

INSECTA MUNDI

A Journal of World Insect Systematics

0437

The Trichoptera of Panama. II. Ten new species
of microcaddisflies (Trichoptera: Hydroptilidae)

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Date of Issue: August 28, 2015

Harris, S. C. and B. J. Armitage
The Trichoptera of Panama. II. Ten new species of microcaddisflies (Trichoptera:
Hydroptilidae)
Insecta Mundi 0437: 1–17

ZooBank Registered: urn:lsid:zoobank.org:pub:2456F124-7594-4A83-8CD4-FFB440D9BAB9

Published in 2015 by

Center for Systematic Entomology, Inc.

P. O. Box 141874

Gainesville, FL 32614-1874 USA

<http://centerforsystematicentomology.org/>

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Layout Editor for this article: Brian J. Armitage

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Abstract. In the Republic of Panama, the family Hydroptilidae (Insecta: Trichoptera) is currently represented by 82 species distributed among 14 genera. In this publication we provide descriptions and illustrations for 10 new species of hydroptilids in the subfamily Hydroptilinae: Tribe Leucotrichiini—*Zumatrichia teribe* and *Z. zegla*; Tribe Neotrichiini—*Neotrichia pamela* and *N. parabullata*; and, Tribe Ochrotrichiini—*Metrichia nowaczyki*, *M. sencilla*, *Nothotrichia panama*, *Ochrotrichia abrelata*, *O. nimmoi*, and *O. pulgara*. The genus *Nothotrichia* is recorded from Panama for the first time.

Key words. Leucotrichiini, Neotrichiini, Ochrotrichiini, *Zumatrichia*, *Neotrichia*, *Metrichia*, *Nothotrichia*, *Ochrotrichia*, cuenca.

Introduction

The Hydroptilidae (Insecta: Trichoptera) is the most diverse caddisfly family taxonomically with over 2,000 species described, and geographically with distribution on all continents save Antarctica (Holzenthal et al. 2007). In the Republic of Panama, this family is represented by 82 species distributed among 14 genera (Aydeé Cornejo, pers. comm.; Armitage et al. 2015). The subfamily Hydroptilinae is by far the larger of the two subfamilies of Hydroptilidae, containing 70 genera distributed, primarily, among six tribes (Holzenthal et al. 2007). The 10 new species described in this paper add to the diversity of three of these tribes and fall within five of the genera. These tribes and genera are all restricted to the New World, with greatest diversity in the Neotropics. One of these genera, *Nothotrichia*, is recorded from Panama for the first time.

As a result of the Central American Hydrometeorological Project (UNESCO 2008), an international effort to characterize major cuencas (water basins) in Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama, and to facilitate processing and exchange of hydrographic and meteorological data, was undertaken. Panama has 52 defined cuencas (Fig. 1). The Instituto Conmemorativo Gorgas de Estudios de la Salud (Gorgas Institute) is evaluating the water quality of these, employing macroinvertebrates. We have included a cuenca descriptor (basin number) for each new recorded species and location.

Methods

The specimens were collected using UV light traps (Calor and Mariano 2012) by Aydeé Cornejo of the Gorgas Institute and the second author, or provided by Dr. R. Wills Flowers of Florida A&M University. Specimens were cleared in 10% KOH, washed, and examined under a stereozoom microscope. Drawings

were made from genitalia mounted on depression slides and examined at 250X using a Leitz compound microscope, and subsequently inked by hand. Specimens listed in this publication are stored in the Universidad de Panamá Museo de Invertebrados (MIUP), and the United States National Museum of Natural History, Smithsonian Institution (NMNH). The order of tribes follows the classification presented by Holzenthal et al. (2007), with the exception of *Nothotrichia* (Parys and Harris 2013; see Note for this genus). Terminology follows that of Marshall (1979). Length was measured from the tip of the head to the end of the wings, and given as a range when more than one individual was present. No associated females or immature stages were determined for any of these new species.

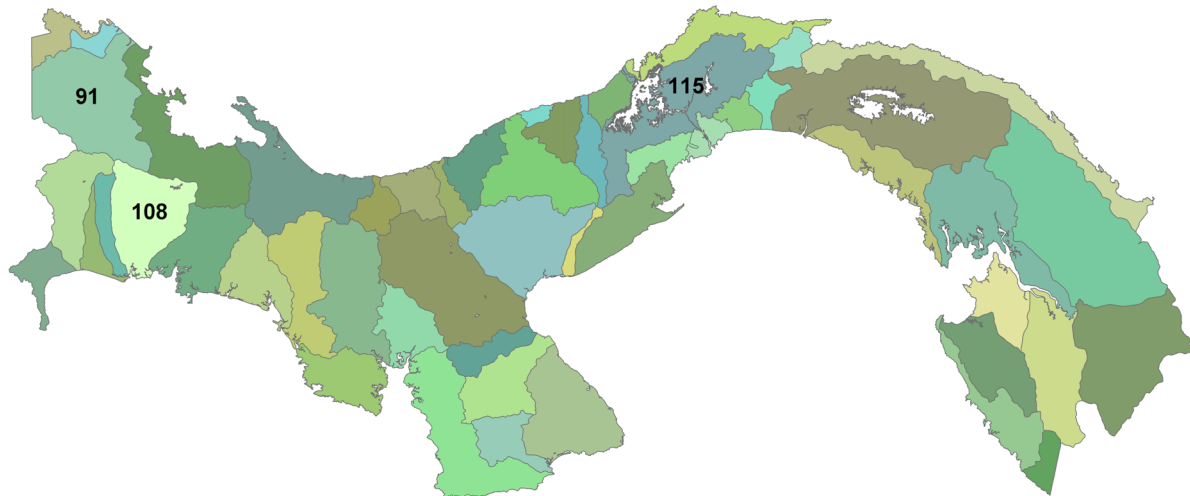


Figure 1. Major cuencas (water basins) of the Republic of Panama. New species were recorded from the cuencas indicated as follows (cuena no.—major river—cuena area): 91—Río Changuinola—3,202 km²; 108—Río Chiriquí—1,905 km²; and, 115—Río Chagres—3,338 km². More comprehensive information about all major cuencas in Panama can be found at the following web site: <http://www.hidromet.com.pa/cuencas.php?idioma=ing>.

Tribe Leucotrichiini—Genus *Zumatrichia*

The genus *Zumatrichia* is represented in the Neotropics by 48 species (Morse 2015). Fifteen of these species are currently known, and nine species were first described, from Panama. Herein, we describe two new species.

Zumatrichia teribe, new species

Fig. 2

Zumatrichia teribe is a member of the *Z. galtena* Group of Flint (1970), with the structure of the basodorsal process from the inferior appendages most similar to *Z. galtena* Mosely. While the apex of this process in the new species is spinose as in *Z. galtena*, it has an accessory spine at midlength, and the basal portion of the inferior appendage is ovate, while that of *Z. galtena* is thin and rectanguloid.

Male. Length 3.0–3.3 mm. Head without modification. Antennae of 19 segments with enlarged scape bearing large circular process. Body and unmodified wings brown in alcohol. Abdominal segment VII annular with posteroventral mesal process. Segment VIII in lateral view wide posteroventrally, tapering dorsally; in dorsal view narrow, emarginated posteriorly; ventrally divided into pair of posterior lobes. Segment IX truncate laterally, narrowing anteriorly, posterodorsally with thin lobe, laterally with elongate setal-bearing lobe; dorsally emarginate anteriorly and posteriorly. Segment X rectanguloid in lateral aspect; in dorsal view square, with posterior margin rounded. Inferior appendages with elongate, thin

basodorsal process, apically divided into 3-4 spikes, subapically with elongate spike, main body an enlarged lobe, which in ventral view is deeply incised posteriorly with numerous setae on margin. Phallus with medial ring-like process, apically enlarged and platelike, laterally with subapical point from ventral surface, internally with elongate dorsal spine and numerous anterobasal spines; in ventral aspect, two pair of posterior spines mesally, with line of basal spines.

Type material. **Holotype, male**—Chiriquí Province: **Cuenca 108**, Quebrada Grande, Boquete, Valle Escondido, below Sabor Restaurant, 8.77970°N and 82.44016°W, 1122 m asl, 2.v.2013, A. Cornejo (MIUP). **Paratypes**—ibid., 2 males (MIUP); **Bocas del Toro Province: Cuenca 91**. Río Teribe at Zegla, 20.iv.1985, R. Flowers and A. Gonzalez, 2 males (NMNH); ibid., 22.iv.1985, 1 male (NMNH).

Etymology. Named for the indigenous people of Bocas del Toros Province (the Teribe or Naso people; related to the Terraba people of Costa Rica) and for the river from which the specimens were collected.

