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# Additions to the genus *Goera* Stephens (Trichoptera, Goeridae) from Southeast Asia

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# Additions to the genus *Goera* Stephens (Trichoptera, Goeridae) from Southeast Asia

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**Abstract.** Two **new species** of *Goera*, *G. zwicki* and *G. nozakii* (Trichoptera, Goeridae), from the Philippines and one **new species**, *G. meyi*, from Vietnam are described and illustrated herein. In addition, type specimens of *G. disparilis* Banks, *G. octospina* Banks, *G. tagalica* Banks, and *G. uniformis* Banks are illustrated. All species of *Goera* known from both the Philippines and Vietnam are listed.

**Key words:** Caddisfly, Trichoptera, *Goera*, new species, Philippines, Vietnam

## Introduction

Nine species of the genus *Goera* Stephens 1829 (Trichoptera, Goeridae) are known from the Philippines archipelago. Ulmer described the first, *Goera longispina* in 1907, and subsequently, *G. impar* in 1930. Banks described three species: *G. octospina* (1920), *G. tagalica* (1931), and *G. disparilis* (1937). Mey added two species by describing *G. siccana* and *G. mindanensis* in 1998. Finally, Malicky and Chantaramongkol (1992) and Malicky (2009) described *G. rolandmuelleri* and *G. jesbak*, respectively.

Eleven species of the genus *Goera* are known from Vietnam (Armitage and Arefina 2003; Armitage et al. 2005; Mey, 2005; Malicky 2010). Six species have been described from Vietnam: *G. fimbriata* Navás 1932, *G. tricaisema* Malicky 1995, *G. monticolaria* Mey 1997, *G. galli* Armitage and Arefina 2003, *G. hubleyi* Armitage and Arefina 2003, and *G. schefterae* Armitage and Arefina 2003; and, an additional 5 species have been recorded from Vietnam: *G. fissa* Ulmer 1926 (as *G. altofissura* Hwang 1957 in Armitage and Arefina 2003), *G. mandana* Mosely 1938, and *G. arcuata* Yang and Armitage 1996 (Armitage and Arefina 2003); *G. kawamotonis* Kobayashi 1987 and *G. uniformis* Banks 1931 (as *G. tarumana* Malicky 1978 in Armitage and Arefina-Armitage 2009).

We were kindly provided material by Dr. Takao Nozaki, which originally was collected in the Philippines by Dr. Andreas Zwick in 1995 and 1996. Examination of this material revealed 3 species of *Goera*: 2 new species (*G. zwicki* and *G. nozakii*), and *G. jesbak*. Additional material on loan from the Smithsonian (**NMNH)** contained another male of *G. nozakii*, which is included herein as a paratype. Among a collection from Vietnam provided to us by Dr. Wolfram Mey of the Museum für Naturkunde der Humboldt-Universität zu Berlin (**MNHB**) was another new species, *G. meyi*.

During the course of studying this genus in Southeast Asia, we borrowed the Banks types of *G. disparilis*, *G. octospina*, *G. tagalica*, and *G. uniformis* from the Museum of Comparative Zoology (**MCZ**), Harvard University, Massachusetts. We include new illustrations for these species, as well as for our specimen of *G. jesbak*.

## Materials and Methods

All new material examined was preserved in ethanol, except for 1 male of *G. octospina* which was pinned. Type specimens borrowed from the MCZ were pinned. Specimens were cleared in 10% KOH

and subsequently examined under a stereomicroscope. Drawings were first penciled using a drawing tube, and later inked by hand. Terminology for genitalia follows that used by Yang and Armitage (1996). Holotypes of the Philippine species are deposited in the Smithsonian Institution Entomology Collection (**NMNH**). The holotype male of *Goera meyi* is deposited in the Museum für Naturkunde der Humboldt-Universität zu Berlin (**MNHB**).

***Goera zwicki* sp. n.**
Fig. 1

**Diagnosis.** This species shares some similarities with *Goera longispina* Ulmer 1907 from the Philippines in the shape the recumbent segment IX having a well developed lateral portion and very narrow ventral part; also in the positioning and length of the ventrolateral processes of tergum X. They differ by the shape of the distal segment of the inferior appendage, which is more recumbent and extended in *G. zwicki* and somewhat quadrate and upright in *G. longispina*; by the morphology of the processes of sternite VI, which are more developed in *G. longispina*; and, by the shape of the phallus, which is longer and narrower in *G. zwicki*.

