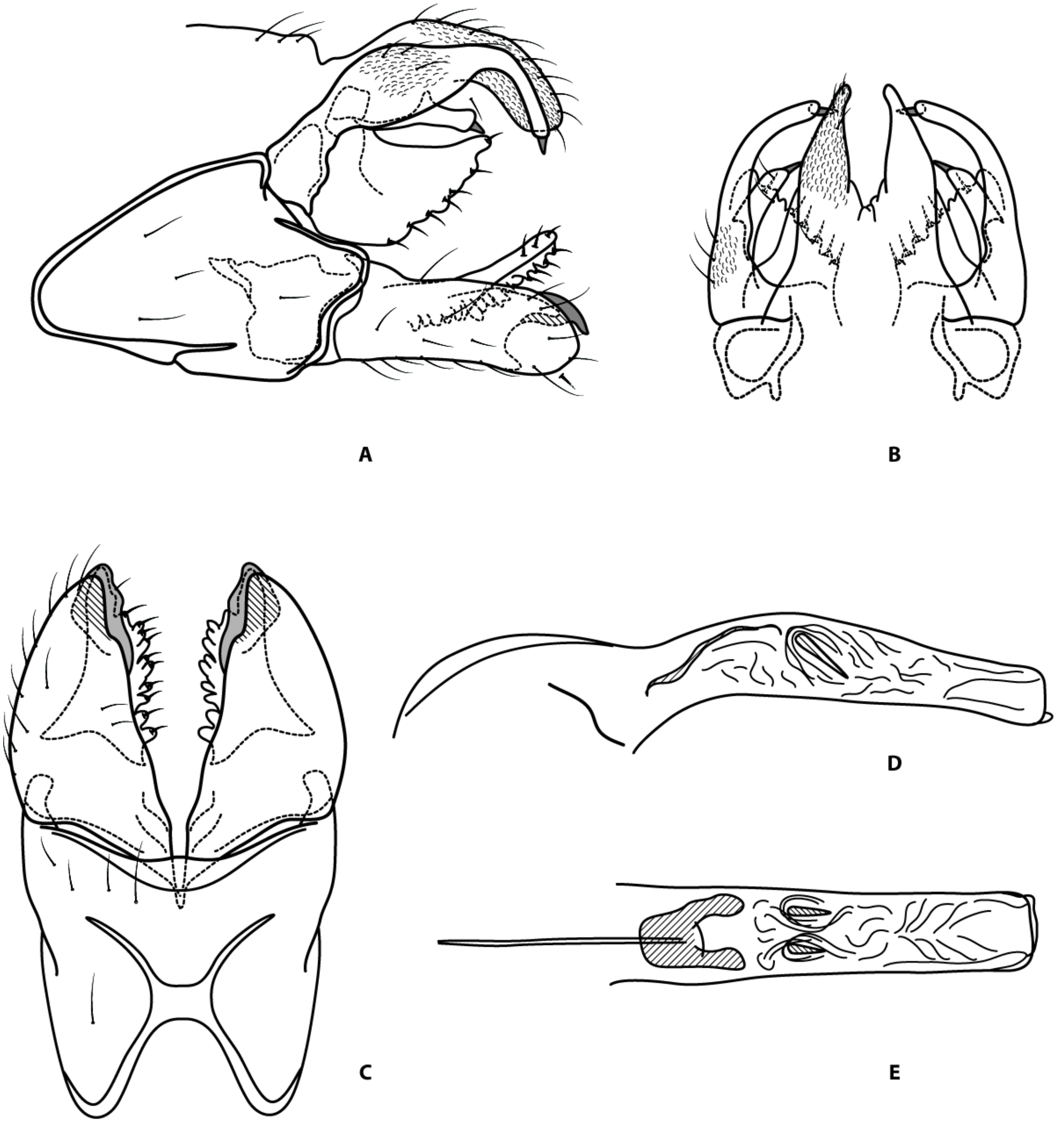

Figure 40. *Cernotina cygnea* Flint 1971. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

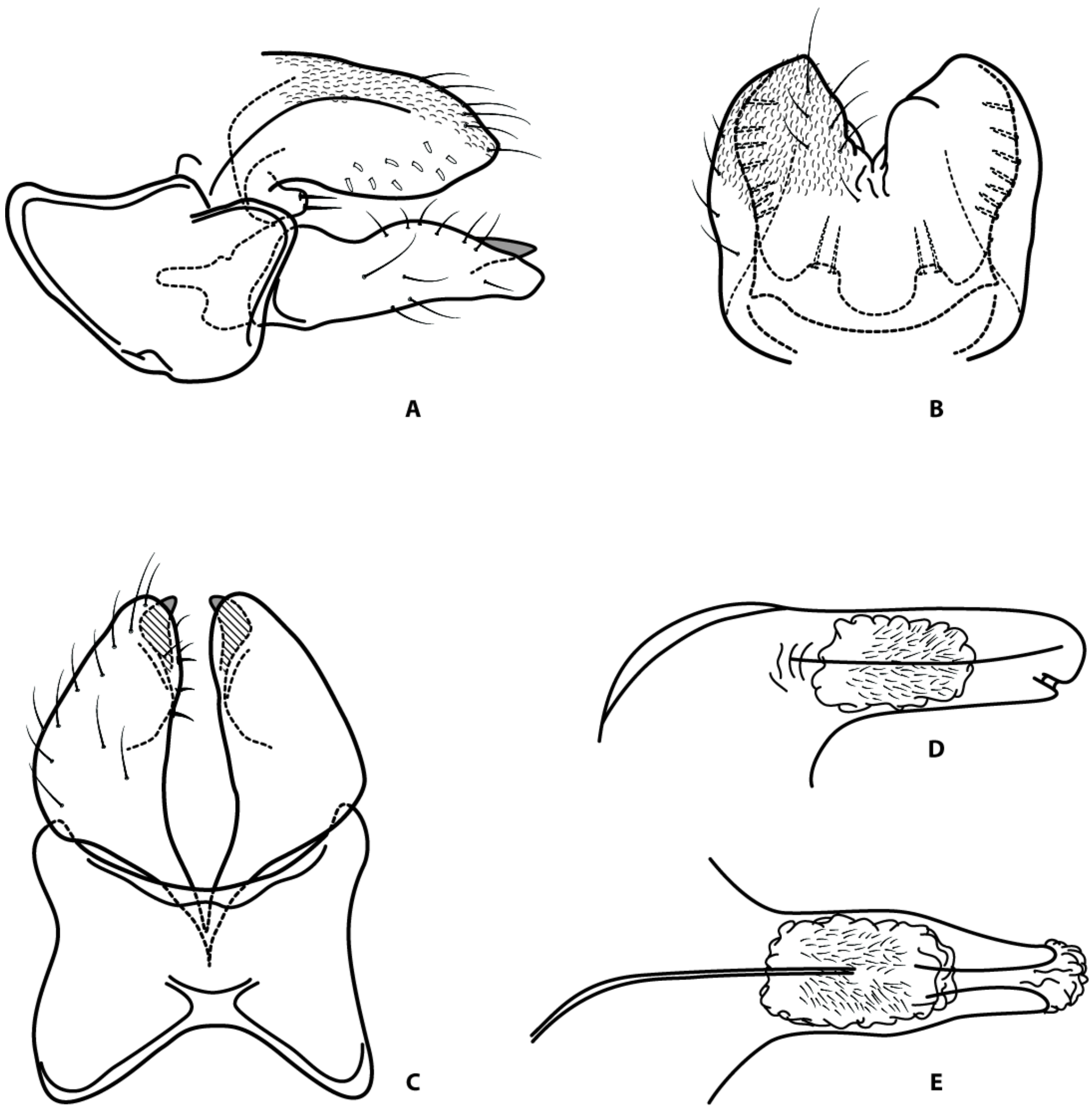

Figure 41. *Cernotina cystophora* Flint 1971. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

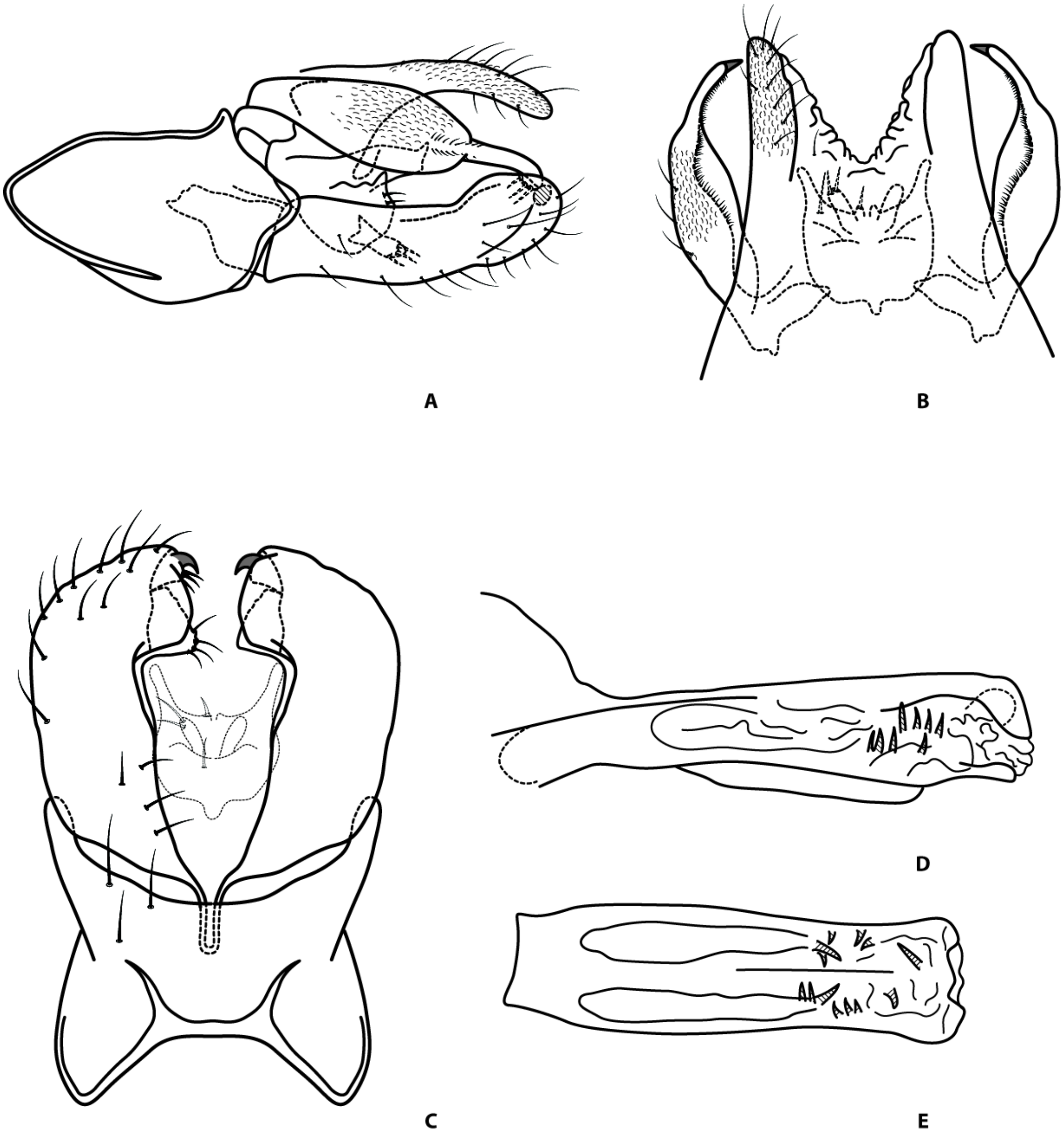

Figure 42. *Cernotina danieli* Flint and Sykora 2004. Male genitalia (paratype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

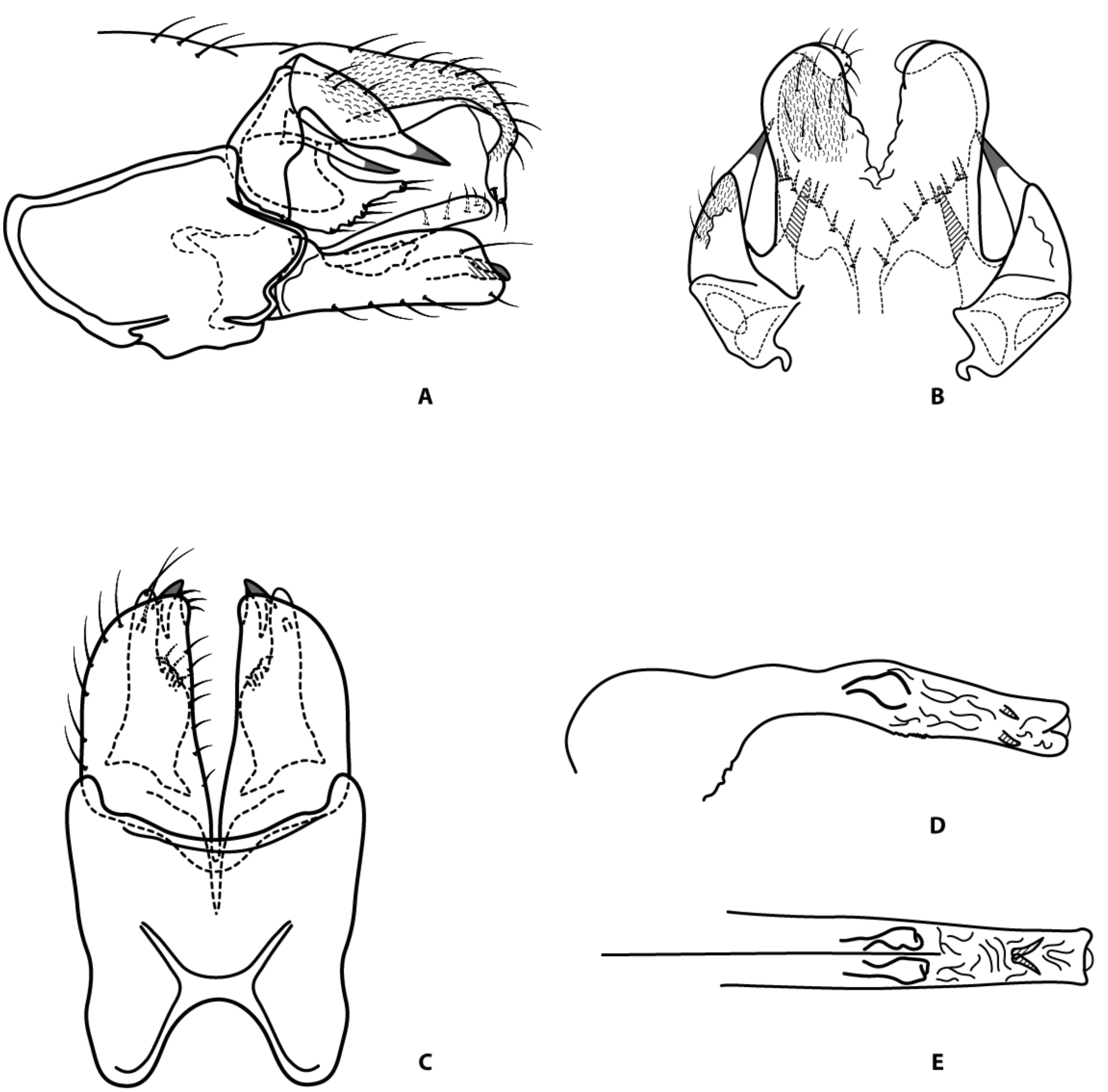

Figure 43. *Cernotina declinata* Flint 1971. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

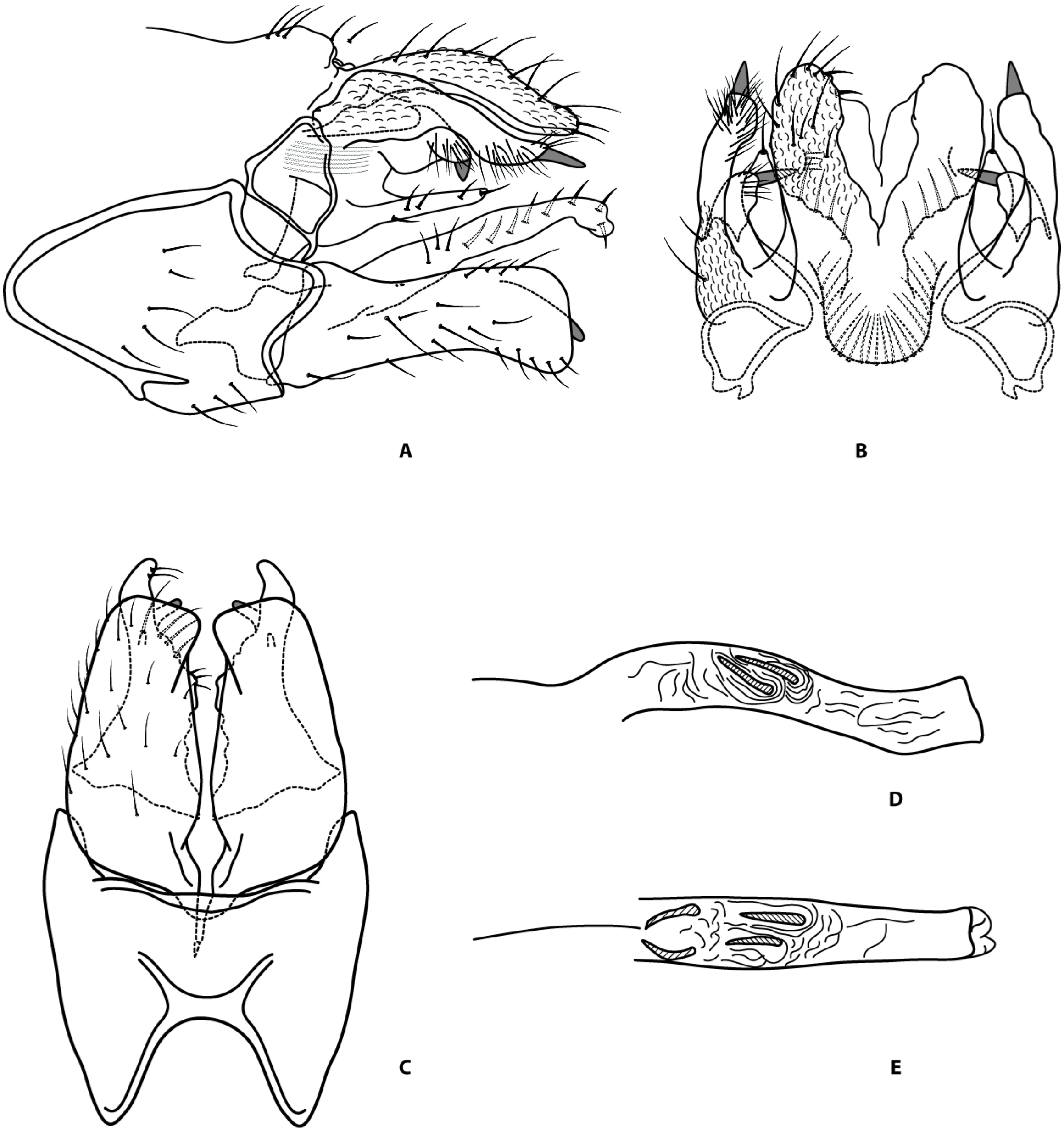

Figure 44. *Cernotina decumbens* Flint 1971. Male genitalia (specimen from Manaus): A – lateral view; B – dorsal view. Male genitalia (holotype): C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

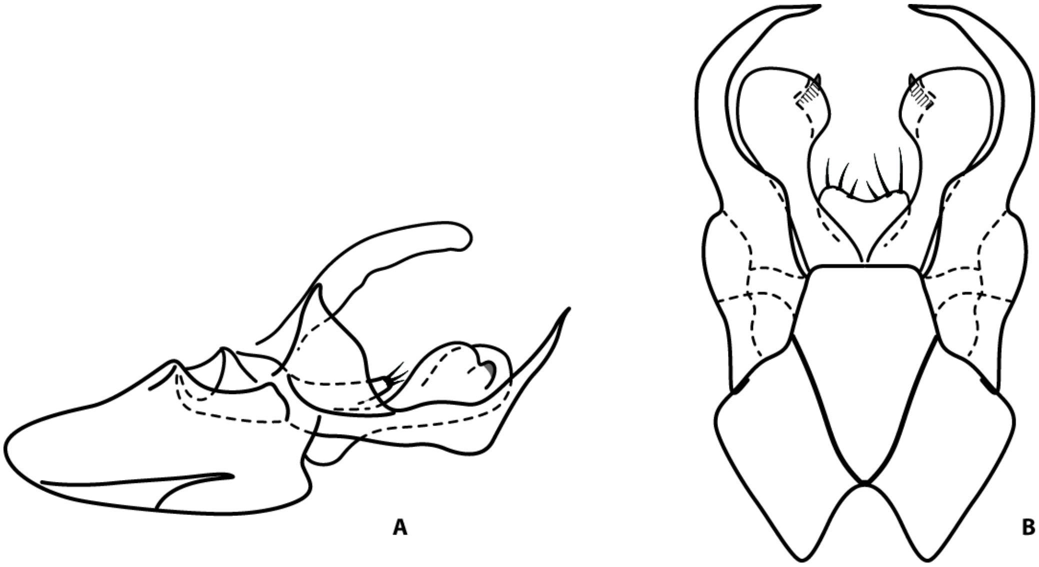

Figure 45. *Cernotina depressa* Flint 1974. Male genitalia (adapted from Flint 1974): A – lateral view; B – ventral view.

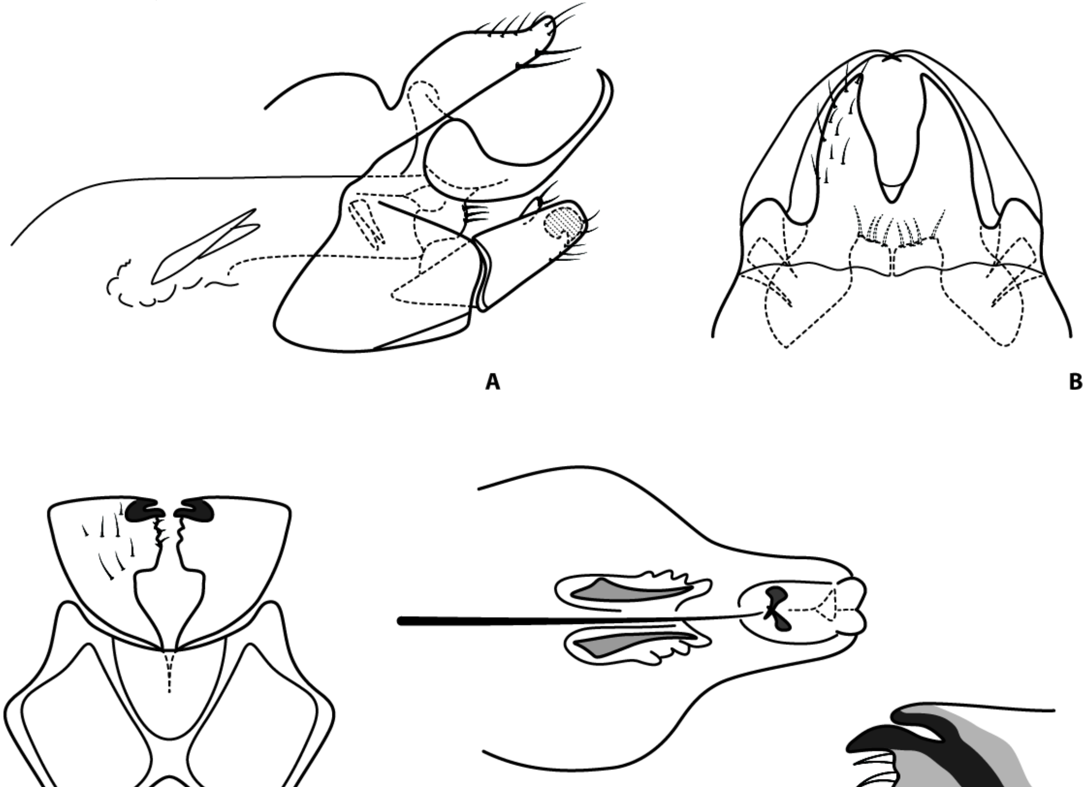

Figure 46. *Cernotina ecotura* Sykora 1998. Male genitalia (adapted from Sykora 1998): A – lateral view; B – dorsal view; C – ventral view; D – phallus, dorsal view; E – detail of apicomesal lobe.

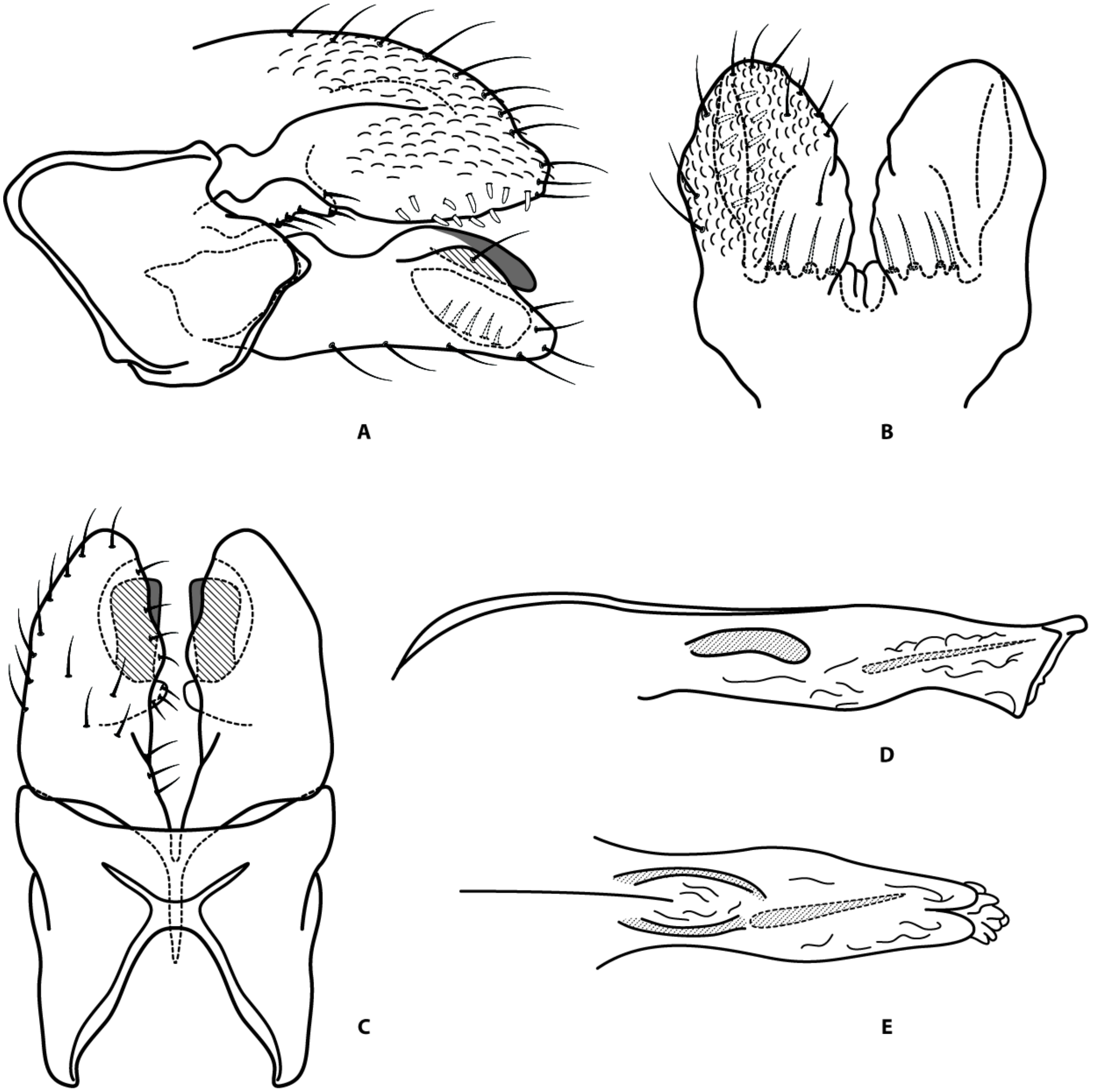

Figure 47. *Cernotina encrypta* Flint 1971. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

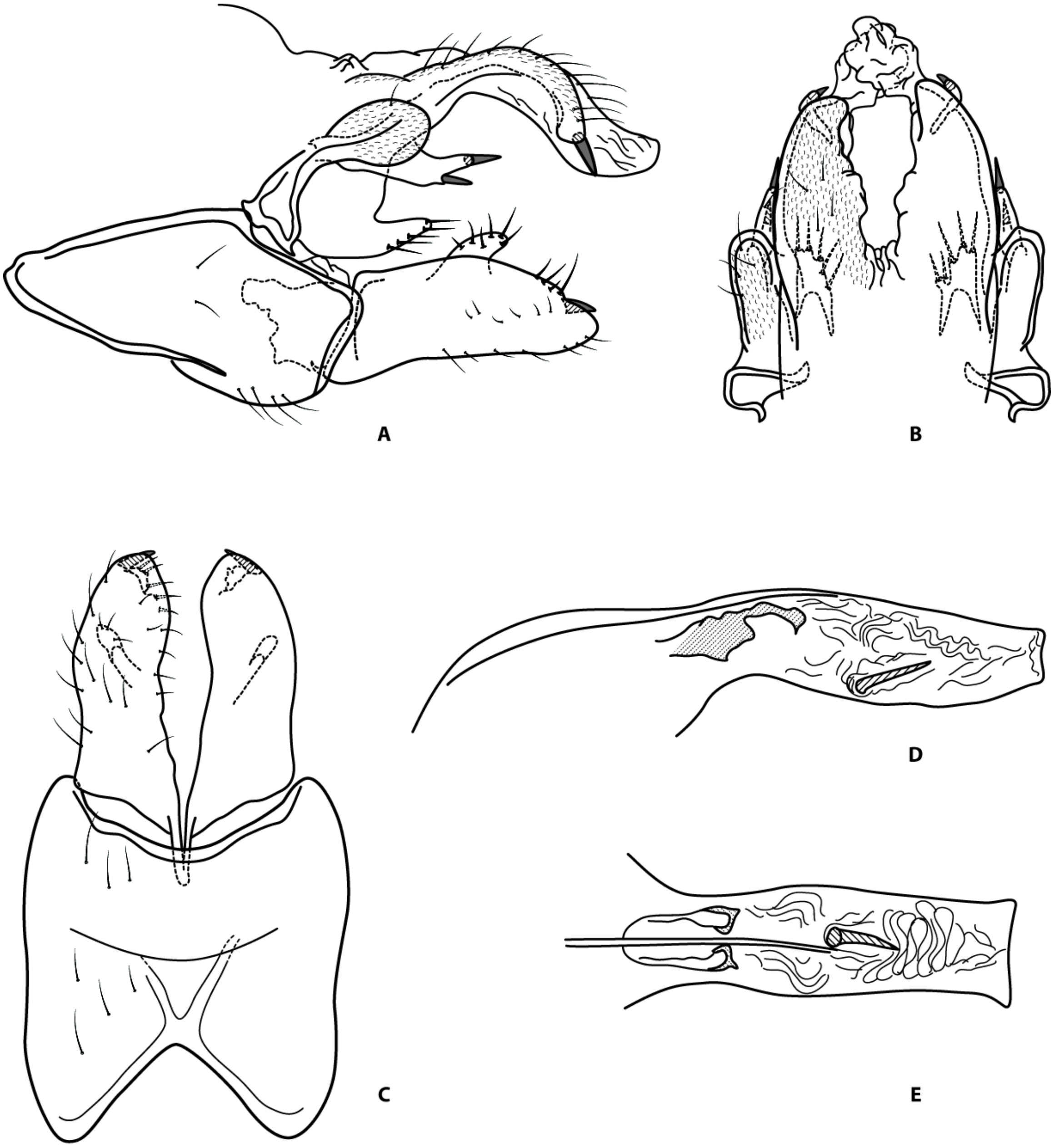

Figure 48. *Cernotina falcata* Camargos, Barcelos-Silva and Pes 2013. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

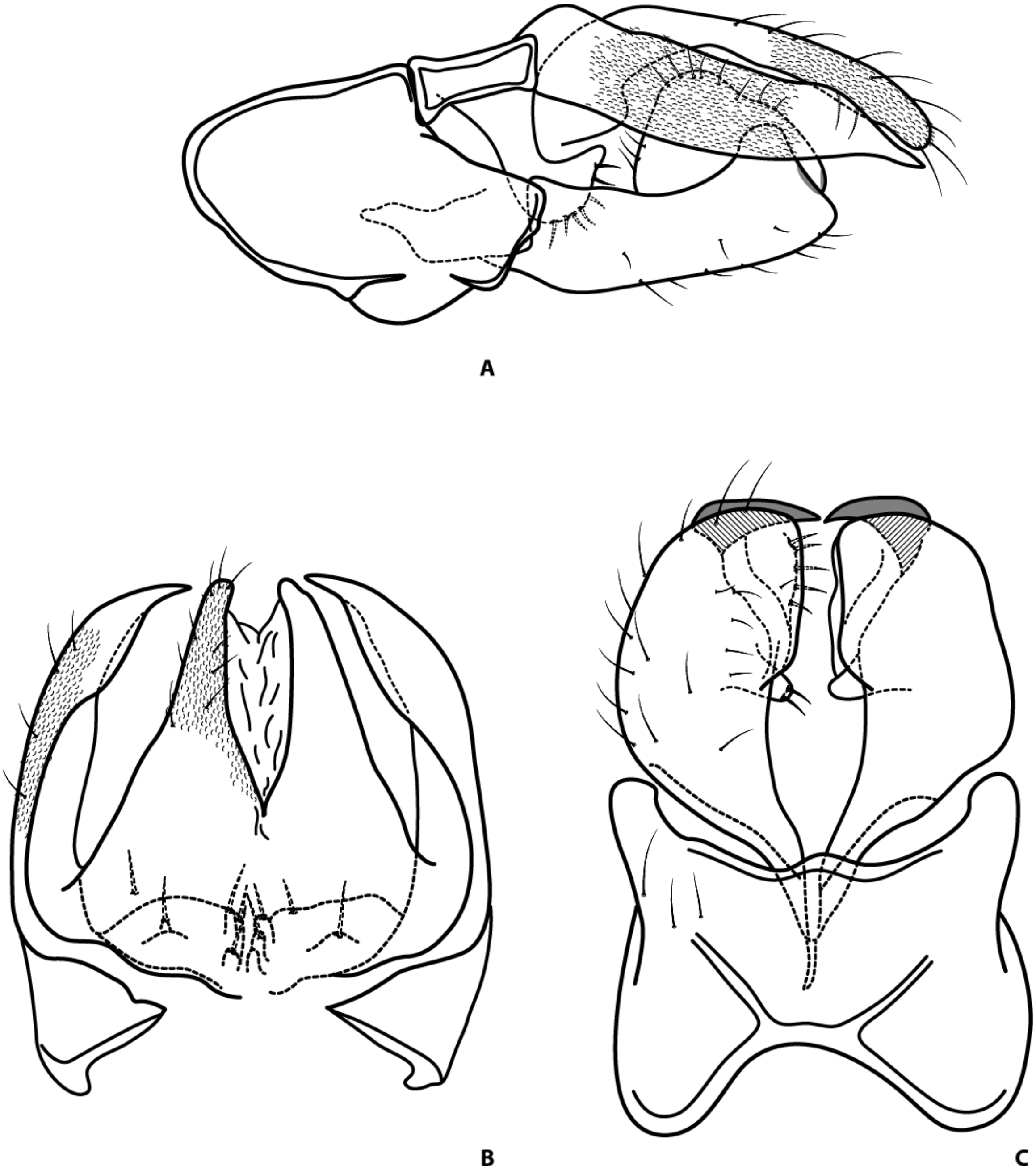

Figure 49. *Cernotina fallaciosa* Flint 1983. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view.

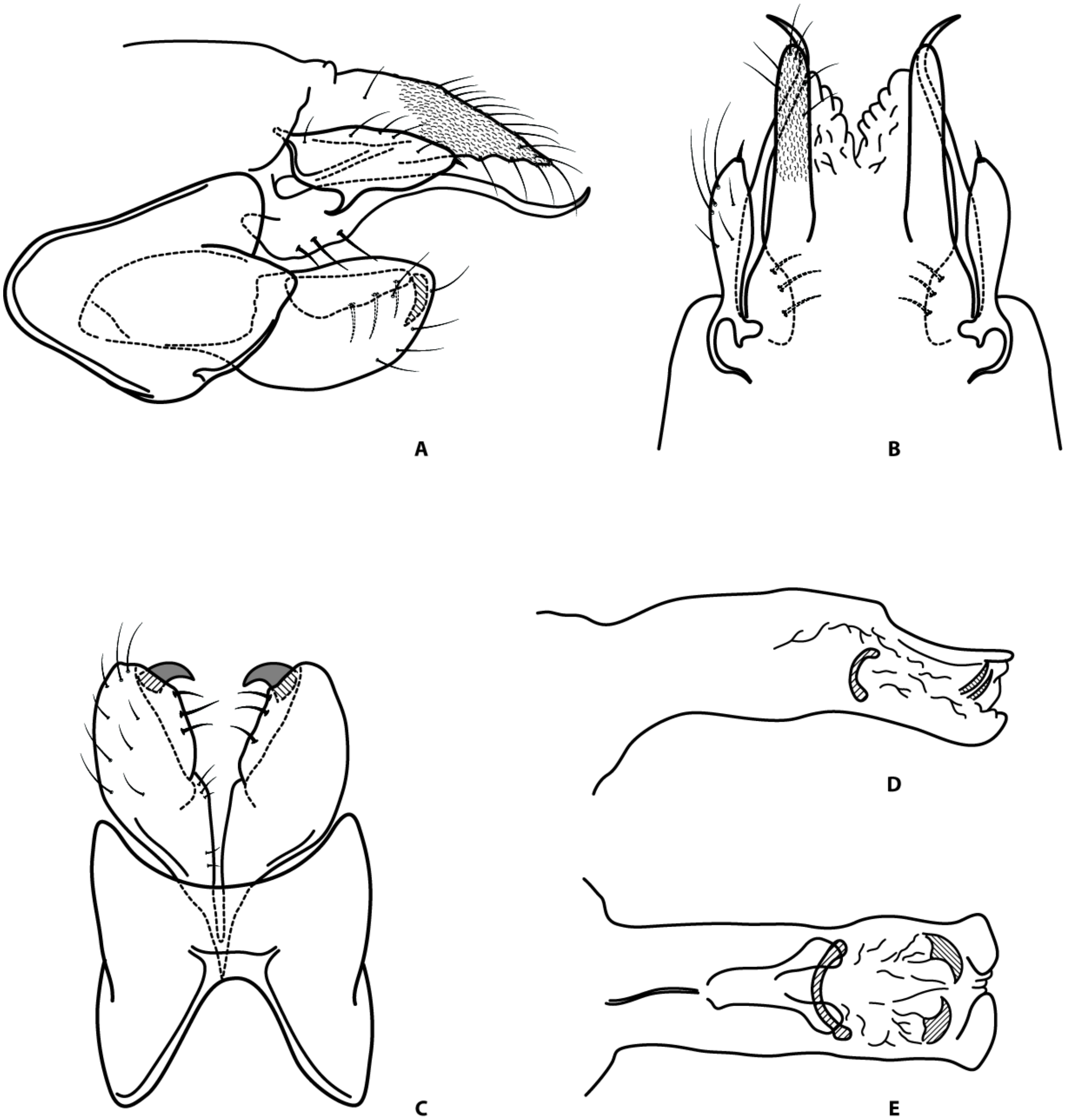

Figure 50. *Cernotina filiformis* Flint 1971. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

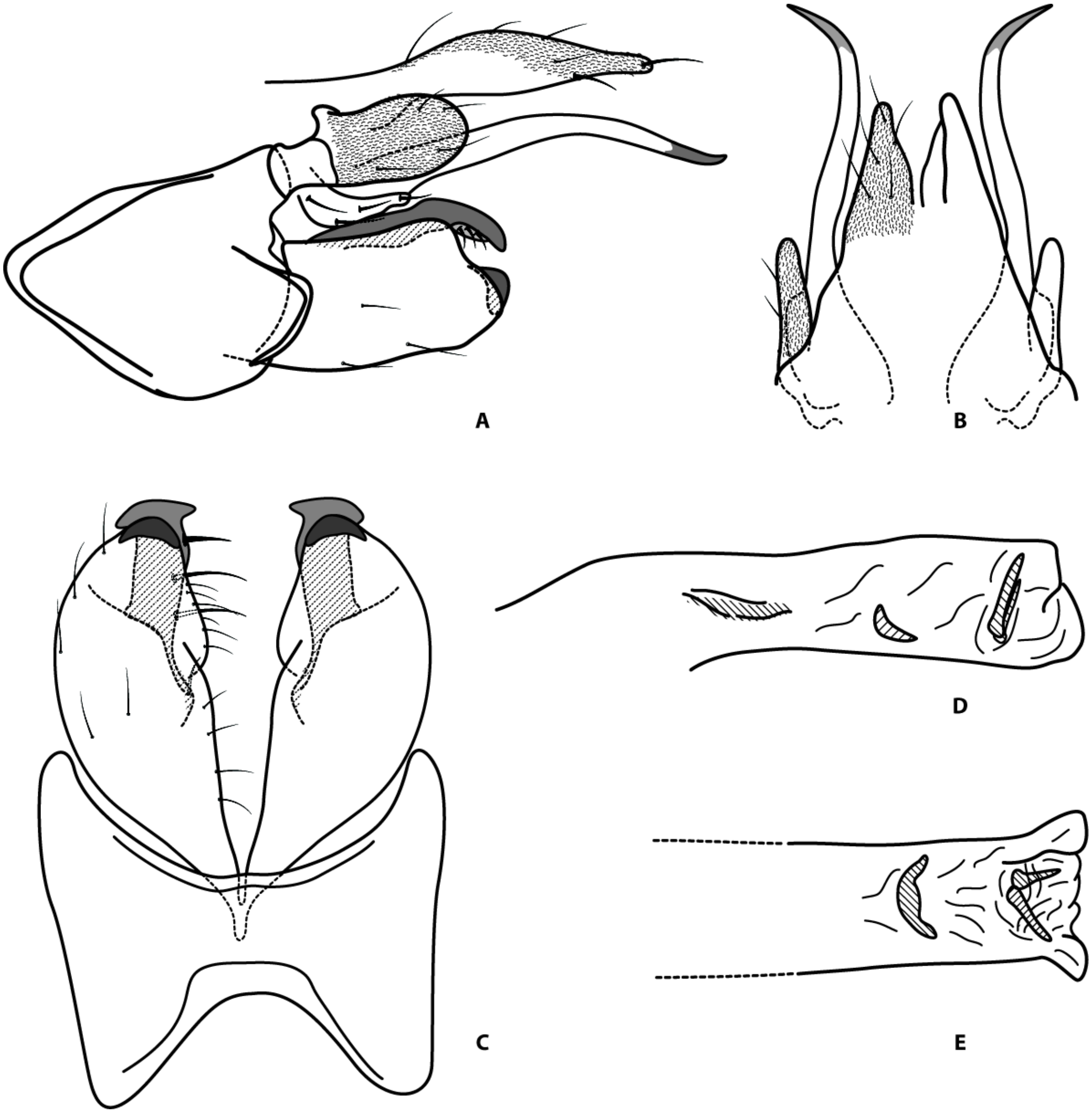

Figure 51. *Cernotina flexuosa* Santos and Nessimian 2008. Male genitalia (paratype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

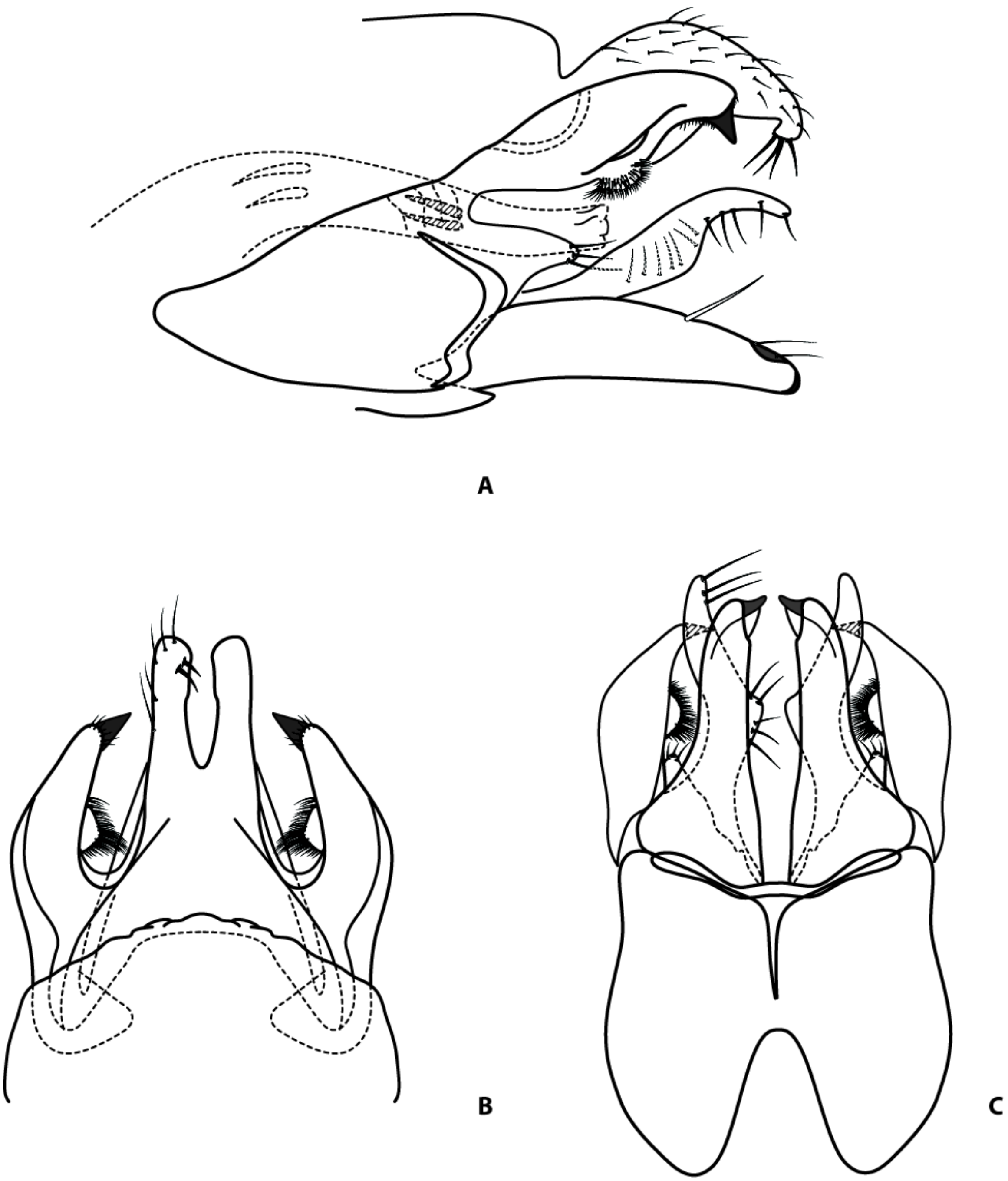

Figure 52. *Cernotina harrisi* Sykora 1998. Male genitalia (adapted from Sykora 1998): A – lateral view; B – dorsal view; C – ventral view.