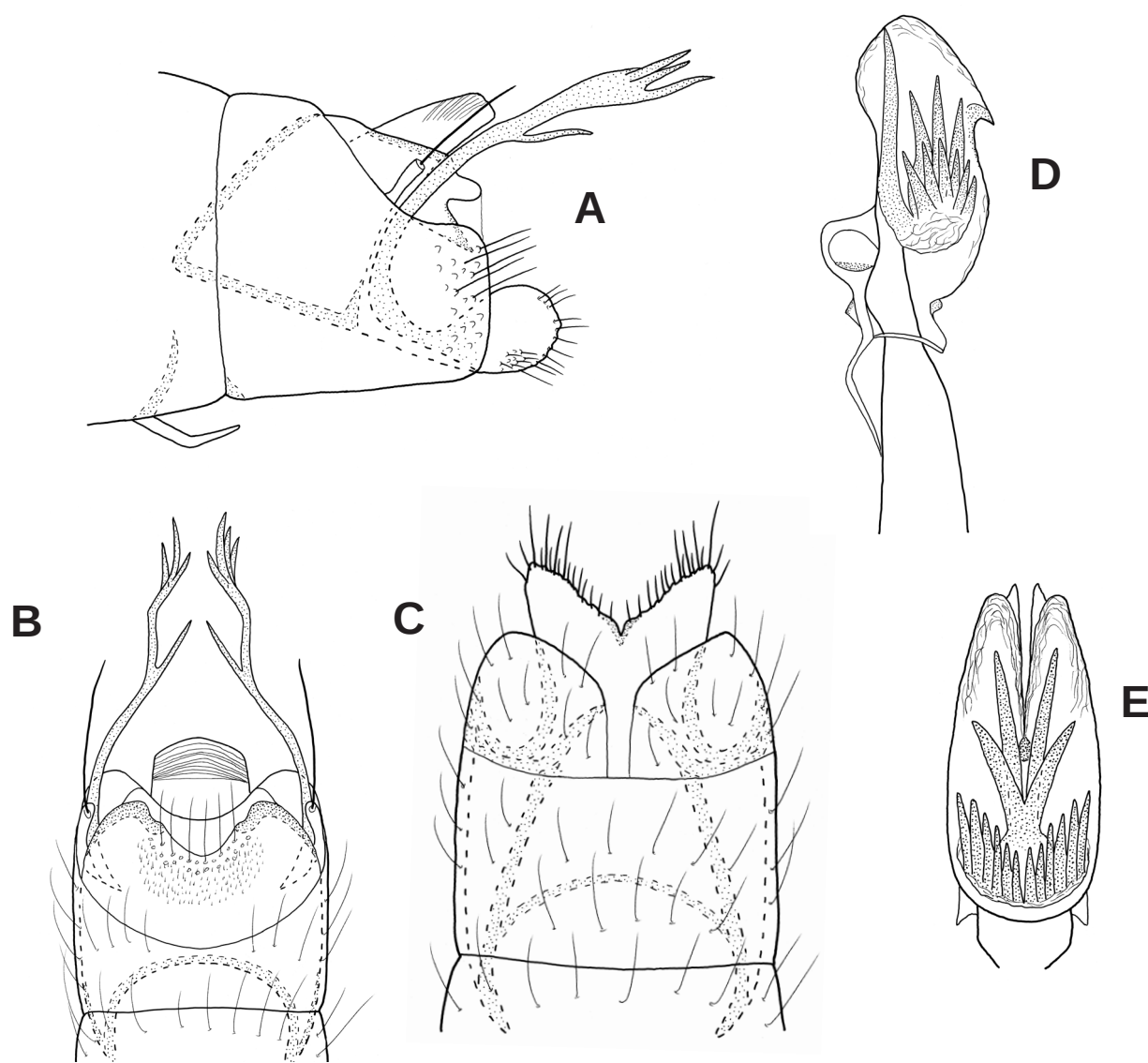


Figure 2. *Zumatruchia teribe*, sp. n., Male genitalia: A) Lateral view; B) Dorsal view; C) Ventral view; D) Phallus, lateral view; E) Phallus apex, ventral view.

Zumatrichia zegla, new species

Fig. 3

Zumatrichia zegla is a member of the *Z. filosa* Group of Flint (1970), with the sternum of abdominal segment VIII having an elongate process. It appears most similar to the Mexican species, *Z. rhamphoides* Flint and *Z. teapa* Flint, differing in the rectangular inferior appendages and the single short spine at the apex of sternal process from segment VIII.

Male. Length 3.0-3.5 mm. Head without modification. Antennae broken, but with enlarged scape, bearing large circular process. Body and unmodified wings brown in alcohol. Abdominal segment VII annular with posteroventral process. Segment VIII in lateral view wide posteroventrally with thin, elongate sternal process ending in a thick spine, tapering dorsally; in ventral view emarginate posteriorly with sternal processes laterally, extending to end of inferior appendages. Segment IX in lateral view rounded dorsally, tapering anteriorly, posterodorsally with large lobe, posteroventrally with elongate setal-bearing process; emarginate anteriorly and

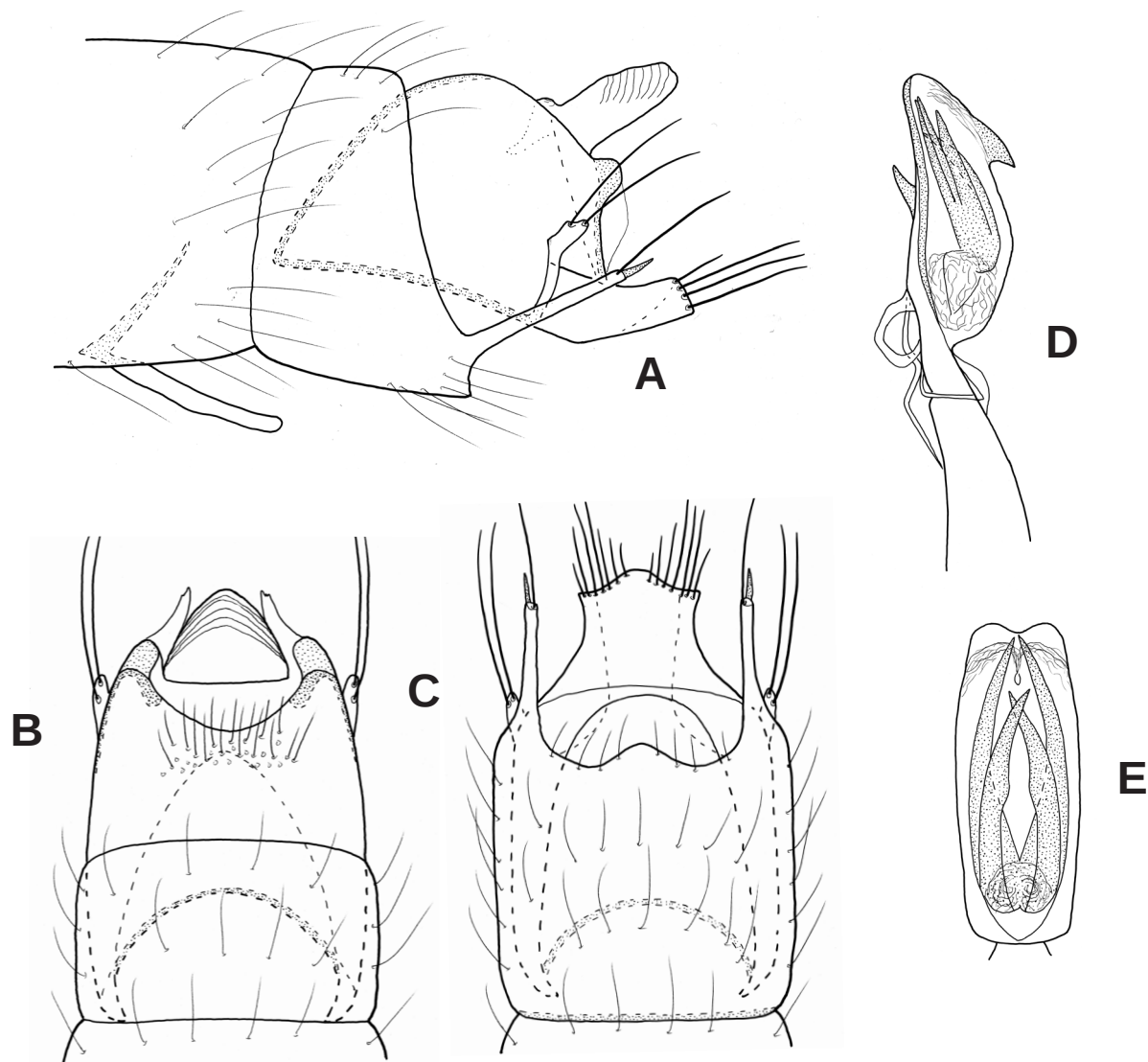


Figure 3. *Zumatrichia zegla*, sp. n., Male genitalia: A) Lateral view; B) Dorsal view; C) Ventral view; D) Phallus, lateral view; E) Phallus apex, ventral view.

posteriorly in dorsal view, with lateral lobes on dorsum. Segment X rectanguloid in lateral aspect; in dorsal view broadly triangular, with posterior margin rounded, basally with narrow lateral extensions. Inferior appendages rectanguloid in lateral view, slightly curving on ventral margin to truncate apex; in ventral view squarish with lateral margins slightly incised and posterior margin setose with mesal protuberance. Phallus with medial ring-like process, apically enlarged and platelike, laterally with subapical point from ventral surface, internally with elongate dorsal spine and several elongate midventral spines; in ventral aspect, one pair of lateral spines and one pair of mesal spines.