**Description.** Color yellow-brown in alcohol. Length of forewing: 8.0 mm. Sternite VI with a central spatula-like process and 3 or 4 lateral spine-like processes. Sternite V with a short triangular process.

*Male genitalia* (Fig. 1): Segment IX long, recumbent in lateral view, with ventral part narrow in ventral view. Ventrolateral processes of tergum X very long, extending slightly beyond inferior appendages, sinusoid distally in lateral view and pincer-like in dorsal view. Median dorsal process of tergum X absent. Preanal appendages digitate. Basal segment of inferior appendage nearly twice as short dorsally than ventrally. Distal segment of inferior appendage with broad basal portion developed posterodorsally into short triangular lobe partially fused with mesal process. Mesal process digitate and bent posteroventrad in lateral view; broadly-triangular in ventral view. Phallic apparatus long, nearly straight in lateral view, constricted behind apical, membranous portion.

**Material Examined. Holotype** male: **Philippines**, Palawan, Narra, old Cu-Mine, 170 m, 14 March 1996, A. Zwick (**NMNH**).

**Etymology.** This species is named for Dr. Andreas Zwick, Curator of Lepidoptera at the State Museum of Natural History, Stuttgart, Germany, and the collector of the specimen.

***Goera nozakii* sp. n.**
Fig. 2

**Diagnosis.** The new species is most similar to *G. jesbak* Malicky in the shape of the short, nearly vertical segment IX with narrow ventral portion, and in the short, spine-like ventrolateral processes of tergum X. It differs by the shapes of the distal segment and mesal process of the inferior appendage. It can also be distinguished by the absence of clearly defined spicules on the apical membranous portion of the phallus, easily observed in *G. jesbak*.

**Description.** Color yellow-brown in alcohol. Length of forewing: 8.6-8.9 mm (n=2). Sternite VI with a central spatula-like process having a truncate apex and 4 lateral spine-like processes on each side. No process on sternite V.

*Male genitalia* (Fig. 2). Segment IX short, nearly vertical in lateral view, with narrow ventral part in ventral view. Ventrolateral processes of tergum X short, not extending beyond inferior appendage, straight and tapered. Median dorsal process of tergum X absent. Preanal appendages short, digitate. Basal segment of inferior appendage quadrate, slightly recumbent in lateral view. Distal segment of inferior appendage short, nearly triangular in lateral view; mesal process elongate, digitate, bent slightly posteroventrad in lateral view, straight in ventral view. Phallic apparatus slightly bent