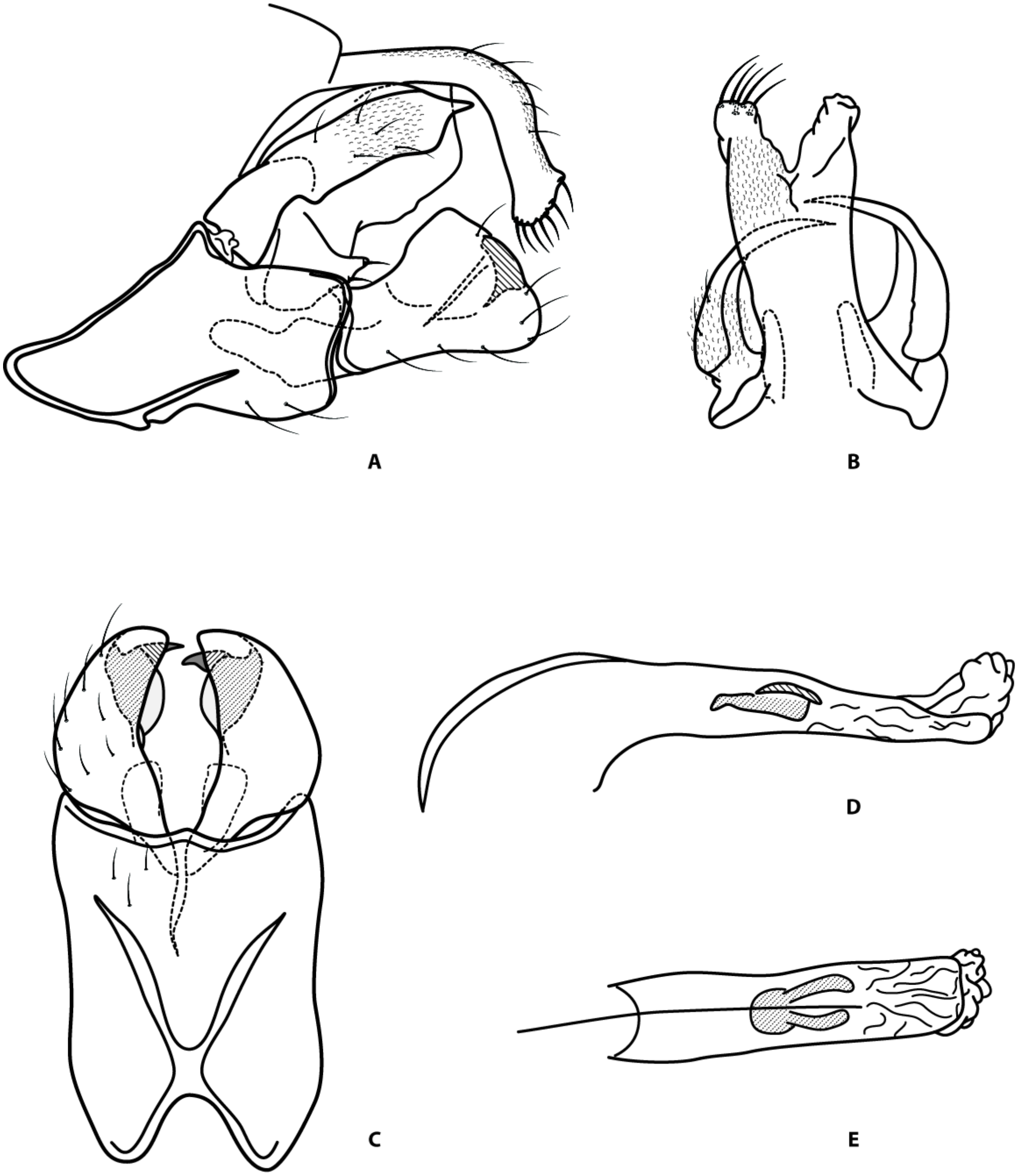

Figure 53. *Cernotina hastilis* Flint 1996. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

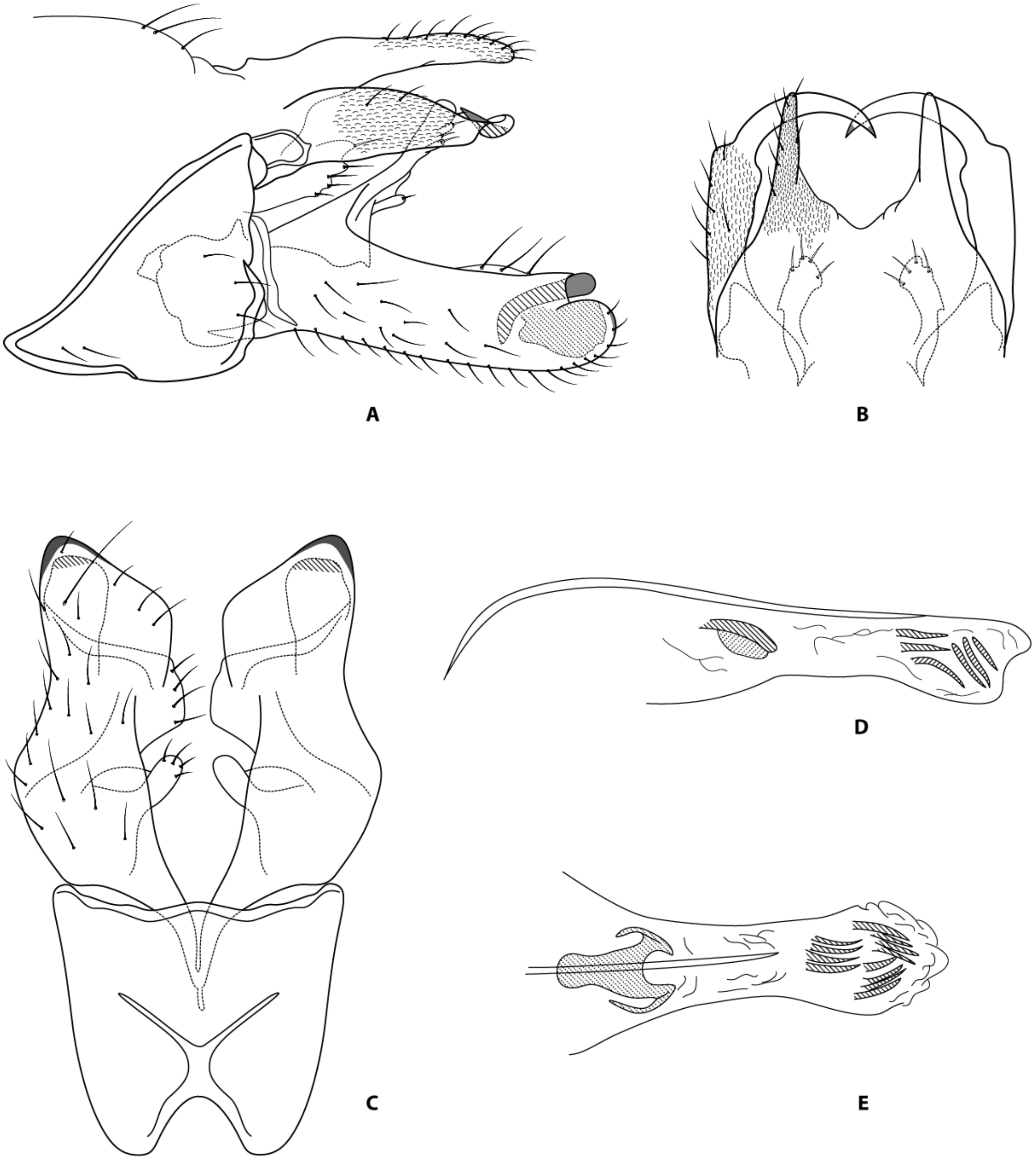

Figure 54. *Cernotina intersecta* Flint 1974. Male genitalia (paratype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

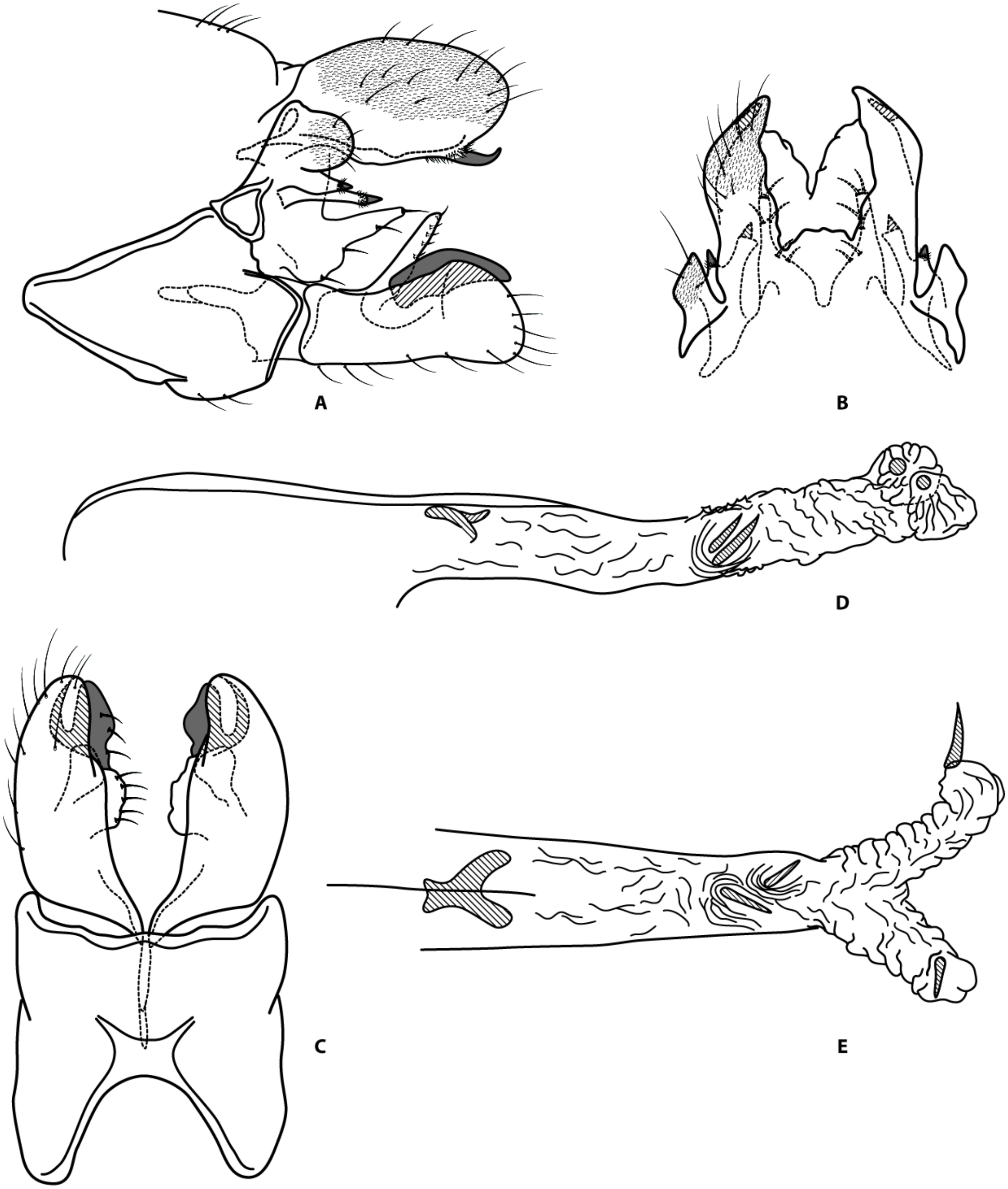

Figure 55. *Cernotina laticula* Ross 1951. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

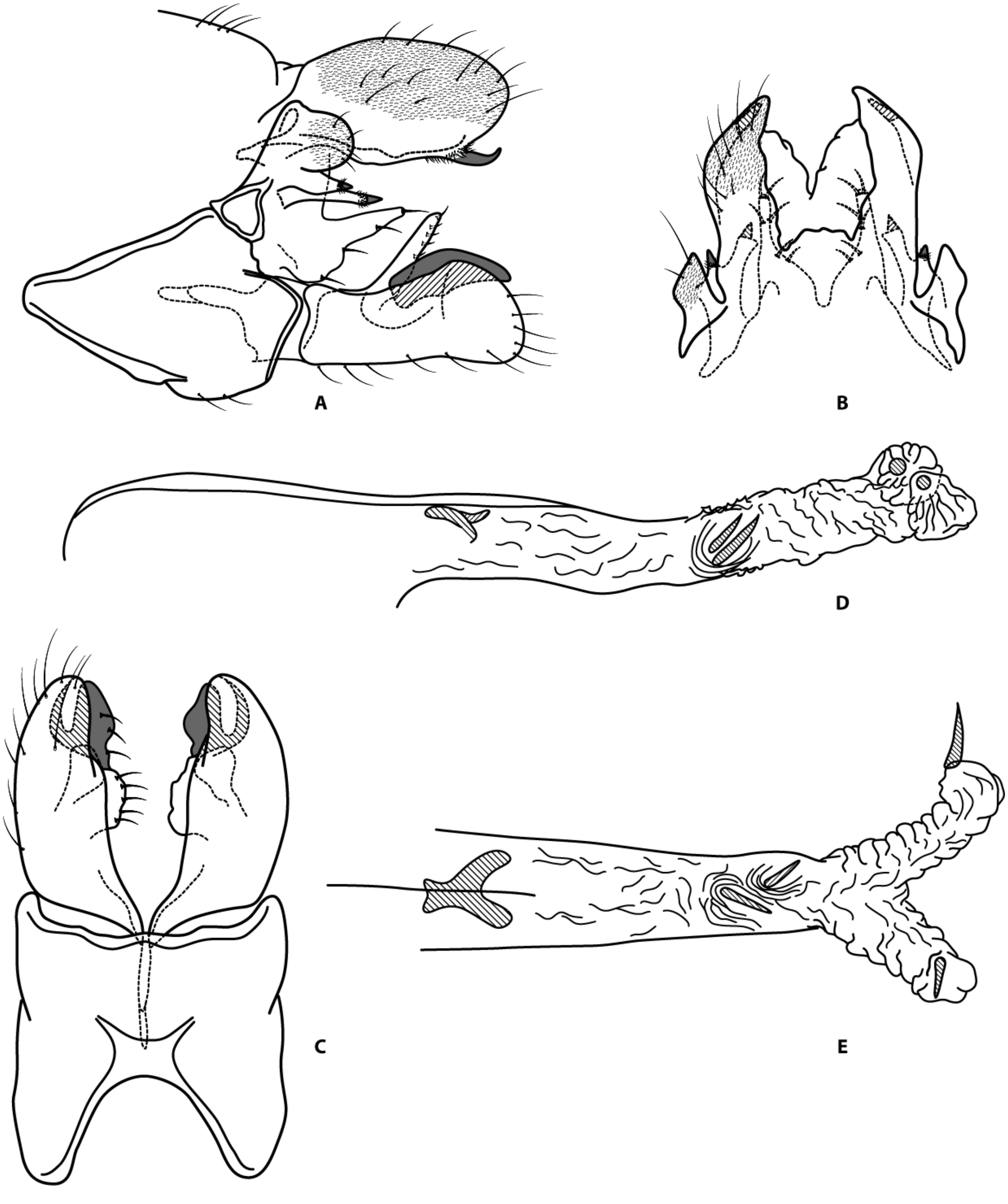

Figure 56. *Cernotina lazzarii* Holzenthal and Almeida 2003. Male genitalia (paratype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

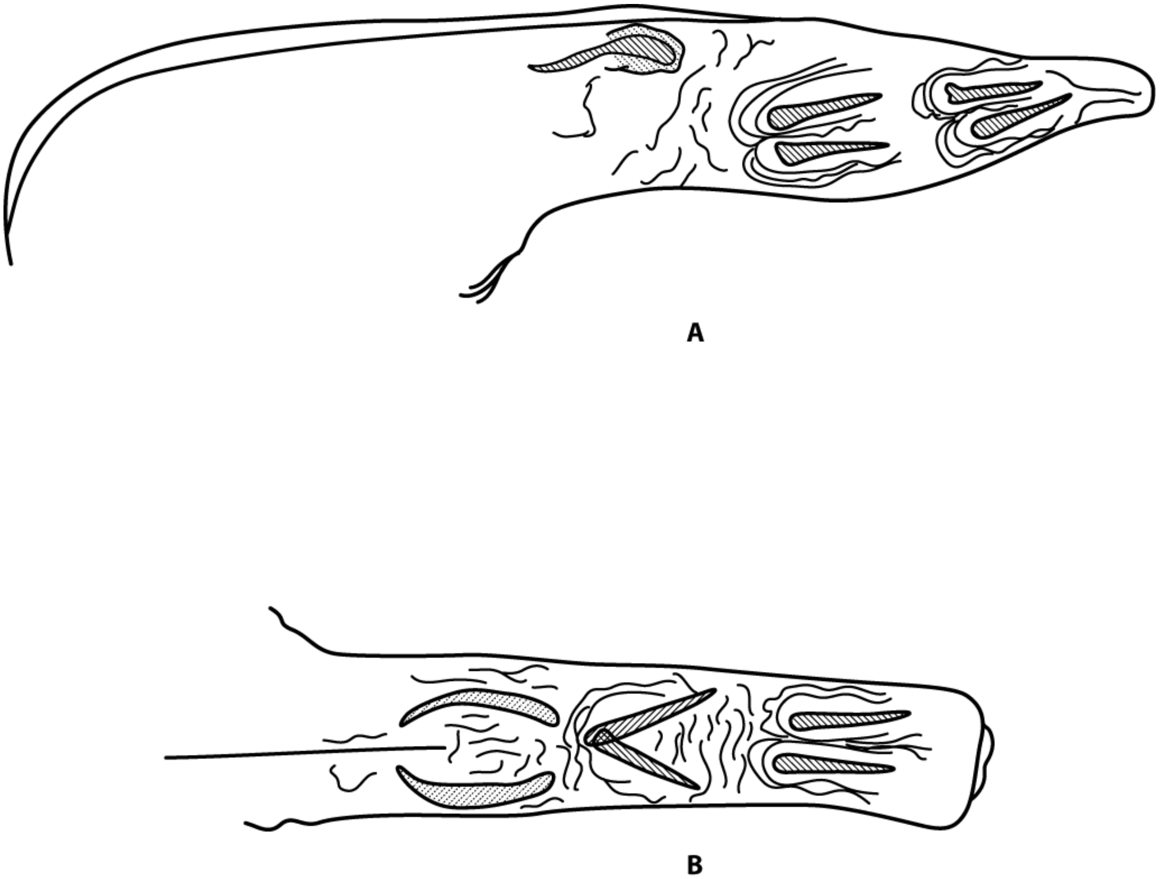

Figure 57. *Cernotina lazzarii* Holzenthal and Almeida 2003. Male genitalia (paratype with phallus not everted): A – phallus, lateral view; B – phallus, dorsal view.

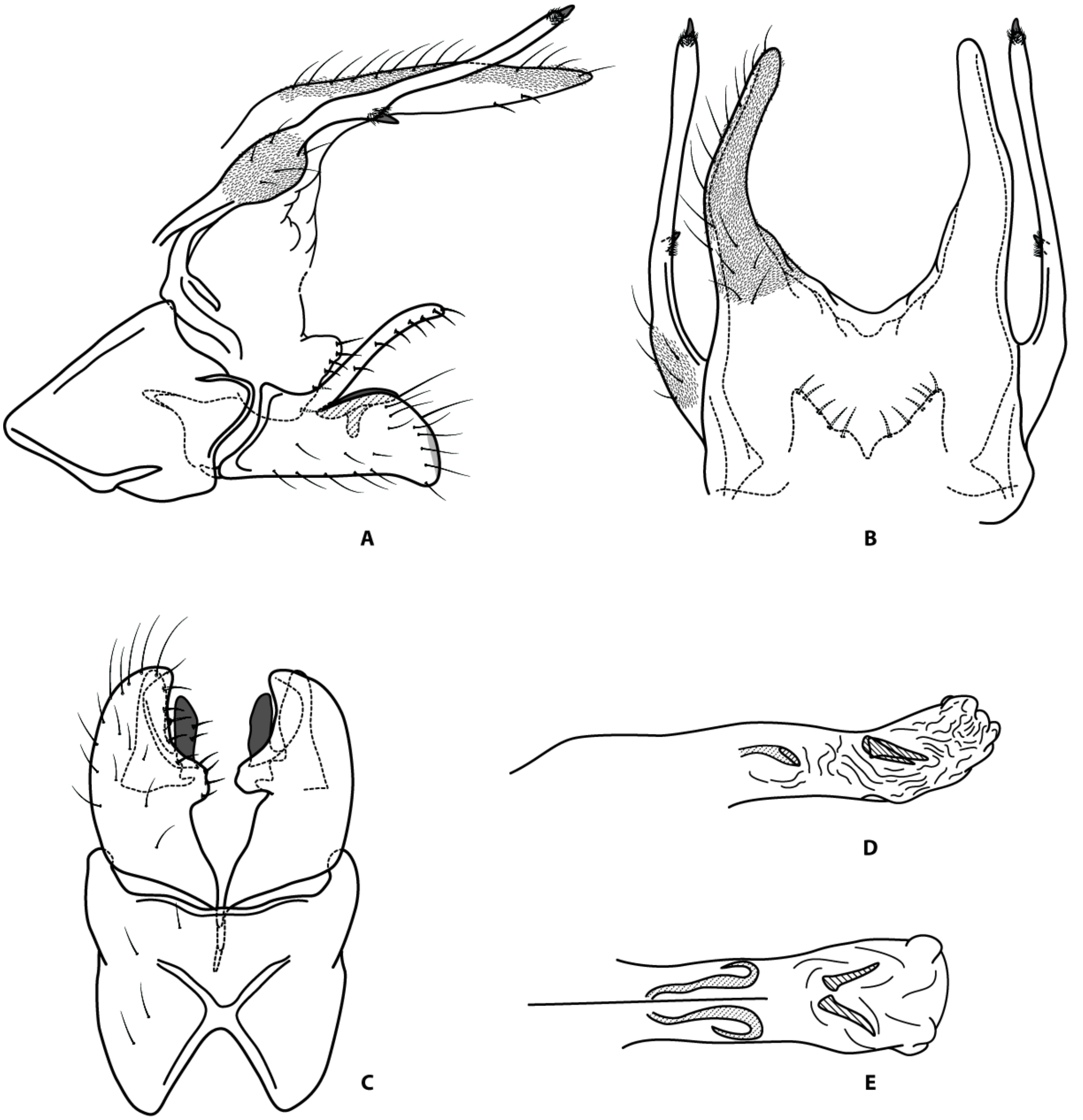

Figure 58. *Cernotina lobisomem* Santos and Nessimian 2008. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

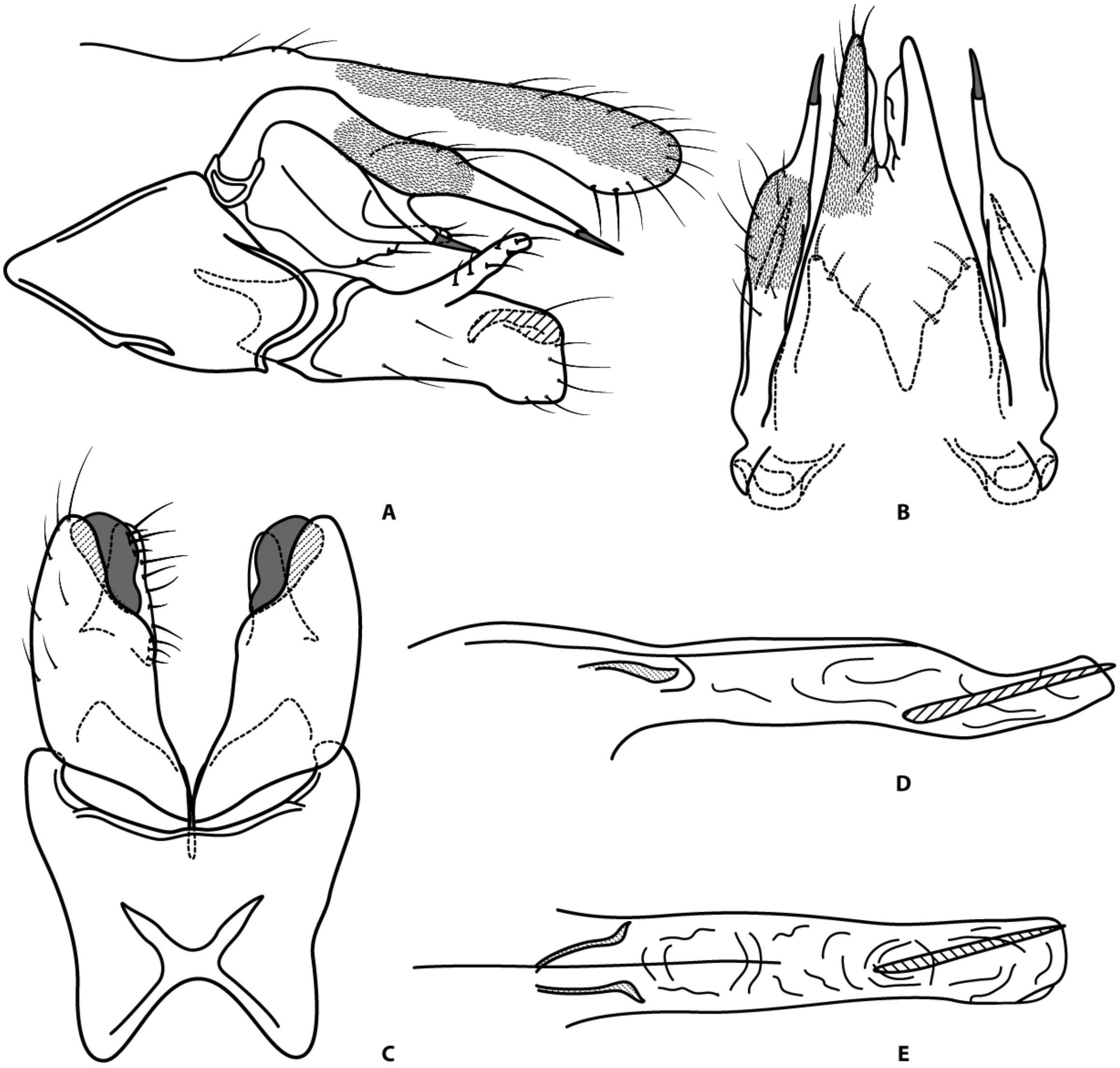

Figure 59. *Cernotina longispina* Barcelos-Silva, Camargos and Pes 2013. Male genitalia (paratype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

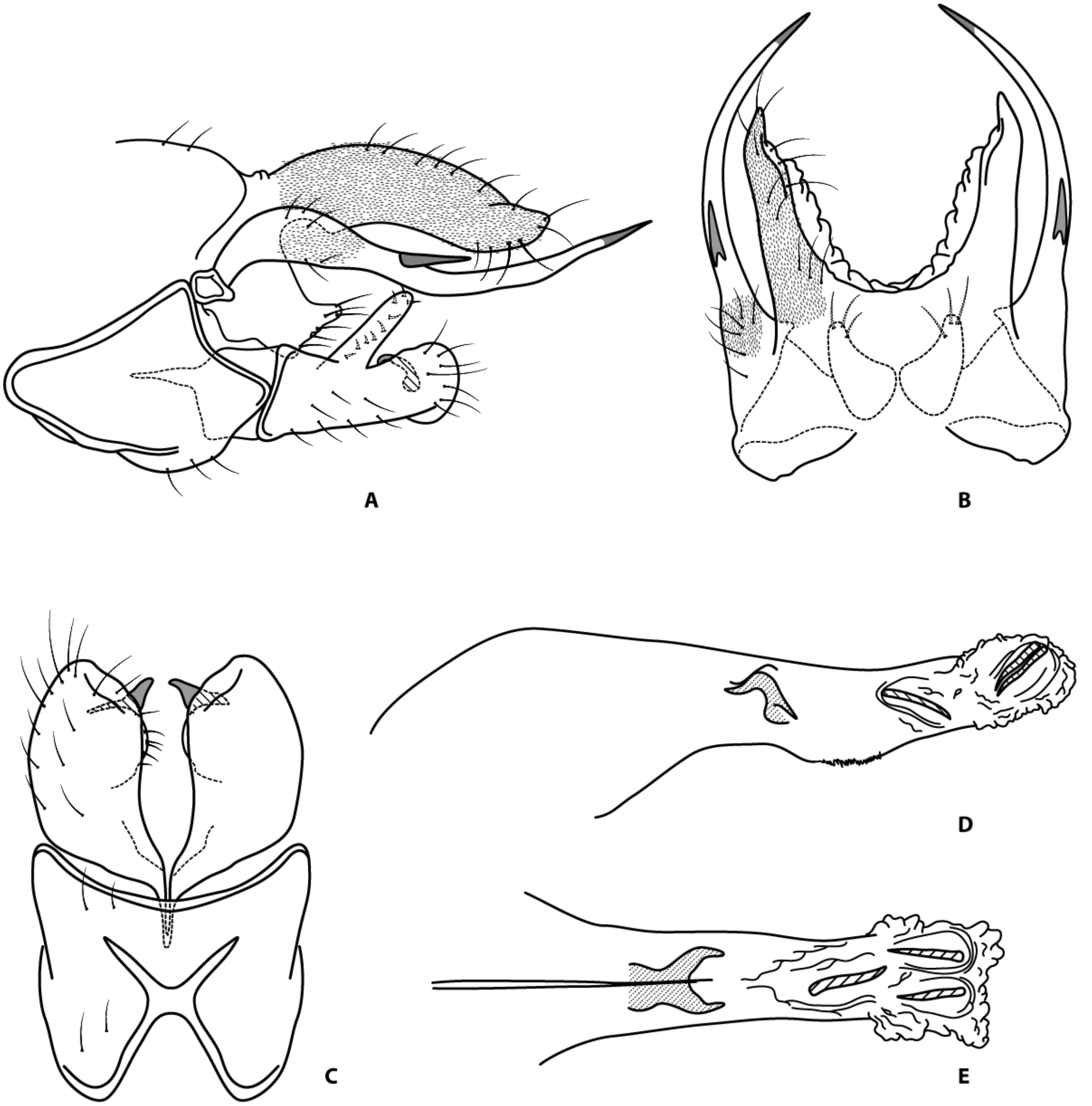

Figure 60. *Cernotina longissima* Flint 1974. Male genitalia (paratype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

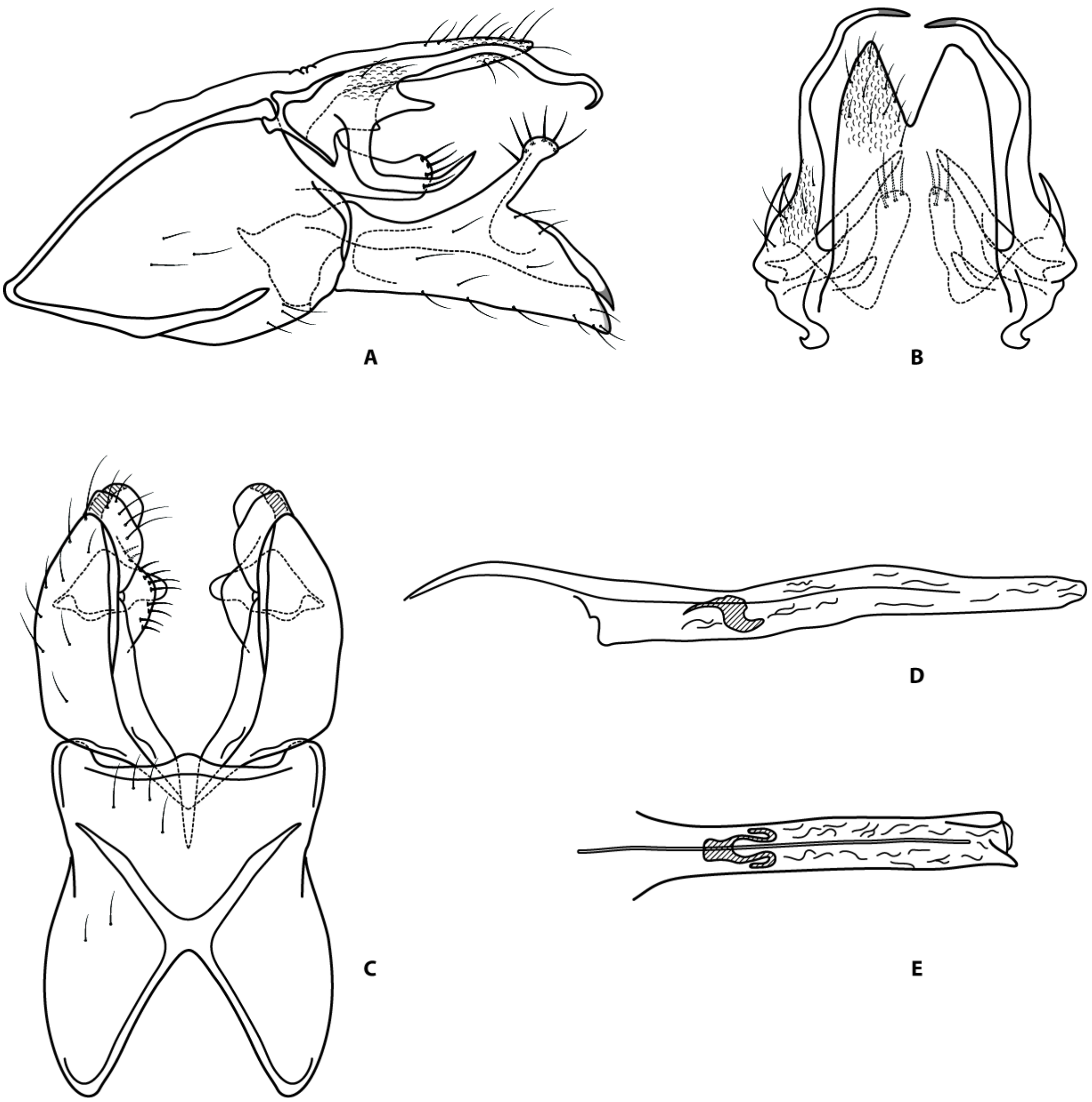

Figure 61. *Cernotina lutea* Flint 1968. Male genitalia (paratype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

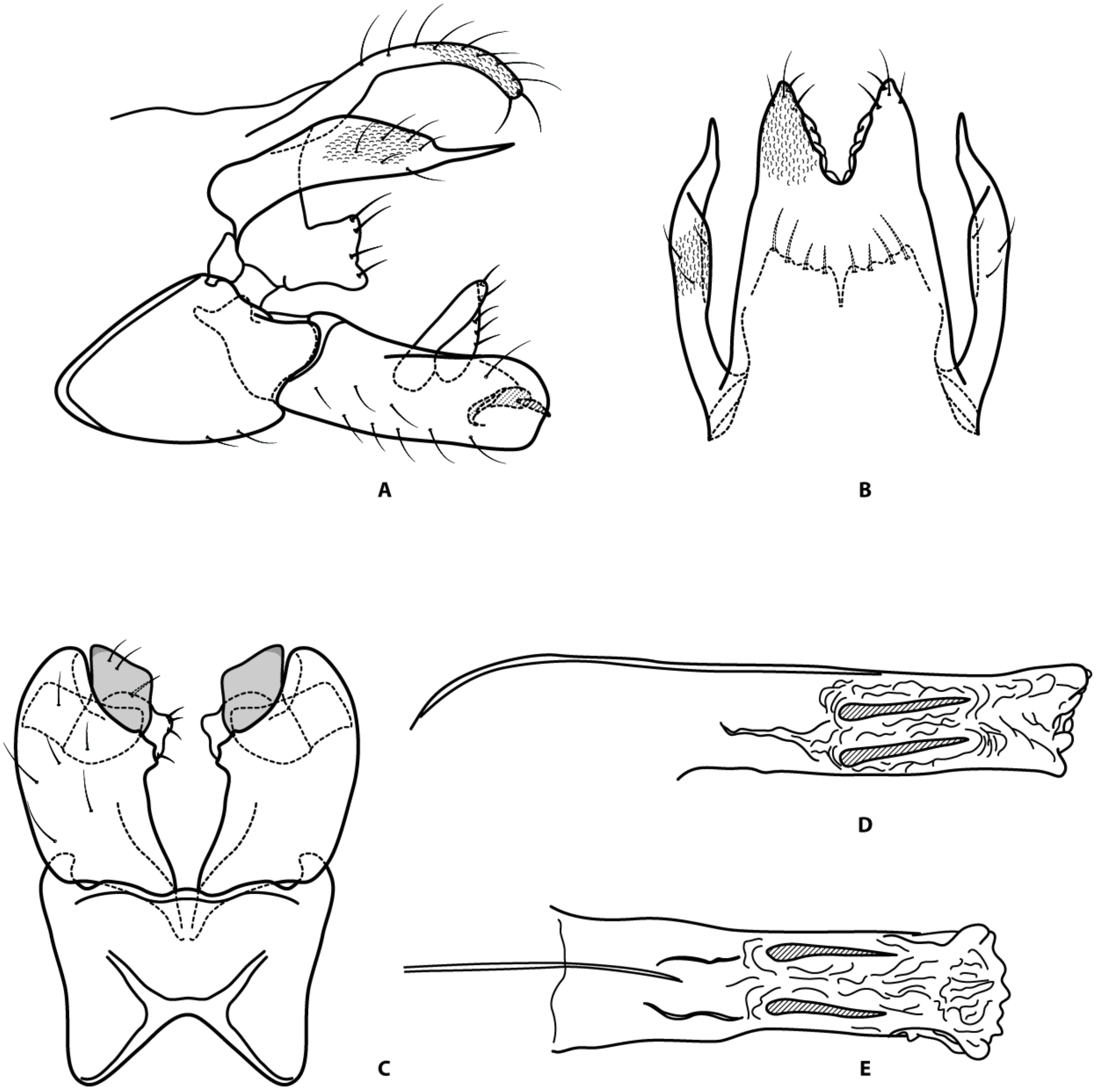

Figure 62. *Cernotina mandeba* Flint 1974. Male genitalia (paratype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

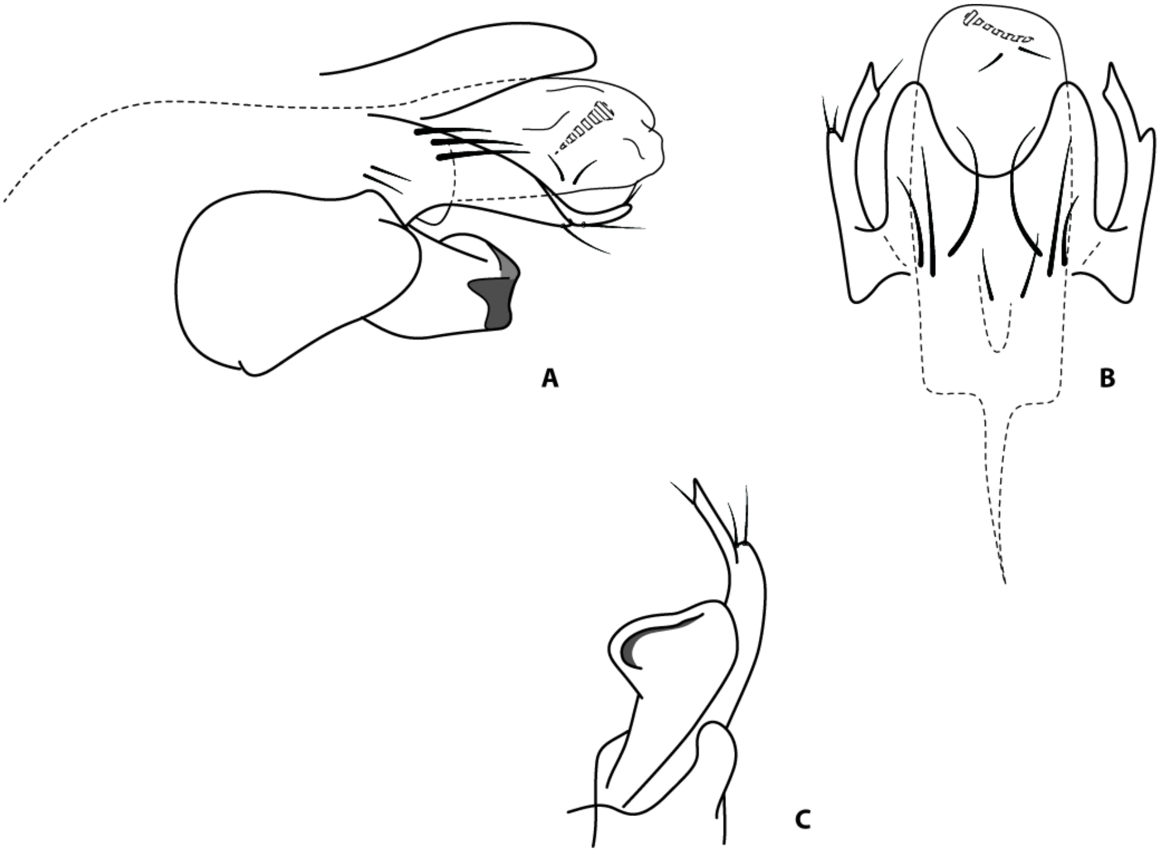

Figure 63. *Cernotina mastelleri* Flint 1992. Male genitalia (adapted from Flint 1992): A – lateral view; B – dorsal view; C – ventral view.