Type material. Holotype, male—Bocas del Toro Province: **Cuenca 91**, Río Teribe at Zegla, 20.iv.1985, R. Flowers and A. Gonzalez (NMNH). **Paratypes**—ibid., 3 males (NMNH and MIUP); ibid., 22.iv.1985, 2 males (NMNH and MIUP).

Etymology. Named for the Panamanian town of Zegla, near the Río Teribe collection locality.

Tribe Neotrichiini—Genus *Neotrichia*

The genus *Neotrichia* is represented in the Neotropics by 118 species. Four of these species are currently known, and two species were first described, from Panama. Herein, we describe two new species.

Neotrichia pamela, new species

Fig. 4

Neotrichia pamela is a member of the *N. canixa* Group of Keth et al. (in press) based on the apical horns of the tenth tergite and the bifid bracteoles, both characteristic of the group, with greatest similarity to *N. corniculans* Flint from Dominica. It differs from this species on the basis of the greatly reduced ventral branch of the bracteole, reminiscent of that of *N. sandyae* Ruiter, and the elongate, narrow lateral portion of the inferior appendages as seen in ventral view, which is much shorter and wider in *N. sandyae*.

Male. Length 1.9 mm, 18 antennal segments, brown in alcohol. Abdominal segment VIII annular. Segment IX incomplete dorsolaterally, medially truncate posteriorly, fused with tergite X dorsally, anteriorly narrowing to rounded apex; in ventral view shallowly incised on posterior margin, deeply incised anteriorly. Tergite X narrow, with pair of symmetrical, sclerotized horns distally, basally fused with segment IX, with small, lateral setal-bearing lobes; in lateral view with apical horn and lateral subapical setal-bearing lobe. Subgenital plate in lateral view narrowing distally to downturned sclerotized apex bearing elongate seta; in ventral view rectanguloid, distal and lateral margins sclerotized, apically with pair of elongate setae. Bracteoles bifid, dorsal branch elongate, with long seta apically, ventral branch greatly reduced, bearing short seta. Inferior appendages thin and elongate in lateral view with apex upturned, ventral process about $\frac{3}{4}$ length of appendage; in ventral view elongate and thin, curving slightly inward with sclerotized spike subapically, mesal processes elongate, wide basally, narrowing distally and bearing elongate apical seta. Phallus tubular, constricted at mid-length and bearing thin paramere encircling shaft, apex divided into pair of short processes, ejaculatory duct protruding distally.

Type material. Holotype, male—Chiriquí Province: **Cuenca 108**, tributary of Quebrada Grande, at waterfall, Boquete, Valle Escondido, 8.78291°N and 82.44579°W, 1253 m asl, 17.ix.2013, A. Cornejo (MIUP).

Etymology. Named for Pamela Ogurchock Harris, daughter-in-law of the senior author, in recognition of her teaching of ecology and freshwater biology to college-bound high-school students.

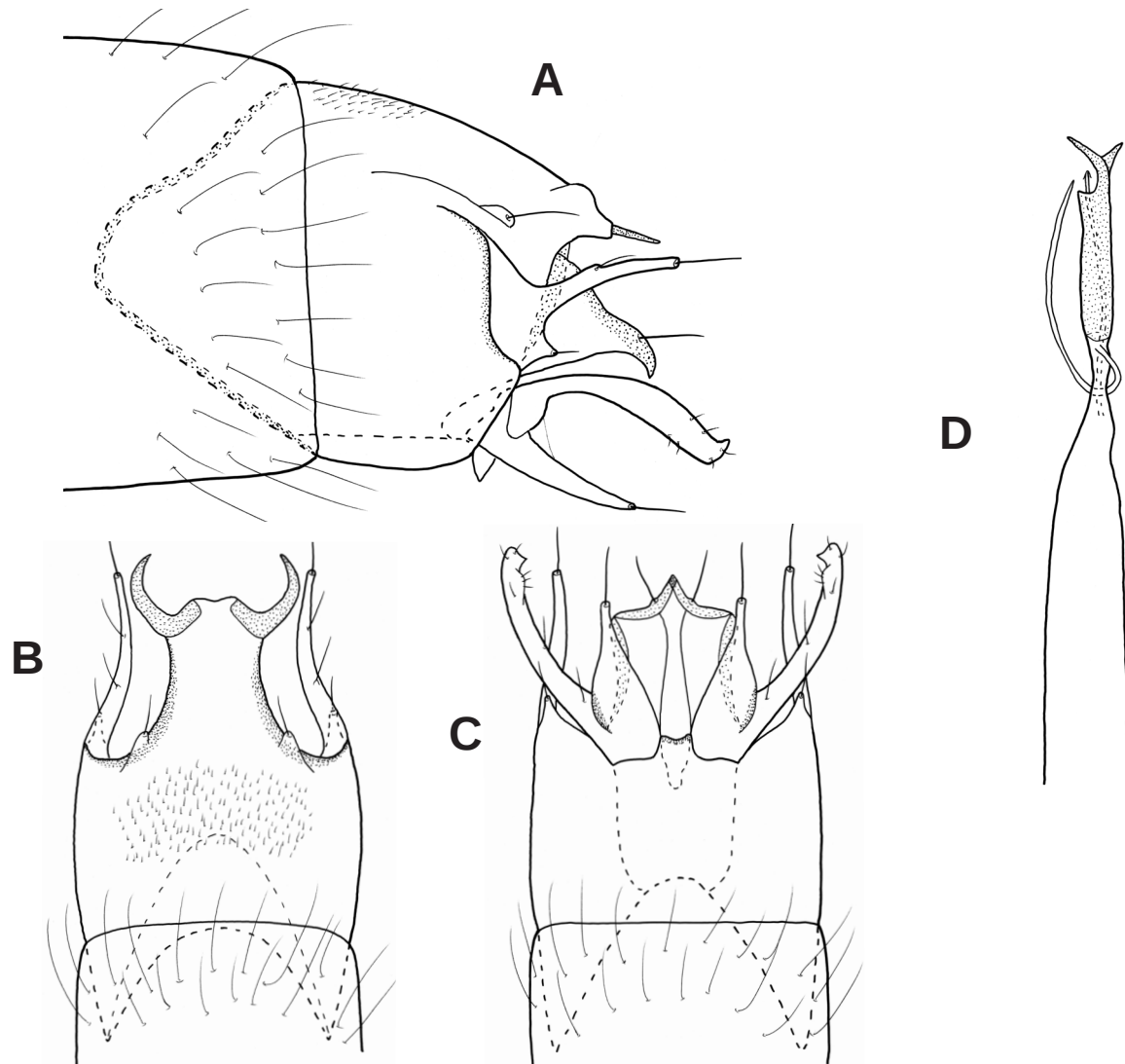


Figure 4. *Neotrichia pamela*, sp. n., Male genitalia: A) Lateral view; B) Dorsal view; C) Ventral view; D) Phallus, lateral view.

***Neotrichia parabullata*, new species**

Fig. 5

Based on the elongate inferior appendages with the distinctive serrated dorsal process, the thin bracteoles, and the phallus apex, this species resembles *N. bullata* Flint from Suriname and French Guiana. It differs in the lack of a sclerotized posterior extension of segment IX and in having an elongate ventral process from the subgenital plate which is strongly recurved. The species does not fit well into any of the species groups established in Keth et al. (in press), although it has some features represented in the *N. collata* group.

Male. Length 1.7-1.9 mm, 18 antennal segments, brown in alcohol. Abdominal segment VIII annular. Segment IX widening posteriorly in lateral view, with margins lightly sclerotized and folded, anteriorly narrowing to rounded apex; in ventral view shallowly incised posteriorly; dorsally deeply incised anteriorly, posteriorly with small lateral spikes that are the sclerotized folds on the margins, laterally forming thin lobes, which cover the base of tergite X. Segment X elongate in

lateral view, truncate distally; in dorsal view rounded apically, basally incompletely fused with segment IX and setose. Subgenital plate in lateral view elongate, subapical ventral process extending back below inferior appendages; in ventral view sinuate distally with pair of elongate lateral setae, ventral process thin apically, bulbous basally. Bracteoles elongate and thin, slightly sinuate on dorsal margins. Inferior appendages thin and elongate in lateral view with serrate, squarish dorsal process subapically, fingerlike basal process bearing apical seta; in ventral view elongate and thin, margins slightly sinuate. Phallus tubular, constricted at midlength and bearing thin paramere encircling shaft, apex truncate with pair of short, curving internal spines.

Type material. Holotype, male—Panama Canal Zone: **Cuenca 115**, Isla Abogada, 9.19903°N and 79.85980°W., 21.ix.1981, R. Kinsey (NMNH). **Paratypes**—ibid., 12 males (NMNH and MUIP); Isla Lion Hill, 9.22580°N and 79.09238°W, 26.vii.1981, R. Kinsey, 1 male (NMNH).

Etymology. Named for the resemblance to *Neotrichia bullata*.