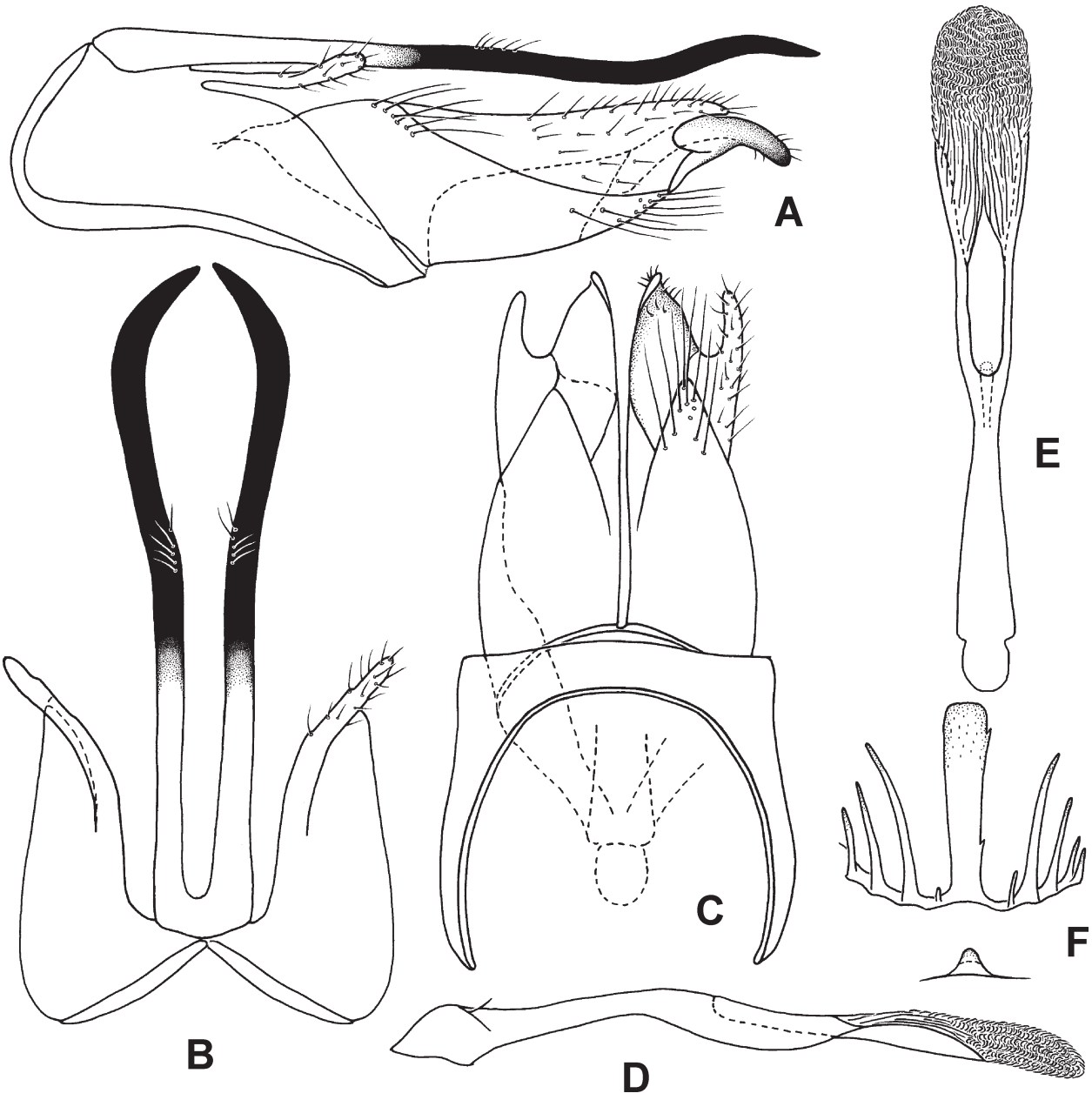


**Figure 1.** *Goera zwicki* sp. n., male genitalia. A) Lateral; B) Dorsal; C) Ventral; D) Phallic apparatus, lateral; E) Phallic apparatus, dorsal; F) Processes of sterna V and VI, ventral.

ventrad medially in lateral view, membranous apical portion about one-third length of entire phallus and appears to have grooved surface.

**Material Examined. Holotype** male: **Philippines**, Palawan, Salakot Falls, road, 300 m, 19 March 1996, light, A. Zwick (**NMNH**). **Paratype:** 1 male, **Philippines,** Palawan, Macagua R., 12 km SW Brooke's Pt., 20 December 1965, D. R. Davis (**NMNH**).

**Etymology.** This species is named for Dr. Takao Nozaki in recognition of his many contributions to the study of caddisflies.