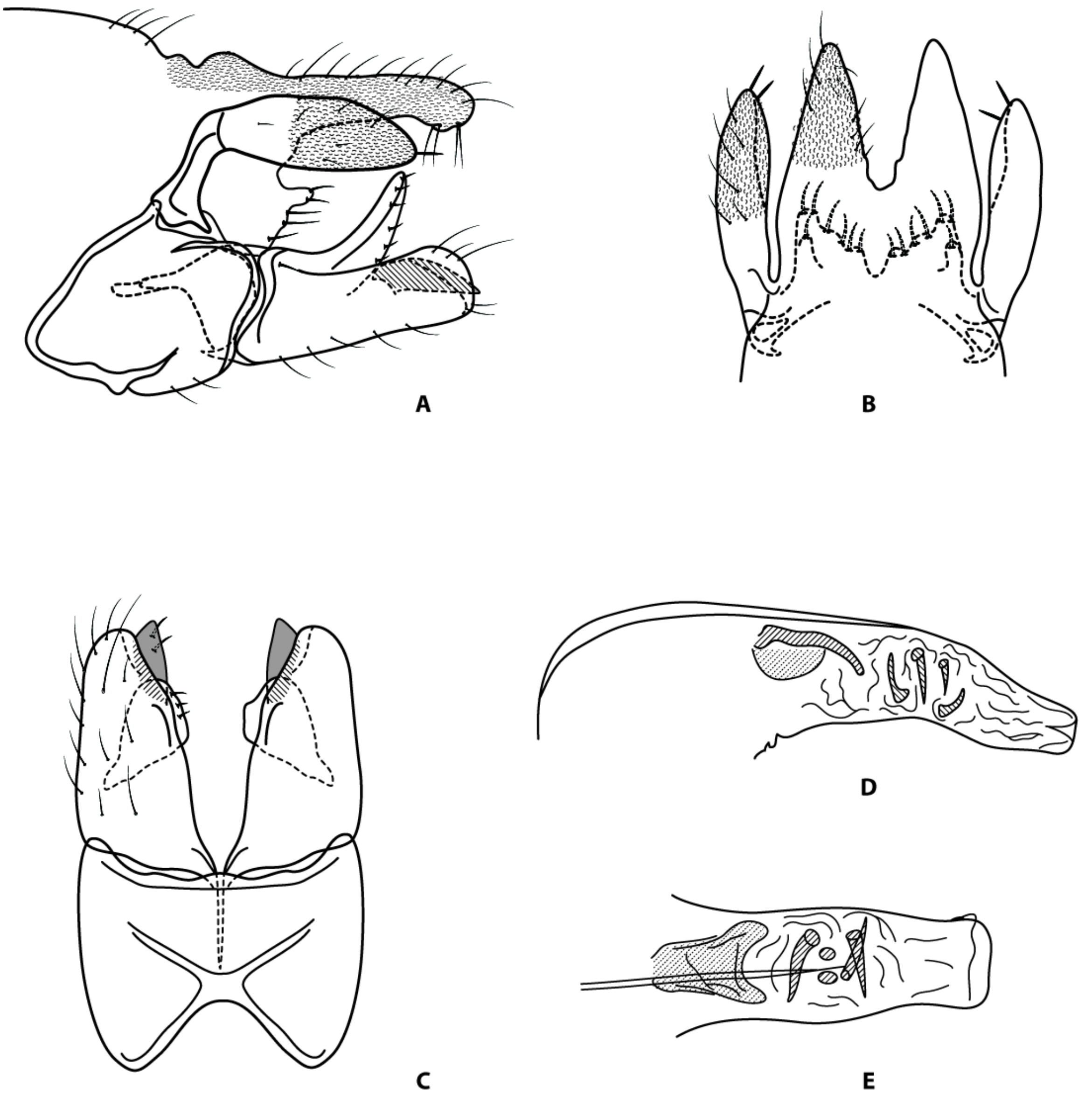

Figure 64. *Cernotina medioloba* Flint 1972. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

Figure 65. *Cernotina obliqua* Flint 1974. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

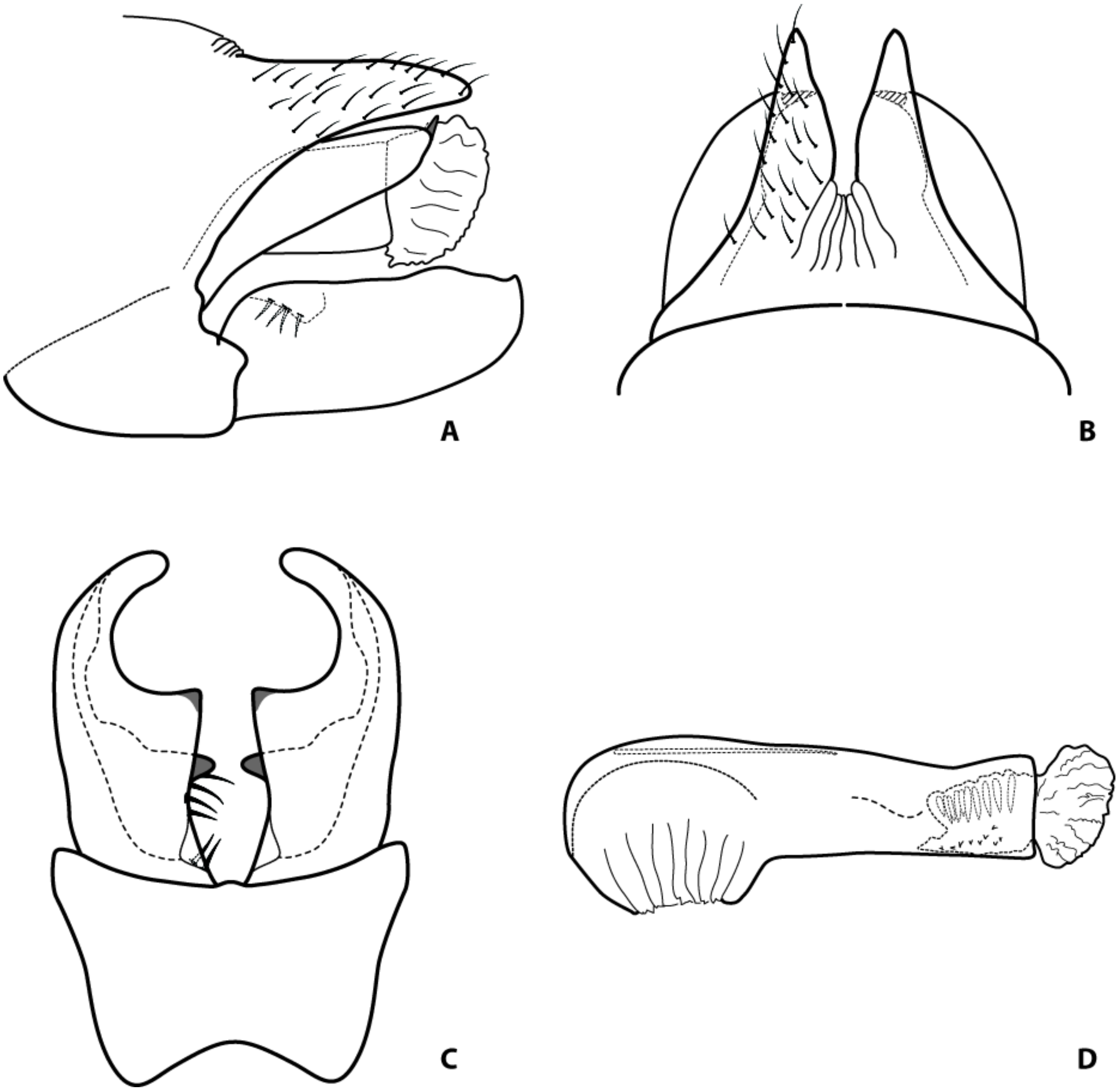

Figure 66. *Cernotina odonta* Santos and Nessimian 2008. Male genitalia (adapted from Santos and Nessimian 2008): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view.

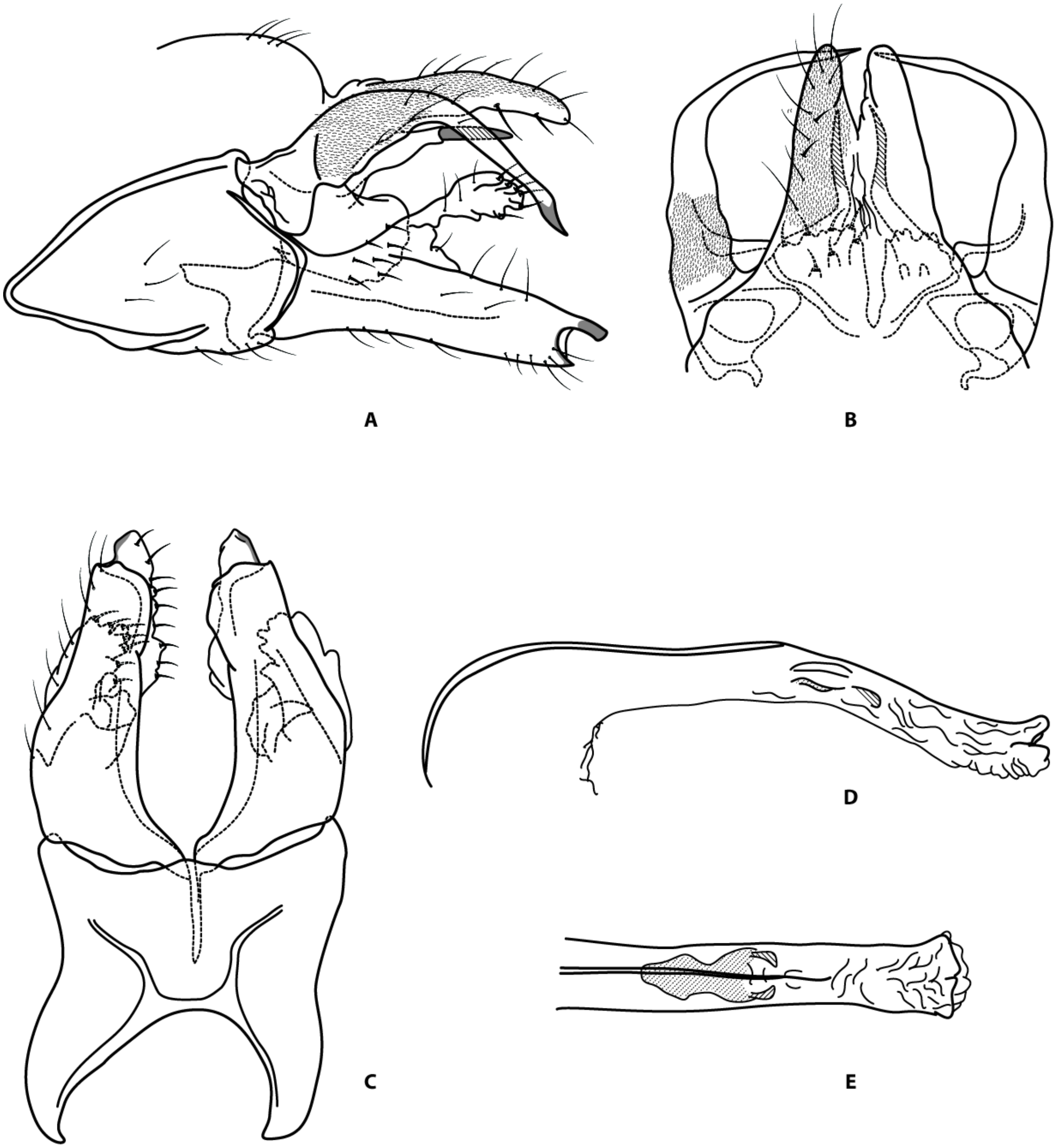

Figure 67. *Cernotina ohio* Ross 1939. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

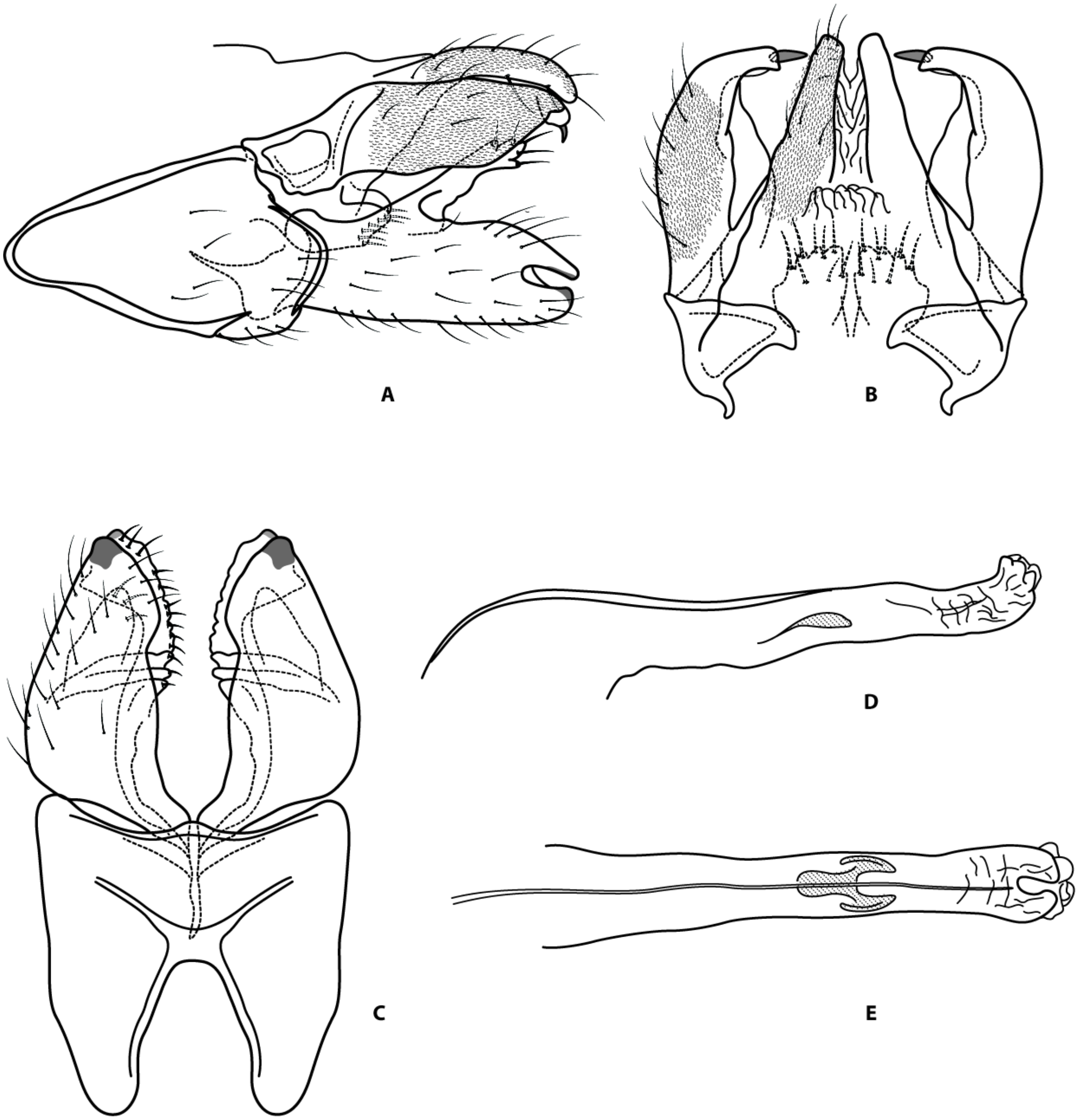

Figure 68. *Cernotina oklahoma* Ross 1938. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

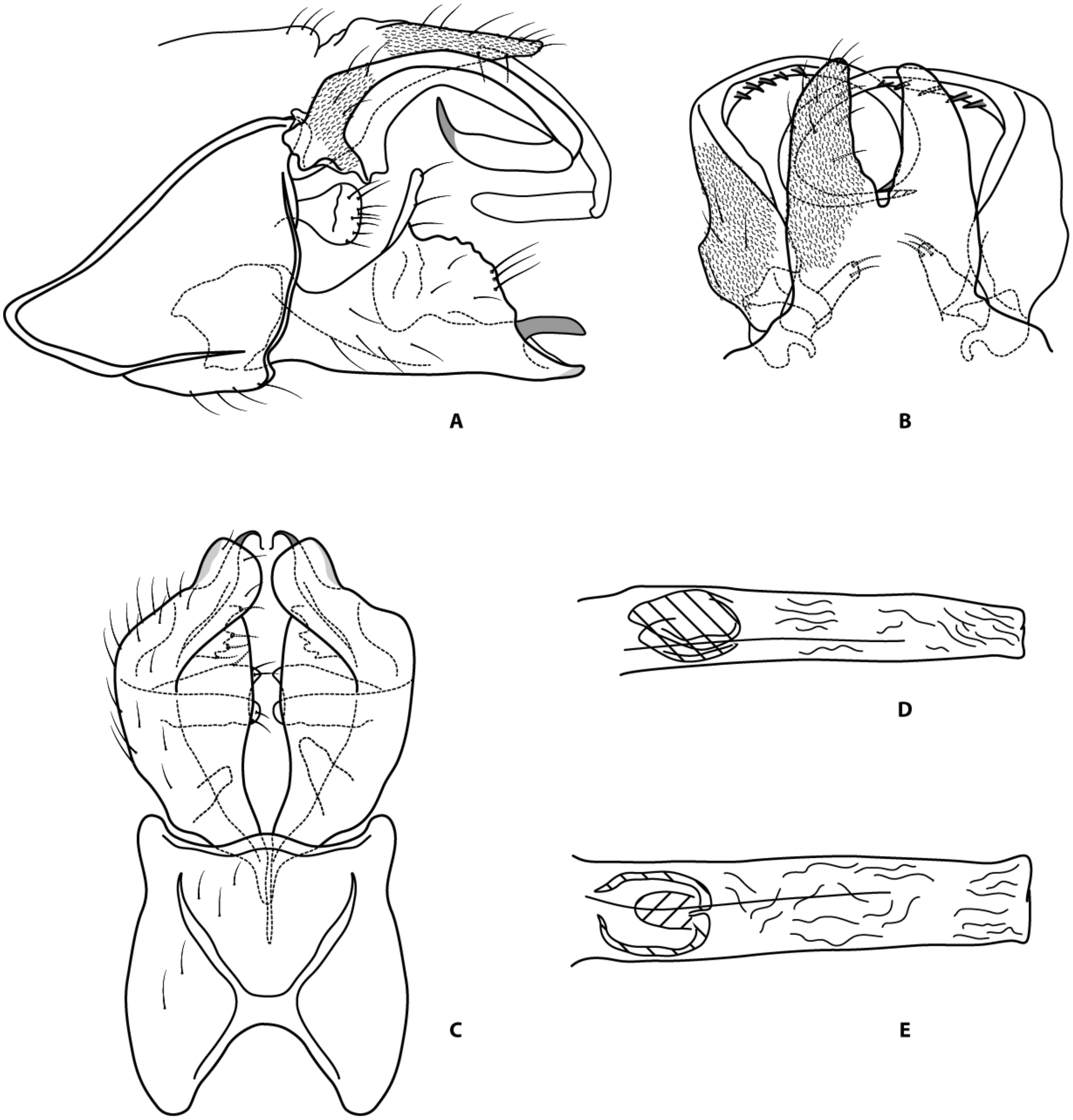

Figure 69. *Cernotina pallida* (Banks 1904). Male genitalia (lectotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

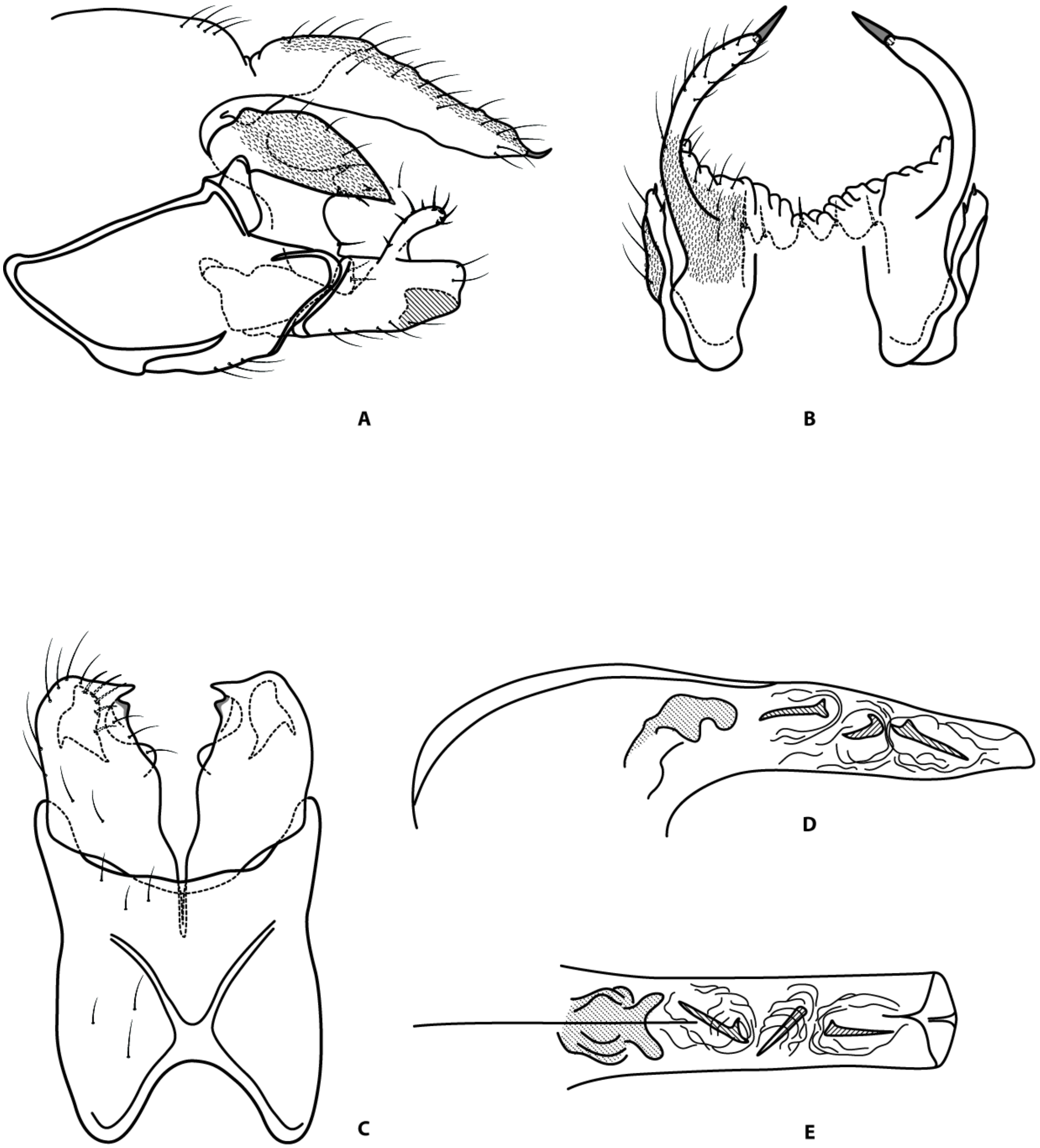

Figure 70. *Cernotina perpendicularis* Flint 1971. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

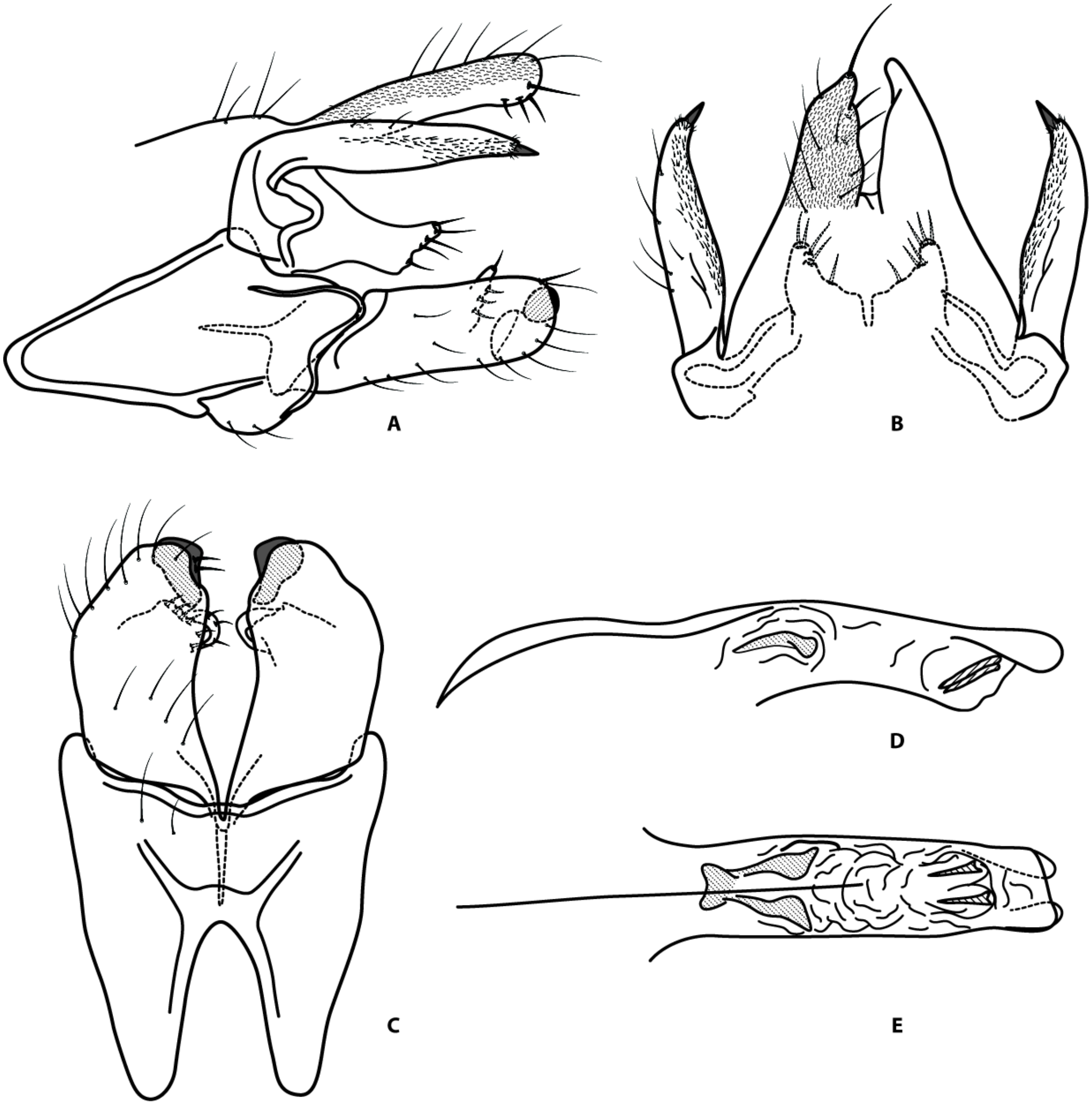

Figure 71. *Cernotina pesae* Santos and Nessimian 2008. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

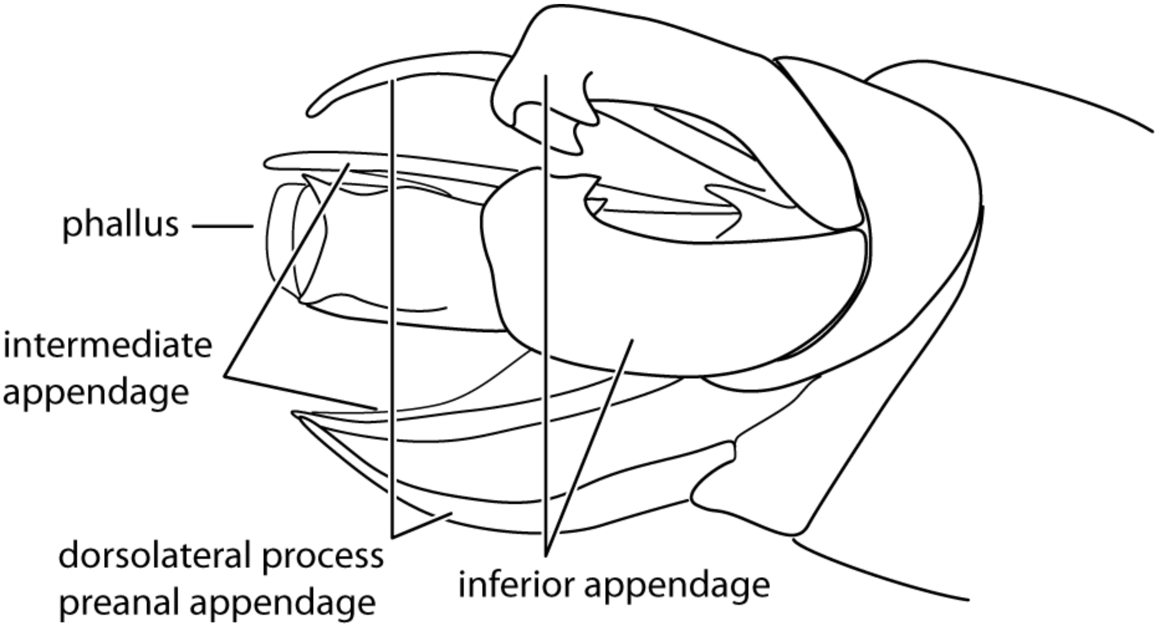

Figure 72. †*Cernotina pulchra* Wichard 2007. Male genitalia (adapted from Wichard 2007).

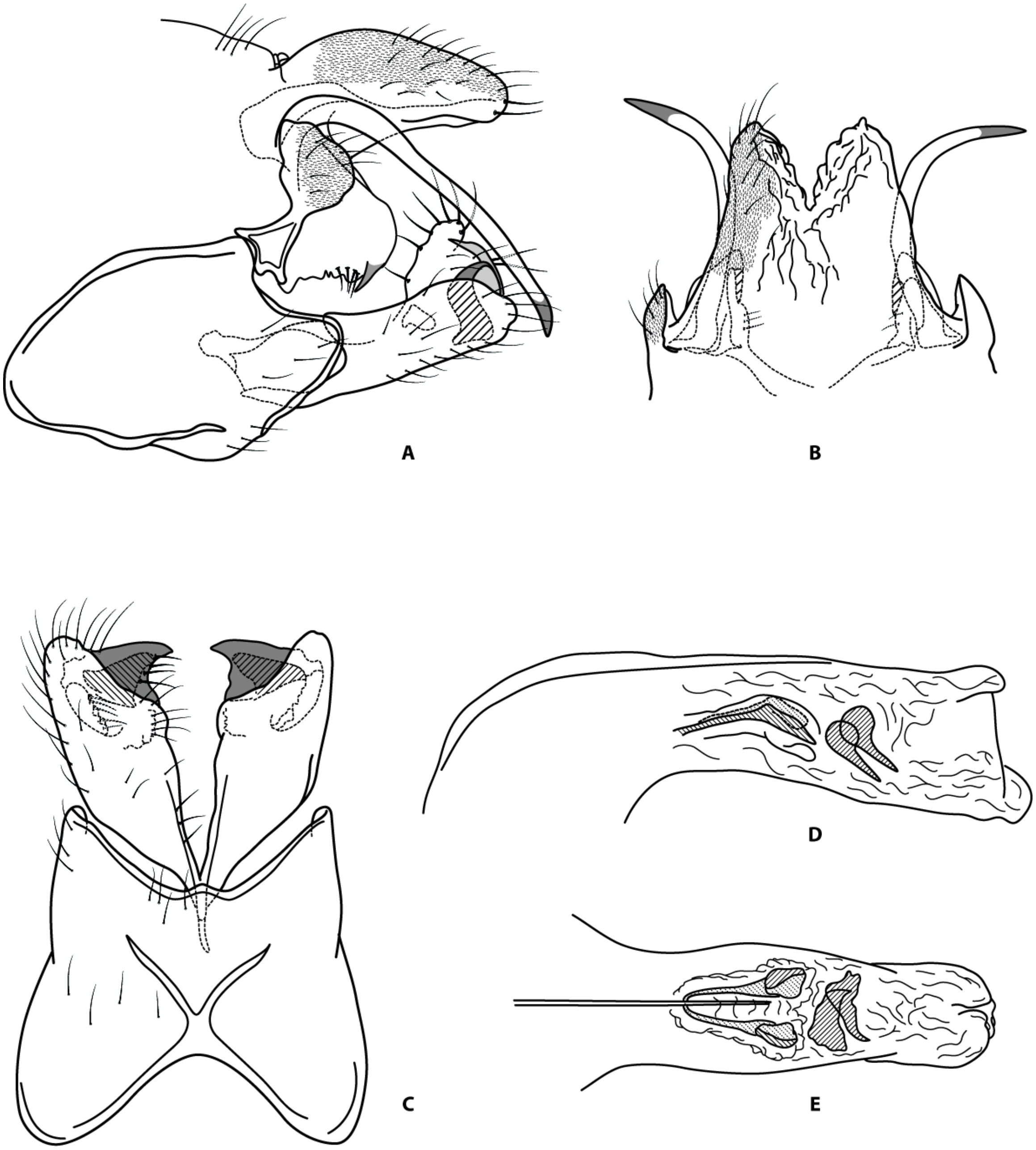

Figure 73. *Cernotina puri* Dumas and Nessimian 2011. Male genitalia (paratype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

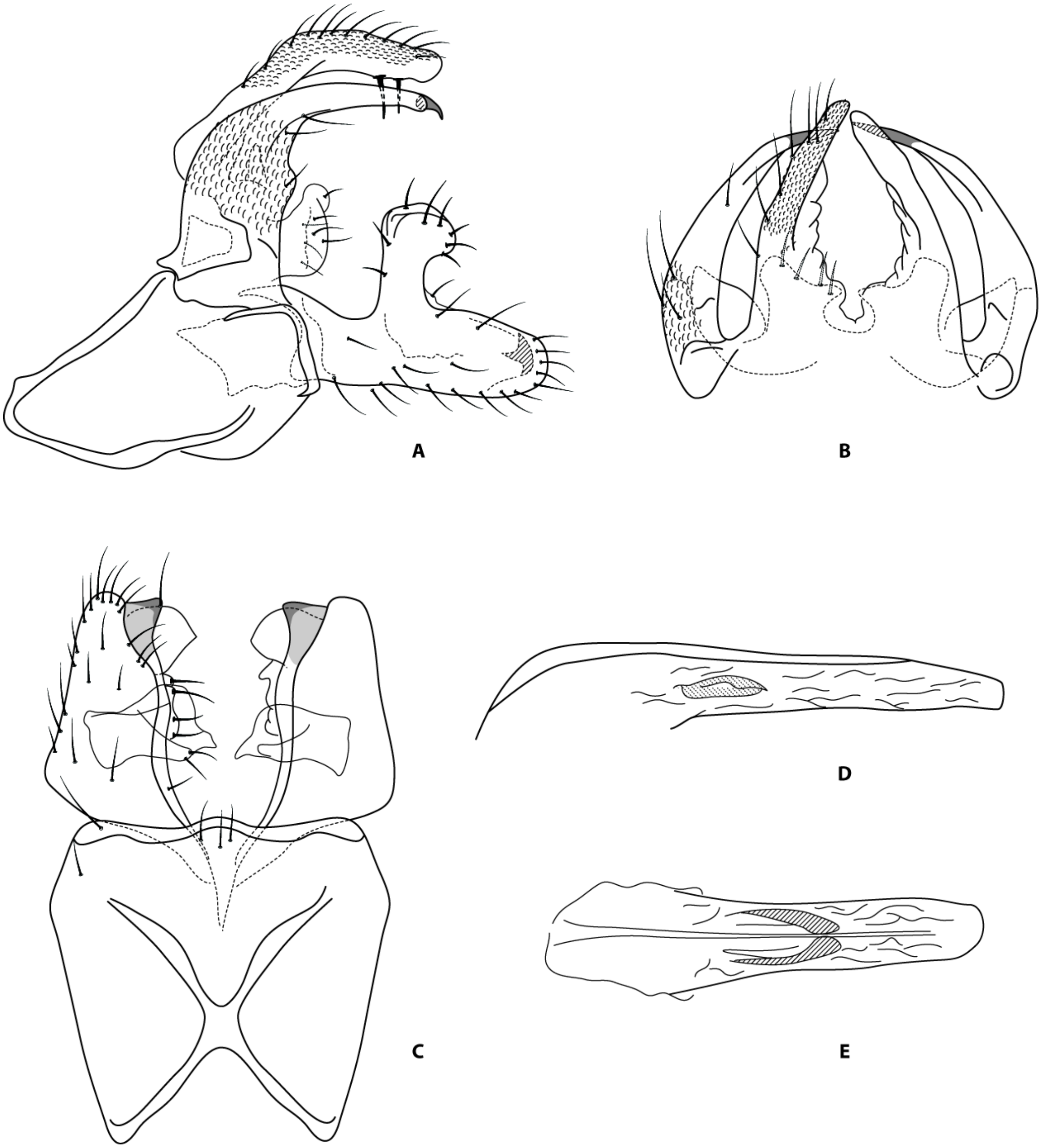

Figure 74. *Cernotina riosanjuanensis* Chamorro-Lacayo 2003. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

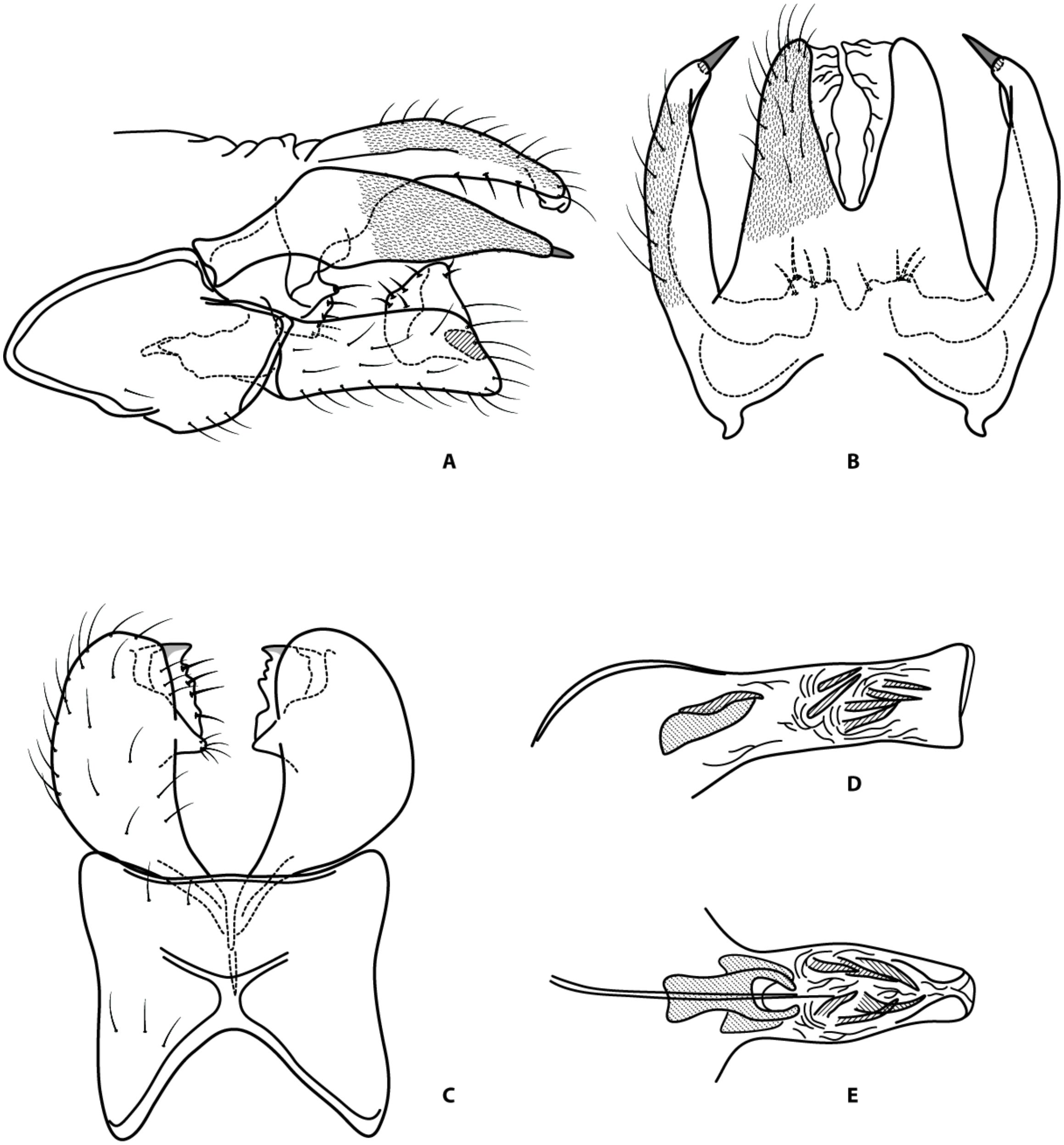

Figure 75. *Cernotina sexspinosa* Flint 1983. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

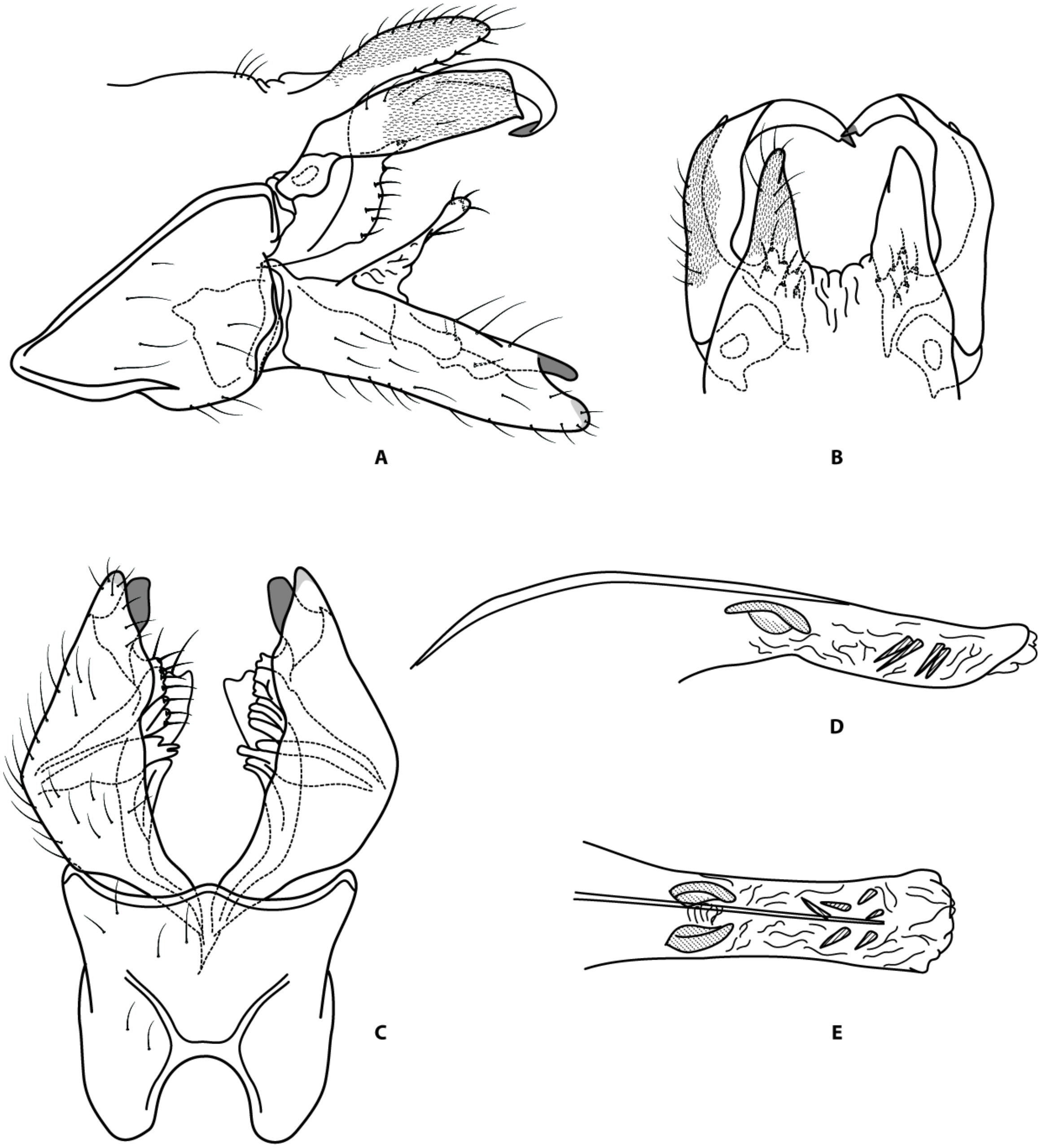

Figure 76. *Cernotina sinosa* Ross 1951. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