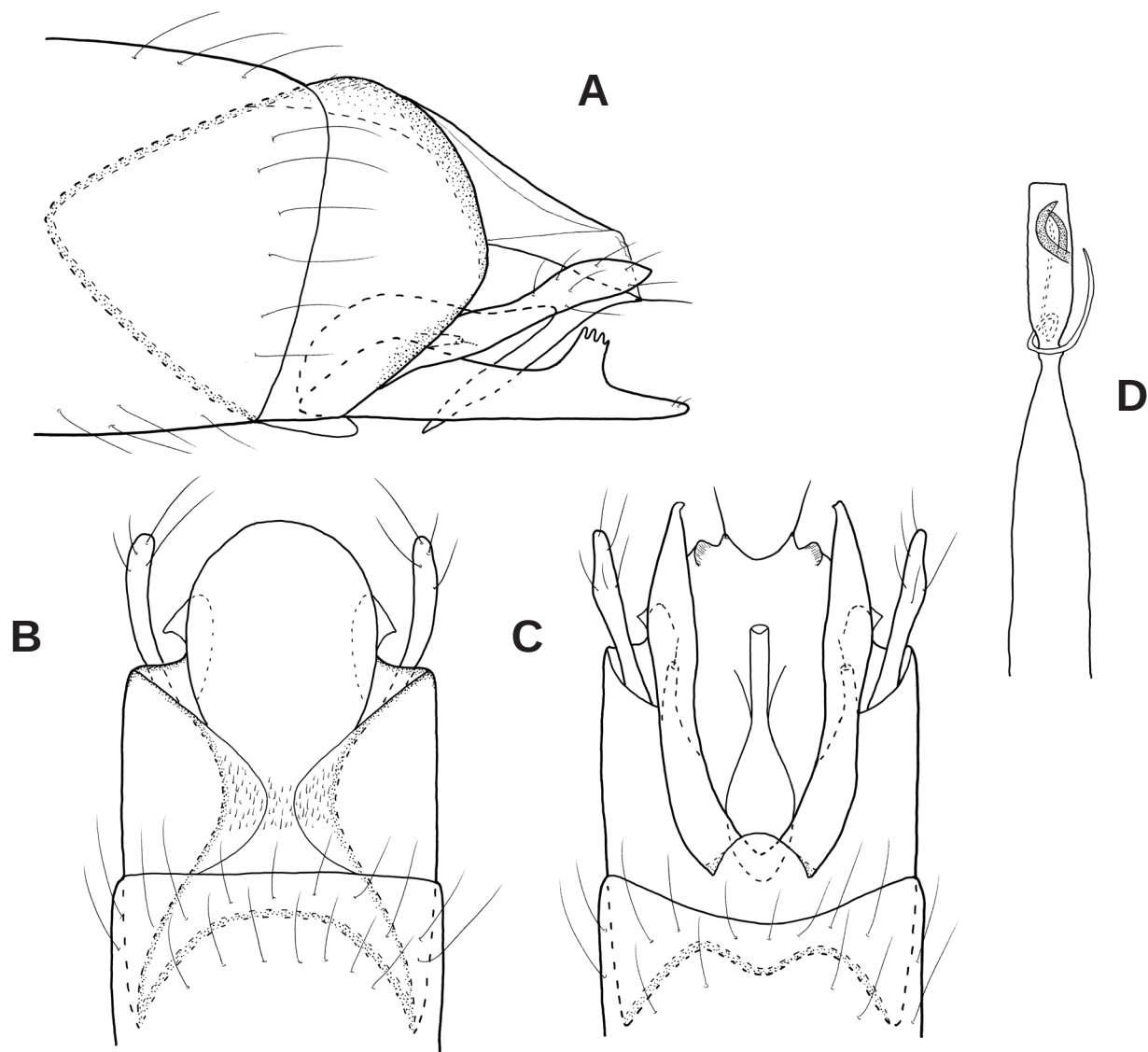


Figure 5. *Neotrichia parabullata*, sp. n., Male genitalia: A) Lateral view; B) Dorsal view; C) Ventral view; D) Phallus, ventral view.

Tribe Ochrotrichiini—Genus *Metrichia*

The genus *Metrichia* is represented in the Neotropics by 105 species (Morse 2015). Thirteen of these species are currently known, and eight species were first described, from Panama. Herein, we describe two new species.

Metrichia nowaczyki*, new species*Fig 6**

Metrichia nowaczyki is a member of the *M. exclamationis* Group of Flint (1972) on the basis of the internal glands and hair pouches of the abdomen, with similarities to *M. ancora* Bueno-Soria and Holzenthal, *M. araguensis* Flint, and *M. cafetalera* Botosaneanu, all of which have the phallus apex with a single elongate spine and dorsally rounded inferior appendages. It differs from these species in the phallus having a second spine at midlength.

Male. Length 2.4 mm. Head without modification, antennae simple with 18 segments. Body and unmodified wings brown in alcohol. Abdominal segment V with dorsal internal sacs. Segments VI and VII annular with dorsal setal brushes (Fig. 6B). Segment VIII in lateral view wide dorsally, narrowing ventrally. Segment IX triangular in lateral view, anterior portion within segments VII and VIII, posterior margin truncate. Preanal appendage (cercus) short, rounded distally in lateral view; in dorsal view squarish; dorsolateral hook elongate and sharply curving ventrad in lateral view; in dorsal and ventral views spikelike. Segment X short and membranous; in dorsal view triangular, apex rounded. Inferior appendages in lateral view with dorsal margin rounded, tapering to posterior apex; in dorsal and ventral views wide basally, narrowing distally to rounded apex. Phallus elongate, extending to end segment VI, tubular, thin lateral spine at midlength, apically truncate, with thin sclerotized spine, subapically.

Type material. Holotype, male—Chiriquí Province: Cuenca 108, Quebrada Grande, Boquete, Valle Escondido, below Sabor Restaurant, 8.77970°N and 82.44016°W, 1122 m asl, 2.v.2013, A. Cornejo (MIUP).

Etymology. Named for Dr. Ronald Nowaczyk, Provost at Clarion University of Pennsylvania, in recognition of his on-going support of faculty and undergraduate research at that institution.

Metrichia sencilla*, new species*Fig. 7**

Metrichia sencilla is a member of the *M. nigritta* Group of Flint (1972) on the basis of having internal glands between abdominal segments V and VI, with similarity to *M. trispinosa* Bueno-Soria from Veracruz, Mexico. The apex of the phallus of *M. trispinosa* is similar to that of the new species, but the inferior appendages of *M. trispinosa* are ovoid, while those of *M. sencilla* are upright and rectanguloid, similar to that seen in *M. riva* (Bueno-Soria).

Male. Length 2.5 mm. Head without modification. Antennae simple with 19 segments. Body and unmodified wings brown in alcohol. Abdominal segment V with small, inconspicuous internal sacs dorsally. Segments VI and VII annular. Segment VIII in lateral view wide dorsally, narrowing ventrally. Segment IX triangular in lateral view, anterior portion within segments VII and VIII, posterior margin rounded. Preanal appendage (cercus) short, truncate distally in lateral view; in dorsal view rounded apically and slightly emarginate on mesal margins; dorsolateral hook elongate and slightly curved ventrad, truncate apically; in dorsal view narrow with subapical lateral point. Segment X elongate and membranous; in dorsal view square, apex emarginate. Inferior appendages in lateral view narrowly rectanguloid, with dorsal margin rounded; in ventral view a rounded parallelogram; in dorsal view narrow over length. Phallus tubular, apex in lateral aspect with pair of