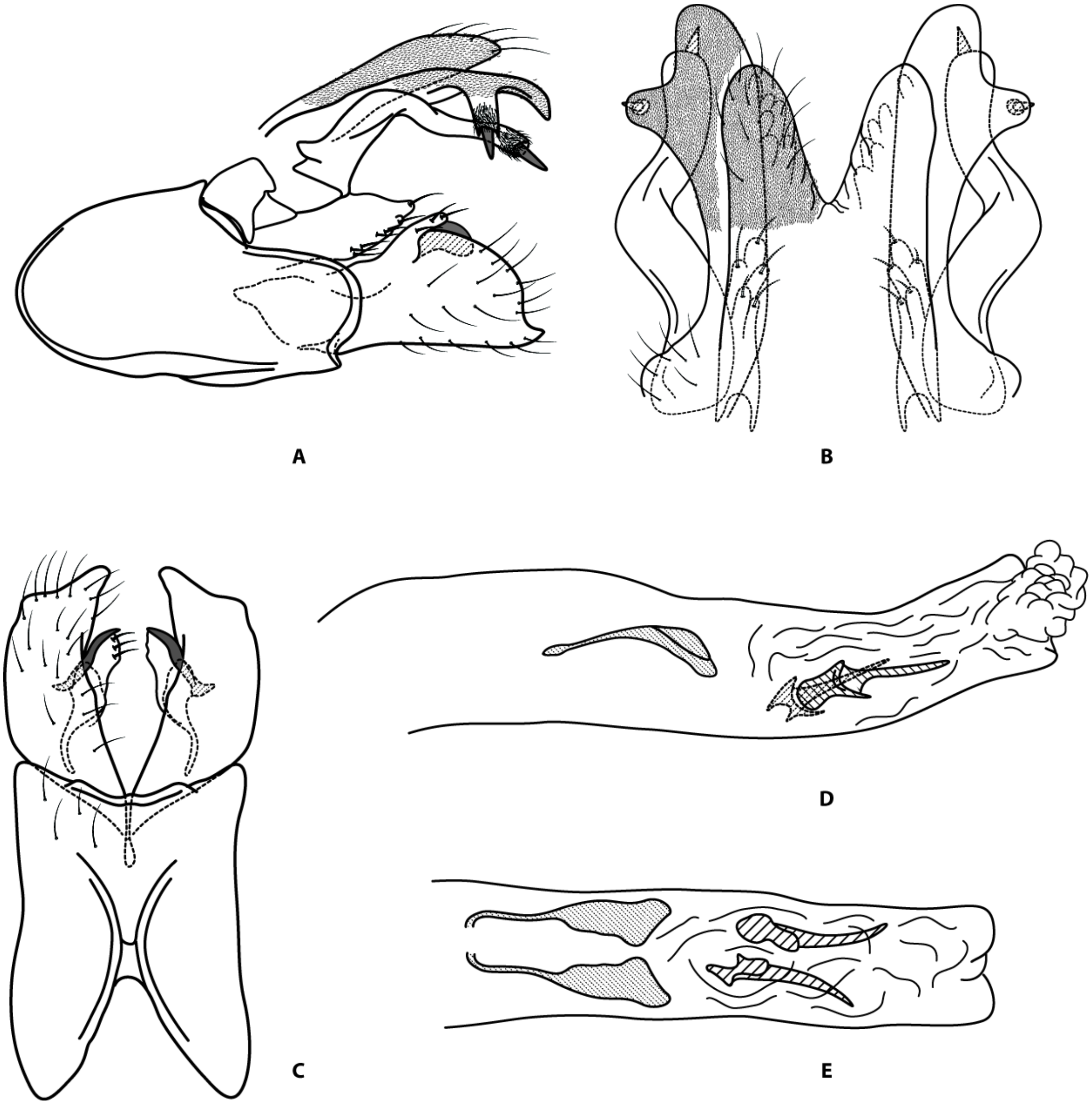

Figure 77. *Cernotina sinuosa* Barcelos-Silva, Camargos and Pes 2013. Male genitalia (paratype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

Figure 78. *Cernotina spicata* Ross 1938. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

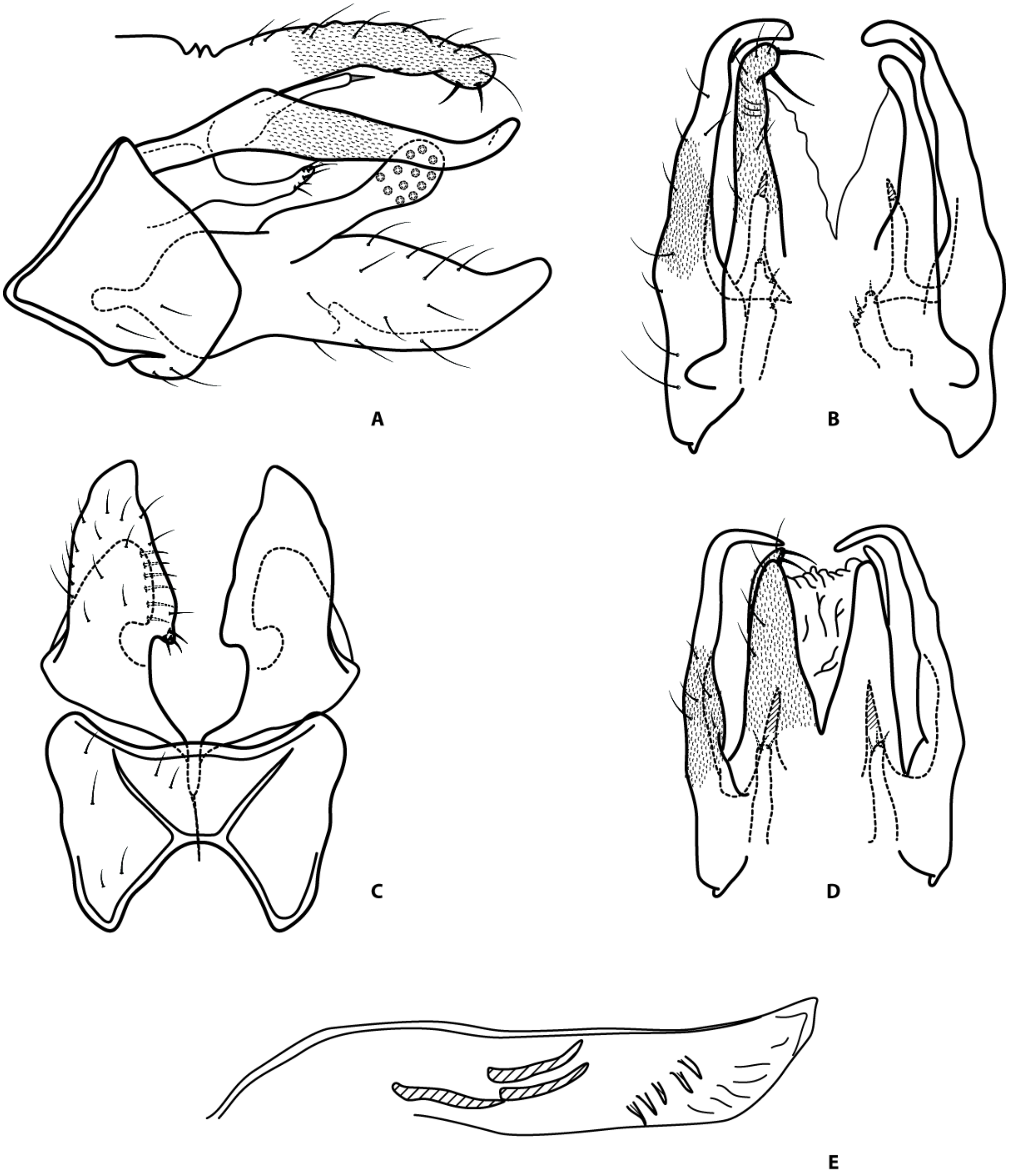

Figure 79. *Cernotina spinigera* Flint 1971. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; E – phallus, lateral view. Male genitalia (paratype): D – phallus, dorsal view.

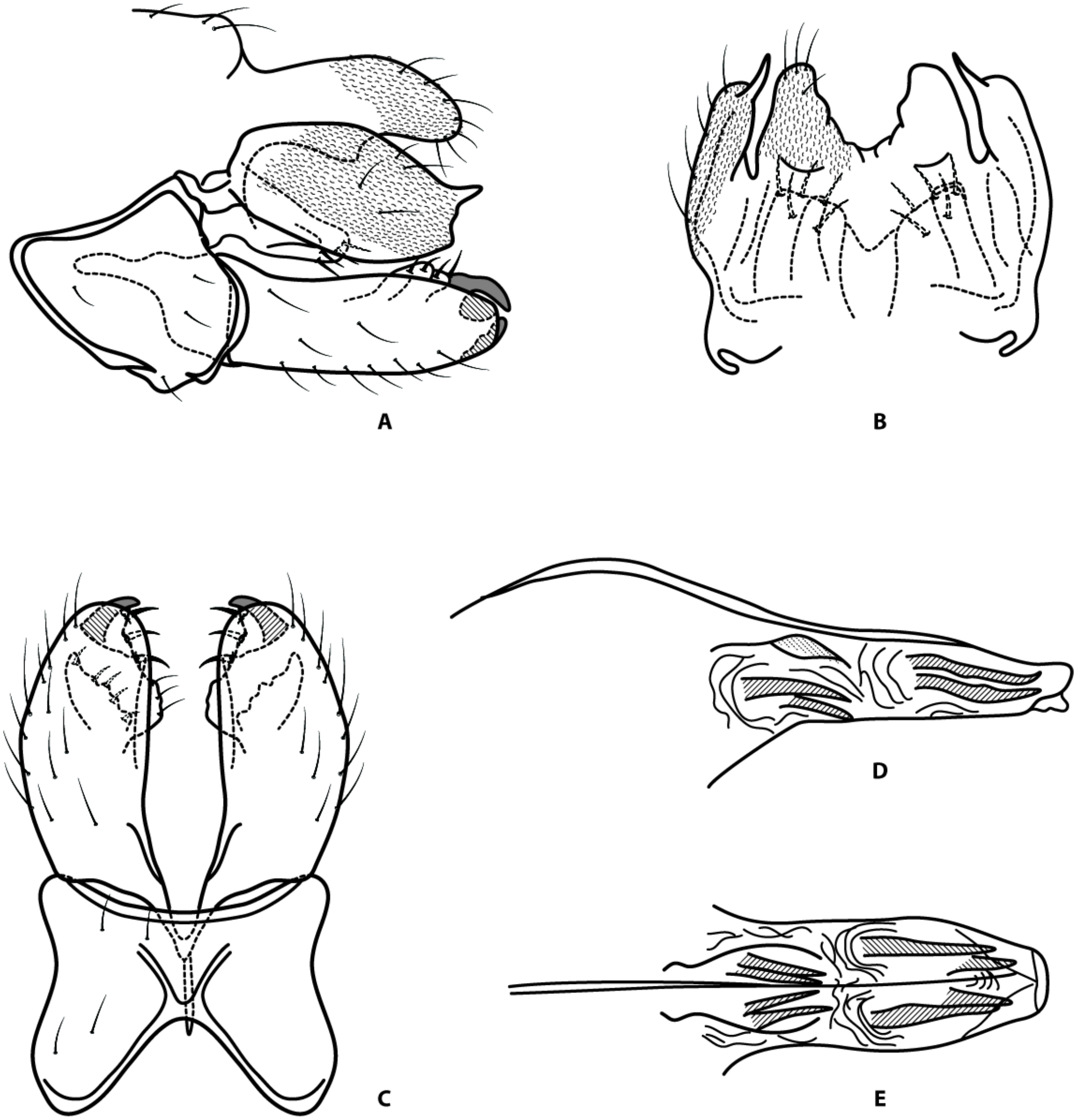

Figure 80. *Cernotina spinosior* Flint 1992. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

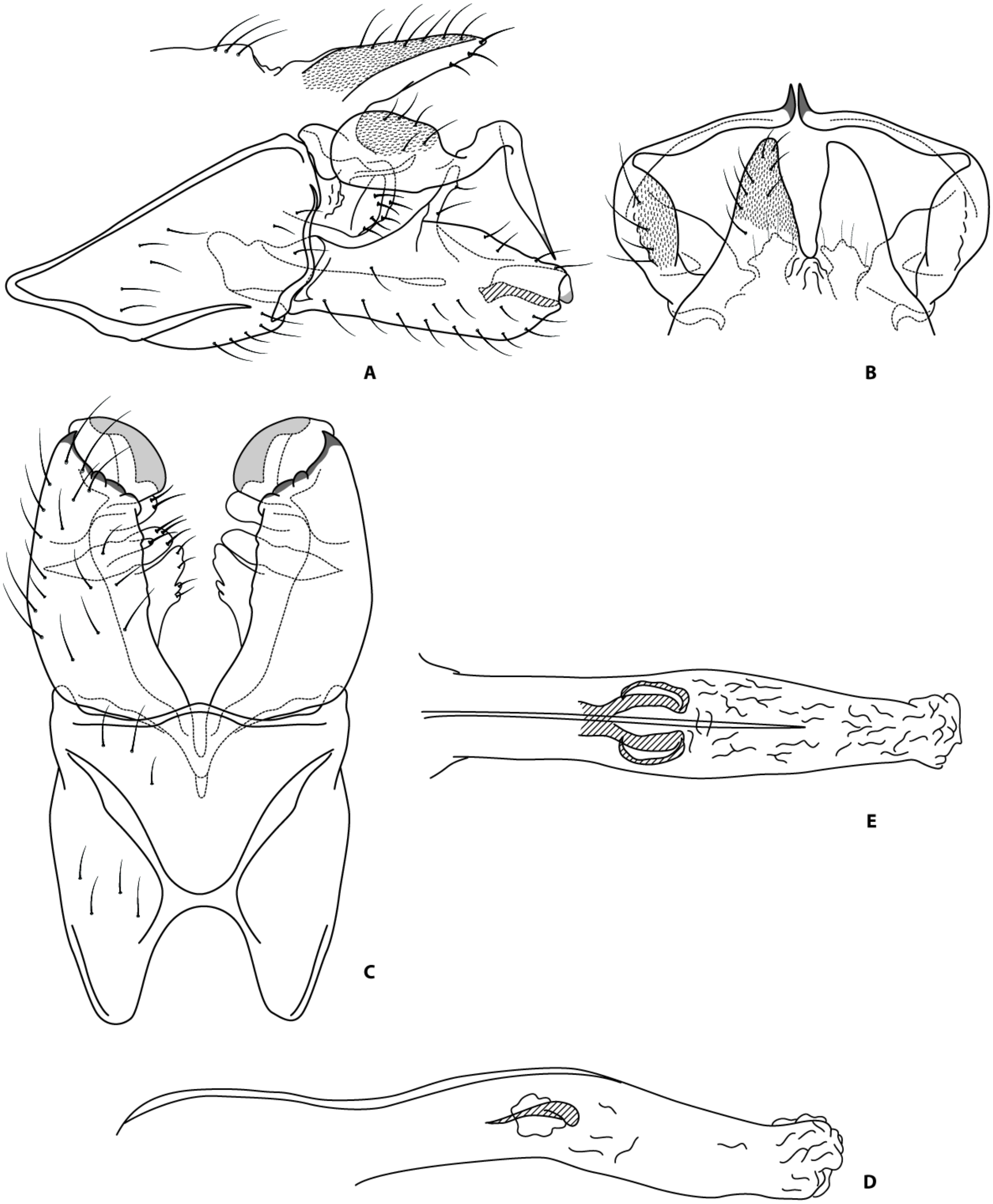

Figure 81. *Cernotina stannardi* Ross 1951. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

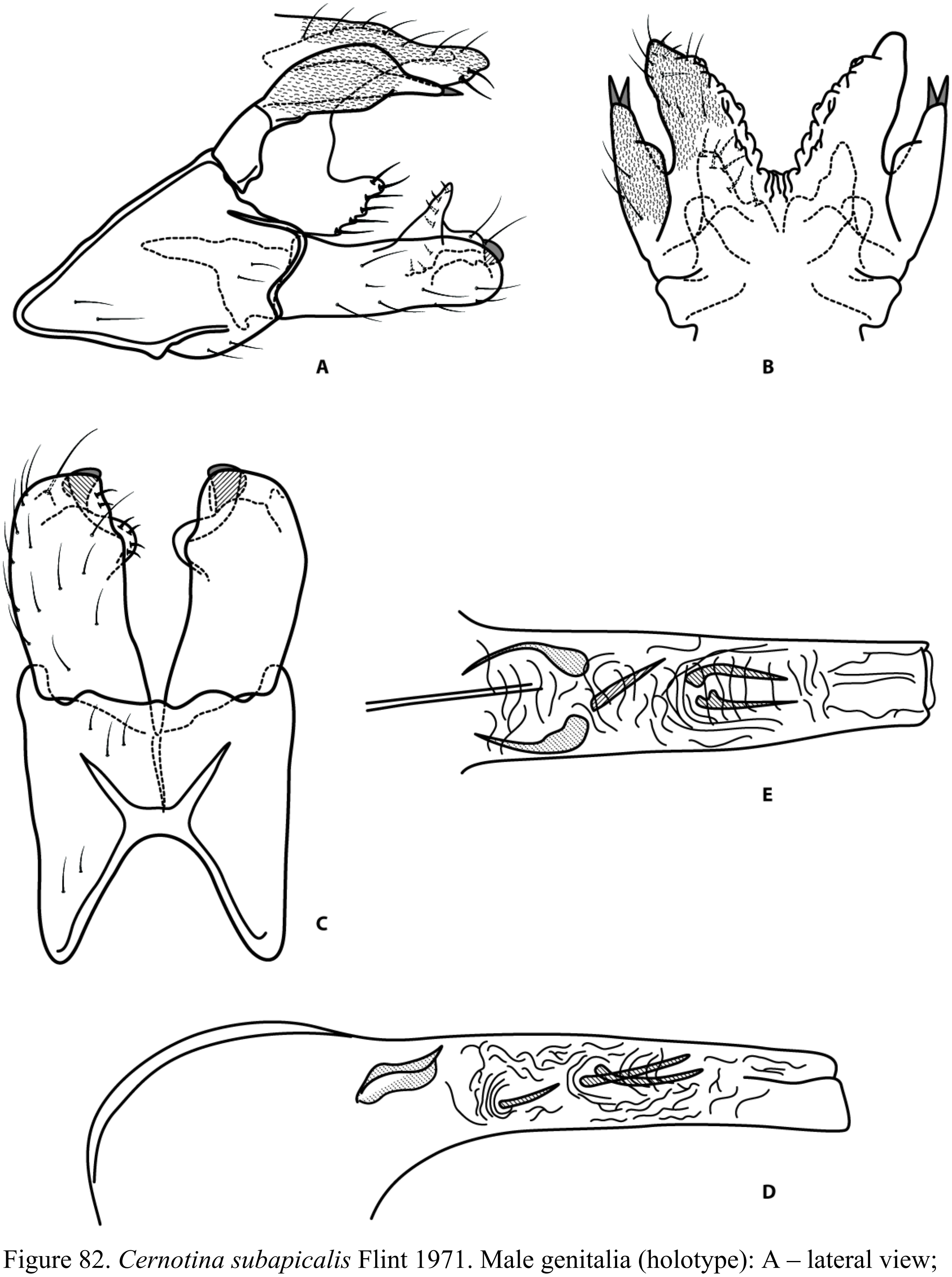

Figure 82. *Cernotina subapicalis* Flint 1971. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

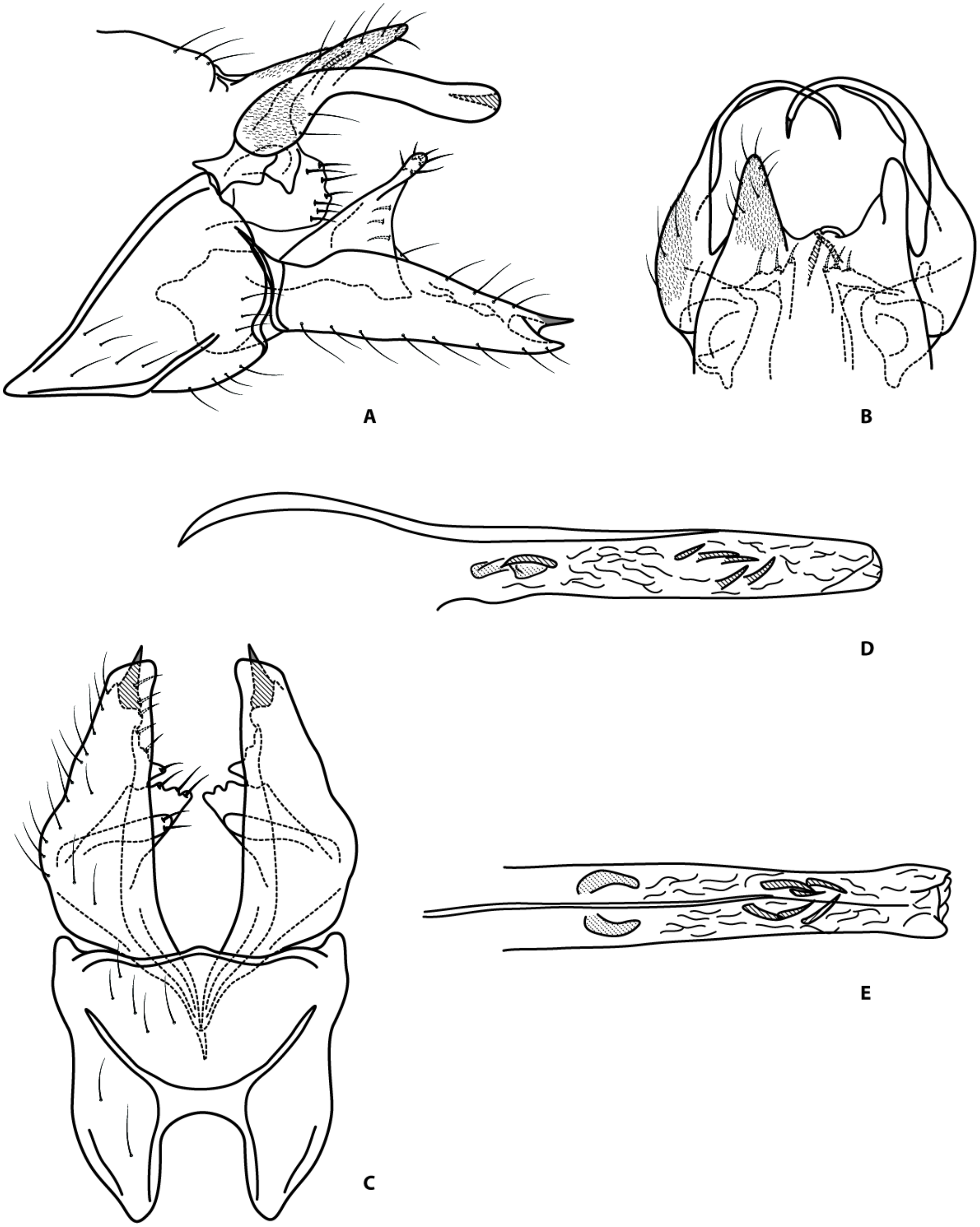

Figure 83. *Cernotina taeniata* Ross 1951. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

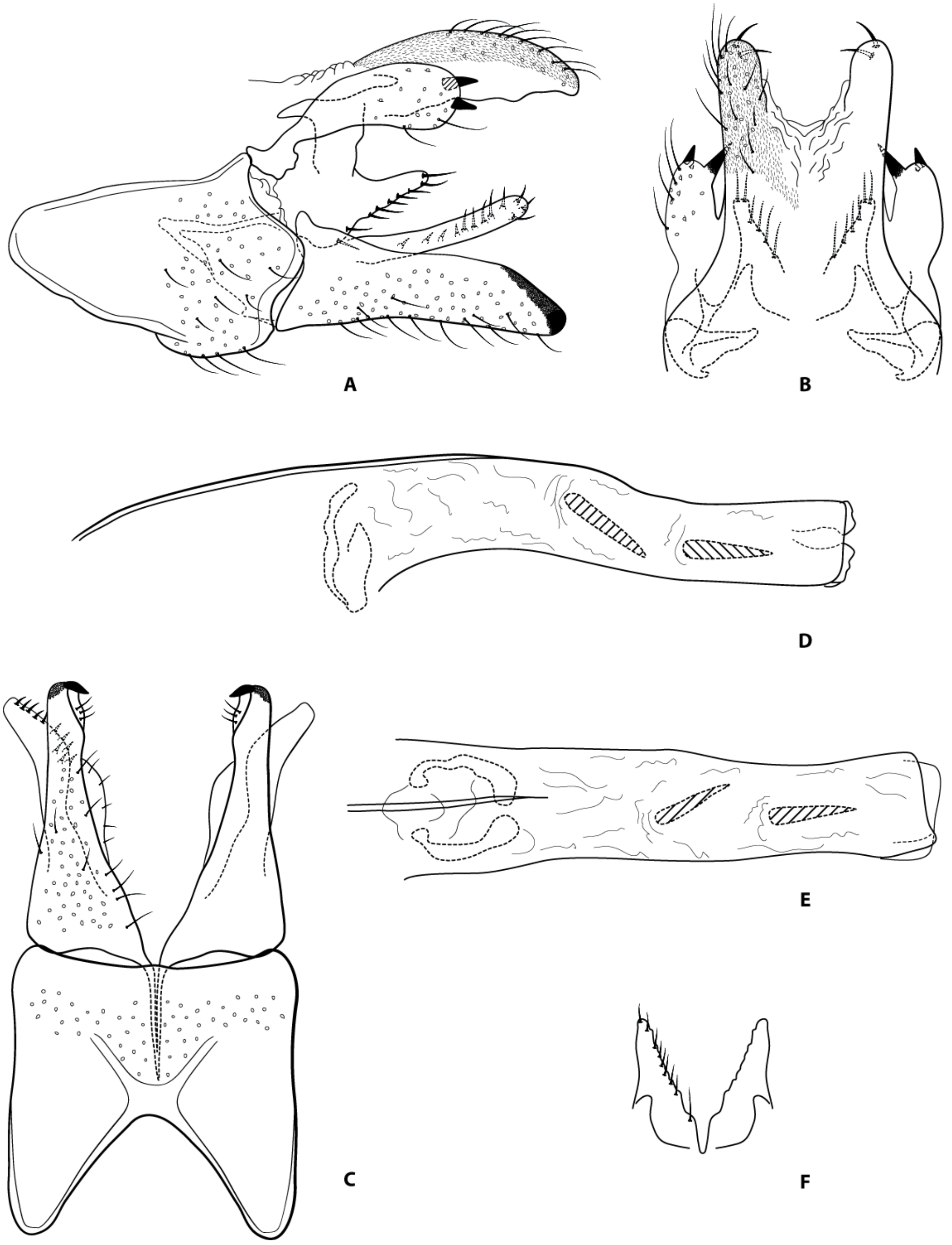

Figure 84. *Cernotina tiputini* Camargos, Ríos-Touma and Holzenthal 2017. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view; F – ventromesal process of the preanal appendage, ventral view.

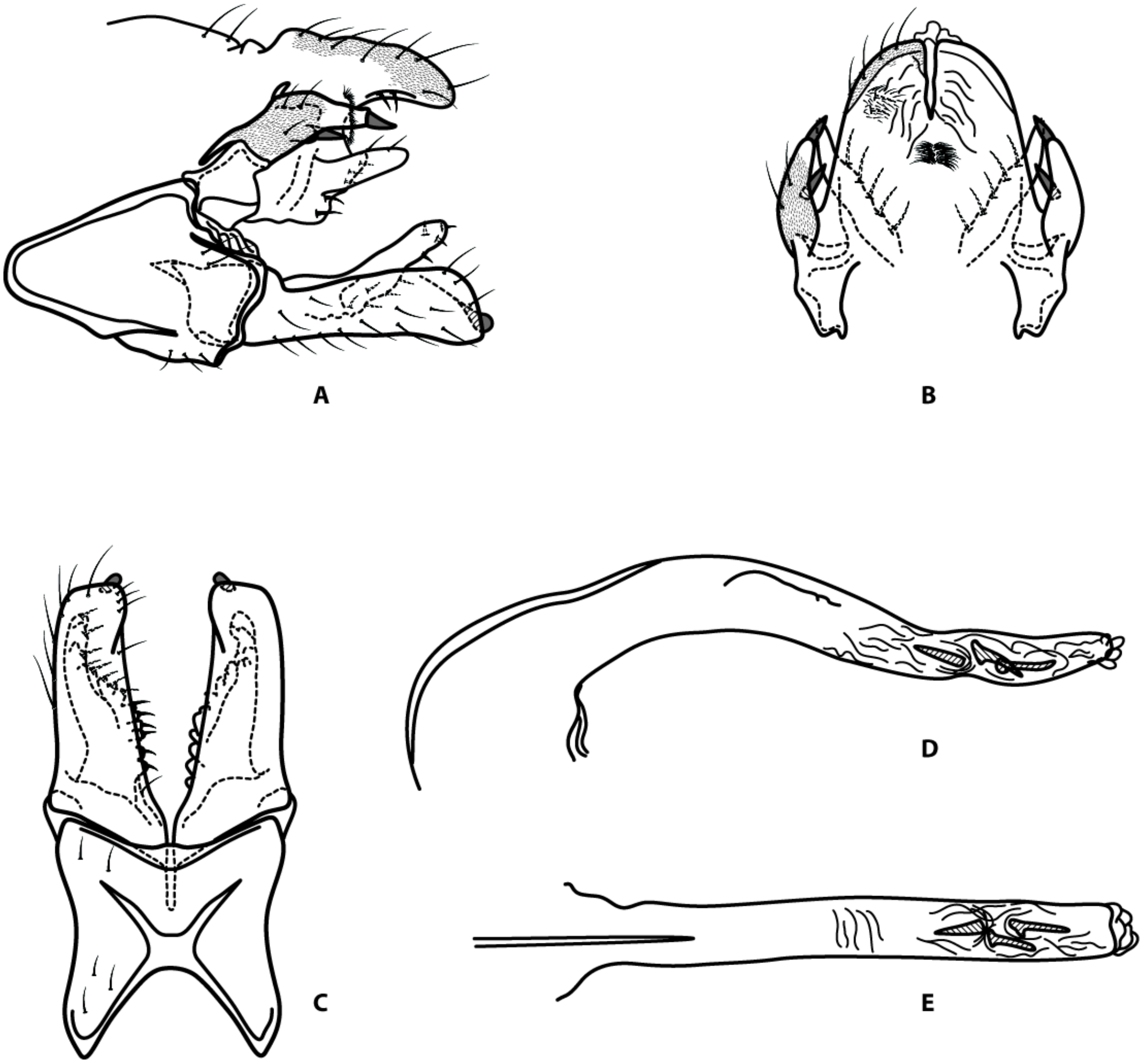

Figure 85. *Cernotina trispina* Flint 1971. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

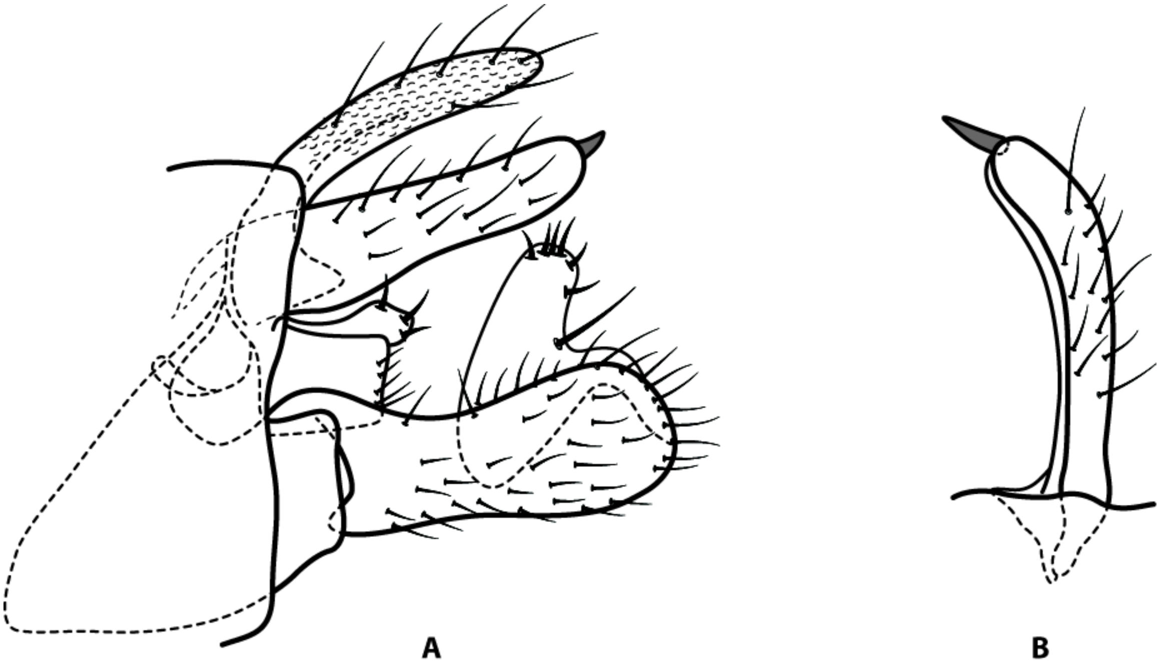

Figure 86. *Cernotina truncona* Ross 1947. Male genitalia (adapted from Ross 1947): A – lateral view; B – ventral view.

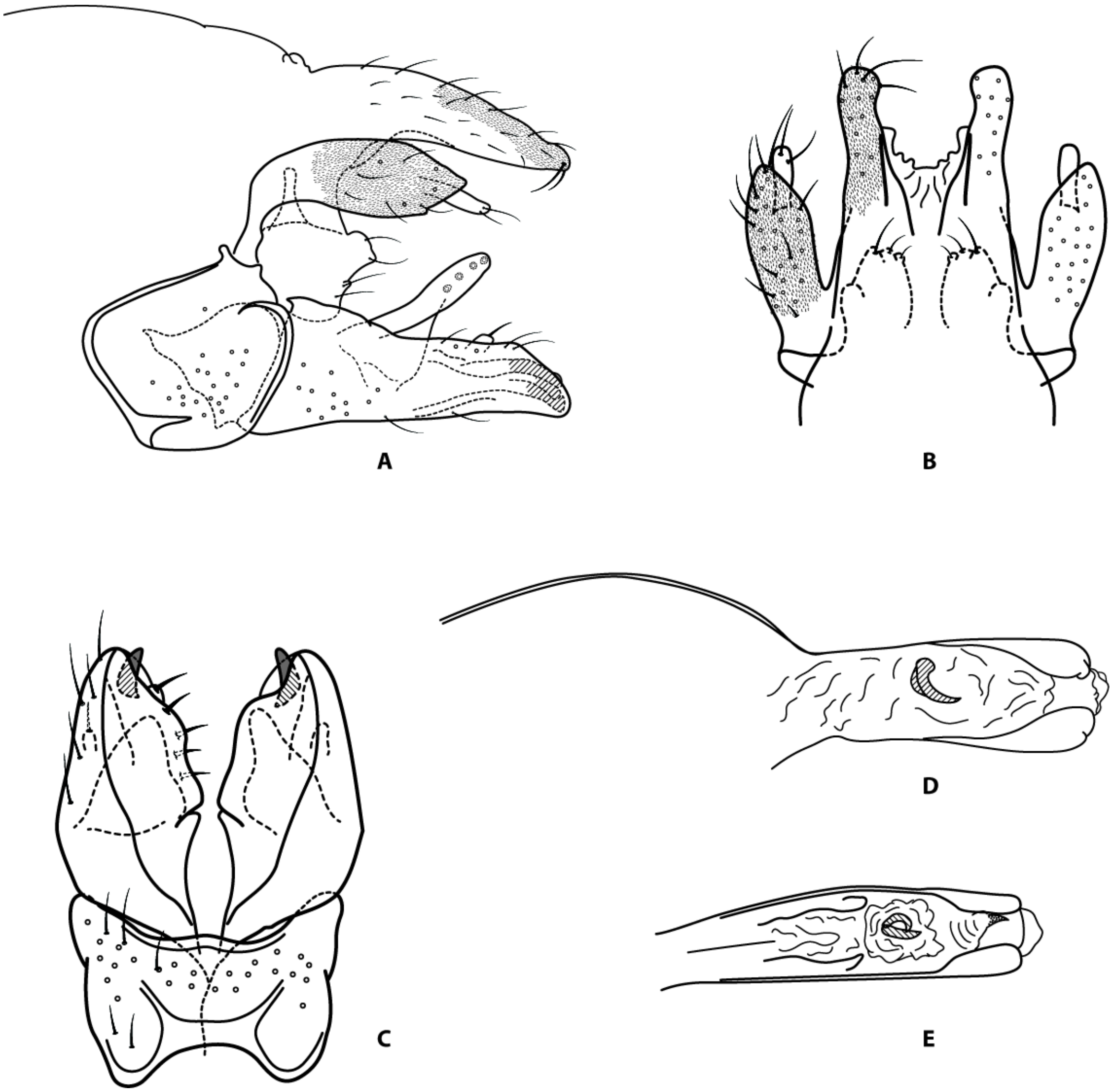

Figure 87. *Cernotina uara* Flint 1971. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

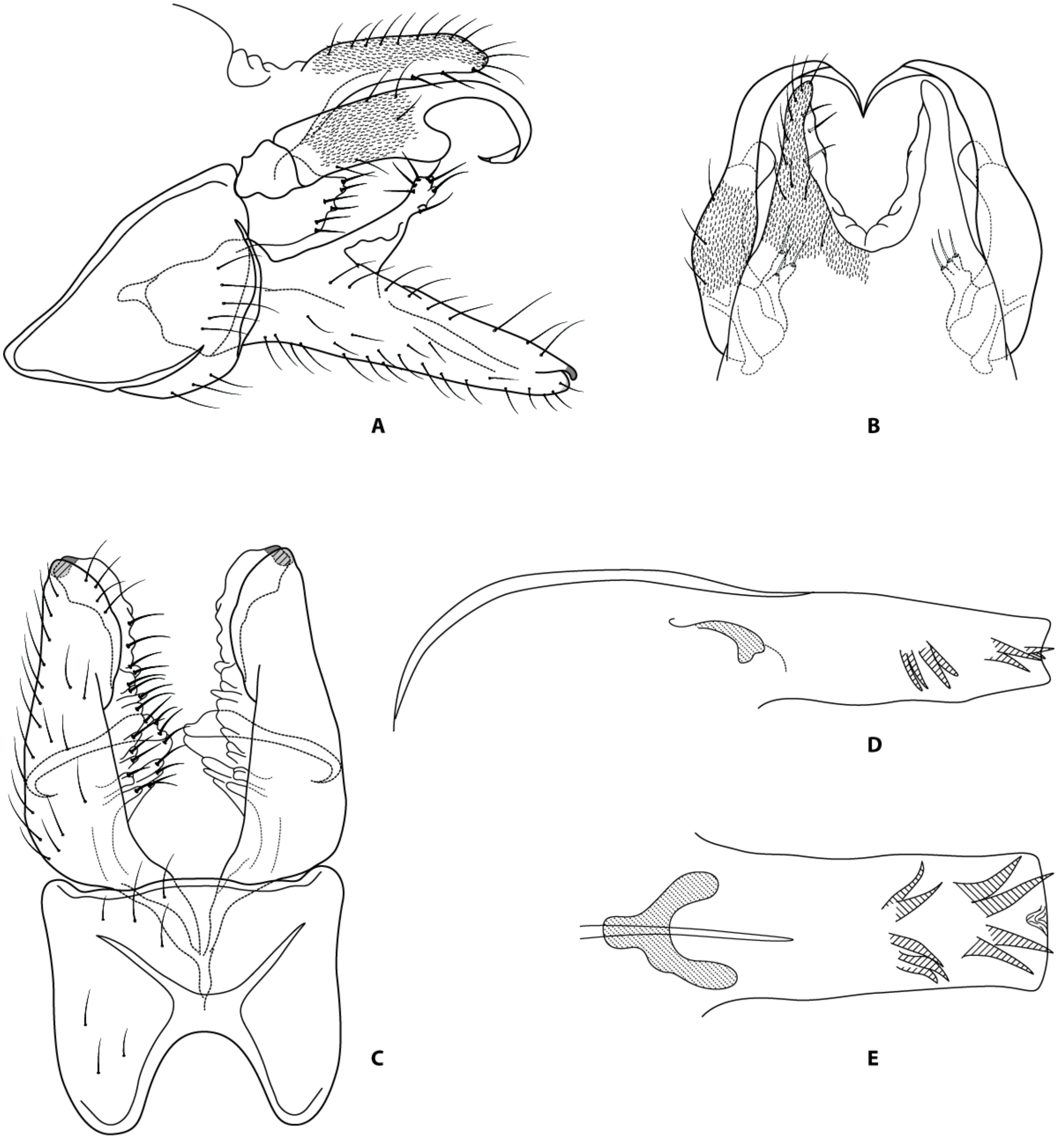

Figure 88. *Cernotina uncifera* Ross 1951. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

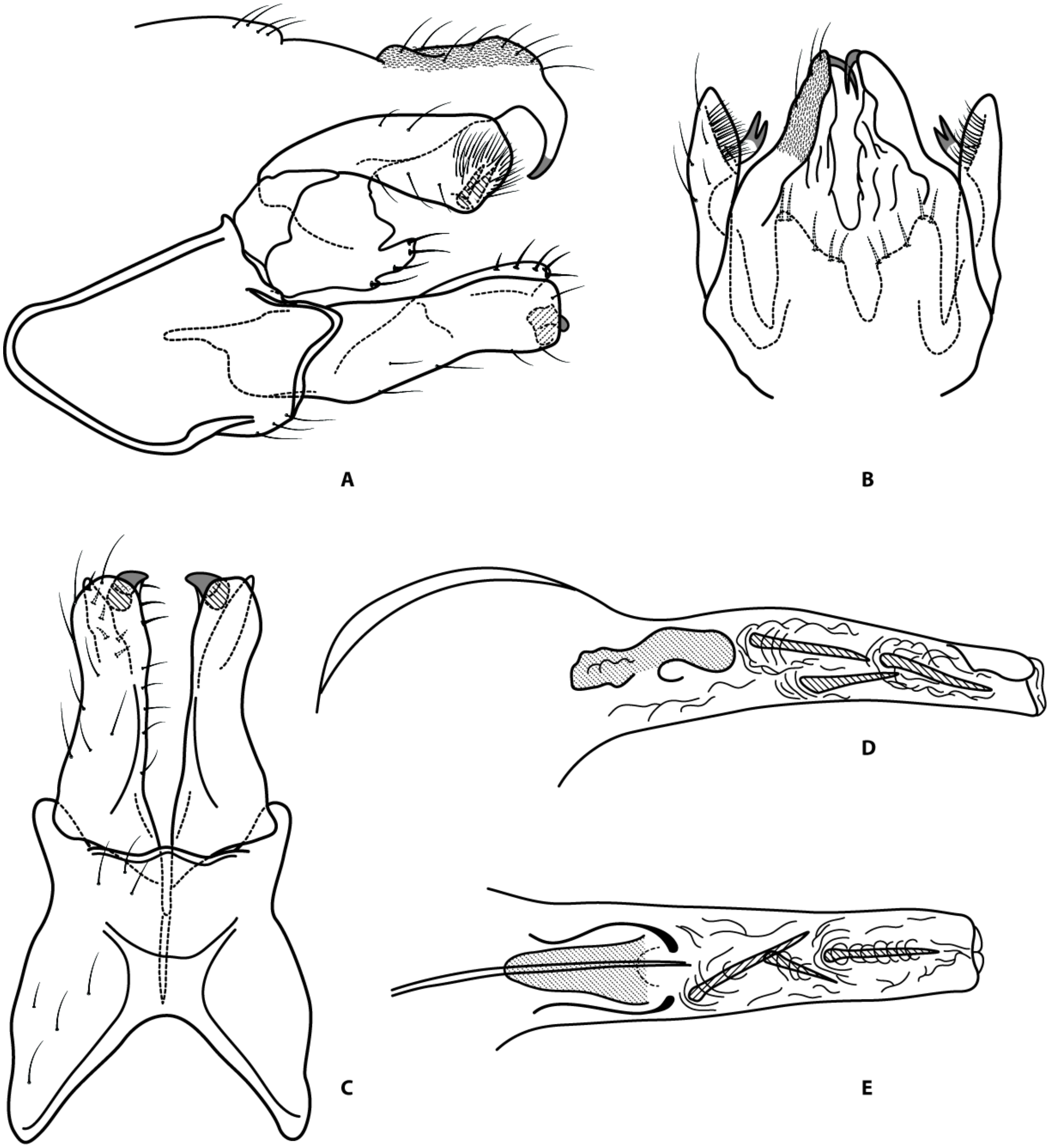

Figure 89. *Cernotina unguiculata* Flint 1971. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

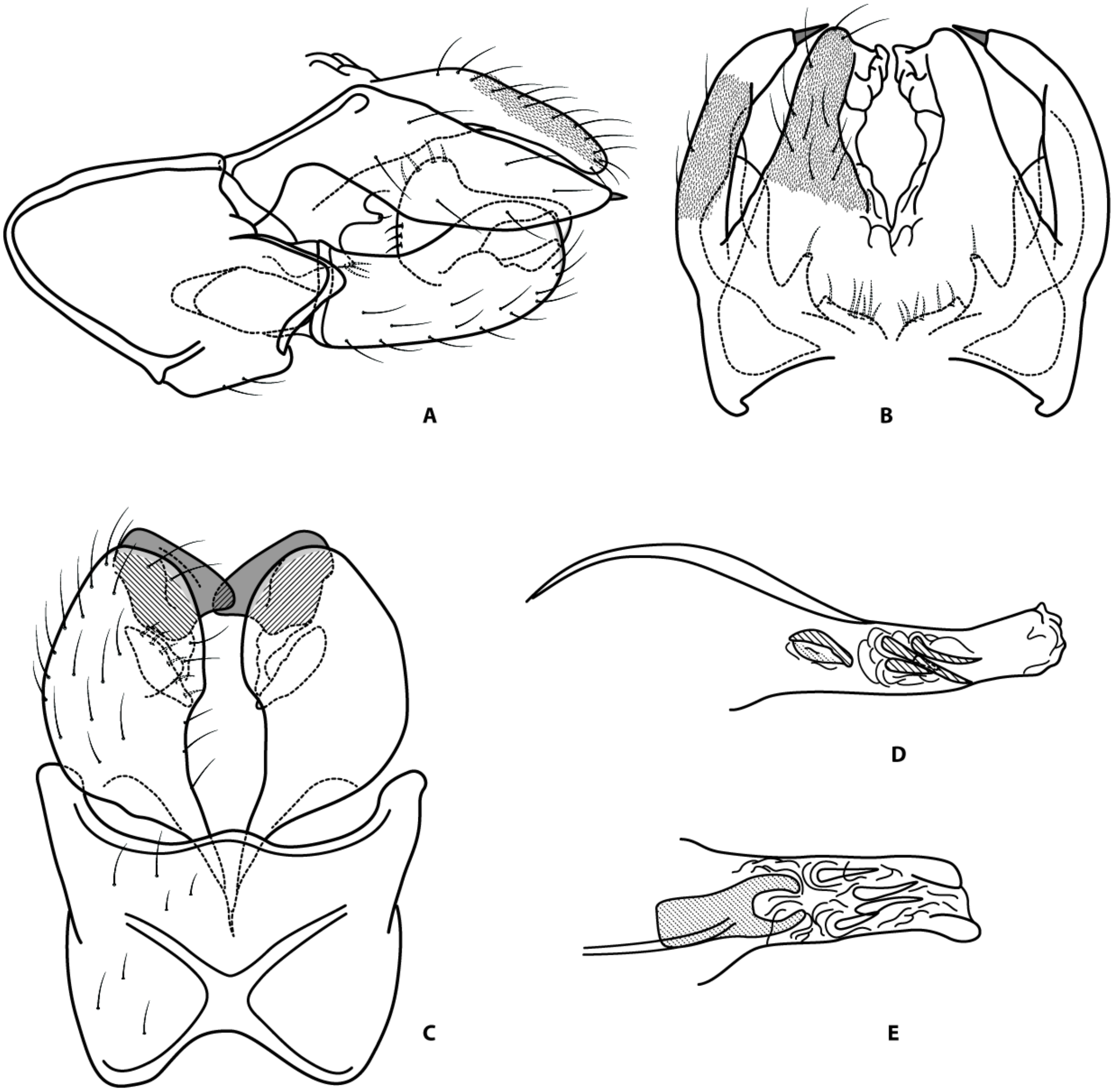

Figure 90. *Cernotina verna* Flint 1983. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

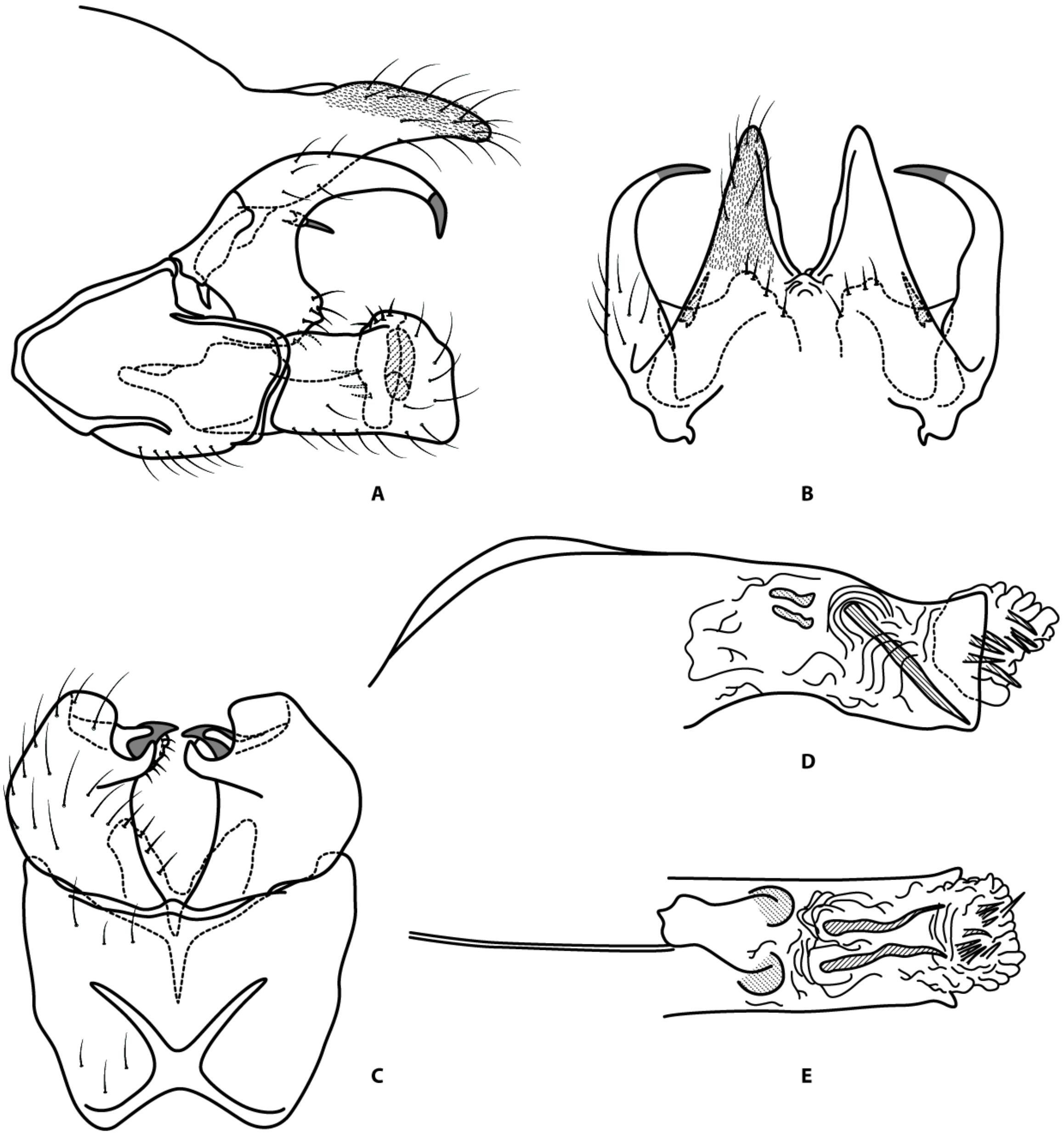

Figure 91. *Cernotina verticalis* Flint 1971. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

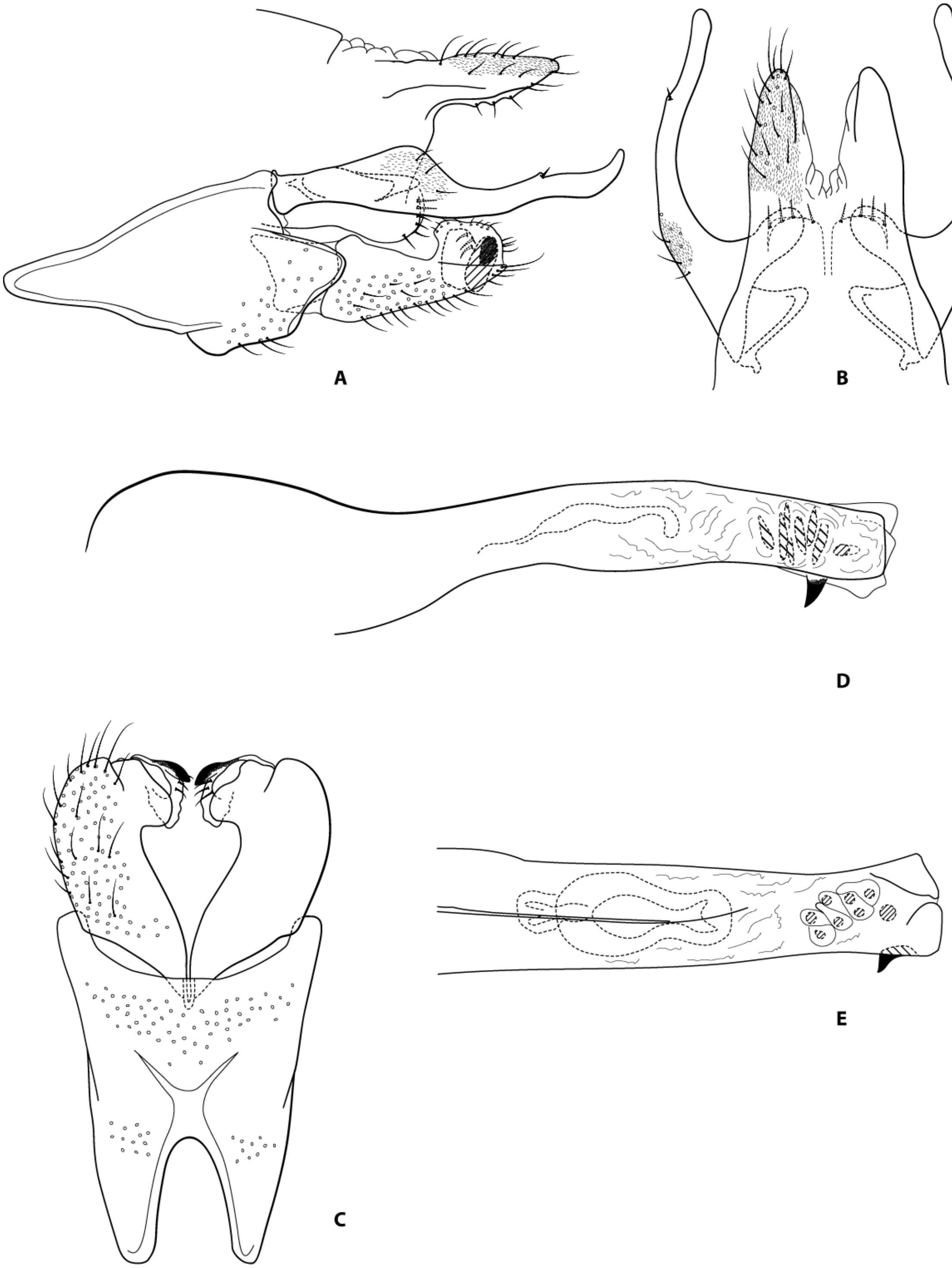

Figure 92. *Cernotina waorani* Camargos, Ríos-Touma and Holzenthal 2017. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

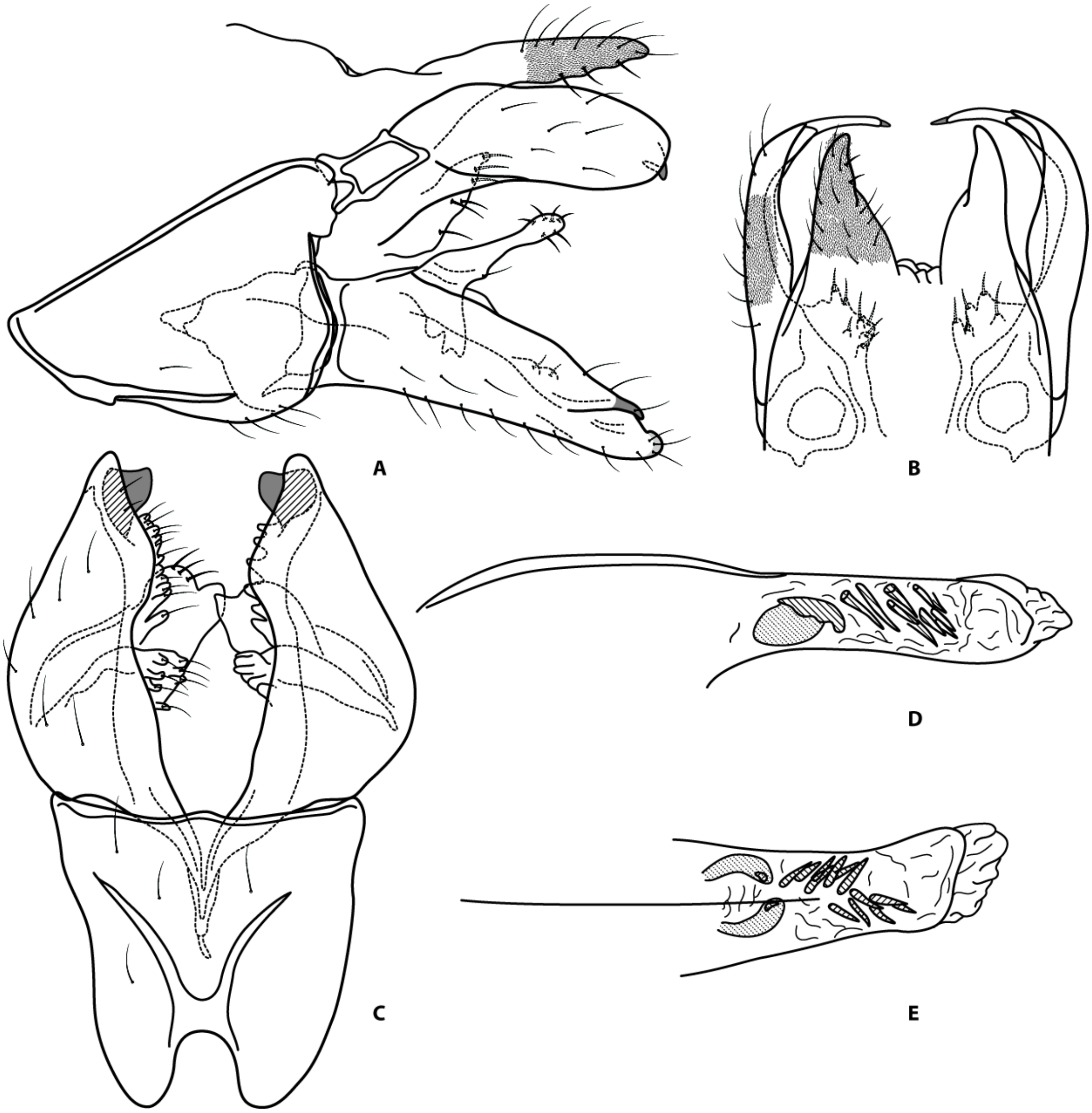

Figure 93. *Cernotina zanclana* Ross 1951. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

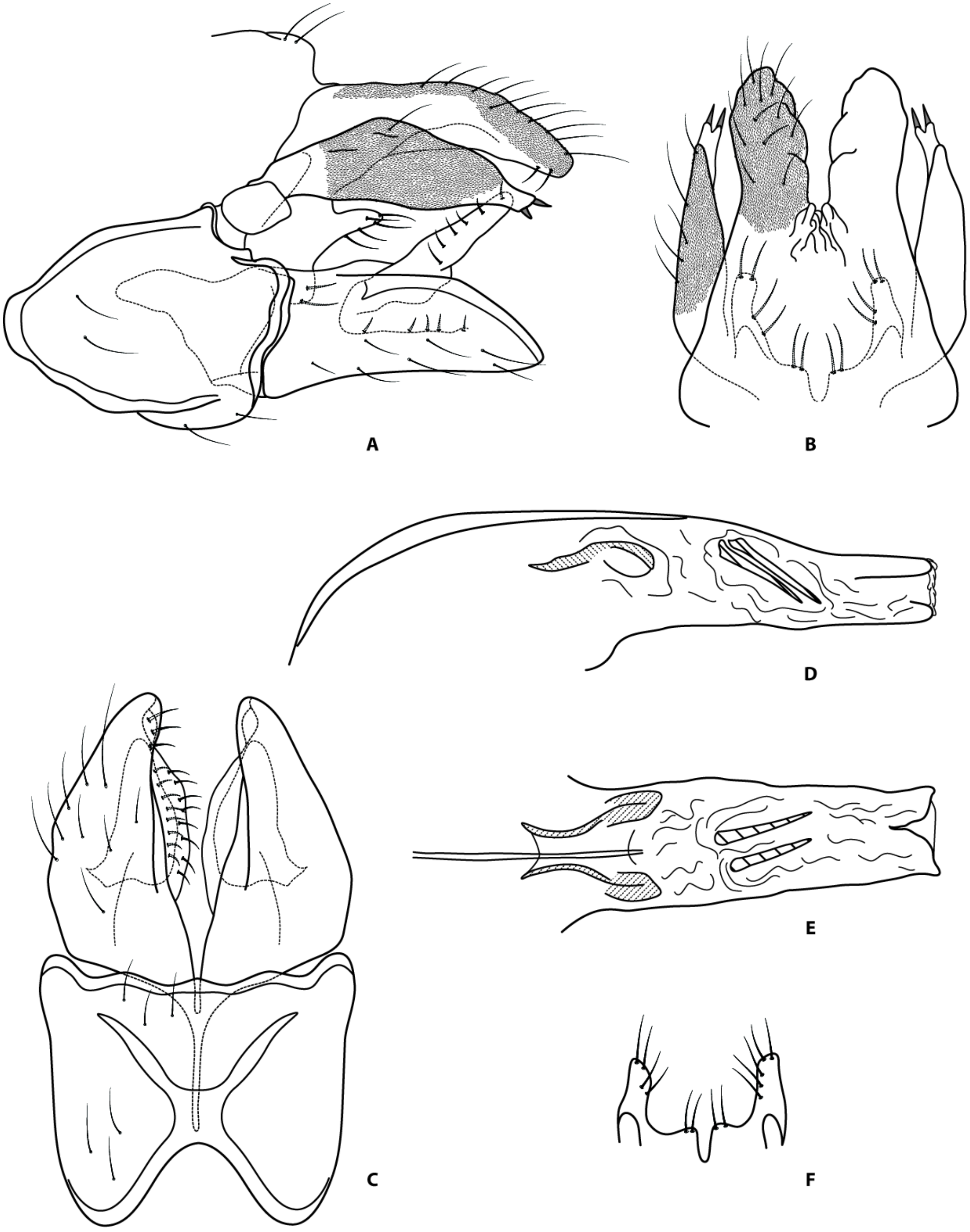

Figure 94. *Cernotina* n. sp. 1. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view; F – ventromesal process of the preanal appendage, ventral view.

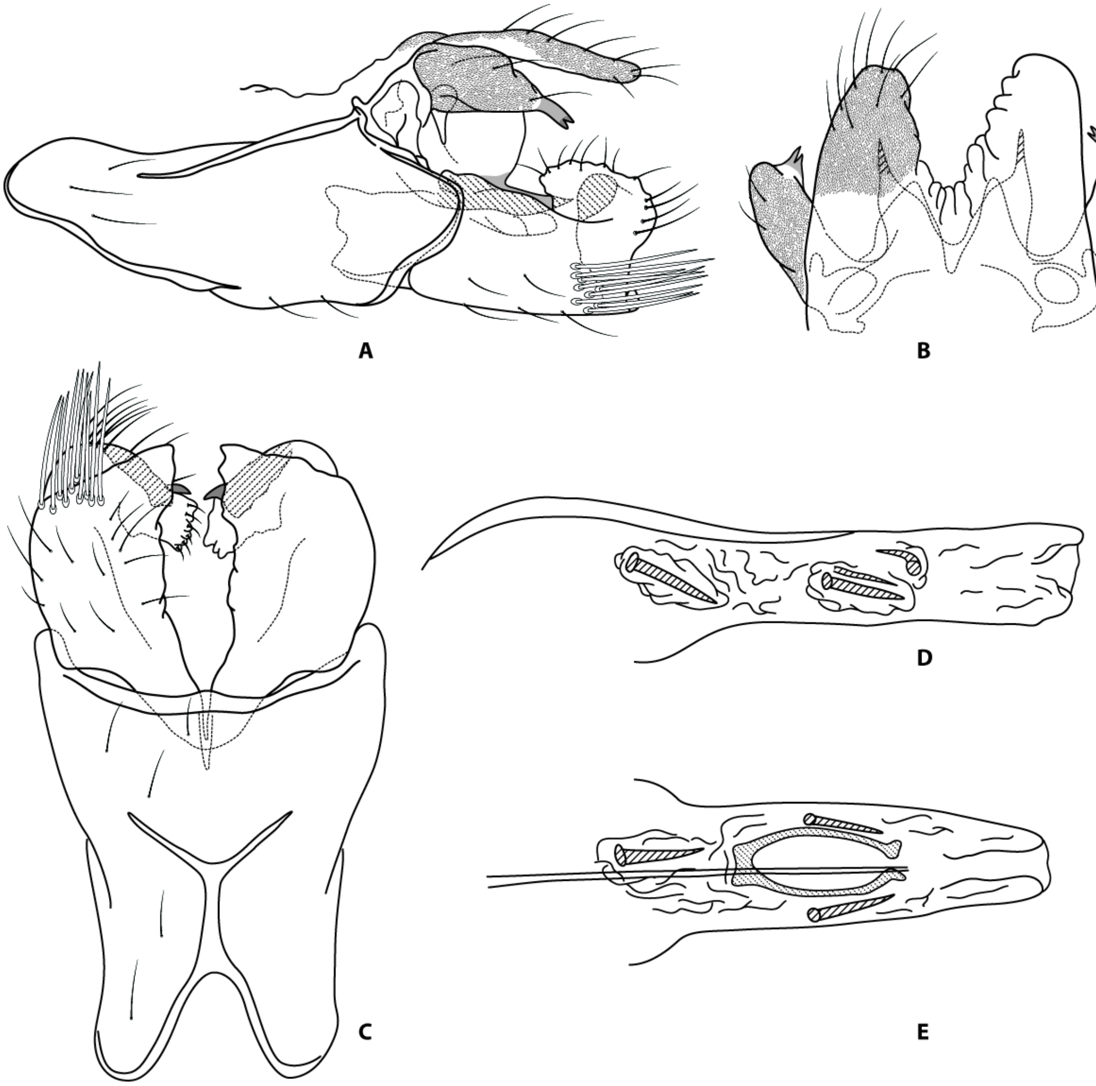

Figure 95. *Cernotina* n. sp. 2. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

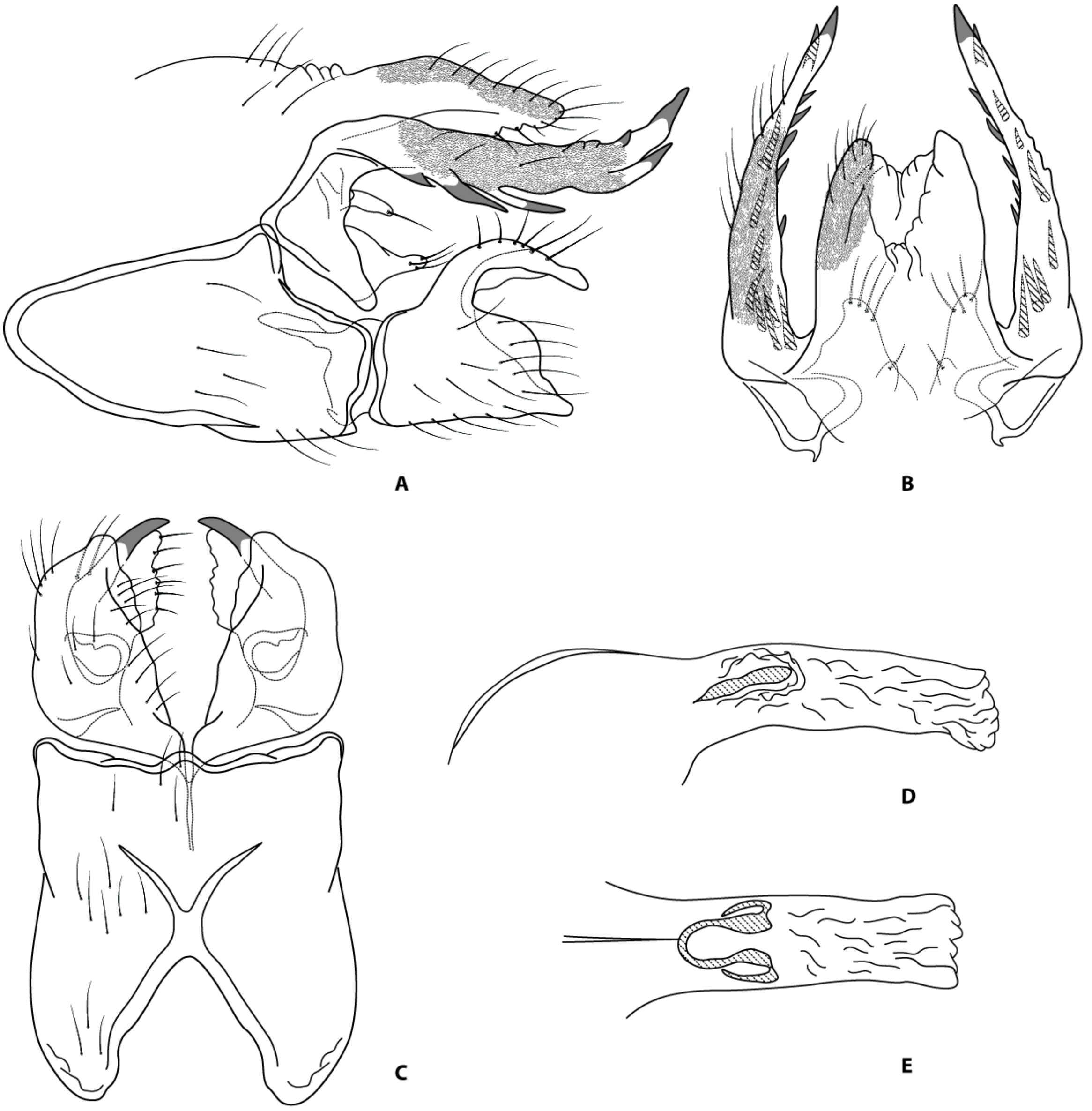

Figure 96. *Cernotina* n. sp. 3. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

Figure 97. *Cernotina* n. sp. 4. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

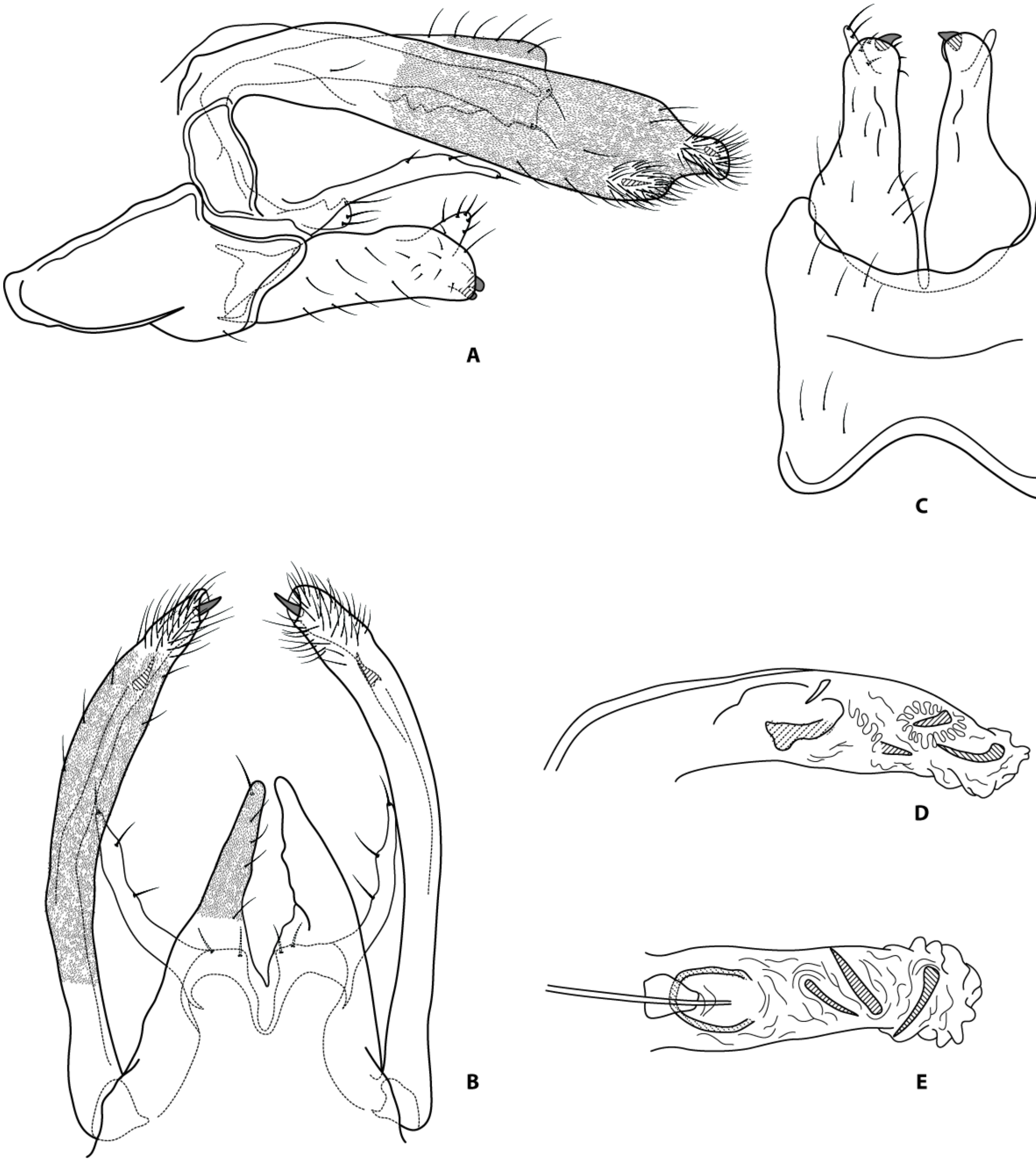

Figure 98. *Cernotina* n. sp. 5. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

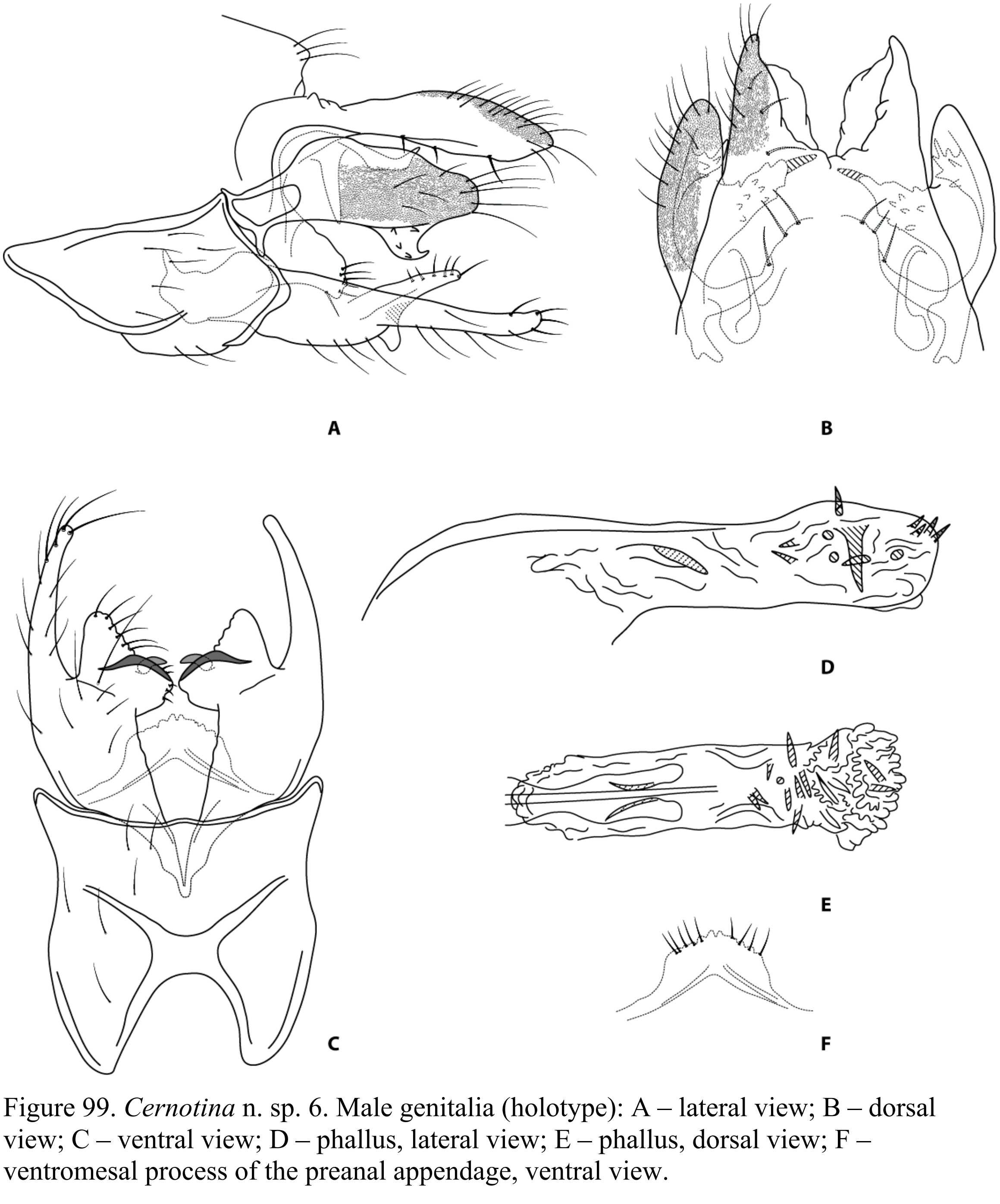

Figure 99. *Cernotina* n. sp. 6. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view; F – ventromesal process of the preanal appendage, ventral view.

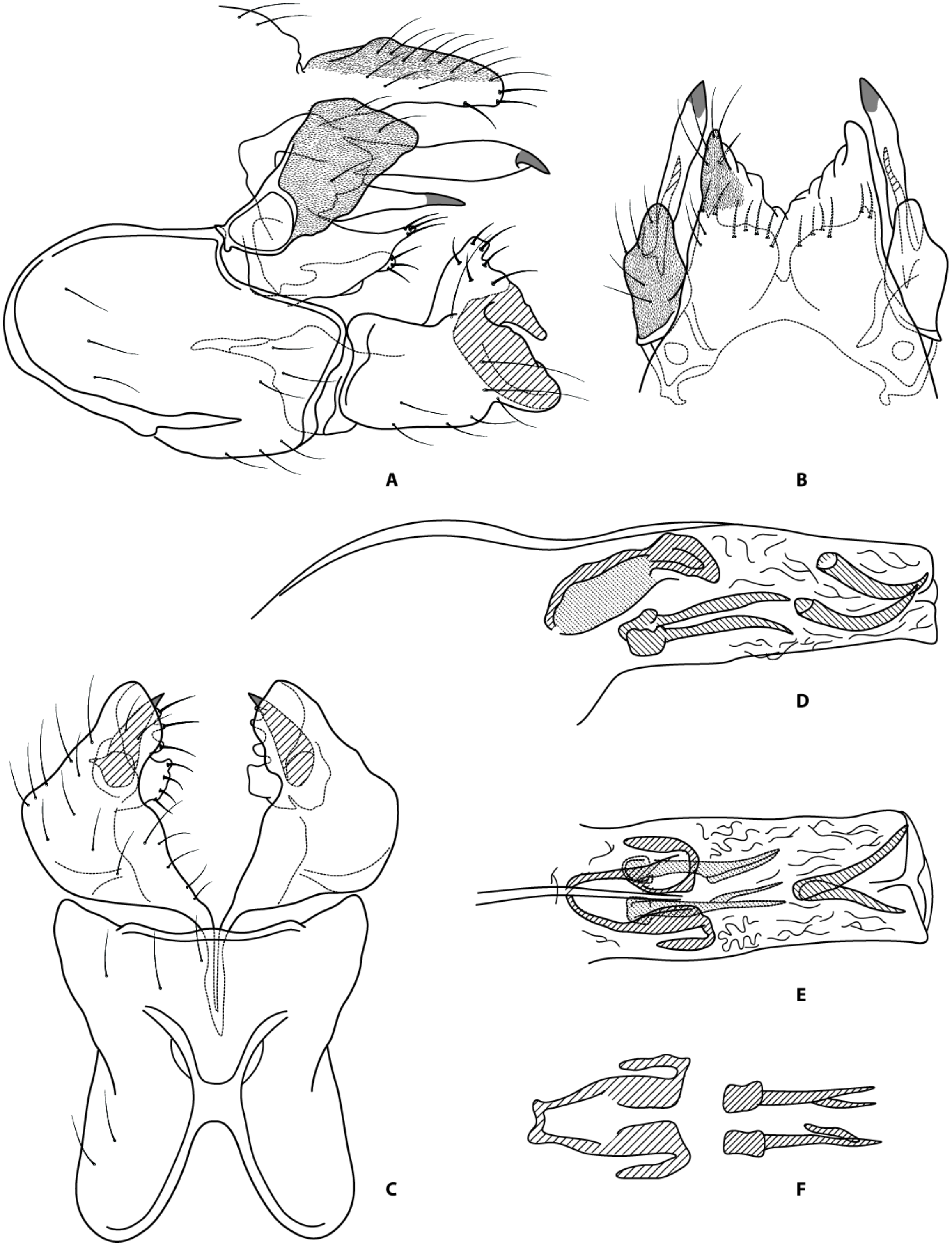

Figure 100. *Cernotina* n. sp. 7. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view; F – spines and phallotrema sclerite, ventral view.