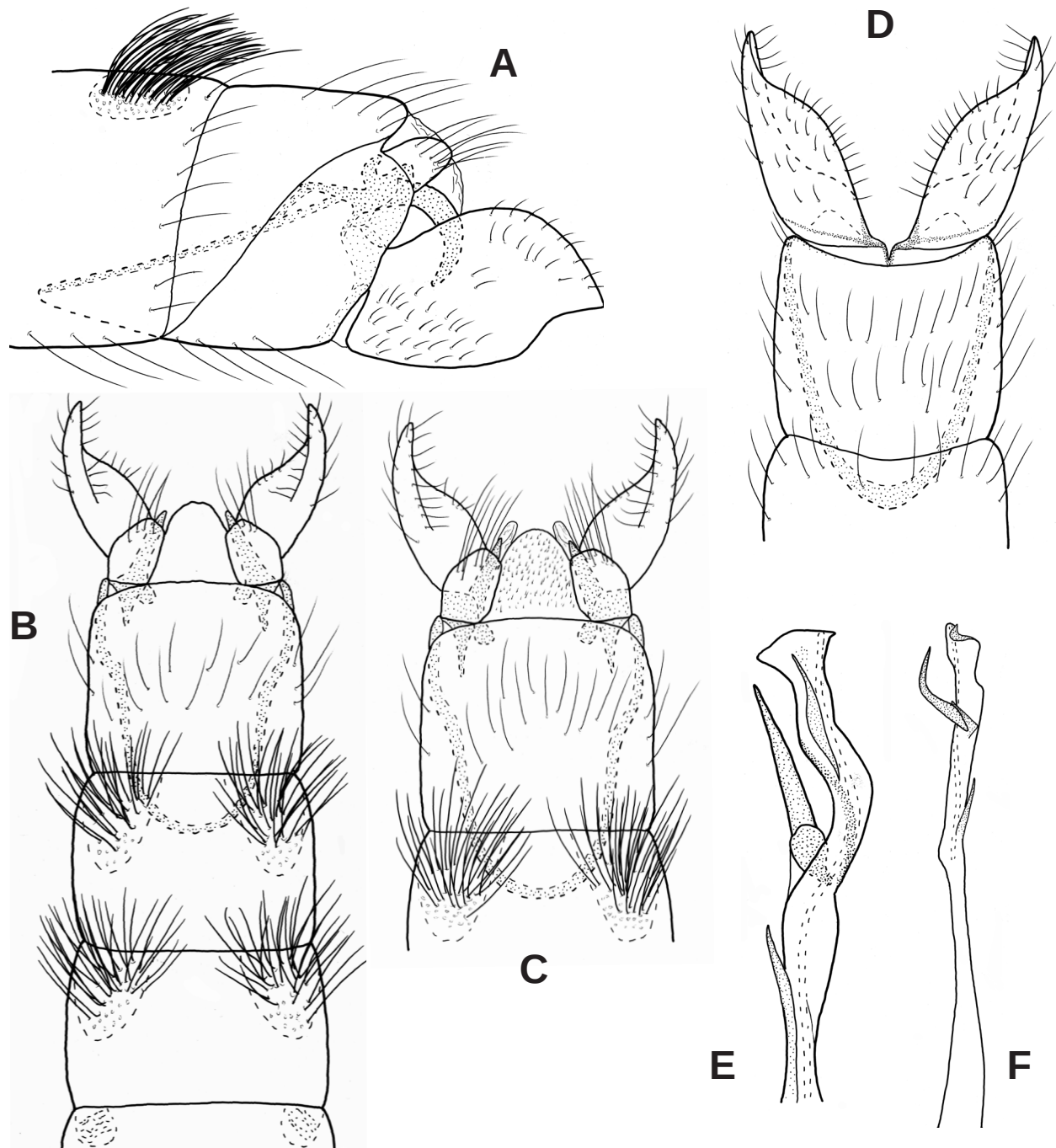


Figure 6. *Metrichia nowaczyki*, sp. n., Male genitalia: A) Lateral view; B) Dorsal view; C) Enlarged dorsal view; D) Ventral view; E) Phallus apex, lateral view; F) Phallus, dorsal view.

thin spines visible, one elongate and sinuate, apex truncate; in dorsal view, three spines visible, one long and two short, apex truncate.

Type material. **Holotype, male**—**Chiriquí Province: Cuenca 108**, Quebrada Grande, Boquete, Valle Escondido, below Sabor Restaurant, 8.77970°N and 82.44016°W, 1122 m asl, 2.v.2013, A. Cornejo (MIUP).

Etymology. Spanish “sencillo,” plain, unadorned, referring to the simplicity of the abdomen and genitalia.

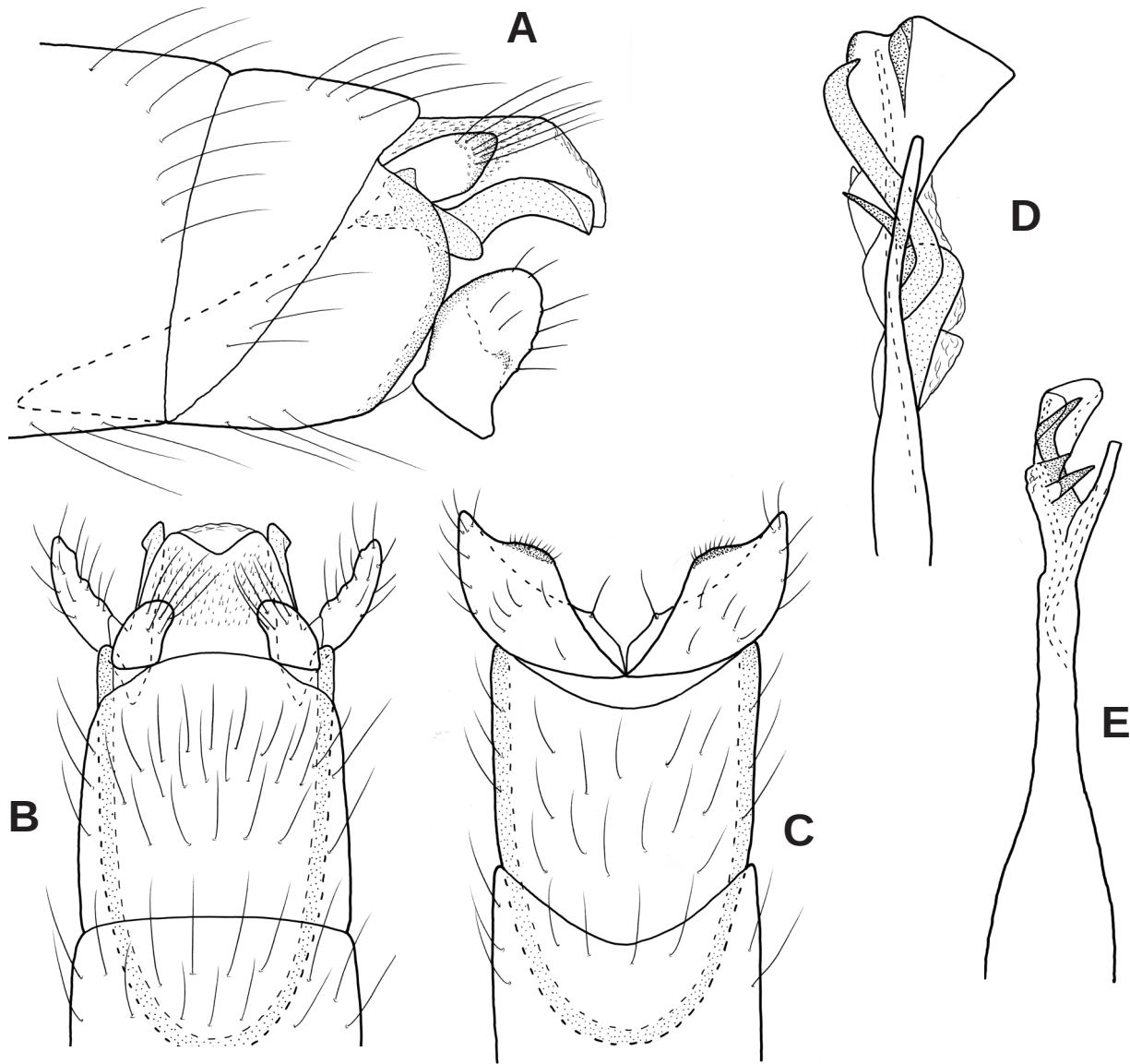


Figure 7. *Metrichia sencilla*, sp. n., Male genitalia: A) Lateral view; B) Dorsal view; C) Ventral view; D) Phallus apex, lateral view; E) Phallus, dorsal view.

Tribe Ochrotrichiini—Genus *Nothotrichia*

The genus *Nothotrichia* currently consists of five species, which, although infrequently collected, occur from Chile northward into Brazil, through Central America into northern California in the United States (Parys and Harris 2013). Of the four species represented in the Neotropics, none were previously known from Panama. Herein, we describe one new species.

Note. Marshall (1979) classified *Nothotrichia* as *incertae sedis* in the subfamily Hydroptilinae. Kelley (1992, and pers. comm.) and Harris and Armitage (1997) suggested that this genus was most correctly placed in the tribe Ochrotrichiini, based on adult characters. This placement was reiterated in Oláh and Johanson (2011). Finally, Parys and Harris (2013), during the process of first describing

a larva of this genus, *Nothotrichia shasta* Harris and Armitage 1997, added to the validity of this placement through comparison of larval characters with other members of the subfamily. However, the Trichoptera World Checklist (Morse 2015) and the most recent phylogenetic treatment at the tribal level (Holzenthal et al. 2007) place this genus in the tribe Orthotrichiini, with which few or no critical characters are shared in either the larval or adult stage. In this paper, we consider *Nothotrichia* to be a member of the Ochrotrichiini.

***Nothotrichia panama*, new species**

Fig. 8

Nothotrichia panama appears to be most closely related to the Chilean species *N. illiesi* Flint on the basis of the numerous short peglike setae on the inferior appendages and the acute phallus apex. *Nothotrichia panama* differs from this species and all others in the genus on the basis of the strongly recurved inferior appendages, the wide, truncate segment X, and the short, protruding medial process of the phallus.

Male. Length 2.0 mm. Antennae broken, but with 18 simple segments. Body brown in alcohol with no evident patterns on wings. Abdominal segment VIII annular. Segment IX in lateral view narrow dorsally, widening posteroventrally; in ventral view broadly emarginate posteriorly; in dorsal view narrowly incised posteriorly. Segment X in lateral view rectangular, with distal margin incised medially, small ventral spike basally; in dorsal view elongate, narrow over most of length, wide basally, rounded apically with margins lightly sclerotized. Inferior appendages in lateral view wide basally, narrowing distally and strongly recurved, numerous short pegs on inner posterior margin; in ventral view generally ovate with long setae on straight mesal margins and numerous peglike setae on inner posterior margins; dorsally ovate, with elongate, thin lobes laterally bearing long mesal setae, dense peglike setae posteriorly. Phallus thin and sinuate, outer edge slightly serrate, wide basally, apex narrowing to thin spike, medial process (ejaculatory duct?) protruding subapically.

Type material. **Holotype, male**—Chiriquí Province: **Cuenca 108**, Tributary of Quebrada Grande, at waterfall, Boquete, Valle Escondido, 8.78291°N and 82.44579°W, 1253 m asl, 17.ix.2013, A. Cornejo (MIUP).

Etymology. Named for the country of Panama, where the species was collected.

Tribe Ochrotrichiini—Genus *Ochrotrichia*

The genus *Ochrotrichia* is represented in the Neotropics by 135 species (Morse 2015). Seventeen of these species are currently known, and 16 species were first described, from Panama. Herein, we describe three new species.

Note. When referring to the right and left sides, we are referring to the insect's right and left side. Thus, when looking at a drawing of the dorsal view, the left side is referred to as the right side in the text. The lateral views of the tenth segment are that of the left side of the insect, when there is significant difference between the left and right sides, we have provided two drawings. This comment also refers to the inferior appendages.

***Ochrotrichia abrelata*, new species**

Fig. 9

This species is a member of the *O. aldama* Group of Flint (1972) on the basis of the simple, divided tenth tergum and the parallel-sided inferior appendages with numerous peglike seta. *Ochrotrichia abrelata* appears most similar to *O. citra* Bueno-Soria and Holzenthal and *O. ramona* Bueno-Soria and Holzenthal both of which have similar shaped inferior appendages. The new species can be

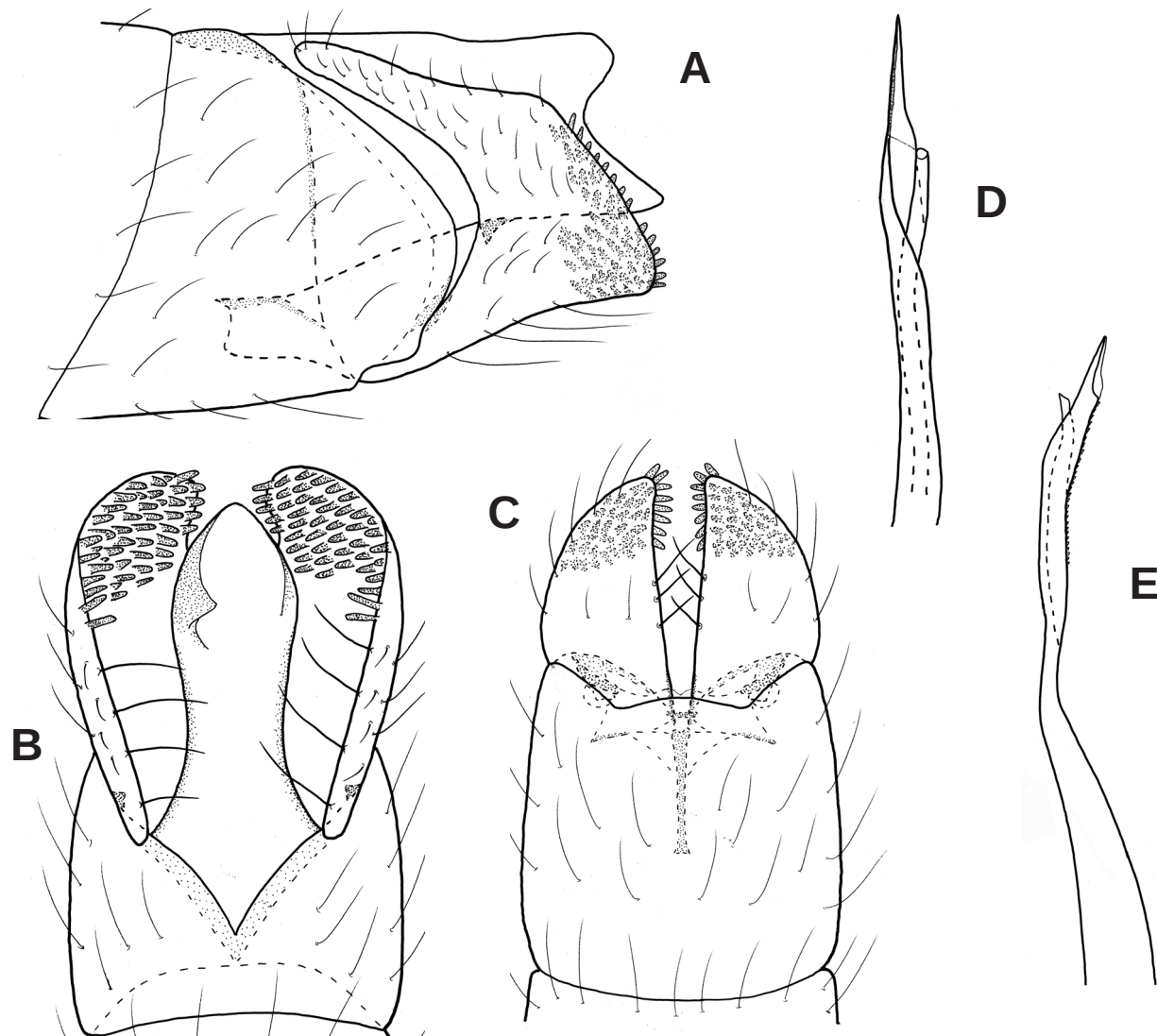


Figure 8. *Nothotrichia panama*, sp. n., Male genitalia: A) Lateral view; B) Dorsal view; C) Ventral view; D) Phallus apex, dorsal view; E) Phallus, lateral view.

separated by the sickle-shaped apical sclerite of the tenth tergum, which is not present in other members of the *O. aldama* group, and by the basal spinelike process of the inferior appendages.

Male. Length 2.8 mm, 36 antennal segments, brown in alcohol. Abdominal segment VII annular, with short posteroventral process. Segment VIII annular in lateral view. Segment IX rectangular in lateral view, incomplete dorsally, sinuate posteriorly, tapering anteriorly; annular ventrally, rounded anteriorly, posteriorly with lateral incisions; dorsally deeply incised on meson to accommodate tergum X. Tergum X divided into one elongate process on left side, short curving process on right side, short basal process sclerotized apically; in left lateral view, short, sclerotized dorsal process overlying elongate, thick process, which terminates in a large sickle-like sclerite, elongate thin process ventrally; in right lateral view, processes similar in appearance. Inferior appendages parallel-sided in lateral view, numerous peglike setae on posterior margin, basally with short process posteriorly; in ventral view rectangular basally, lateral margins rounded distally, peglike setae on mesal margins, cluster of spines ventral to spinelike basal process. Phallus thin and elongate, apically with small lateral lobes.

Type material. Holotype, male—Chiriquí Province: Cuenca 108, tributary of Quebrada Grande, at waterfall, Boquete, Valle Escondido, 8.78291°N and 82.44579°W, 1253 m asl, 17.ix.2013, A. Cornejo (MIUP). **Paratypes**—ibid., 1 male (NMNH).

Etymology. Spanish “abrelatas”, can-opener, referring to the elongate, sickle-shaped sclerite at the apex of the tenth tergum.