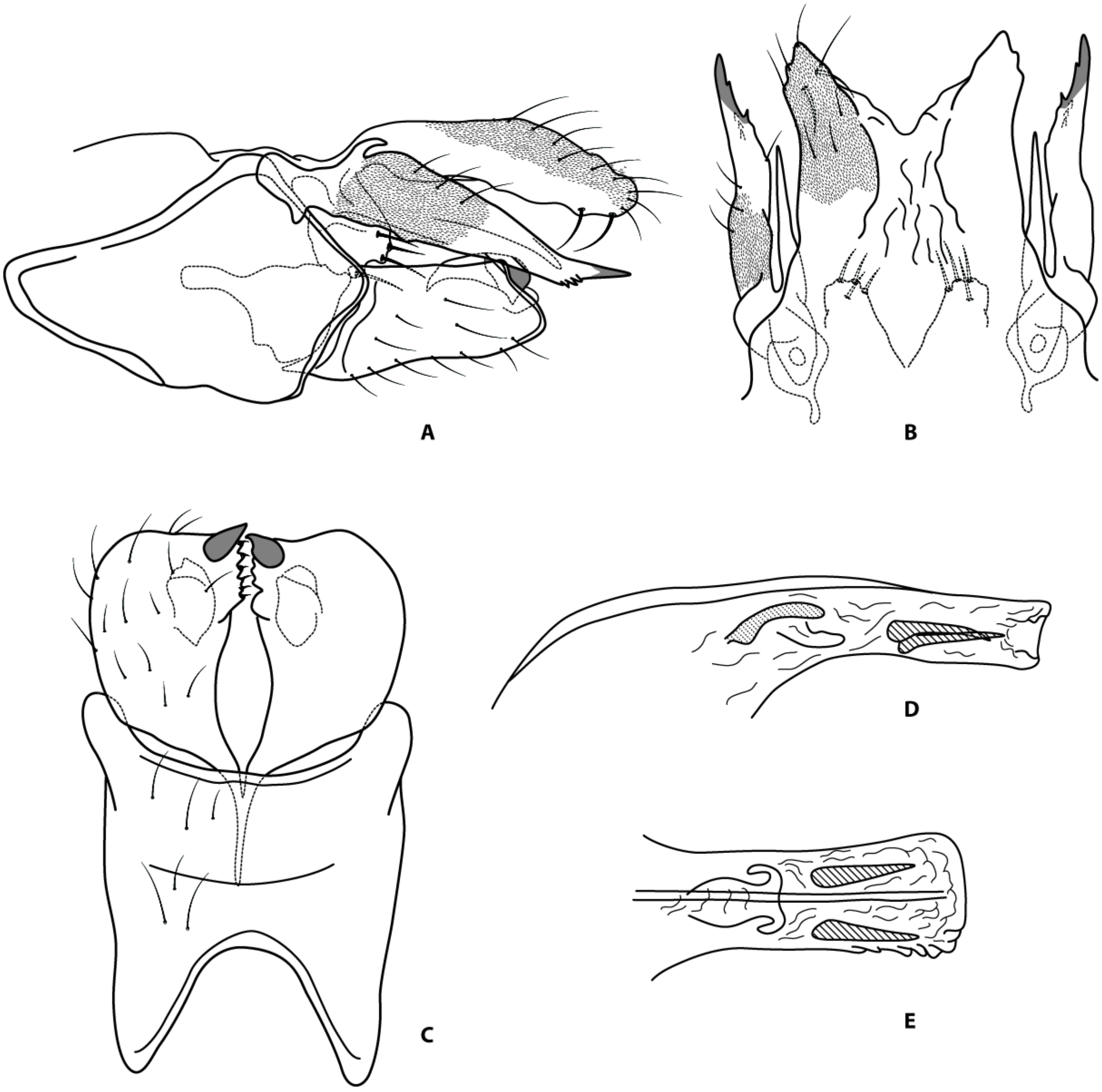

Figure 101. *Cernotina* n. sp. 8. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

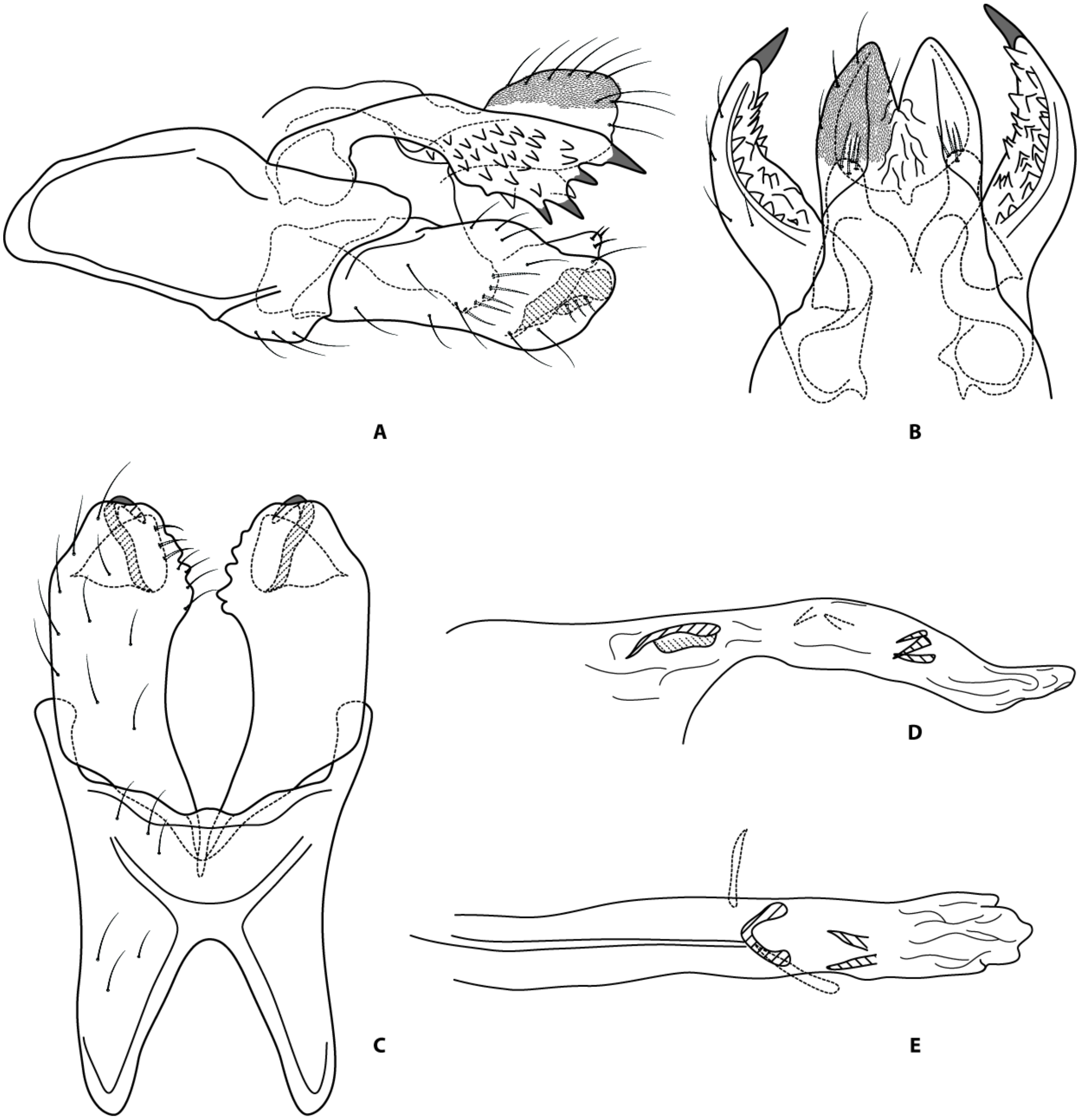

Figure 102. *Cernotina* n. sp. 9. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

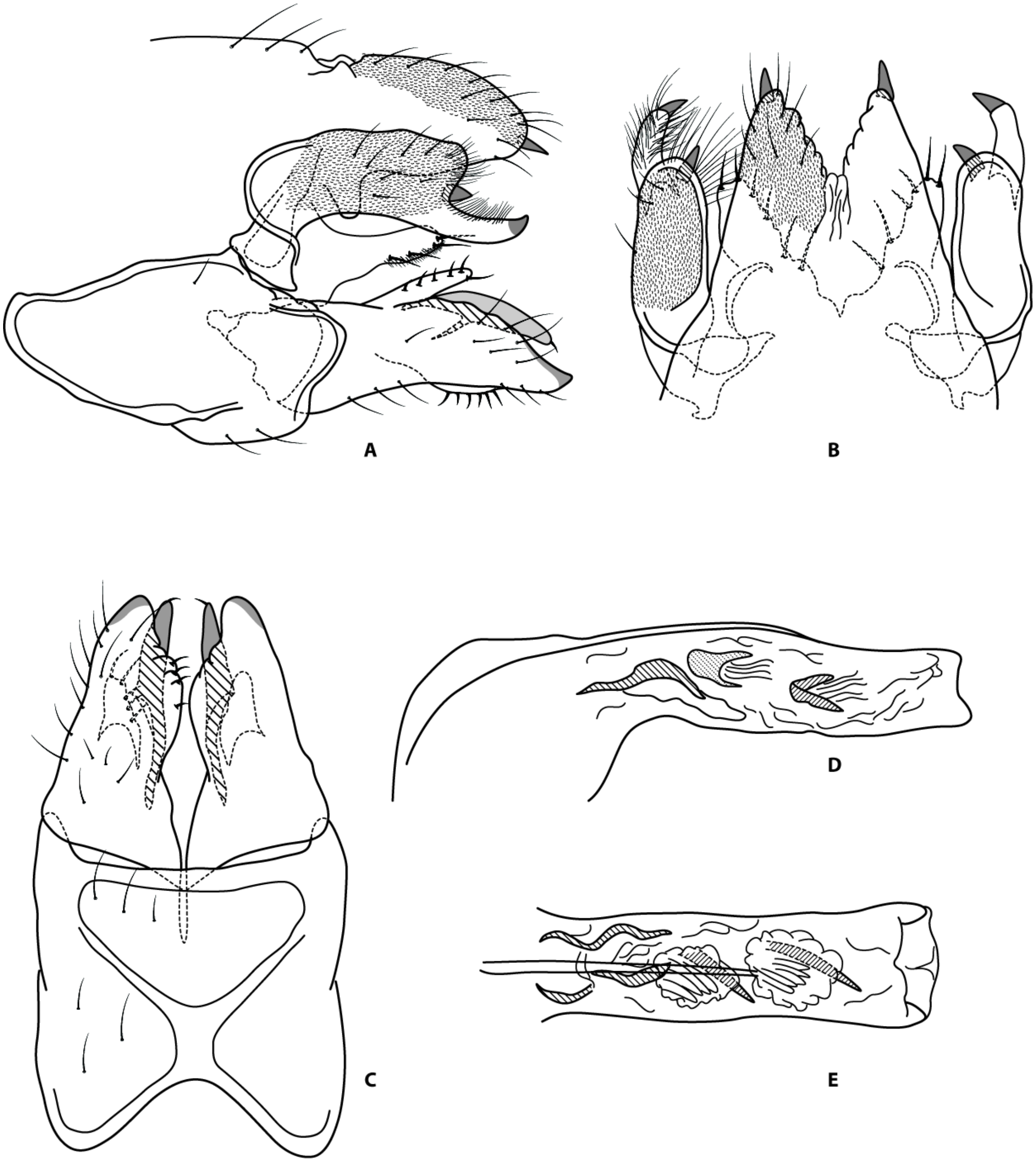

Figure 103. *Cernotina* n. sp. 10. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

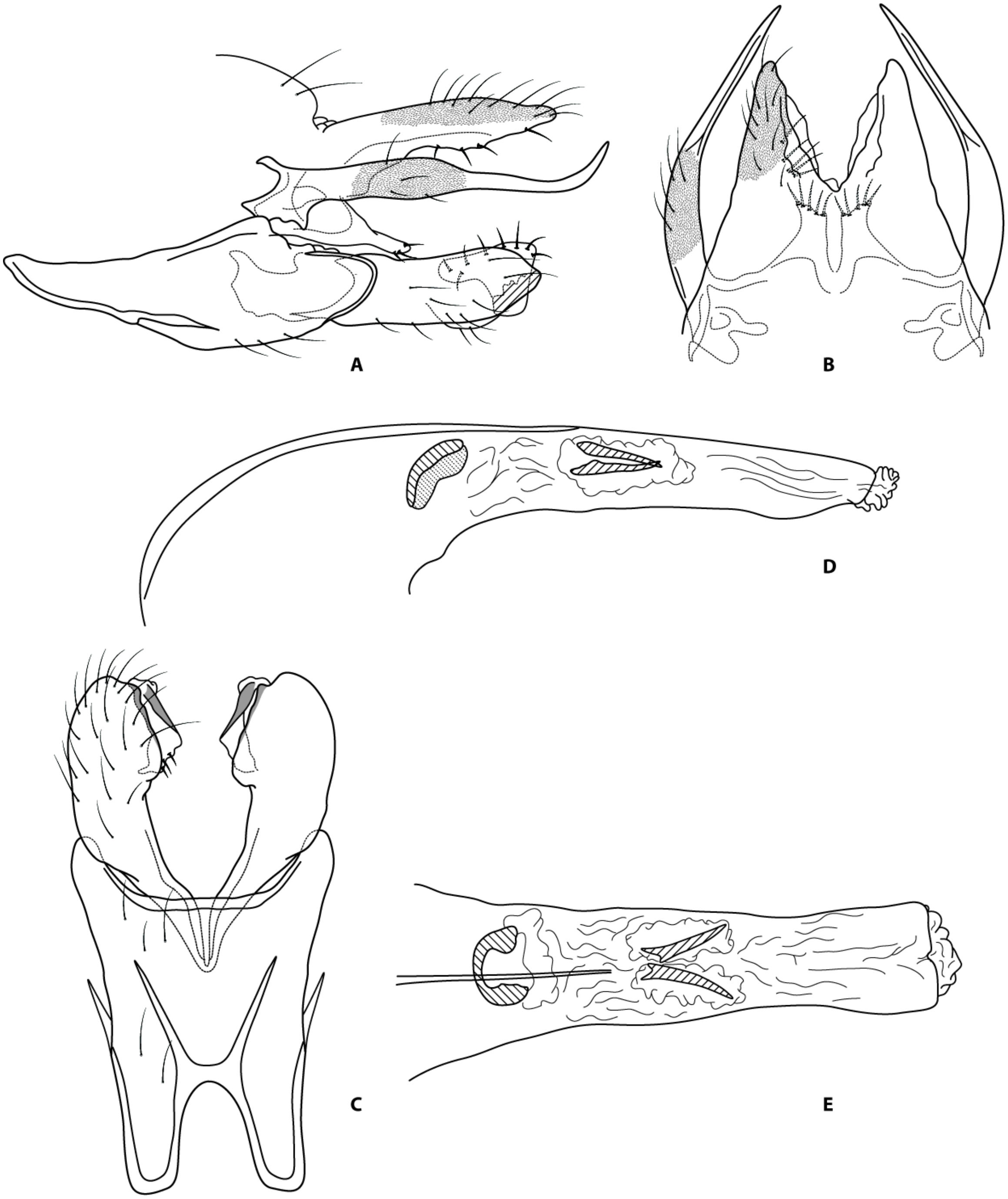

Figure 104. *Cernotina* n. sp. 11. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

Figure 105. *Cernotina* n. sp. 12. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

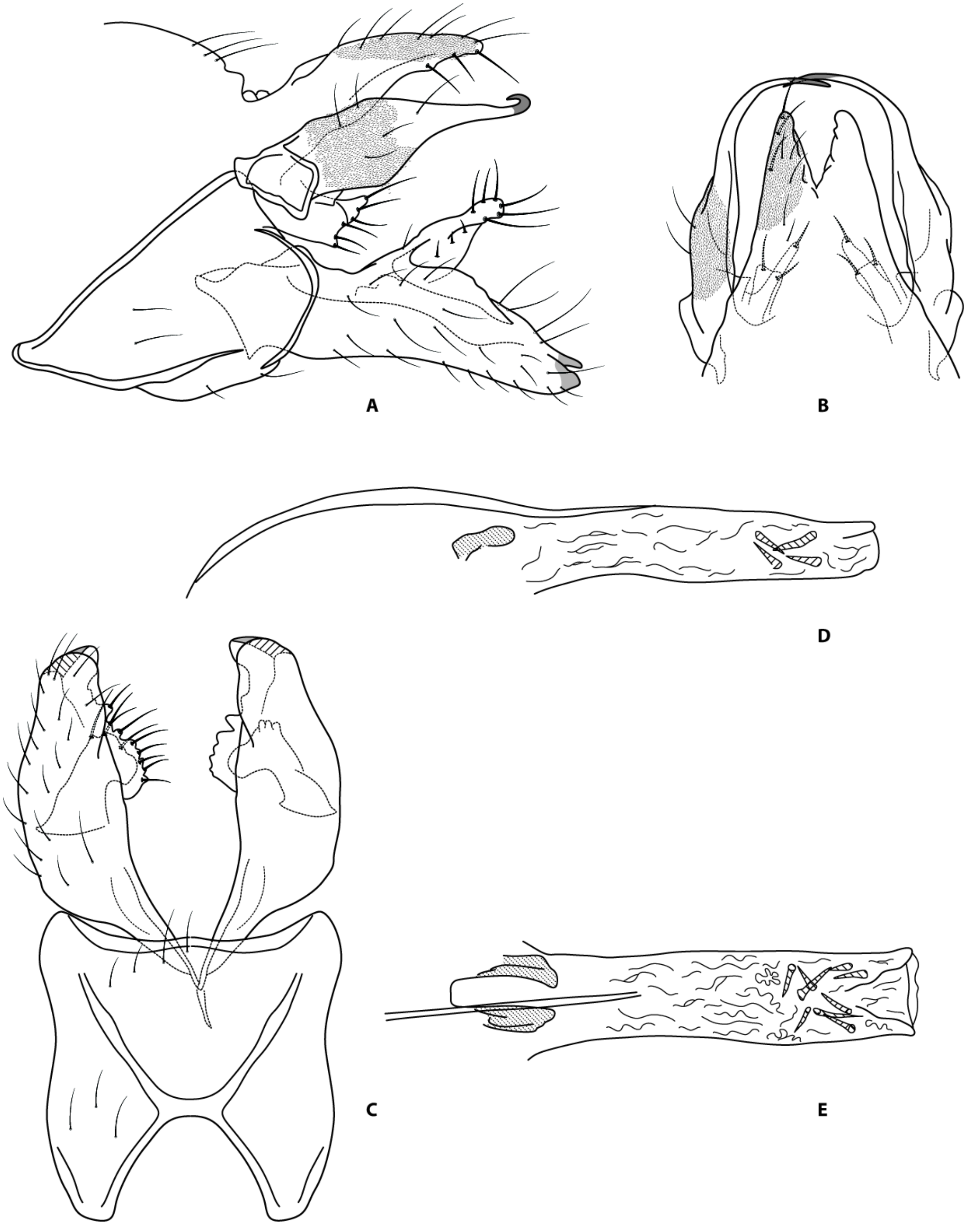

Figure 106. *Cernotina* n. sp. 13. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

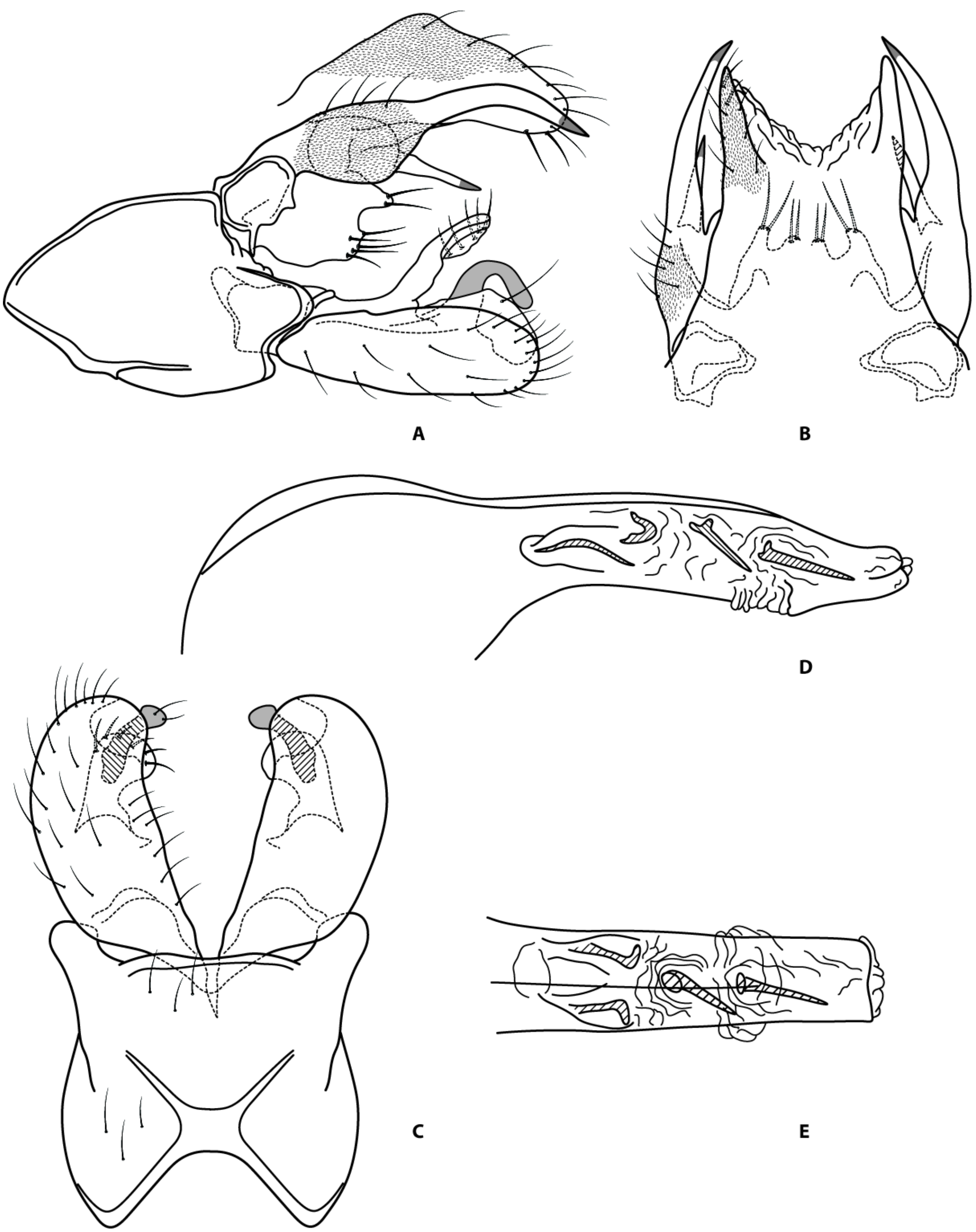

Figure 107. *Cernotina* n. sp. 14. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

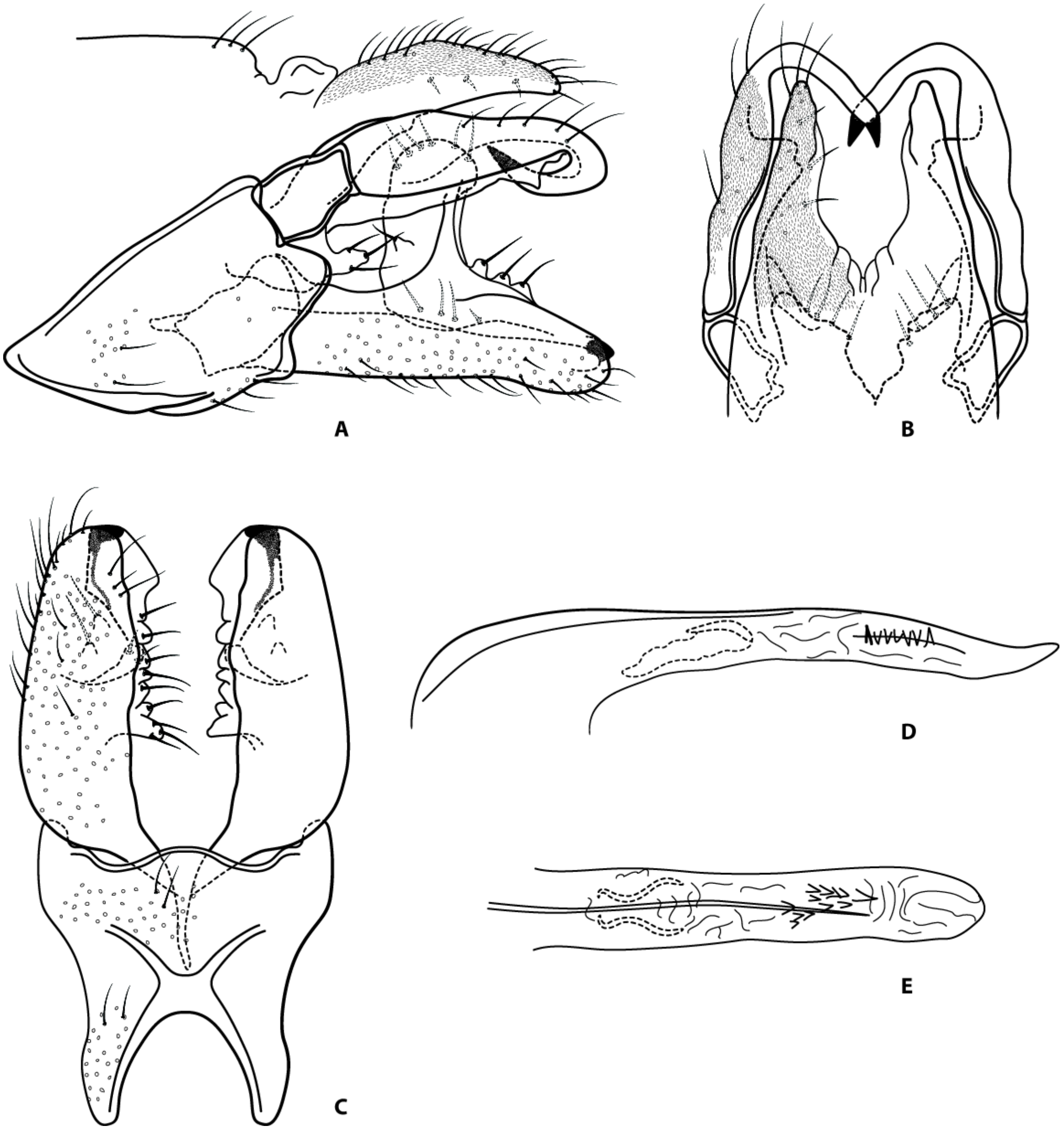

Figure 108. *Cernotina* n. sp. 15. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

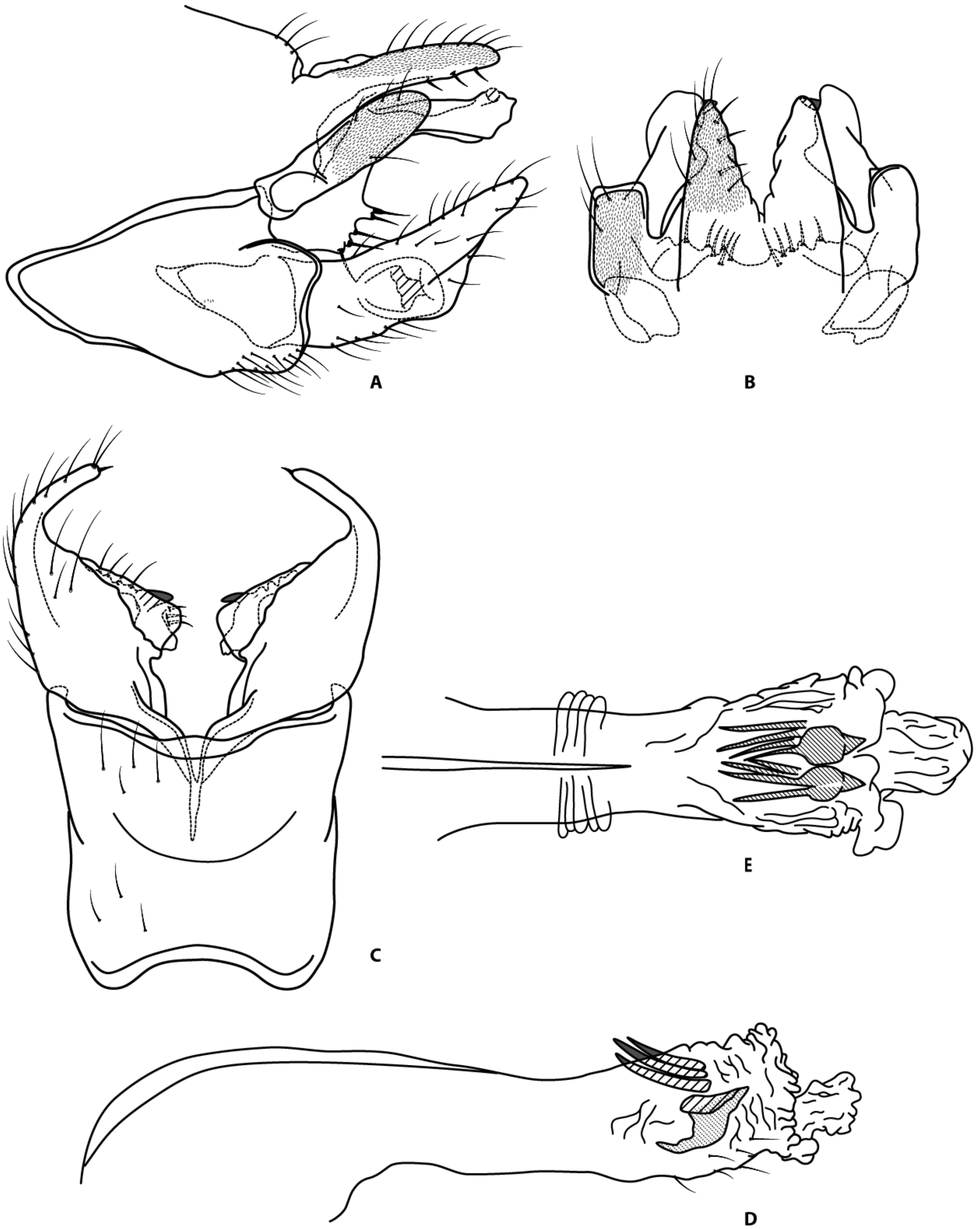

Figure 109. *Cernotina* n. sp. 16. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

Chapter 3. Revision of *Cyrnellus* Banks 1913 (Trichoptera, Polycentropodidae)

Introduction

The genus *Cyrnellus* is a small group in the family Polycentropodidae. Along with the highly diverse *Cernotina*, the 12 extant species of this genus are only found in the New World, from northern United States to Argentina, with only the widespread eastern North American species *Cyrnellus fraternus* occurring outside the Neotropics (Calor and Holzental 2017, Morse 2020).

Among the Neotropical species, 7 are found in the Amazon forest. Although the species in the genus tend to have large ranges of distribution, undescribed *Cyrnellus* may be found in taxonomically unexplored areas in the Amazon, as discovered by Flint (1971). There is no fossil evidence of this genus, and no molecular clock estimates of time of divergence from its sister taxa.

Along with *Cernotina* and *Polyplectropus*, no species occur in the Chilean sub-region (Holzenthal and Calor 2017). Such zoogeographical pattern is observed in many other Trichoptera families, and in different insect groups (Brundin 1966).

The larva of *Cyrnellus* was first described by Flint (1964), bases on collections in Iowa, Oklahoma, Tennessee, and Virginia. He identified it as *C. fraternus* due to a comparison with the female lectotype and the supposed absence of additional species in North America. The gut content of the larvae of this species consisted mainly of fine organic particles, in addition to less frequent arthropod remains (Wiggins 1996) While there is evidence of invertebrate body parts in the guts of *C.fraternus* (Wiggins 1996), gut analyses were not performed on Neotropical species (Camargos et al. 2017, Holzenthal and Calor 2017).

The morphology of larval *Cyrnellus* resembles that of *Cernotina* and *Polycentropus* by the lack of teeth on the medial margin of the anal claw, although some species of *Cyrnellus* in the Amazon have a slightly serrated anal claw (Pes et al 2018). They differ mainly by the shape of the dorsal sclerite of the anal proleg, with *Cyrnellus* having two sclerotized dark bands that do not touch each other at any point, unlike that structure in *Cernotina* and *Polycentropus*, where these bands touch to form the letter X (Fig. 1) (Wiggins 1996, Pes et al 2018).

Larval retreats of *Cyrnellus* resemble those of *Nyctiophylax* (Wiggins 1996). The larvae use small depressions in rock and wood substrates covered with a roughly circular flattened silken roof, (Flint 1971). The larval chamber has its floor covered with silk, and the larva has enough space to reverse its position to exit through any of the two open ends (Wiggins 1996). Larvae can be found in large rivers, which can explain the large range of distribution of the species, but also in smaller streams with slow-flowing waters, lakes, and reservoirs. As with many other Polycentropodidae genera, little is known about the biology of the adults, other than their attraction to light traps.

Taxonomic History

Described by Nathan Banks in 1913, the genus already had two other species previously described within the genus *Cyrnus*, those being *Cyrnus fraternus* Banks 1905 from Plummet Island, Maryland and *Cyrnus risi* Ulmer 1907 from Buenos Aires, Argentina. The type species for *Cyrnellus* designated by Banks is C*yrnellus minimus* Banks,1913, original combination, with a lectotype later designated by Flint (1967) from Porto Velho, Brazil. When *Cyrnus fraternus* was first described, Banks mentioned a similarity with *Cyrnus pallidus* (later *Cernotina pallida*), differing by its larger size, longer fork 3 in the forewing, darker body and the overall genital parts. *Cyrnus risi* was the first species collected in the Neotropics, in Brazil. When placing the species in the genus *Cyrnus*, the author was already aware that this species had peculiar wing venation, which could lead to the establishment of a new genus (Ulmer 1907).

Banks would also describe *Nyctiophylax marginalis* from Ohio (Banks 1930), being considered closely related to *N. vestitus*, today considered a *nomen dubium* (Morse 1972), by the color of the setae and wing venation characters. Later, the species *Cyrnellus zernyi* was described from eastern Amazon in Brazil, and the transfer *N. marginalis* to *Cyrnellus* was suggested (Mosely 1934). Ross (1938b) later synonimized it to *Nyctiophylax marginalis*, and posteriorly transferred this species to the genus *Cyrnellus*.

In 1964, Dr. Oliver Flint, Jr., described for the first time the larva of the genus *Cyrnellus* and synonymized *Nyctiophylax fraternus* with *Cyrnellus. marginalis*, establishing the new combination *Cyrnellus fraternus* (Flint 1964). Thus this species travelled from *Cyrnus*, then to *Nyctiophylax* and finally to *Cyrnellus*, where it still stands.

In his 1971 paper Flint revolutionized how trichopterologists understood polycentropodid diversity in the Amazon and added much knowledge to a genus with few known species until then. He redescribed *C. fraternus* and synonymized *C. minimus*. He also redescribed *C. risi* based on material from Argentina. In addition, he described *C. mammillatus*, *C. collaris*, *C. arotron*, *C. ulmeri*, and *C. bifidus* from central and eastern Amazon, collected during expeditions by Ernst Fittkau and Georges Marlier.

Later, Flint described *C. misionensis* from Misiones, Argentina and *C. rianus* from Entre Ríos, Argentina and Lavalleja, Uruguay (Flint 1983). Both species are somewhat similar to *C. risi*, also found in the region.

Up until this time, *Cyrnellus* along, with its related genera, were placed in Psychomyiidae, with a consensus that they should be in the Polycentropodidae only arising in the 1990s (see historical review by Chamorro and Holzenthal 2011). An exception to this was the work of Ulmer, who placed these genera in “Polycentropidae” early on (Ulmer 1907).

Entering the new millennium, *C. zapatariensis* was described by Dr. Chamorro (2003) from Isla Zapatera, Nicaragua. The species bears resemblance to the ubiquitous *C. fraternus*. Finally, Janos Oláh described *C. kesken* and *C. kozepes* from Corrientes, Argentina; in the paper, he defended the idea that small morphological variations are enough to separate different species (Oláh 2017).

Many researchers have updated distribution records of *Cyrnellus* species during the second half of the 20th Century. An increasing professional training of Latin American scientists was observed, leading to more frequent regional checklists and updated records (Paprocki et al. 2004, Calor 2011, Ríos-Touma et al. 2017, Dumas and Nessimian 2012, Desidério et al. 2017). Additionally, a comprehensive catalog of Neotropical species became available during this period (Holzenthal and Calor 2017).

The present study is the first comprehensive revision of *Cyrnellus*, including redescriptions of 11 described species, revalidation of of new species, and the synonymization of dubious taxa.

Checklist of *Cyrnellus* species

Cyrnellus arotron Flint, 1971

Cyrnellus bifidus Flint, 1971
Cyrnellus collaris Flint, 1971
Cyrnellus fraternus (Banks, 1905)
Cyrnellus kesken Oláh, 2017 (= *C. minimus*, **new synonym**)
Cyrnellus kozepes Oláh, 2017 (=*C. ulmeri*, **new synonym**)
Cyrnellus mammillatus Flint, 1971
Cyrnellus minimus Banks, 1913 (**new status**)
Cyrnellus misionensis Flint, 1983
Cyrnellus rianus Flint, 1983
Cyrnellus risi (Ulmer, 1907)
Cyrnellus ulmeri Flint, 1971
Cyrnellus zapatariensis Chamorro, 2003

Methods

Species delimitation

In this study, characters of the male genitalia were the main source of variation used to discriminate species. Such morphological characters had non-variable states within the taxon, while characters with continuous variation were not used as the main source of species delimitation, albeit they were still described. Variation in sclerotized shapes was rarely observed, and they were usually congruent within long geographical distances.

Morphological terminology

Because of the morphological conservatism among different species of *Cyrnellus*, the terminology focus on genitalic characters. Terminology for male genitalia was adapted from Chamorro (2003, 2010). Bilaterally symmetrical structures are referred to in singular.

Specimen dissection

Abdomens of male specimens were removed from the thorax and "cleared" following the methods described by Blahnik et al. (2007) with warm 85% lactic acid.

Clearing causes sclerotized internal and external cuticular structures of the male genitalia to become semi-transparent, thus presenting a clear view of internal and external morphology. While still warm from the lactic acid, a stream of water propelled by a syringe inserted inside the abdomen was used to flush out macerated non-cuticular tissues obscuring the view.

For a few specimens, especially those collected decades ago and where the soft tissue became hardened, an overnight bath in 10-12% KOH solution was also used for better clearing. After KOH treatment, specimens were bathed in 10% acetic acid in 70% ethanol to halt the clearing process by neutralizing the KOH. Some specimens also needed Chlorazole Black E (Fischer Scientific Int., Inc.) stain to observe structures that became overly transparent with the use of KOH.

To prepare wings of pinned specimens, the procedure described by Prather (2003) was used. For specimens stored in alcohol, the wings were removed, observed with the microscope, then were placed in a microvial with the remainder of the specimen(s).

Illustrations

All genitalic structures were done using a drawing tube, often referred to as *camera lucida*, coupled to an Olympus BX 41 compound microscope. Wings were photographed on a dissecting microscope coupled with a Leica camera, and processed in the application Leica Acquire. Head and thorax were illustrated using a dissecting microscope coupled with an ocular grid and grid paper. All final drawings were digitized using Adobe Illustrator (CS 5, Adobe Systems, Inc.), tracing scanned pencil sketches obtained with the drawing tube with digital vectors.

With some exceptions noted in the text, the illustrations are from the holotype. In a few species, illustrations of additional specimens are also provided to show intra-specific variation or different disposition of membranous structures. For the species not available to examine in this study, images from the original published descriptions were used do guide the digital vectors.

In order to easily compare between illustrations of different species, the figures have standardized letterings corresponding to each view of the male genitalia as follows: A –lateral view, abdominal segments IX and X, and appendages; B – dorsal view, segment X-intermediate appendage complex and preanal appendages; C – ventral view, segment sternum IX and inferior appendages; D – lateral view of the phallus; E – dorsal view of the phallus; G-F – details of specific structures when needed.

Species descriptions

To standardize and format consistent descriptions across all species, the software DELTA (DEscription Language for TAxonomy, Dallwitz et al., 1999 onwards) was used, following the steps described by Holzenthal and Andersen (2004). To generate natural language descriptions, the following directives of the Delta Editor's "Action Sets" were used: "layout for natural language descriptions" and "translate into natural language – RTF, single file for all taxa." The resulting file was edited in Microsoft® Word for fine adjustments of font and punctuation. The program also helped in designing a dichotomous identification key to the species of *Cyrnellus*. To generate the key, the following directives of Delta Editor's "Action Sets" were used: "Translate into KEY format" and "run – Confirmatory characters", excluding characters with more than 2 states to keep the key dichotomous.

Material examined and specimen management

More than 120 specimens were observed in this study. All pinned specimens, or lot of specimens in alcohol, deposited in the University of Minnesota Insect Collection have a unique alphanumeric identification with data readable in software Specify.

Types of the species described in this work, additional material examined and borrowed specimens from different institutions are deposited as indicated in the species descriptions in the following institutions:

NMNH National Museum of National History, Washington, DC, USA
UMSP University of Minnesota Insect Collection, Saint Paul, Minnesota, USA
DZRJ Coleção Entomológica Proessor José Alfredo Pinheiro Dutra, Departamento de Zoologia, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil
INPA Coleção de Invertebrados do Instituto Nacional de Pesquisas da Amazônia Collection, Manaus, Brazil
INHS Illinois Natural History Survey, Champaign, Illinois, USA

MCZ Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA
MECN Museo Ecuatoriano de Ciencias Naturales, Quito, Ecuador
USFQ Museo de Ecología Acuática de la Universidad San Francisco de Quito, Ecuador

Results

Homology of the male genitalia of *Cyrnellus*

Compared to the complexity of male genitalia in *Polyplectropus*, *Polycentropus* and even *Cernotina*, the species in *Cyrnellus* have relatively simple and few genitalic structures. However, this apparently simplicity can lead to difficulty in understanding homologies with the other genera, since many structures are fused, reduced or absent. In addition, different authors used different names for the same structures, a phenomenon commonly observed across different genera of Polycentropodidae (Chamorro 2010, Camargos et al. 2017). Here I followed Flint (1971) and Chamorro (2003) for genitalic structures and adapted additional structures to what I interpreted from the morphoplogical analyses of the different species.

Sternum IX

Segment IX in *Cyrnellus* is synscleritous, entirely fused, surrounding the terminalia ventrally and laterally, apparently fusing dorsally with the intermediate appendage-tergum X complex. Laterally, the segment mostly has a shape resembling an inverted “L,” being either more vertical or more inclined posterad. Ventrally, sternum IX can be more quadrate or rectangular.

Segment X

Most of the complex male genitalic structures originate from segment X (Nielsen 1957, Roy et al. 1980, Snodgrass 1935). In addition, as in other polycentropodids (Chamorro 2010, Camargos et al. 2017), male *Cyrnellus* also have tergum X fused with the intermediate appendages, forming a semi-membranous dorsal complex, always setose. This structure in *Cyrnellus* is usually rectangular, without spines, strong curvatures, or special setae, such as observed in some *Cernotina*. In some specimens, a membranous apicoventral lobe can be more pronounced, even though this structure can vary with the individual specimen and the way it was preserved, not being a source of reliable diagnostic characters. Dorsally, the tergum X-intermediate appendage complex can be quadrate or trapezoidal.

Preanal appendage

Often called *cercus* in older articles, this structure in *Cyrnellus* is digitate or oblong, sclerotized, setose, with varying relative lengths in comparison with the intermediate appendage, being able to surpass it. The appendage bears a slender mesobasal process, which is usually glabrous, except from a single stark seta at mid-length, a tuft of apical setae, and in some species, another tuft basally, such as in *C. misionensis* (Fig. 118A). In many species, the mesobasal process is directed posteroventrad, but it can also be curved posterodorsad such as in *C. rianus* (Fig. 119A). Unlike those of other Polycentropodidae genera, the preanal appendages in *Cyrnellus* are not as variable, lacking spines and strong curvature to any direction.

Inferior appendage

The inferior appendage is one-segmented in *Cyrnellus*, and it is the most varied structure in male genitalia for this genus. Because of that, it is also the most detailed structure in illustrations and descriptions. It is sclerotized, setose, and generally elongate. Laterally it can be straight or sinuous with dorsal curvatures and occasional ventrally recurved (Fig. 113A, 117A). Ventrally, it can have its median margin straight (Fig. 119C, 120C), or concave (Fig. 114C, 116C, 121C, 122C). Its median margin can also be entire (Fig. 117C) or have a ridge delimiting a less setose median section of the appendage, separated from the setose main body (Fig. 115C). In addition to the main body of the appendage, the sclerotized apicomesal lobe is very variable in its general shape, size and position. It can be a single spine (Fig. 119C, 114C), bifid (Fig. 112C, 121C), or it can be a single spine with a secondary smaller spine (Fig. 11C), and it can be apical (Fig. 114C, 122C) or arise from the mid-length of the appendage (Fig. 119C, 120C), for example.

Phallus

The phallus in *Cyrnellus* is located below tergum X and above the subgenital plate. It is usually broad, with a basal phallotremal sclerite with varying shapes dorsally, with lateral arms separated (Fig. 122D, E), connected anteriorly (Fig. 121D, E), posteriorly (Fig. 116D, E), or in a circle (Fig. 118D, E). In *C. arotron* (Fig. 111D, E), the sclerite occupies almost the entirety of the phallic endotheca.

Subgenital plate

This genus possesses this plate just below the phallus, which in lateral view resembles a slender process, similar in size, width, and shape to the mesobasal process of the preanal appendage. The plate can also be slightly fusiform, less elongate than the aforementioned process. It is glabrous except from a tuft of apical setae.

Genus *Cyrnellus* Banks, 1913

Cyrnellus Banks, 1913:88 [Type species: *Cyrnellus minimus* Banks 1913, original designation]. —Flint, 1971:28 [key, Amazonian species].

Generic description

General. Length of forewing: 3.0 – 4.5 mm. General body color from stramineous with brown or gray setae to entirely brown.

Head. Antennae with roughly same length of body, scape broad, setose (Fig. 110A). Maxilary palps with third article arising subapically from second article (Fig. 110B). Head subquadrate, without ocelli. Central setal area occupying most of head dorsally; frontal-, antennal- and preocellar- setal wart somewhat indistinguishable from each other, narrow laterally and extending posteriad medially; ocellar setal wart oval, positioned vertically; postocellar setal wart roughly as large as ocellar setal wart, extending anterolaterad; occipital setal wart large, slightly smaller than half central of setal area (Fig 110A).

Thorax. Forelegs with 3 tibial spurs, 2 apical and 1 preapical at midlength of segment. Prothorax short, about 3 times shorter than head, with a pair of rectangular and horizontal median pronotal setal warts, lateral pronotal setal wart either absent or fused with median (Fig. 110A).

Midlegs with 4 tibial spurs, 2 apical and 2 preapical at midlength of segment. Mesonotum about as long as head, with mesoscutal setal warts oval, almost touching each other medially, and mesoscutellar setal wart cordate, large, more than 4 times larger than mesoscutal setal wart (Fig. 110A).

Hind legs with 4 tibial spurs, 2 apical and 2 preapical at midlength of segment. Metanotum shorter than head, without setal warts.

Wings. Forewing venation (Fig. 110C): forks 2-5 present; fork 2 rooted, fork 3 petiolate with respect to median (m) crossvein, fork 4 petiolate, fork 5 petiolate or sessile with respect to median-cubital (m-cu) crossvein; discoidal and thyridial cells closed, medial cell open. Hind wing venation (Fig. 100D): forks 2 and 5 present.