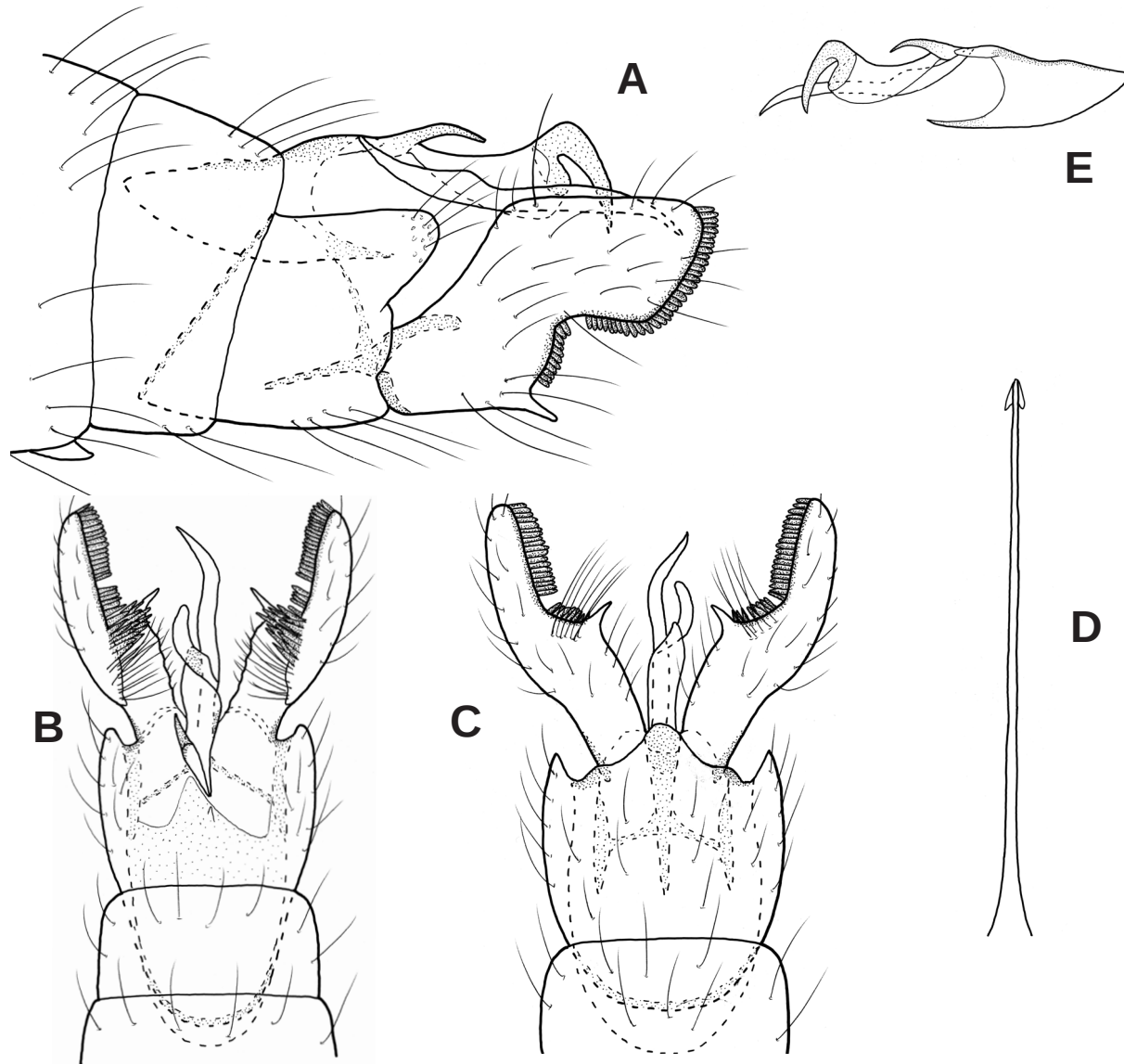


Figure 9. *Ochrotrichia abrelata*, sp. n., Male genitalia: A) Lateral view; B) Dorsal view; C) Ventral view; D) Phallus, dorsal view; E) Segment X, right lateral view.

***Ochrotrichia nimmoi*, new species**

Fig. 10

Ochrotrichia nimmoi is a member of the *O. arranca* Group of Flint (1972) on the basis of the sigmoid shape of the inferior appendages, which bear thick spines basally, and the elongate processes

of tergum X. *Ochrotrichia nimmoi* appears most similar to *O. confusa* (Morton), which is known from Chihuahua, México. It differs from this species and others in the group on the basis of the elongate subapical spine on the inferior appendage, similar to that seen in *O. pectinifera* Flint and the elongate, thin lateral process from the right side of segment X.

Male. Length 2.8-3.1 mm, 26 antennal segments, brown in alcohol. Abdominal segment VII annular, with short posteroventral process. Segment VIII in lateral view thin and annular; posterior margin slightly emarginate in dorsal view. Segment IX rectangular in lateral view, incomplete dorsally, sinuate posteriorly, tapering anteriorly; annular ventrally, rounded anteriorly, posteriorly with shallow lateral incisions; dorsally deeply incised on meson to accommodate tergum X. Tergum X divided into numerous elongate processes; process from right side thin and elongate, bulbous subapically; right medial process wide basally, narrowing distally and sinuate, thin apically sclerotized process originating ventrobasally; left lateral process wide, acute apically and lightly sclerotized; ventral mesal process wide basally, rounded apically with sclerotized lateral, triangular process; in left lateral view dorsal process sclerotized apically and originating from thin sinuate process, which is overlain by several lateral processes; posterior processes both wide, narrowing to acute apices; pair of thin rods originating anteriorly, tapering distally. Inferior appendages in lateral view sigmoid in shape with 3-4 short spines basolaterally and elongate spine subapically; in ventral view wide basally, narrowing distally, series of short spines on subapical mesal margins, thick setae apically on mesal folds. Phallus thin and elongate, apically with small lateral lobes.

Type material. **Holotype, male**—Chiriquí Province: **Cuenca 108**, tributary of Quebrada Grande, at waterfall, Boquete, Valle Escondido, 8.78291°N and 82.44579°W, 1253 m asl, 17.ix.2013, A. Cornejo (MIUP). **Paratypes**—ibid., 10 males (MIUP and NMNH).

Etymology. Named for Dr. Andrew Peebles Nimmo in memory and recognition of his many contributions to the study of Trichoptera in North America.

Ochrotrichia pulgara, new species

Fig. 11

This species is another member of the *O. arranca* Group of Flint (1972) on the basis of the sigmoid shape of the inferior appendages which bear thick spines basally, and the elongate processes of tergum X. *Ochrotrichia pulgara* appears most similar to *O. tagala* Flint and *O. yepachica* Harris both of which have the apex of the inferior appendage modified into a thumblike process. It differs from these species and others in the group on the basis of the numerous basal spines on the inferior appendages and the structure of the tenth tergum.

Male. Length 3.1 mm, 26 antennal segments, brown in alcohol. Abdominal segment VII annular, with short posteroventral process. Segment VIII in lateral view thin and annular. Segment IX rectangular in lateral view, narrowing dorsally, sinuate posteriorly, tapering anteriorly; annular ventrally, rounded anteriorly, posteriorly with shallow, lateral incisions; dorsally deeply incised on meson to accommodate tergum X. Tergum X divided into numerous elongate processes; process from right side thick basally, narrowing distally; right medial process wide basally, divided into two thin, elongate processes distally, one of which is sclerotized apically; left lateral process wide basally, curving distally and narrowing to bulbous apex, underlying this process is another thin process, which tapers distally, basal to the left lateral process is a pair of short, heavily sclerotized, spinelike processes; in left lateral view, dorsal process elongate, and sinuate, sclerotized apically, pair of short, sclerotized processes laterally, ventrally shelflike, with small point subapically; in right lateral view, dorsal sclerite bifid at about half length tergite, upper sclerite sclerotized apically, basally ringlike, laterally with thin elongate process, ventrally, shelflike with preapical point from ventral margin, subapically with bulbous, membranous process, which originates mesally and connects with dorsal sclerites. Inferior appendages sigmoid in shape in lateral view with cluster of short spines basolaterally and

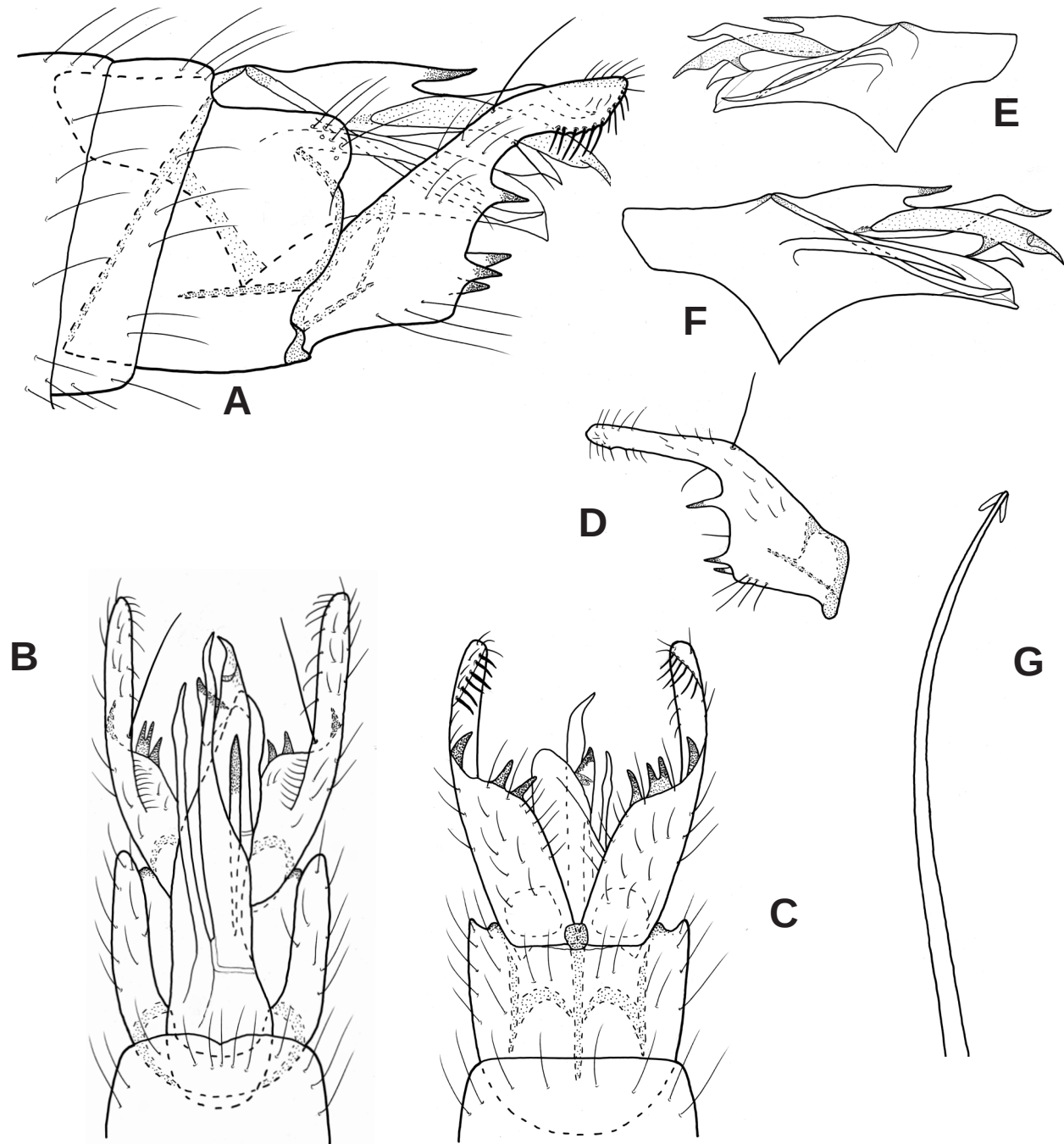


Figure 10. *Ochrotrichia nimmoi*, sp. n., Male genitalia: A) Lateral view; B) Dorsal view; C) Ventral view; D) Inferior appendage, right lateral view; E) Segment X, right lateral view; F) Segment X, left lateral view; G) Phallus, lateral view.

elongate thumblike spine subapically; in ventral view wide basally, rectanguloid distally, series of short spines on subapical margins, elongate spine apically. Phallus thin and elongate, apically with small lateral lobes.

Type material. **Holotype, male**—Chiriquí Province: **Cuenca 108**, tributary of Quebrada Grande, at waterfall, Boquete, Valle Escondido, 8.78291°N and 82.44579°W, 1253 m asl, 17.ix.2013, A. Cornejo (MIUP).

Etymology. Spanish “pulgar”, thumb, referring to the thumb-like process of the inferior appendage.

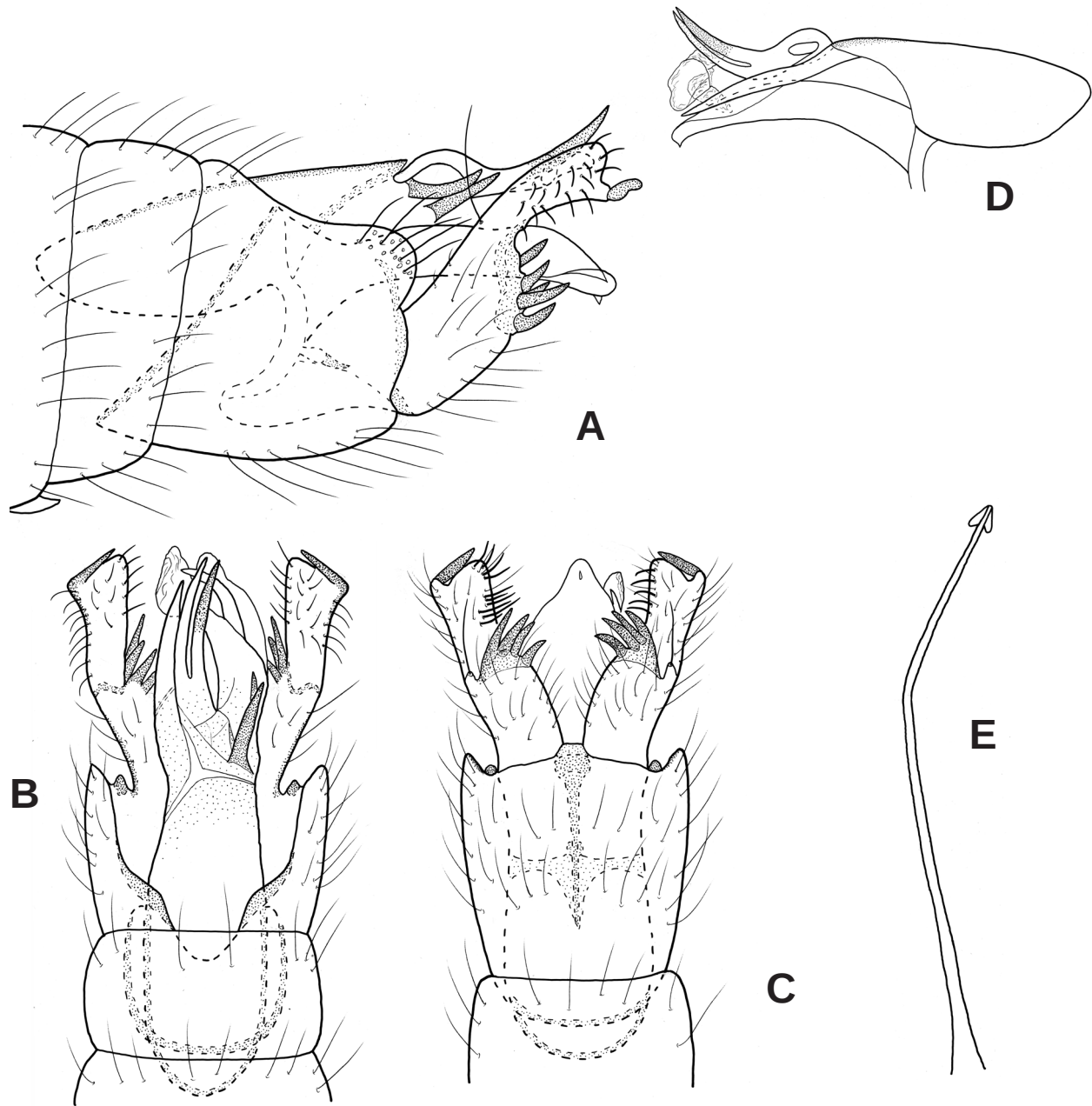


Figure 11. *Ochrotrichia pulgara*, sp. n., Male genitalia: A) Lateral view; B) Dorsal view; C) Ventral view; D) Segment X, right lateral view; E) Phallus, dorsal view.

Acknowledgments

We thank Ken Manuel (Duke-Energy), Dave Ruitter (U.S. EPA, retired), and an anonymous reviewer for reviewing our manuscript and making valuable comments. Aydeé Cornejo of the Gorgas Institute and Dr. R. Wills Flowers of Florida A&M University kindly provided some of the material

described in this paper. Leah Keth is thanked for her work in converting the line drawings into an electronic format.

Literature Cited

- Armitage, B. J., S. C. Harris, and R. W. Holzenthal.** 2015. The Trichoptera of Panama. I. New records for caddisflies (Insecta: Trichoptera) from the Republic of Panama. *Insecta Mundi* 435: 1-10.
- Calor, A. R., and R. Mariano.** 2012. UV light pan traps for collecting aquatic insects. *EntomoBrasilis* 5: 164-166.
- Flint, O. S., Jr.** 1970. Studies of Neotropical caddisflies. X. *Leucotrichia* and related genera from North and Central America (Trichoptera: Hydroptilidae). *Smithsonian Contributions to Zoology* 60: 1-64.
- Flint, O. S., Jr.** 1972. Studies of Neotropical caddisflies. XIII. The genus *Ochrotrichia* for Mexico and Central America (Trichoptera: Hydroptilidae). *Smithsonian Contributions in Zoology* 118: 1-28.
- Harris, S. C., and B. J. Armitage.** 1997. New member of the Chilean genus *Nothotrichia* from North America (Trichoptera: Hydroptilidae). p. 123-128. *In*: O. S. Flint, Jr. and R. W. Holzenthal (editors). *Proceedings of the 8th International Symposium on Trichoptera*. Ohio Biological Survey; Columbus, OH. 496 p.
- Holzenthal, R. W., R. J. Blahnik, A. L. Prather, and K. M. Kjer.** 2007. Order Trichoptera Kirby, 1813 (Insecta), Caddisflies. p. 639-698. *In*: Z.-Q. Zhang and W. A. Shear (eds.). *Linnaeus Tercentenary: Progress in Invertebrate Taxonomy*. *Zootaxa* 1668: 1-766.
- Kelley, R. W.** 1992. Phylogenetic relationships of micro-caddisfly genera (Hydroptilidae). *Bulletin of the North American Benthological Society* 9: 145 (abstract).
- Keth, A. J., S. C. Harris, and B. J. Armitage.** (in press). The Genus *Neotrichia* in North America, Mexico, and the Caribbean Islands. *The Caddis Press*. Columbus, OH. 142 p.
- Marshall, J. E.** 1979. A review of the genera of Hydroptilidae (Trichoptera). *Bulletin of the British Museum of Natural History (Entomology)* 39: 1-105.
- Morse, J. C.** 2015. Trichoptera World Checklist. Available from <http://www.clemson.edu/cafls/departments/esps/database/trichopt/index.htm> (accessed 15 June 2015).
- Oláh J., and K. A. Johanson.** 2011. New Neotropical Hydroptilidae (Trichoptera). *Annales Historico-Naturales Musei Nationalis Hungarici* 103: 117-255.
- Parys, K. A., and S. C. Harris.** 2013. Larva of *Nothotrichia shasta* Harris and Armitage (Trichoptera: Hydroptilidae) from California, USA, with its phylogenetic and taxonomic implications. *Zootaxa* 3620: 589-595.
- UNESCO.** 2008. Balance Hídrico Superficial de Panamá, Período 1971-2002. Documentos Técnicos del PHI-LAC, N°9. Montevideo, Uruguay. 133 p.

Received July 29, 2015; Accepted August 14, 2015.

Review Editor David Bowles.