Abdomen. Without remarkable structures.

Male genitalia. Sternum IX in lateral view reversed L-shaped, with angle from straight to oblique, reaching tergum X, indistinctly fused. Terga IX and X membranous, fused with intermediate appendage; ventral membranous projections may be laterally expanded. Intermediate appendage slightly sclerotized, setose, forming a fused complex structure; intermediate appendage complex in dorsal view quadrate to trapezoidal, laterally quadrate to rectangular. Preanal appendage divided; main body of the appendage/dorsolateral appendage robust, setose, ovate to digitate, may be shorter, longer, or as long as intermediate appendage; mesobasal process elongate, with varying lengths, from shorter to about as long as main body of appendage, with pair of apical setae and single preapical seta. Inferior appendage in lateral view elongate, with round apex, with varying degree of dorsal curvature, may be slightly curved dorsad; in ventral view, may be curved mesad with bulbous base or straight at base, may have mesal ridge dividing body of appendage into large external setose area and internal glabrous area;

apicomesal lobe present, sclerotized, positioning from midlength of appendage to apical, with varying shapes, usually as bifid or entire spine curved mesad. Phallus long or short, without spines free on phallic membrane; phallic sclerite distinct, with varying shapes and degrees of sclerotization, may have arms laterally constricted at midlength. Subgenital plate present, bearing tuft of apical setae, with shape elongate to subtriangular and positioned in varying direction.

Key to male *Cyrnellus*

1. Inferior appendage in ventral view with internal ridge and sparsely setose mesal margin ………………………………………………………………………………… 2

Inferior appendage in ventral view without internal ridge and whole body densely setose……………………………………………………………………... 8

2(1). Main body of preanal appendages digitate ……………………………………… 3

Main body of preanal appendages ovate………………………………………… 6

3(2). Intermediate appendage complex with ventrolateral margins membranous, not extending laterad; phallus elongate…………………………………………….… 4

Intermediate appendage complex with ventrolateral margins membranous, extending laterad; phallus short……………………………………………….... 5

4(3). Main body of the dorsolateral appendage exceeding intermediate appendage complex; intermediate appendage complex, in lateral view, nearly square; mesal margin of inferior appendages straight basal to apicomesal spines; apicomesal lobe entire, subapical…………………………………………… ***Cyrnellus risi***

Main body of the dorsolateral appendage not exceeding intermediate appendage complex; intermediate appendage complex, in lateral view, rectangular; mesal margin of inferior appendages concave basal to apicomesal spines; apicomesal lobe bifid, apical……………………………………………… ***Cyrnellus bifidus***

5(3). Intermediate appendage complex, in lateral view, nearly square; apicomesal lobe entire, subapical…………………………………………… ***Cyrnellus fraternus***

Intermediate appendage complex, in lateral view, rectangular; apicomesal lobe bifid, close to the midlength of the inferior appendage…..…… ***Cyrnellus ulmeri***

6(2). Intermediate appendage complex, in lateral view, nearly square………………… 7

Intermediate appendage complex, in lateral view, rectangular……… ***Cyrnellus mamillatus***

7(6). Apicomesal lobe of inferior appendage subapical, round, with small point on its anterior margin; phallic sclerite simple, with 2 broad arms.……………………………………………………… ***Cyrnellus collaris***

Apicomesal lobe of inferior appendage as a broad mesal spine near the midlength of the inferior appendage, and a secondary spine more apically and centered on the body of the appendage; phallic sclerite robust, with 2 apical horns, and lateral arms covered with spines……………………………………………………… ***Cyrnellus arotron***

8(1). Dorsolateral appendage of tergum X exceeding intermediate appendage complex……………………………………………………………… 9

Dorsolateral appendage of tergum X not exceeding intermediate appendage complex…………………………………………………………….. 10

9(8). Apicomesal lobe of inferior appendage robust, with wide base, constricted to apical curved spine. directed posteriad, close to the midlength of the inferior appendage…………………………………….……………… ***Cyrnellus rianus***

Apicomesal lobe of inferior appendage slender, acute, directed mesad, apical on inferior appendage……..…………………………………… ***Cyrnellus minimus***

10(8). Main body of preanal appendage digitate; picomesal lobe apical, directed mesad……………………………………………… ***Cyrnellus zapatariensis***

Main body of preanal appendage ovate; picomesal lobe subapical, directed posteriad……………………………………………… ***Cyrnellus misionensis***

Species descriptions

Cyrnellus arotron Flint 1971

(Fig. 111)

Flint, 1971:32 [Type locality: Brazil [Edo. Pará], Rio Tocantins im hause des Ingenieurs von Rio Impex; NMNH; G/male/]; —Flint, 1982:19 [distribution]. —Angrisano, 1994:138 [distribution]. —Paprocki et al., 2004:16 [checklist]. —Angrisano and Scanga, 2007:7 [checklist]. —Dumas et al., 2010:8 [distribution]. —Paprocki and França, 2014:84 [checklist].

At first glance, *C. arotron* resembles *C. fraternus* in ventral view. However, the main point of the apicomesal lobe is situated more at mid-length in this species. In addition, the lobe also bears a secondary point slightly more apically, not contiguous in a single sclerotized structure like in *C. ulmeri*. In cleared specimens it is possible to see the large and complex phallothremal sclerite, another remarkable characteristic from this species.

Adult. Length of forewing 3.5 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 111A, C), in lateral view, reversed L-shaped, apparently fused with intermediate appendage dorsally; ventrally subquadrate. Tergum IX and X (Fig. 111A, B) membranous, fused with intermediate appendage; fused structure, in lateral view, nearly square, with ventrolateral margins membranous, extending laterad; in dorsal view, narrower at base. Main body of preanal appendage (Fig. 111A, B) ovate, setose, not exceeding intermediate appendage complex; mesobasal process shorter than main body of appendage. Inferior appendage (Fig. 111A, C), in lateral view, broad basally, elongate, almost straight posteriad, narrowing to round apex; in ventral view, posterior margins round; mesal margin concave basad of apicomesal spines, with similar width along body of appendage, with internal ridge and sparsely setose mesal margin; apicomesal lobe sub-apical, broad, tapering to sclerotized hook, and secondary spine posteriorly, directed mesad. Phallus (Fig. 111D, E) elongate, phallic sclerite complex, highly sclerotized, with two apical horns curved mesad and many spines along the length of its lateral arms; sinuous in lateral view. Subgenital plate, in lateral view, elongate, pointing posteroventrad.

Material examined: Brazil: Rio Tocantins, im Hause des Ingenieurs von Rio Impex, 5.xi.1960, Lichtfang (A-50-2), E.J. Fittkau – holotype male [alcohol] (NMNH).

Distribution: Argentina, Brazil, Uruguay.

***Cyrnellus bifidus* Flint 1971**

(Fig. 112)

Flint, 1971:32 [Type locality: Brazil [Edo. Amazonas], Paraná do Careiro, Divininopolis; NMNH; /male/G]; —Flint, 1982:20 [distribution]. —Paprocki et al., 2004:16 [checklist]. —Dumas et al., 2010:9 [distribution]. —Paprocki and França, 2014:84[checklist].

This species is easily recognized by the bifid apicomesal lobe points. It differs from *C. ulmeri* and even *C. arotron* by the position of the lobe, much more apical in *C. bifidus* than in *C. ulmeri* or *C. arotron*. In addition, its phallotremal sclerite is laterally more complex than in *C. ulmeri*, with a ventral projection, and less complex than the large spiny sclerite of *C. arotron*. Dorsally, the seclerite is Y-shaped, rather than arch-shaped as in *C. ulmeri*, or the complex horned structure in *C. arotron*.

Adult. Length of forewing 3.5 – 4.4 mm, n = 2. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 112A, C), in lateral view, reversed L-shaped, apparently fused with intermediate appendage dorsally; ventrally elongate. Tergum IX and X (Fig. 112A, B) membranous, fused with intermediate appendage; fused structure in lateral view, rectangular, with ventrolateral margins membranous; in dorsal view, quadrate. Main body of preanal appendages (Fig. 112A, B) digitate, setose, not exceeding intermediate appendage complex; mesobasal process as long as main body of appendage. Inferior appendage (Fig. 112A, C), in lateral view, broad basally, elongate, slightly curved dorsally, with broad round apex; in ventral view, posterior margins truncate; mesal margin concave basad of apicomesal spines, expanding into mesal setose circular lobes, with internal ridge and sparsely setose mesal margin; apicomesal lobe broad, in bifid sclerotized spines, directed mesad. Phallus (Fig. 112D, E) elongate, phallic sclerite in lateral view indistinct, elongate, with apex broader than base, and subapical ventral projection; in dorsal view distinct, Y-shaped. Subgenital plate, in lateral view, elongate, slightly curved apicoventrad.

Material examined: Brazil: [Amazonas] Paraná do Careiro, Divinópolis, 29.vii.1961, Lichfang (A-223), E.J. Fittkau – holotype male [alcohol] (NMNH); **Argentina:** Buenos Aires, Lima, Río Paraná de las Palmas, 16.xii.1979, C.M. & O.S. Flint Jr. – 1 male [pinned] (NMNH).

Distribution: Argentina, Brazil.

Cyrnellus collaris Flint 1971

(Fig. 113)

Flint, 1971:31 [Type locality: Brazil [Edo. Amazonas], Rio Solimões, bei Mission S. Rita; NMNH; /male/G]; —Flint, 1996b:391 [distribution]. —Angrisano, 1994:139 [distribution]. —Paprocki et al., 2004:16 [checklist]. —Angrisano and Scanga, 2007:7 [checklist]. —Paprocki and França, 2014:84 [checklist].

This species resembles *C. mammillatus* in the lateral oblong shape of the subgenital plate and in the ventral aspect of the inferior appendages. However, the point of the apicomesal lobe in *C. collaris* is located on the anterior margin of the structure, while in *C. mammillatus*, it is located at the mid-length of the lobe. In addition, the dorsal aspect of the phallotremal sclerite is different in the two species, with a heavily sclerotized apicoventral margin in *C. collaris*, and lyre-shaped, with a broad base in *C. mammillatus*.

Adult. Length of forewing 3.5 – 4.1 mm, n = 2. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 113A, C), in lateral view, reversed L-shaped, apparently fused with intermediate appendage dorsally; ventrally trapezoidal. Tergum IX and X (Fig. 113A, B) membranous, fused with intermediate appendage; fused structure, in lateral view, nearly square, with ventrolateral margins membranous, extending laterad; in dorsal view, trapezoidal. Main body of preanal appendage (Fig. 113A, B) ovate, setose, not exceeding intermediate appendage complex; mesobasal process shorter than main body of appendage. Inferior appendage (Fig. 113A, C), in lateral view, broad basally, curved anterodorsad, then recurved posteriad, with round apex; in ventral view, posterior margins round; mesal margin concave basad of apicomesal spines, slightly expanding into mesal setose circular lobes, with internal ridge and sparsely setose mesal margin; apicomesal lobe broad, round, sclerotized, with small pointy apex, directed mesad. Phallus (Fig. 113D, E) short, phallic sclerite in lateral view, indistinct, linear, sinuous; in dorsal view distinct, with 2 parallel sclerotized lines laterally curving posterad, wider apically. Subgenital plate, in lateral view, round, with rounded apex, pointing posteroventrad.

Material examined: Brazil: Rio Solimões, bei Mission S. Rita, 24.viii.1961, Lichtfang (A-234), E.J. Fittkau – holotype male [alcohol] (NMNH); **Peru:** Madre de Dios, Manú [National Park], Pakitza, 12º7'S, 70º58'W, el. 250 m, 20.ix.1988, M. Pogue – 1 male [pinned] (NMNH); **Argentina:** Entre Rios, Parque Nacional El Palmar, Mirador La Glorieta, crossing Arroyo el Palmar, ARG-2014, 41º53'17"S, 58º16'26"W, el. 15 m, 13-16.ii.2014, C. Diederich, C. Gonçalves, D.M. Takiya – 16 males [alcohol] (INPA).

Distribution: Argentina, Brazil, Peru, Uruguay.

Cyrnellus fraternus (Banks 1905)

(Fig. 114, 115)

(Banks), 1905:17 [Type locality: United States, Maryland, Plummer's Island; MCZ; /female/E; in *Cyrnus*]. —Flint, 1964:469 [to *Cyrnellus*;, larva, ; biology]; —Flint, 1971:29 [/male/;G, synonymy, ; distribution]; —Flint, 1982:21 [distribution]. —Holzenthal, 1988:59 [distribution]. —Angrisano, 1994:138 [distribution]. —Johnson et al., 1998:641 [biology]. —Blahnik et al., 2004:5 [distribution]. —Cohen, 2004:76 [checklist]. —Paprocki et al., 2004:16 [checklist]. —Bowles et al., 2007:23 [checklist]. —Chamorro-Lacayo et al., 2007:46 [checklist]. —Dumas et al., 2009:360 [checklist]; —Dumas et al., 2010:9 [distribution]. —Stocks, 2010:165 [wing coupling structure and function]. —Djernaes, 2011:45 [/male/;

/female/]. —Flint, 2011:106 [checklist]. —Nogueira and Cabette, 2011:352 [distribution]. —Barcelos et al., 2012:1278 [checklist]. —Manzo et al., 2014:166 [distribution]. —Paprocki and França, 2014:84 [checklist].

This species closely resembles *C. minimus*, and for many years, they were considered the same species. With the aid of molecular tools in species delimitation, we found consistent variation between the two (Takiya, et al., in press). *Cernotina fraternus* has a secondary mid ridge on the ventral margin of the inferior appendage, while *C. minimus* and *C. zapatariensis*, for instance, do not. In addition, *C. minimus* usually has a more apical apicomesal lobe, while in *C. fraternus*, such lobe and point are located more sub-basally. This species also differs from *C. arotron*, especially in the simplicity of the phallotremal sclerite compared to the very robust and complex sclerite in *C. aroton*.

Adult. Length of forewing 3.0 – 4.5 mm, n = 6; length of forewing in female 4.0 – 4.8, n = 3. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 114A, C, 115A, C), in lateral view, reversed L-shaped, apparently fused with intermediate appendage dorsally; ventrally subquadrate. Tergum IX and X (Fig. 114A, B, 115A, B) membranous, fused with intermediate appendage; fused structure, in lateral view, nearly square, with ventrolateral margins membranous, extending laterad; in dorsal view, trapezoidal. Main body of preanal appendage (Fig. 114A, B, 115A, B) digitate, setose, not exceeding intermediate appendage complex; mesobasal process as long as main body of appendage. Inferior appendage (Fig. 114A, C, 115A, C), in lateral view, broad basally, narrowing to round apex; In ventral view, posterior margins round; mesal margin concave basad of apicomesal spines, expanding into mesal setose circular lobes, with internal ridge and sparsely setose mesal margin; apicomesal lobe subapical, broad, tapering to sclerotized hook, directed mesad. Phallus (Fig. 114D, E, 115D, E) short, phallic sclerite in lateral view, indistinct, basally broad, slightly curved, with constriction at mid-length; in dorsal view distinct, as arc-shaped sclerite, with sinuous lines slightly constricted at midlength, with posterior ends flattened and laterally curved hooks pointing anteriad. Subgenital plate, in lateral view, subtriangular, pointing posteroventrad.

Material examined: United States: Maryland, Plummer's Island, August – lectotype female [pinned] (MCZ-ENT-0011538) (MCZ); Minnesota, Wabasha, Wabasha County, 44.383330 N, 92.066670 W, el. 345m, 15.viii.1941, Peters – 1 male [pinned] (UMSP000014637) (UMPS); Brown Co. Cottonwood R., Flandrau S.P., N 44º17.545', W 94º28.134', 0.2.viii.1999, DC Houghton – 1 male [pinned] (UMSP000118402) (UMSP); Ohio, Put-in-Bay, 8.viii.26, G. Townsend – lectotype male of *Nyctiophylax marginalis* [pinned] (MCZ-ENT 0001635) (MCZ); COSTA RICA: Guanacaste, Parque Nacional Guanacaste, Río Tempisquito, Maritza, 10.958000, -85.497000, el. 550 m, 19-20.vii.1987, Holzenthal, Morse & Clausen – 1 male [pinned] (UMSP00048550) (UMSP); **Brazil**: Amapá, Amapá, #2 Rio Amapá Grande, Cachoeira Grande, 2º9'43.1" N, 50º55'17.3" W, el. 36 m, 07-08.viii.2015, N. Hamada – 1 male [alcohol] (ENT 3268) (INPA); Amazonas, Barcelos, (#09) Rio Demeni, 0º38'5.3" S, 62º51'52.3" W, el. 34m, 24-25.ix.2014, AMO Pes, GRD Gomes, D Colpani – 1 male [alcohol] (ENT 3258) (INPA); Nova Olinda do Norte: (#9) Foz do Rio Abacaxis, 3º56'17.5" S, 58º47'19.5" W, el. 10 m, 09-10.viii.2015, A.M. Pes, N. Hamada, P. Barcelos-Silva – 1 male [alcohol] (ENT 3266) (INPA); (#3) Igarapé Socoró, 4º16'59.1" S, 58º35'35.5" W, el. 47 m, 06.viii.2015, A.M. Pes, N. Hamada, P. Barcelos-Silva – 2 males [alcohol] (ENT 3267, 3269) (INPA); Unterer Rio Madeira, etwa 20 km voder Mundung des Madeira in den Amazonas, 10.ix.1960, (A-11), E.J. Fittkau – 5 females and 1 male [alcohol] (NMNH); Goiás, Colinas do Sul: Encontro das águas, Rio São Miguel, GO-2013-025, 14º16'21.2" S, 47º54'56" W, el. 527 m, 27.x.2013. DM Takiya, BM Camisão E, CC Gonçalves – 3 males [alcohol] (ENT 3085, 3086, 3087) (INPA); Mato Grosso, Poconé: Foz Ipiranga, Pousada Piuval, Charco no rio (charco 5). 16º23'9.9" S, 56º37'17" W, el. 114 m, 28.vii. 2013, B Clarkson, BHL Sampaio, N Ferreira Jr. – 1 male [alcohol] (ENT 3095) (DZRJ); Minas Gerais, Rio Paraúna, 3 km S, Santana do Riacho. 19º10.986' S, 43º43.485'W. el. 650 m, 11.xi.2001, Holzenthal, Paprocki, Blahnik, Amarante – 16 males and 4 females [alcohol] (UMSP000093146) (UMSP).

Distribution: Argentina, Brazil, Costa Rica, Ecuador, El Salvador, Mexico, Panama, Paraguay, Suriname, Uruguay, U.S.A., Venezuela.

Cyrnellus mammillatus Flint 1971

(Fig. 116)

Flint, 1971:30 [Type locality: Brazil [Edo. Amazonas], Lago des Rio Luna am oberen Teil; NMNH; [male]; —Flint, 1982:21 [distribution]; —Flint, 1996b:391 [distribution]. —Angrisano, 1994:138 [distribution]. —Blahnik et al., 2004:5 [distribution]. —Cohen, 2004:76 [checklist]. —Paprocki et al., 2004:16 [checklist]. —Angrisano and Scanga, 2007:7 [checklist]. —Calor, 2011:323 [checklist]. —Dumas et al., 2010:9 [distribution]. —Souza et al., 2013:9 [distribution]. —Paprocki and França, 2014:84 [checklist].

This species is very similar to *C. collaris*, especially in the shape of the inferior appendage in ventral view, and the subgenital plate in lateral view. It differs by having straighter inferior appendages, rather than recurved ventrad such as in *C. collaris*, and the position of the point of the apicomesal lobe, at mid-length of the lobe in *C. mammillatus* and more at the anterior margin in *C. collaris*. In addition, in dorsal aspect, the phallotremal sclerite in *C. mammillatus* is lyre-shaped, with broad base and sinuous lateral arms, while in *C. collaris* the sclerite is more complex, with heavily sclerotized apical margin.

Adult. Length of forewing 3 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 116A, C), in lateral view, reversed L-shaped, apparently fused with intermediate appendage dorsally; ventrally elongate. Tergum IX and X (Fig. 116A, B) membranous, fused with intermediate appendage; fused structure, in lateral view, rectangular, with ventrolateral margins membranous, extending laterad; in dorsal view, quadrate. Main body of preanal appendage (Fig. 116A, B) ovate, setose, not exceeding intermediate appendage complex; mesobasal process shorter than main body of appendage, slightly curved apicodorsad. Inferior appendage (Fig. 116A, C), in lateral view, broad basally, slightly curved anterodorsad, then recurved posteriad, narrowing to round apex; in ventral view, posterior margins round; mesal margin concave basad of apicomesal spines, slightly expanding into mesal setose circular lobes, with internal ridge and sparsely setose mesal margin; apicomesal lobe broad, sclerotized, with small pointy apex, directed mesad. Phallus (Fig. 116D, E) elongate, phallic sclerite in lateral view, indistinct, linear, sinuous; in dorsal view distinct, lyre-shaped sclerite, with sinuous lines, constricted at posterior end, broad basally. Subgenital plate, in lateral view, globular, with rounded apex, pointing posteroventrad.

Material examined: Brazil: Lago des Rio Luna am oberen Teil, nicht weit von der Einmündung des Flusses, 23.ix.1960, Lichtfang (A-22-2), E.J. Fittkau – holotype male [alcohol] (NMNH); São Paulo, Estação Biológica de Boracéia, Rio Claro, at Poço Verde, 22º38.843'S, 45º52.492"W, el. 840 m, 18.ix.2002, Blahnik, Prather, Melo, Forehlich, Silva – 1 male [pinned] (UMSP000088016) (UMSP); **Ecuador:** Orellana, Reserva de Biodiversidad Tiputini, small stream, Harpia Trail, 00.63496ºS, 76.14602"W, el. 240 m, 22.x.2011, Holzenthal & Ríos-Touma – 25 males and 5 females [alcohol] (UMSP00138274) (UMSP); **Peru:** Madre de Dios, Manú Biosphere Reserve, 10 km S. of Pakitza, Lat -12.116670, Long -70.966670, el. 250 m, 13-14.ix.1988, Flint & Friedburg – 1 male [pinned] (UMSP000146405) (UMSP).

Distribution: Argentina, Brazil, Ecuador, Paraguay, Peru, Uruguay.

Cyrnellus minimus Banks 1913, new status

(Fig. 117)

Banks, 1913:88 [Type locality: Camp 41, 360 Kilometers from Porto Velho, Brazil, and Madeira Mamoré River, Matto Grosso, Brazil (Mann coll.); MCZ; [male]. – Flint, 1967:5 [synonym].

Cyrnellus kesken Oláh, 2016:158 [male]. **NEW SYNONYM**

This species is very similar to *C. fraternus*, and for many years, *C. minimus* was considered its junior synonym. However, they differ by the absence of secondary mid ridge in the ventral aspect of the inferior appendage, while that ridge occurs in *C. fraternus*, separating a less setose body internally and the rest of the segment more setose in its mid-width and laterally. In addition, the apicomesal lobe point in *C. minimus* is more apical, while in *C. fraternus* it is more sub-apical. Based on the published description, *C. kesken* is the junior synonym of *C. minimus*, since the major difference the author mentioned was of the shape of the ventral projection of segment X, a very membranous and variable structure.

Adult. Length of forewing 3.0 – 4.0 mm, n = 4. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 117A, C), in lateral view, reversed L-shaped, apparently fused with intermediate appendage dorsally; ventrally subquadrate. Tergum IX and X (Fig. 117A, B) membranous, fused with intermediate appendage; fused structure, in lateral view, nearly square, with ventrolateral margins membranous, extending laterad; in dorsal view, trapezoidal. Main body of preanal appendage (Fig. 117A, B) digitate, setose, exceeding intermediate appendage complex; mesobasal process shorter than main body of appendage. Inferior appendage (Fig. 117A, C), in lateral view, broad basally, curved abruptly dorsad in mid-length, than slightly recurved posteriad, narrowing to round apex; in ventral view, posterior margins round; mesal margin concave basad of apicomesal spines, expanding into mesal setose circular lobes, without internal ridge, with whole body densely setose; apicomesal lobe elongate, tapering to sclerotized hook, directed mesad. Phallus (Fig. 117D, E) short, phallic sclerite in lateral view, indistinct, basally broad, slightly curved, with constriction at mid-length; in dorsal view distinct, as arc-shaped sclerite, slightly constricted on anterior quarter, with posterior ends narrow. Subgenital plate, in lateral view, elongate, pointing posteriad.

Material examined: Brazil: Camp 41, 360 km from Porto Velho, Madeira Mamoré River, Mann. 10 Sept. 1960, E.J. Fittkau – lectotype male of *Cyrnellus minimus* [pinned] (MCZ-ENT 00011806) (MCZ); Mato Grosso, Poconé: Foz Ipiranga, Pousada Piuval, Charco no rio (charco 5). 16º23’9.9” S, 56º37’17” W, el. 114 m, 28.vii. 2013, B Clarkson, BHL Sampaio, N Ferreira Jr. – 2 males [alcohol] (ENT 3090, 3093) (DZRJ); Mato Grosso do Sul, Ladário, Lago próx. À pousada vitória régia, 19º01’10.02” S, 57º33’02.07” W, el. 89 m, 17.ix.2008, A.M. Sanseverino – 2 males [alcohol] (DZRJ 2225 - ENT 3071, 3072) (DZRJ).

Distribution: Argentina, Brazil.

Cyrnellus misionensis Flint 1983

(Fig. 118)

Flint, 1983:33 [Type locality: Argentina, Pcia. Misiones, Arroyo Piray Mini, Rt. 17 W Dos Hermanas; NMNH; [male].

This species is similar to *C. risi* in the posteriad direction of the apicomesal lobe point, located sub-apically. It differs mainly by the length of the apicomesal lobe point, much more elongate in *C. misionensis* than in *C. risi*. In addition, this structure projects below the ventral margin of the inferior appendage in lateral view in *C. misionensis*.

Adult. Length of forewing 4.5 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 118A, C), in lateral view, reversed L-shaped, apparently fused with intermediate appendage dorsally; ventrally trapezoidal. Tergum IX and X (Fig. 118A, B) membranous, fused with intermediate appendage; fused structure, in lateral view, nearly square, with ventrolateral margins membranous, extending laterad; in dorsal view, narrower at base. Main body of preanal appendage (Fig. 118A, B) ovate, setose, not exceeding intermediate appendage complex; mesobasal process as long as main body of appendage, with short basal branch. Inferior appendage (Fig. 118A, C), in lateral view, elongate, slightly curved anterodorsally, narrowing to round apex; in ventral view, posterior margins round; mesal margin straight basad of apicomesal spines, with similar width along body of appendage, without internal ridge, with whole body densely setose; apicomesal lobe sub-apical, with broad base tapering to a sclerotized hook, directed posteriad. Phallus (Fig. 118D, E) elongate, phallic sclerite in lateral view, indistinct, basally narrow, slightly curved, with constriction at midlength; in dorsal view indistinct. Subgenital plate, in lateral view, subtriangular, pointing posteroventrad.

Material examined: Argentina: Misiones, Arrroyo Piray Mini, Rt. 17 W Dos Hermanas, 23.xi.1973, O.S. Flint, Jr. – holotype male [pinned] (NMNH).

Distribution: Argentina.

Cyrnellus rianus Flint 1983

(Fig. 119)

Flint, 1983:33 [Type locality: Argentina, Pcia. Entre Ros, Arroyo P. Verne, 4 km N Villa San José; NMNH; [/male/]. —Angrisano and Scanga, 2007:7 [checklist].

This species is similar to *C. risi* by ventral aspect of the inferior appendages, with apicomesal lobe pointing posteriad. However, the apicomesal lobe in *C. rianus* is much longer and positioned at the mid-length of the appendage, while in *C. risi*, the lobe point is located sub-apically.

Adult. Length of forewing 4.5 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 119A, C), in lateral view, reversed L-shaped, apparently fused with intermediate appendage dorsally; ventrally subquadrate. Tergum IX and X (Fig. 119A, B) membranous, fused with intermediate appendage; fused structure, in lateral view, nearly square, with ventrolateral margins membranous, extending laterad; in dorsal view, quadrate. Main body of preanal appendage (Fig. 119A, B) digitate, setose, exceeding intermediate appendage complex; mesobasal process shorter than main body of appendage, slightly curved apicodorsad. Inferior appendage (Fig. 119A, C), in lateral view, narrow basally, slightly curved anterodorsally, with broad round apex; in ventral view, posterior margins round; mesal margin straight basad of apicomesal spines, with similar width along body of appendage, without internal ridge and whole body densely setose; apicomesal lobe sub-basal, elongate, tapering to sclerotized hook, directed posteriad. Phallus (Fig. 119D, E) short, phallic sclerite in lateral view, indistinct, basally broad, slightly curved, with constriction at mid-length; in dorsal view distinct, as horseshoe-shaped sclerite, with sinuous lines, slightly broader at anterior fourth. Subgenital plate, in lateral view, elongate, pointing posteroventrad.

Material examined: Argentina: Entre Ríos, Arroyo P. Verne, 4 km N. Villa San José, 15.xi.1973, O.S. Flint, Jr. – holotype male [pinned] (NMNH); **Brazil:** Pará, ca. 60 km S. of Altamira, Rio Xingu Camp, 3º39'S, 52º22'W, 8-12.x.1986, P. Spangler & O. Flint – 1 male [pinned] (NMNH).

Distribution: Argentina, Brazil, Uruguay.

Cyrnellus risi **(Ulmer 1907)**

(Fig. 120)

(Ulmer), 1907a:40 [Type locality: Buenos Aires; ZSZMH; [/male/; in *Cyrnus*]. —Banks, 1913:88 [to *Cyrnellus*.]. —Flint, 1971:31 [[/male/;G, distribution, lectotype; distribution]; —Flint, 1982:22 [distribution]. —Angrisano, 1994:138 [distribution]. —Blahnik et al., 2004:5 [distribution]. —Cohen, 2004:76 [checklist]. —Paprocki et al., 2004:16 [checklist]. —Angrisano and Scanga, 2007:7 [checklist]. —Barcelos et al., 2012:1278 [checklist]. —Paprocki and França, 2014:84 [checklist].

This species is similar to the southern species *C. misionensis* and *C. rianus*, in the posteriad direction of the apicomesal lobe sclerotized point, and the general shape of the phallotremal sclerite. However, the apicomesal lobe in *C. risi* is generally short and broad, not surpassing the ventral margin of the inferior appendages in lateral aspect, such as in *C. misionensis*, and is placed sub-apically, not at mid-length of the inferior appendages, like in *C. rianus*.

Adult. Length of forewing 4 mm, n = 1. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 120A, C), in lateral view, reversed L-shaped, apparently fused with intermediate appendage dorsally; ventrally trapezoidal. Tergum IX and X (Fig. 120A, B) membranous, fused with intermediate appendage; fused structure, in lateral view, nearly square, with ventrolateral margins membranous; in dorsal view, quadrate. Main body of preanal appendage (Fig. 120A, B) digitate, setose, exceeding intermediate appendage complex; mesobasal process shorter than main body of appendage. Inferior appendage (Fig. 120A, C), in lateral view, narrow basally, slightly curved dorsally, with broad round apex; in ventral view, posterior margins round; mesal margin straight basad of apicomesal spines, with similar width along body of appendage, with internal ridge and sparsely setose mesal margin; apicomesal lobe subapical, broad, tapering to sclerotized hook, directed mesad. Phallus (Fig. 120D, E) elongate, phallic sclerite in lateral view, indistinct, basally narrow, slightly curved, with constriction at midlength; in dorsal view distinct, as horseshoe-shaped sclerite, with sinuous lines, posterior ends round and laterally curved hooks. Subgenital plate, in lateral view, subtriangular, pointing posteroventrad.

Material examined: Brazil: São Paulo, Piracicaba, 11.xi.1965, C.A. Triplehorn – 1 male [alcohol] (NMNH); **Guyana:** Upper Takuktu - Upper Essequibo, Rupununi R., 3º45.1'N, 59º18.6'W, 31.iii-2.iv.1994, Oliver S. Flint Jr. – 4 males and 1 female [alcohol] (NMNH); **Perú:** Madre de Dios, Rio Tambopata Res, 30 air km, SW. Puerto Maldonado, el. 290 m, 21-25.xi.1979, J.B. Heppner – 1 male [alcohol] (NMNH); **Suriname:** Coppename R., Tonckens Falls, 31.vii.1943, Geijskes – 1 male [alcohol] (NMNH); **Uruguay:** Taquarembó, Río Taquarembó, Taquarembó Chico, 20.i.1960, C.S. Carbonell – 1 male [alcohol] (NMNH); **Venezuela:** Bolívar state, Acampamento Río Aro, Río Aro, 07º37.443'N, 64º08.324'W, el. 90 m, 10-11.vii.2010, U.V. lights, Holzenthal & Thomson – 11 males [pinned] (UMSP000137519 – UMSP 000137530) (UMSP).

Distribution: Argentina, Brazil, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela.

Cyrnellus ulmeri Flint 1971

(Fig. 121)

Flint, 1971:32 [Type locality: Brazil [Edo. Pará], Rio Tocantins im hause des Ingenieurs von Rio Impex; NMNH; /male/]; —Flint, 1996b:391 [distribution]. —Angrisano, 1994:138 [distribution]. —Paprocki et al., 2004:16 [checklist]. —Angrisano and Scanga, 2007:7 [checklist]. —Paprocki and França, 2014:85 [checklist].

Cyrnellus kozepes Oláh, 2016:159 [male]. **NEW SYNONYM**

Although other species also have bifid points of the apicomesal lobe of the inferior appendage, such as *C. bifidus* and even *C. arotron*, this species is unique. In *C. ulmeri*, the points are contiguously sclerotized, with the spines aligned on the ventral margin, and not separated as in *C. arotron*. In *C. bifidus*, the bifid point of the apicomesal lobe of the inferior appendages are apical, and in *C. ulmeri*, the lobe is more sub-apical. Based on the published description, *C. kozepes* is the junior synonym to *C. ulmeri*, since the major differences the author mentioned were the phallic sclerite and position of apicomesal lobe of the inferior appendage, which are either difficult to discern or variable, and the shape of the ventral projection of segment X, a very membranous and highly variable structure.

Adult. Length of forewing 3.5 – 4.0 mm, n = 2. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 121A, C), in lateral view, reversed L-shaped, apparently fused with intermediate appendage dorsally; ventrally trapezoidal. Tergum IX and X (Fig. 121A, B) membranous, fused with intermediate appendage; fused structure, in lateral view, rectangular, with ventrolateral margins membranous, extending laterad; in dorsal view, quadrate. Main body of preanal appendage (Fig. 121A, B) digitate, setose, not exceeding intermediate appendage complex; mesobasal process shorter than main body of appendage. Inferior appendage (Fig. 121A, C), in lateral view, elongate, slightly curved anterodorsally, narrowing to round apex; in ventral view, posterior margins round; mesal margin concave basad of apicomesal spines, slightly expanding into mesal setose circular lobes, with internal ridge and sparsely setose mesal margin; apicomesal lobe broad, in bifid sclerotized spines, directed mesad. Phallus short (Fig. 121D, E), phallic sclerite in lateral view, indistinct, as 2 pairs of parallel lines, anterior being shorter and posterior longer; in dorsal view distinct, horseshoe-shaped. Subgenital plate, in lateral view, subtriangular, pointing posteroventrad.

Material examined: Brazil: Rio Tocantins Im Hause des Ingenieurs von Rio Impex, 5.xi.1960, Lichtfang (A-50-2), E.J. Fittkau – holotype male [alcohol] (NMNH); **Argentina:** Tucuman, Concepción, 19.ii.1970, L.E. Pena G. – 1 male [pinned] (NMNH).

Distribution: Argentina, Brazil, Peru, Uruguay.

Cyrnellus zapatariensis Chamorro-Lacayo 2003

(Fig. 122)

Chamorro-Lacayo, 2003:485 [Type locality: Nicaragua, Granada, Isla Zapatera, El Bambú, Frente a Lago de Nicaragua, 11º45.829’N, 85º51.991’W, el. 42 m; UMSP; /male/]. — Chamorro-Lacayo et al., 2007:46 [checklist].

This species is similar to *C. minimus* by the shape of the apicomesal lobe point of the inferior appendage, and the lack of secondary mid ridge of the same appendage in ventral view. However, it differs by the slightly more truncate inferior appendage in lateral view, and the lobes positioned even more apically in *C. zapatariensis*.

Adult. Length of forewing 4.5 mm, n = 2. Head and thorax typical for the genus.

Male genitalia. Sternum IX (Fig. 122A, C), in lateral view, reversed L-shaped, apparently fused with intermediate appendage dorsally; ventrally subquadrate. Tergum IX and X (Fig. 122A, B) membranous, fused with intermediate appendage; fused structure, in lateral view, nearly square, with ventrolateral margins membranous, extending laterad; in dorsal view, quadrate. Main body of preanal appendage (Fig. 122A, B) digitate, setose, not exceeding intermediate appendage complex; mesobasal process shorter than main body of appendage. Inferior appendage (Fig. 122A, C), in lateral view, broad basally, curved abruptly dorsad in mid-length, narrowing to round apex; in ventral view, posterior margins round; mesal margin concave basad of apicomesal spines, expanding into mesal setose circular lobes, without internal ridge and whole body densely setose; apicomesal lobe narrow, in acute sclerotized spine, directed mesad. Phallus (Fig. 122D, E) short, phallic sclerite in lateral view, indistinct, basally broad, slightly curved, with constriction at mid-length; in dorsal view distinct, as U-shaped sclerite, slightly constricted on anterior quarter, with posterior ends narrow. Subgenital plate, in lateral view, elongate, slightly curved apicoventrad.

Material examined: Nicaragua: Granada, Isla Zapatera, El Bambú, Frente a Lago de Nicaragua, 11º45.829'N, 85º51.991'W, el. 42 m, 19.vii.2001, Chamorro, Martinez, Ruiz – holotype male [alcohol] (UMSP000066725) (UMSP); Granada, 20.v.1988, Valle S. – 1 male [alcohol] (UMSP000066726) (UMSP).

Distribution: Nicaragua.

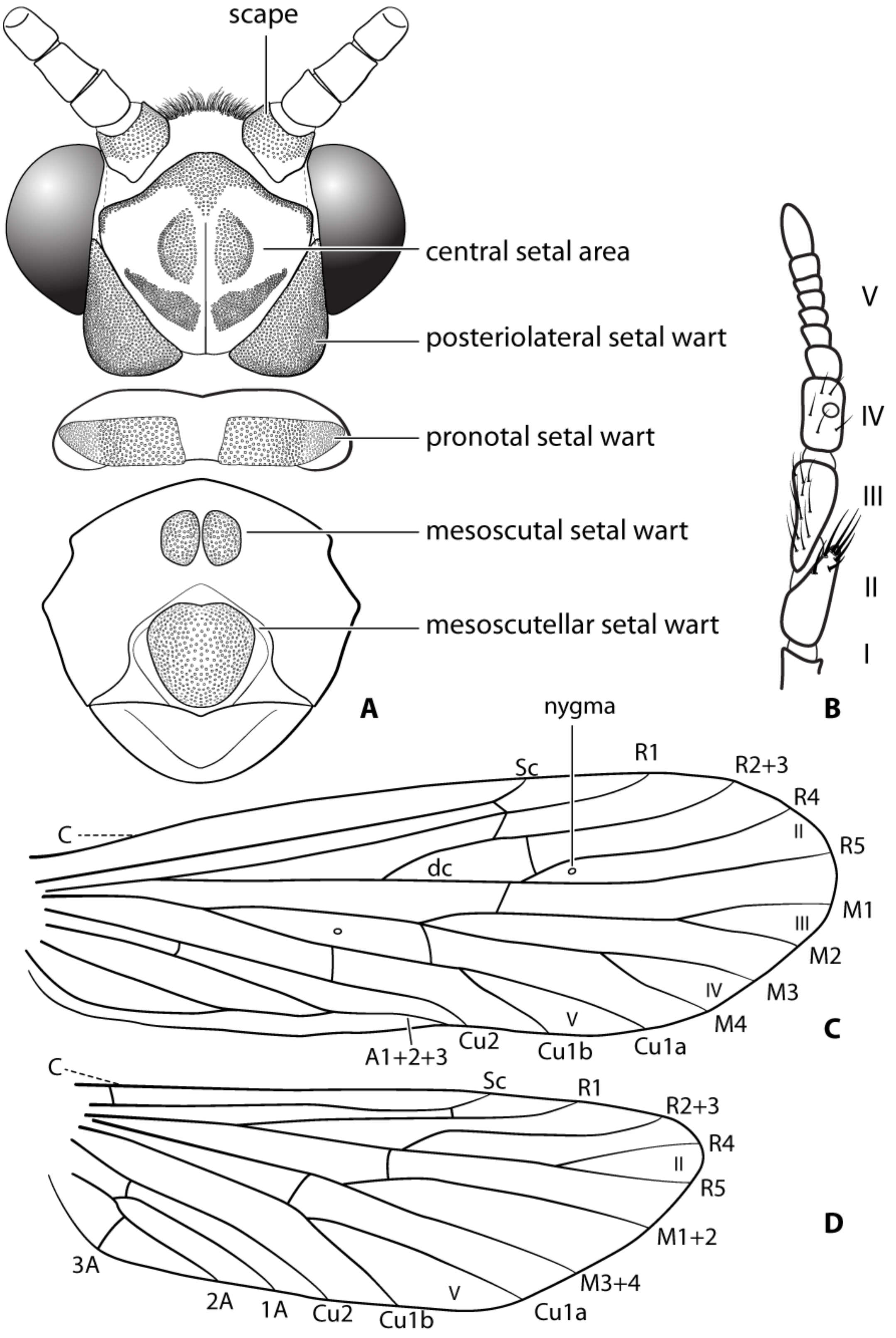

Figure 110. Morphology of adult *Cyrnellus*. *Cyrnellus fraternus*: A – head and thorax; B – maxillary palp with enumerated palpomeres; C – forewing; D – hind wing.

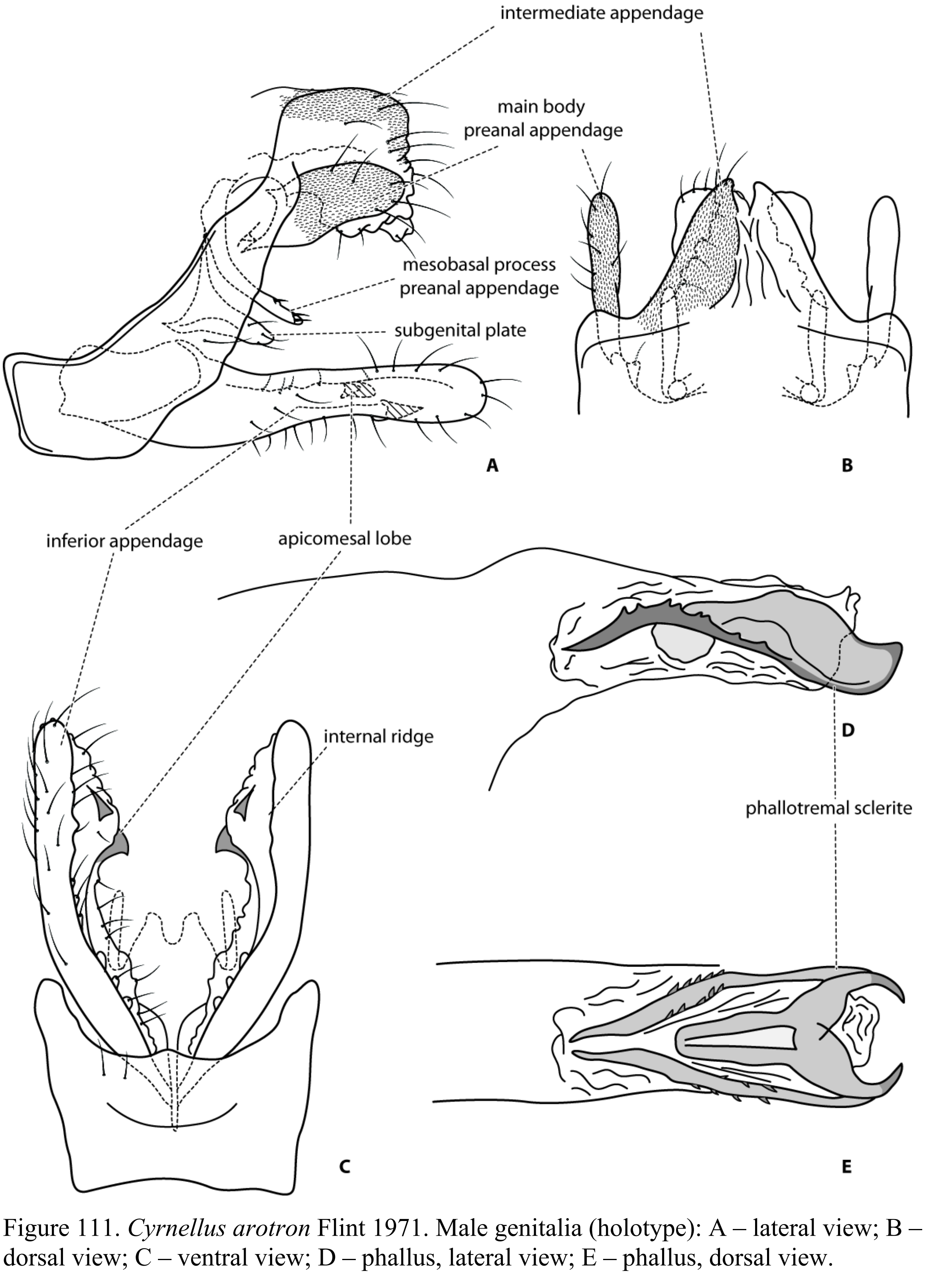

Figure 111. *Cyrnellus arotron* Flint 1971. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

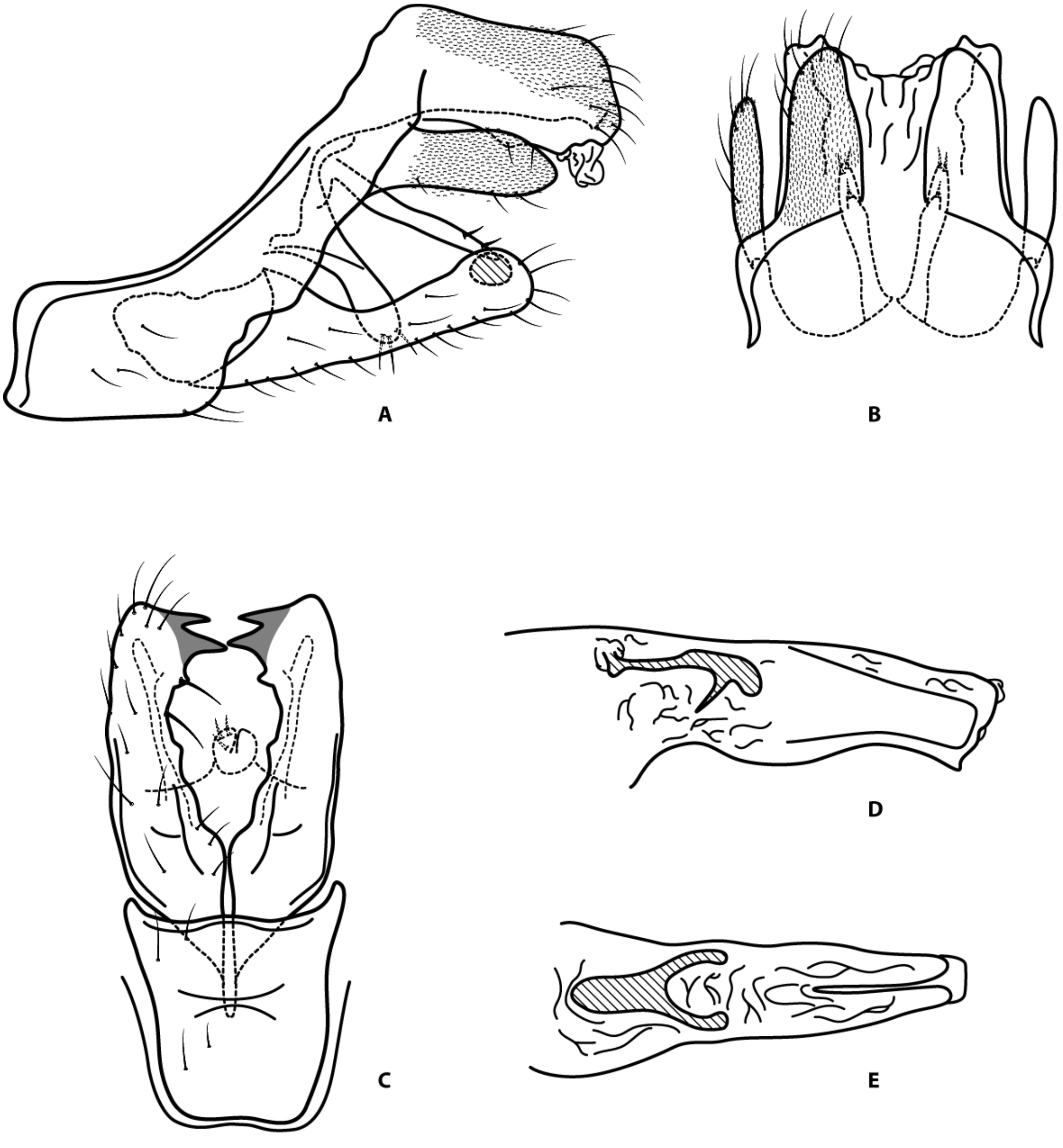

Figure 112. *Cyrnellus bifidus* Flint 1971. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

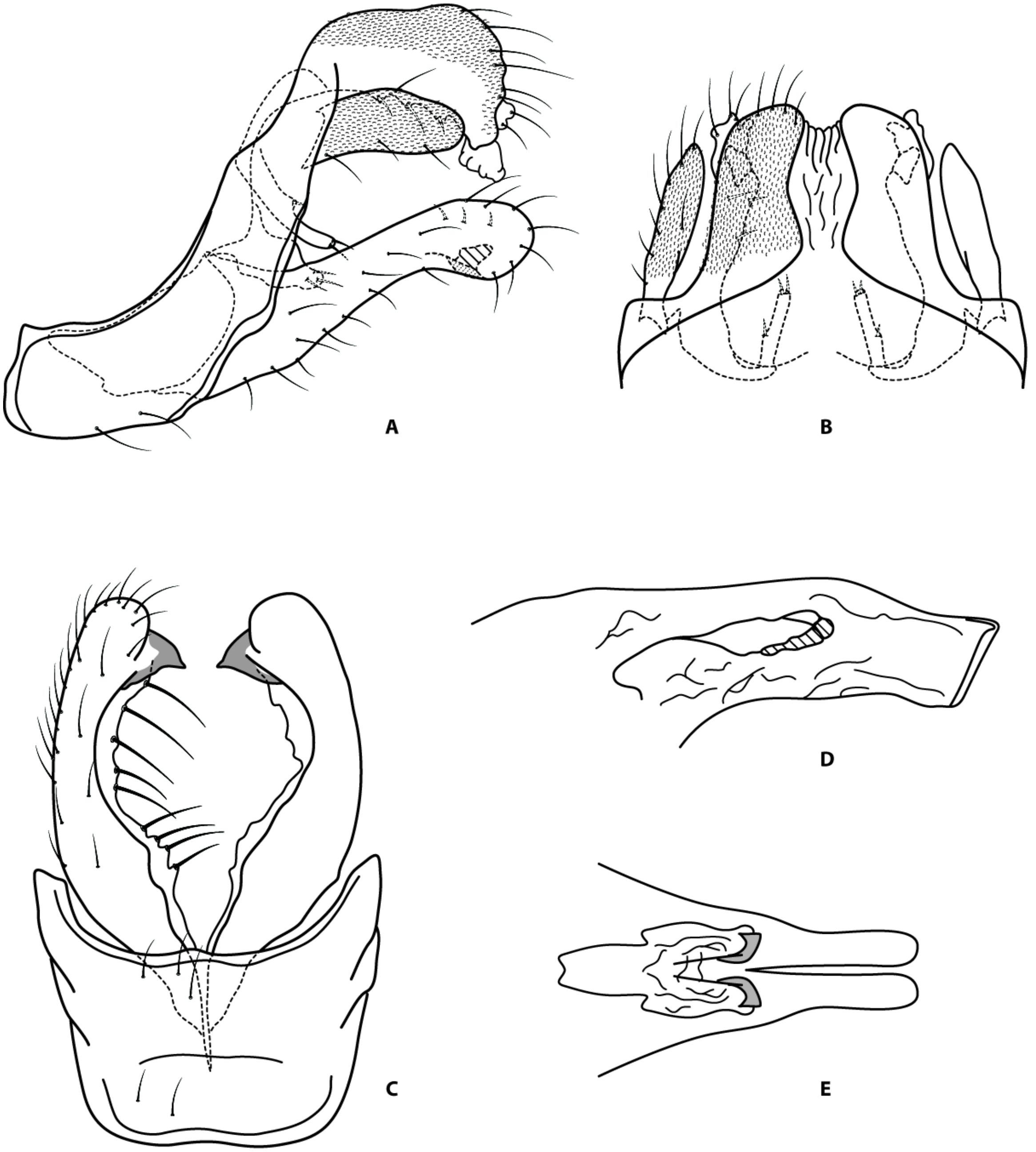

Figure 113. *Cyrnellus collaris* Flint 1971. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

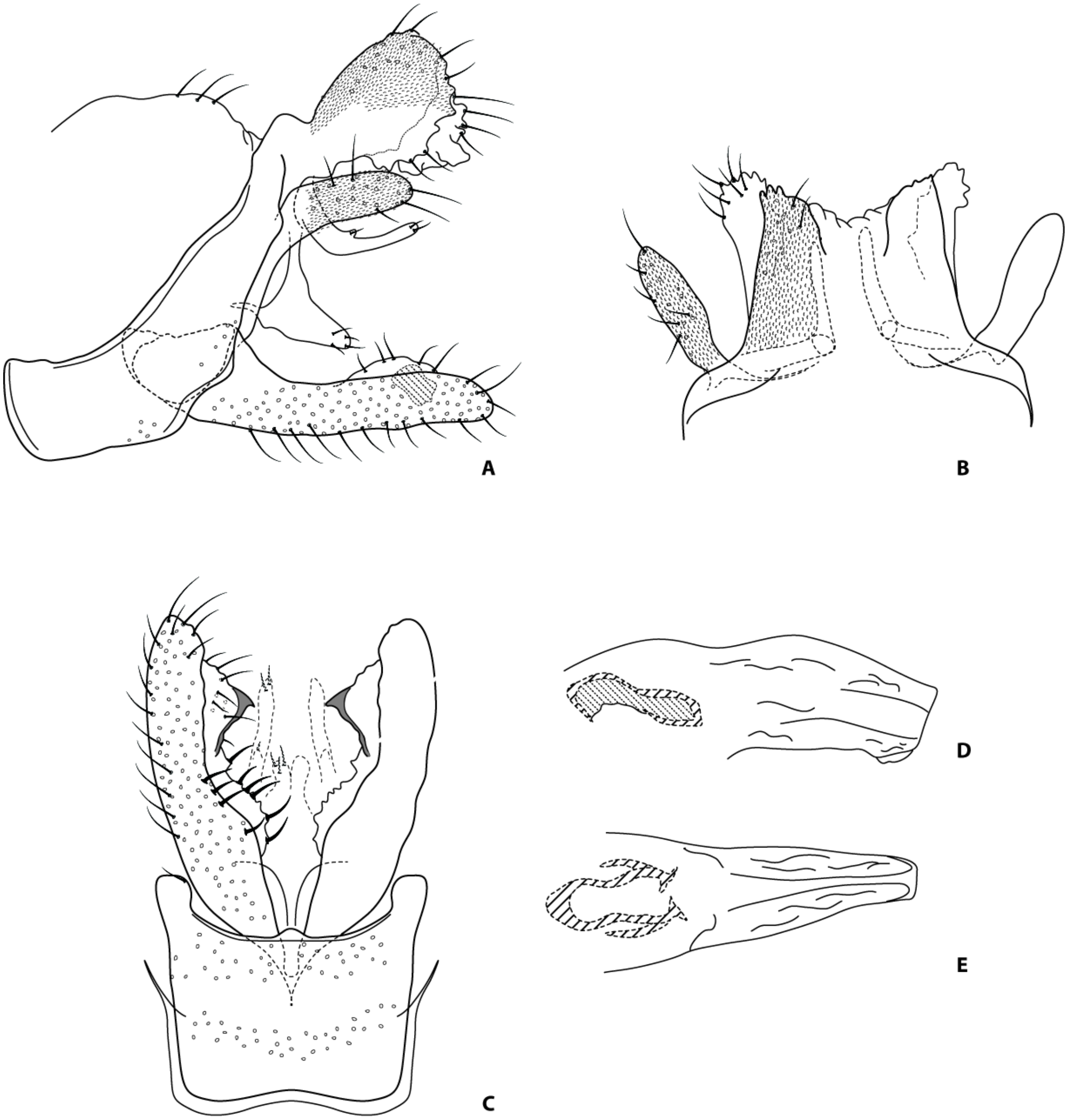

Figure 114. *Cyrnellus fraternus* (Banks 1905). Male genitalia (specimen from Minnesota): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

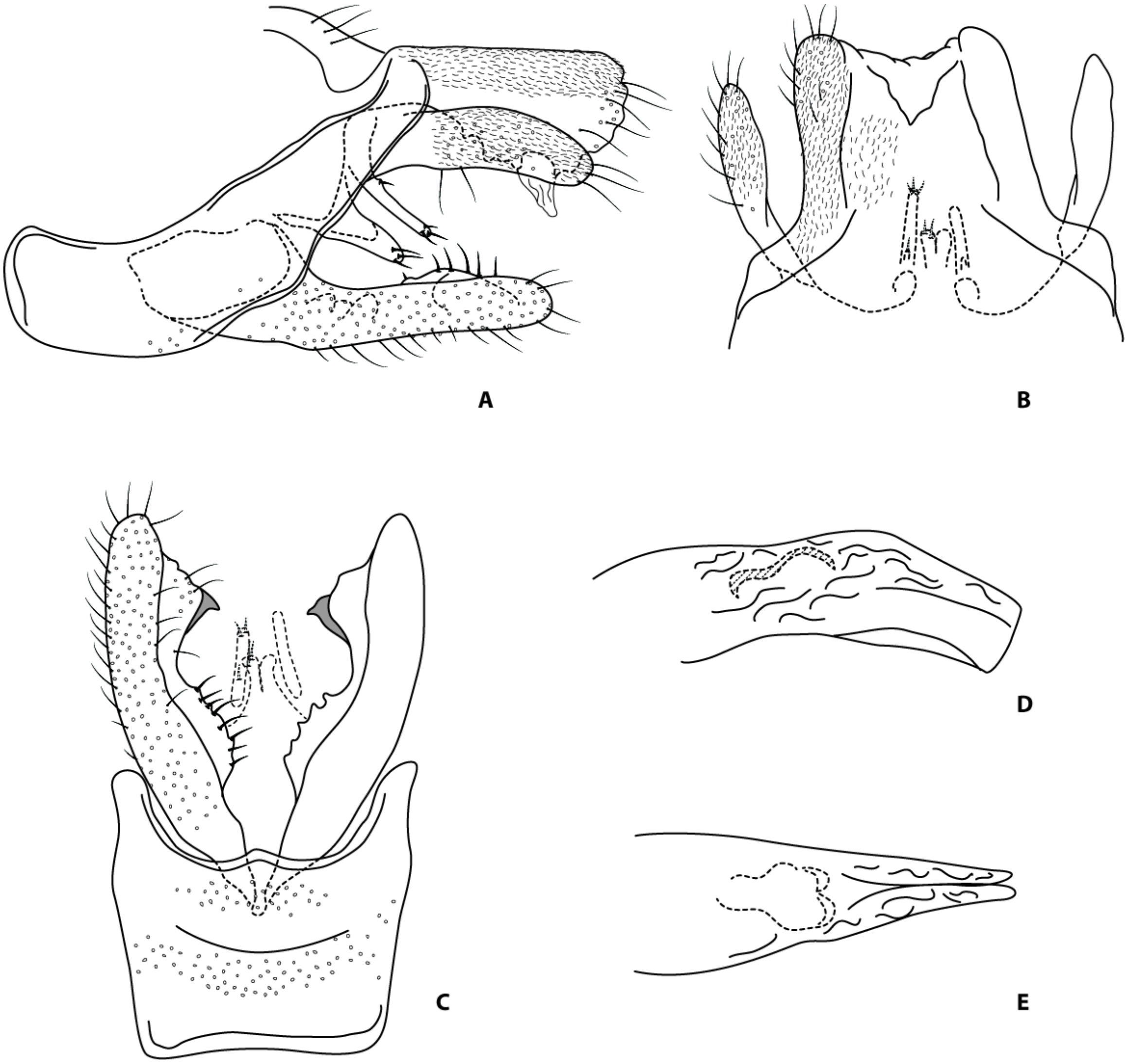

Figure 115. *Cyrnellus fraternus* (Banks 1905). Male genitalia (lectotype from *Cyrnellus marginalis*): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

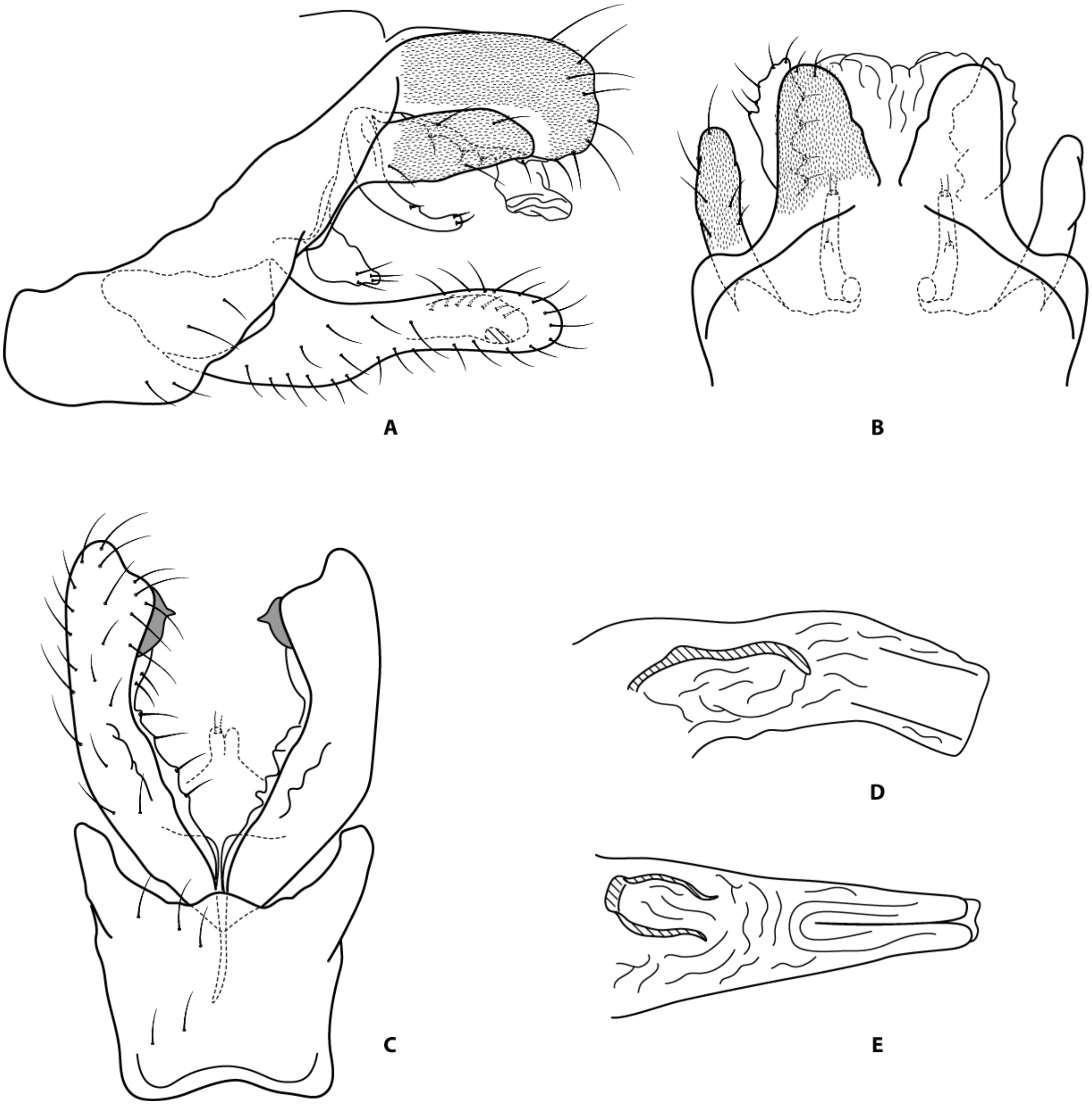

Figure 116. *Cyrnellus mammillatus* Flint 1971. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

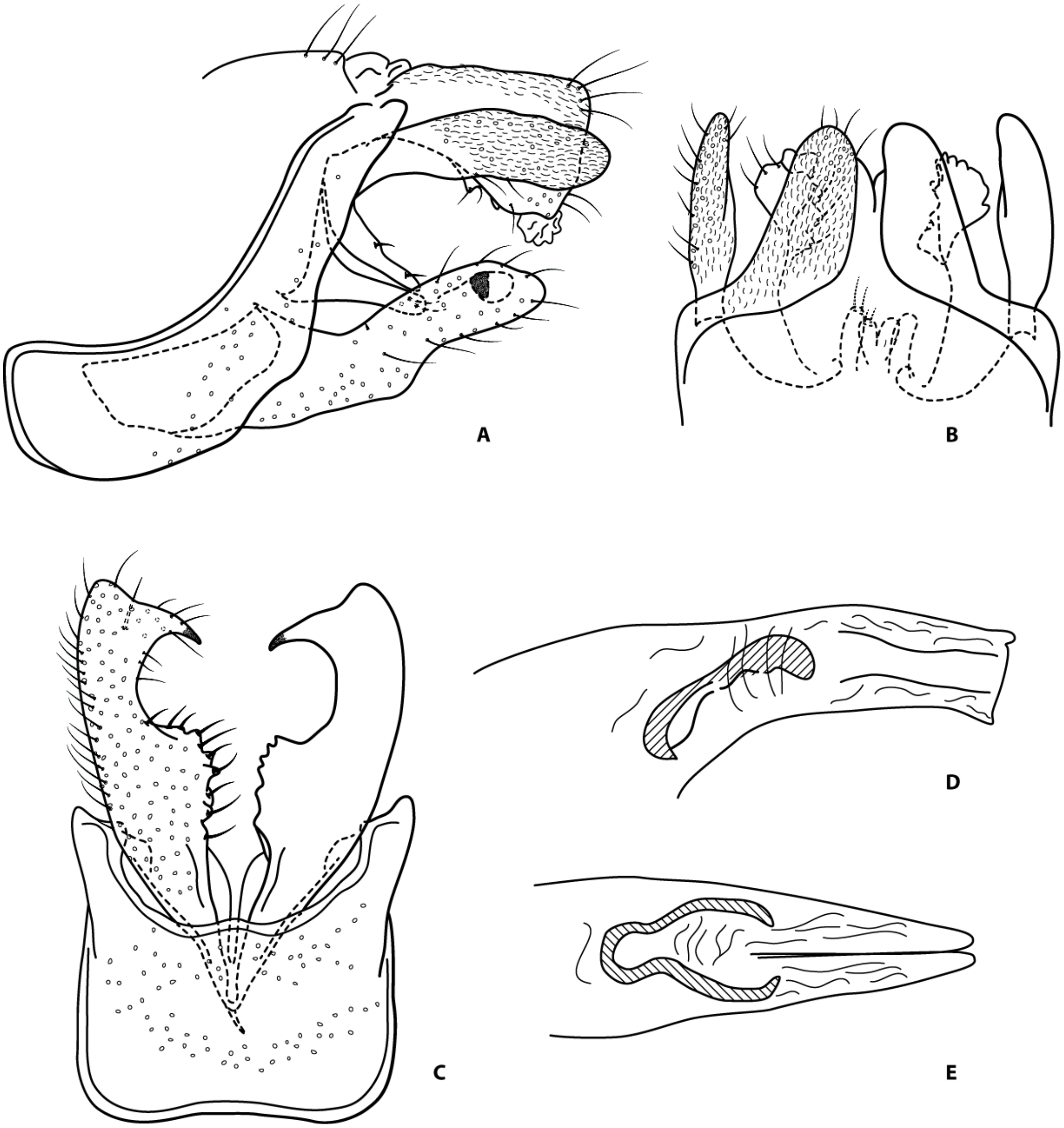

Figure 117. *Cyrnellus minimus* Banks 1913. Male genitalia (lectotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

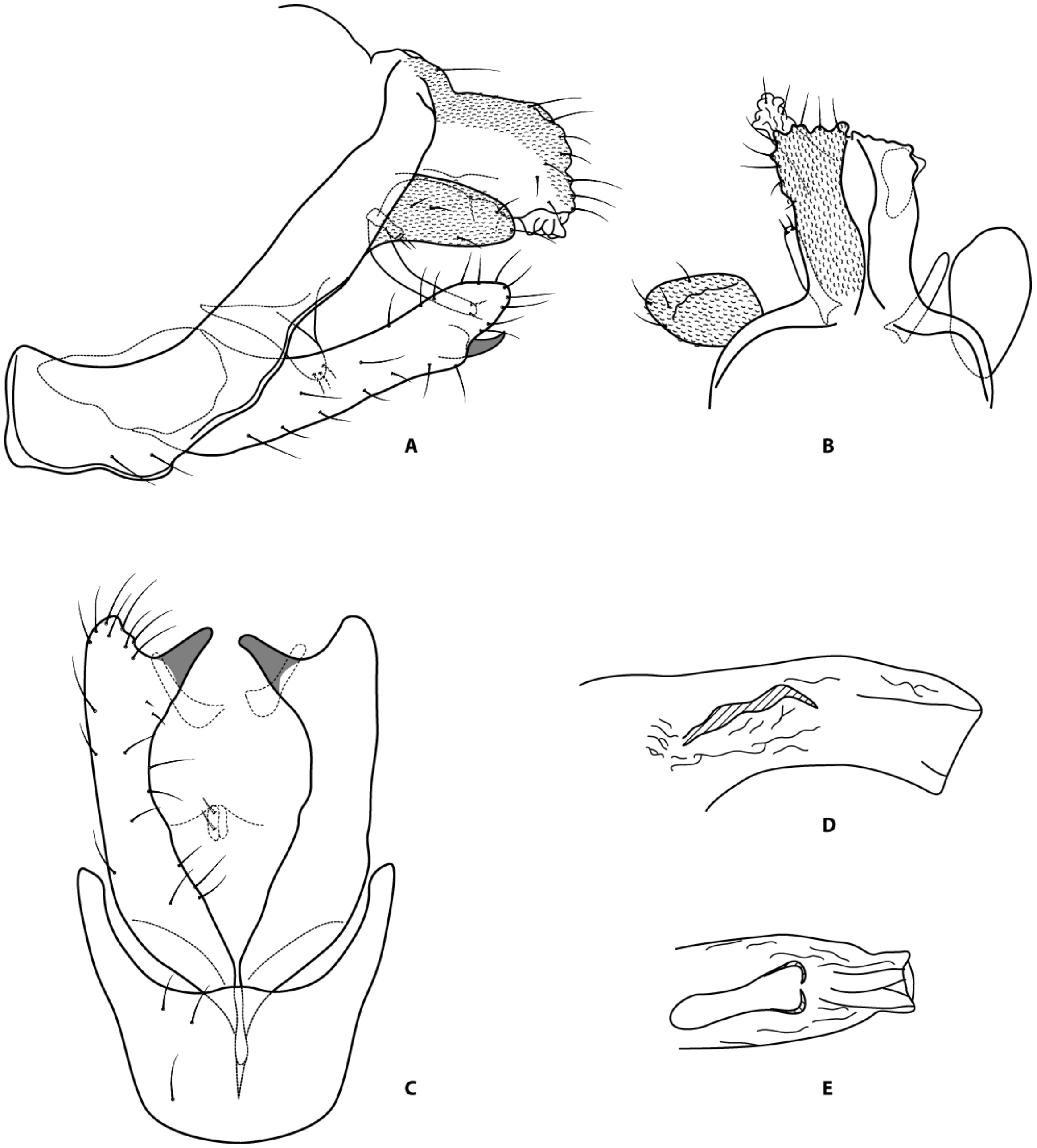

Figure 118. *Cyrnellus misionensis* Flint 1983. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

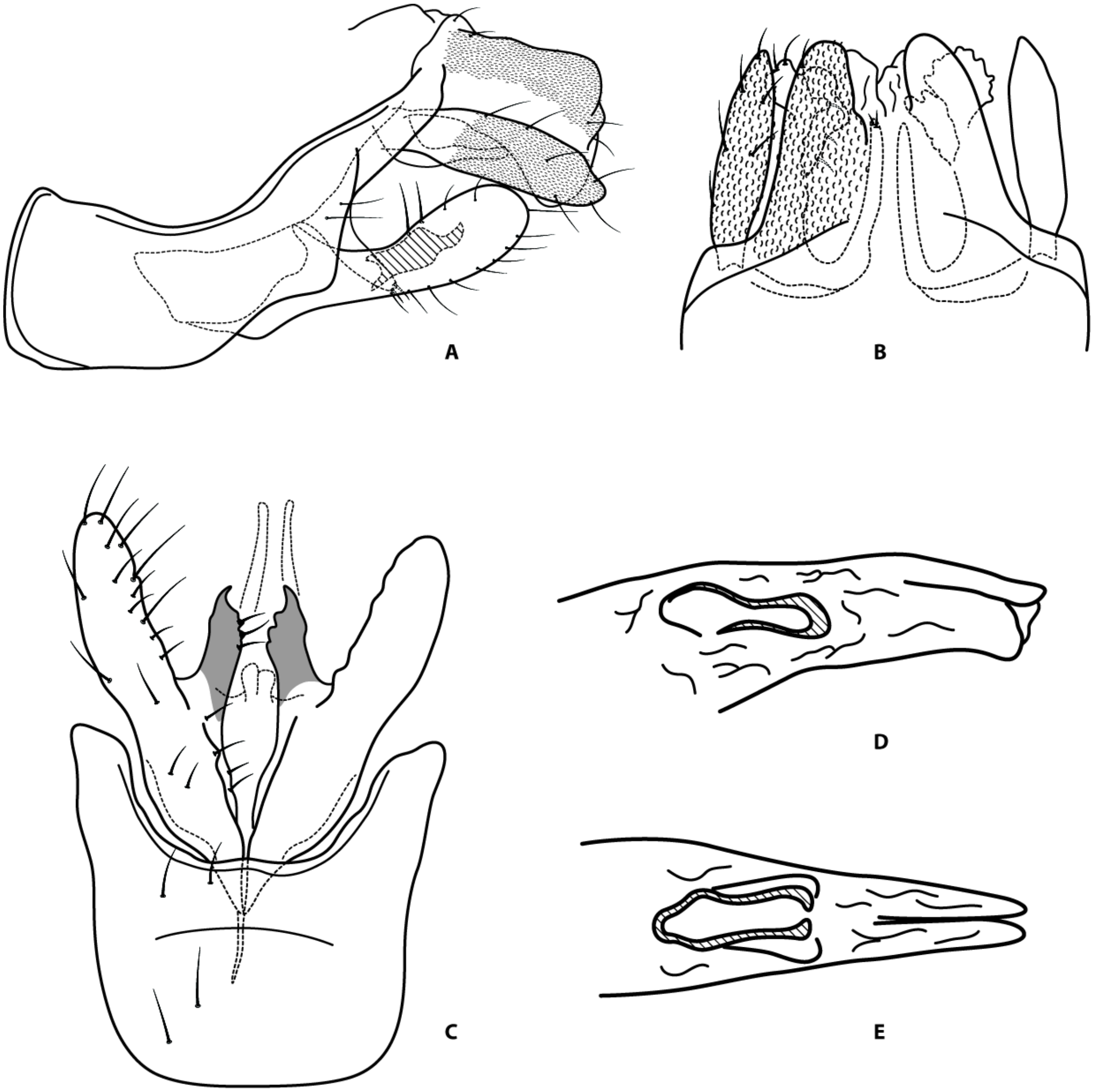

Figure 119. *Cyrnellus rianus* Flint 1983. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

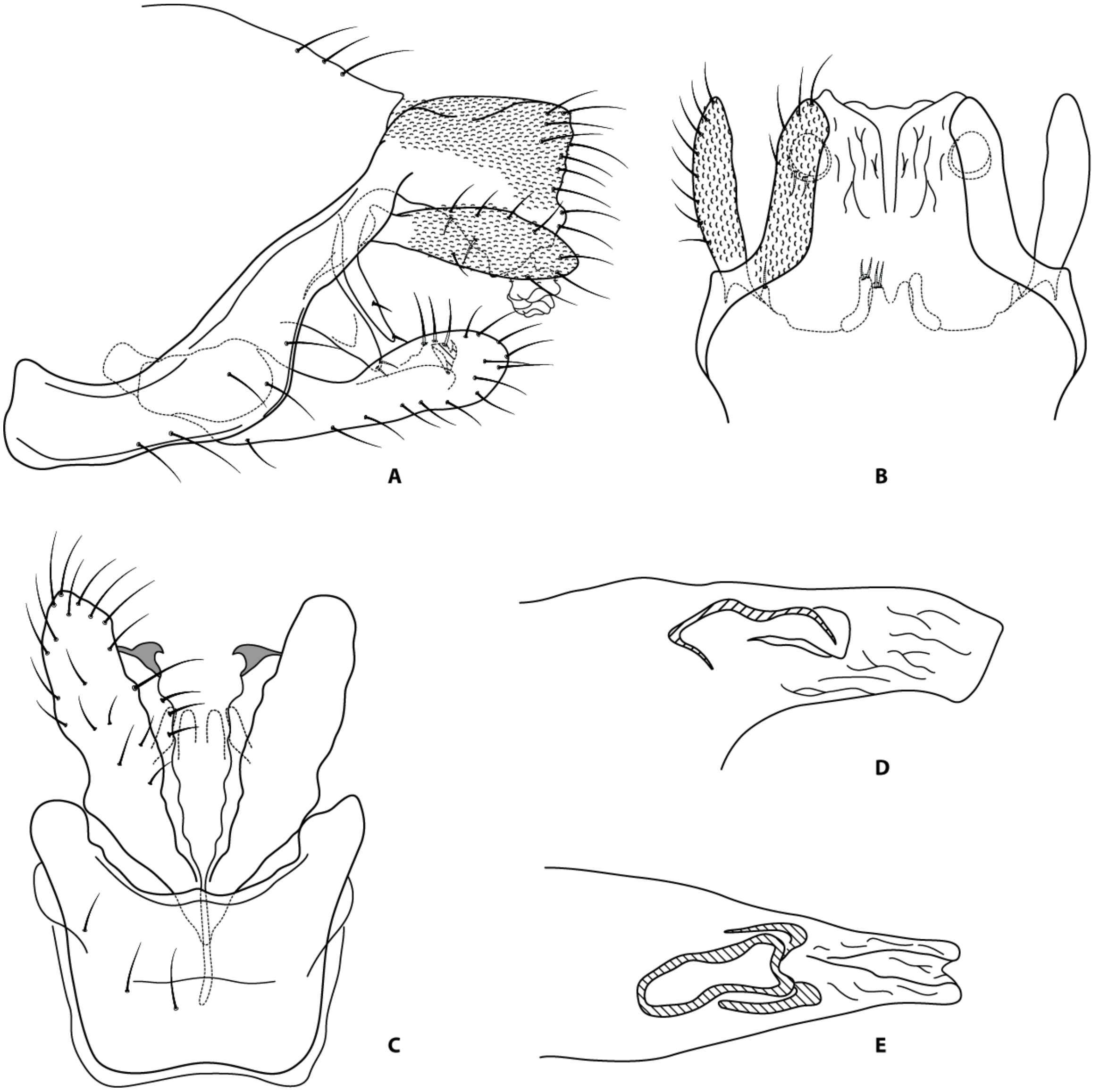

Figure 120. *Cyrnellus risi* (Ulmer 1907). Male genitalia (material from Bolívar): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

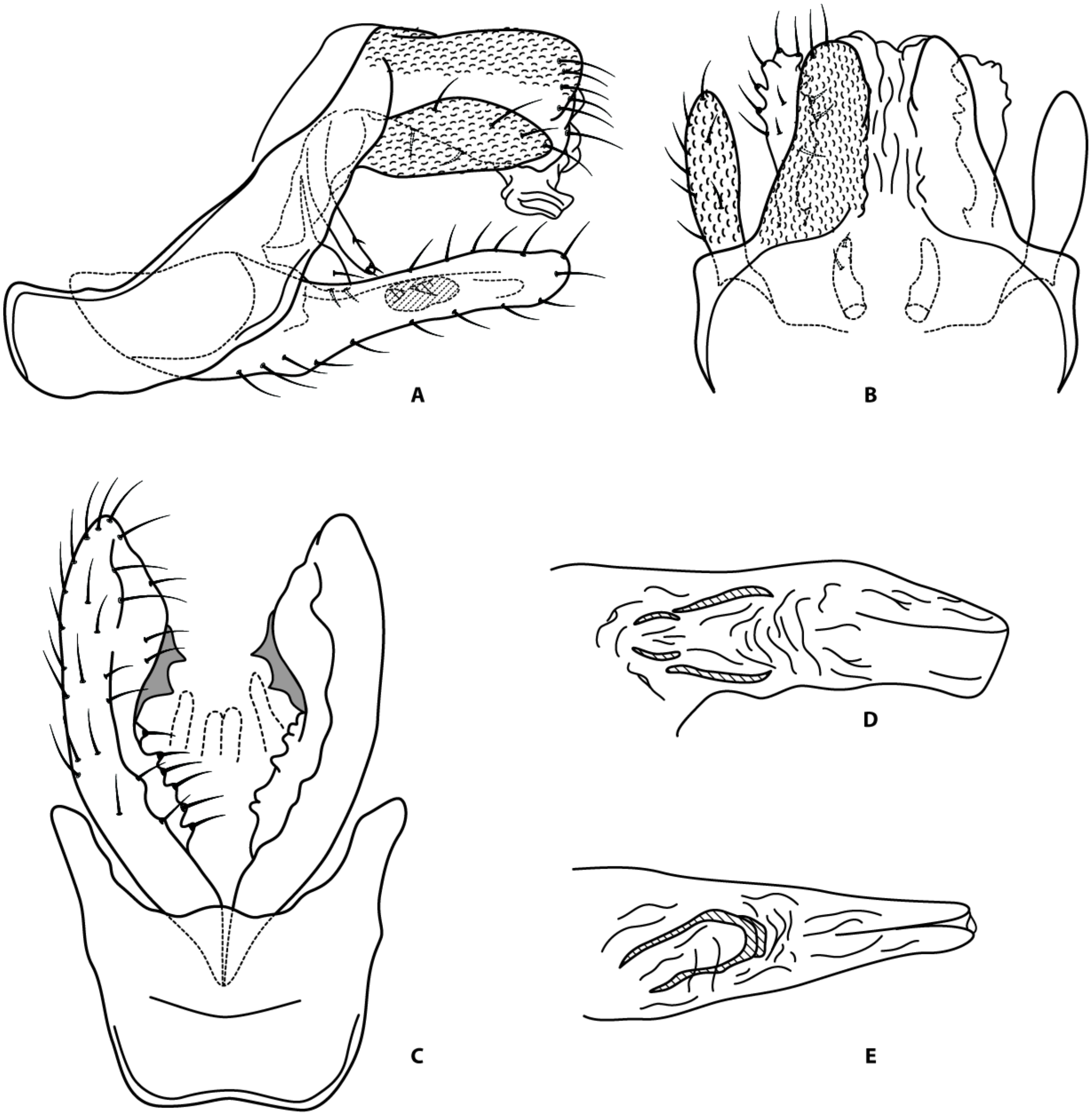

Figure 121. *Cyrnellus ulmeri* Flint 1971. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

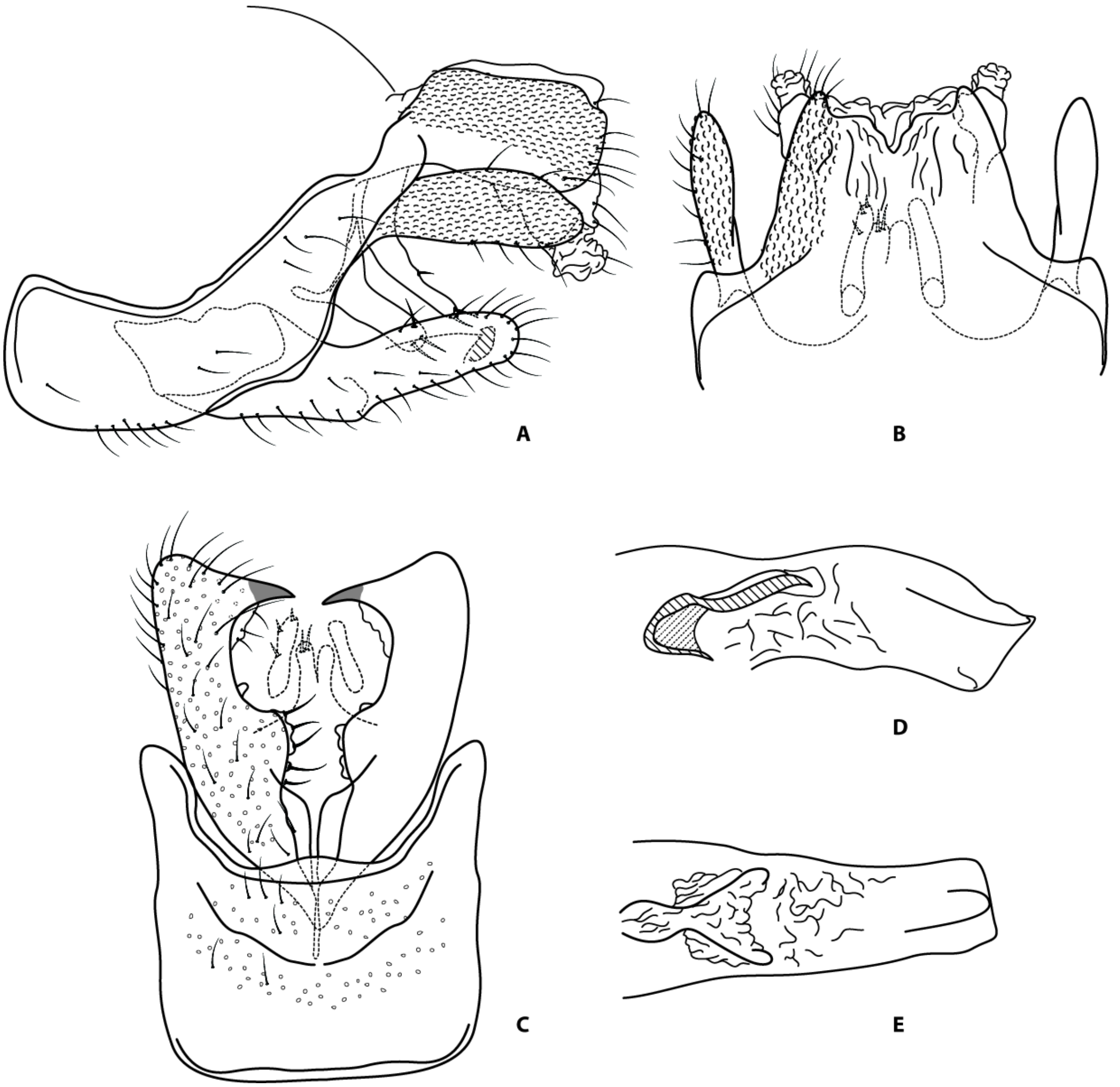

Figure 122. *Cyrnellus zapatariensis* Chamorro 2003. Male genitalia (holotype): A – lateral view; B – dorsal view; C – ventral view; D – phallus, lateral view; E – phallus, dorsal view.

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