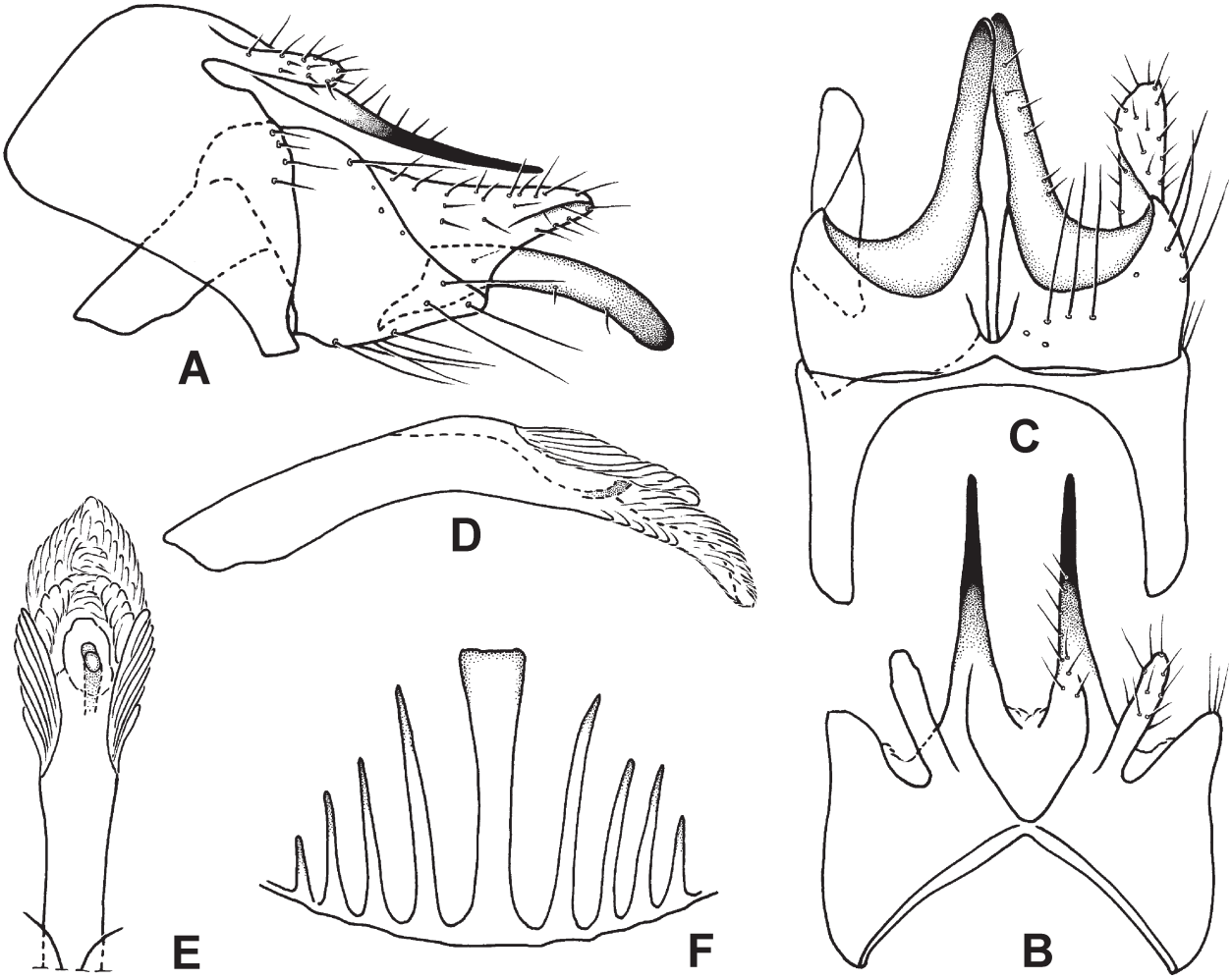


**Figure 2.** *Goera nozakii* sp. n., male genitalia. A) Lateral; B) Dorsal; C) Ventral; D) Phallic apparatus, lateral; E) Phallic apparatus, dorsal; F) Process of sternum VI, ventral.

***Goera meyi* sp. n.**
Fig. 3

**Diagnosis.** The new species belongs to the *G. fissa* Group and within the group it most closely resembles *G. schefterae* Armitage and Arefina in the shape of the ventrolateral processes of tergum X in dorsal view. However, tergum X in *G. schefterae* bears a mesolateral spur that is short, whereas a longer spur in *G. meyi* is positioned ventrolaterally. In addition, the ventromesal lobe of segment IX in ventral view is apically tapered in *G. schefterae* and long and spatulate in *G. meyi*.

**Description.** Color light brown in alcohol. Length of forewing: 8.5 mm. Sternite VI with a central spatula-like process fused at base with 2 lateral spine-like processes, additional 3-4 lateral spine-like processes on each side. Sternite V with short triangular process.

*Male genitalia* (Fig. 3)**.** Segment IX recumbent in lateral view, with ventral part narrowed and terminating in long, apically tapered ventromesal lobe nearly as long as half of main body of segment IX; in ventral view ventromesal lobe spatulate apically. Ventrolateral process of tergum X long, slender; in lateral view extended posteriorly as far as inferior appendage; in dorsal view apical portion bent outward, apex blunt; bearing spur arising at ventrolateral position near midpoint of process and directed posterad. Median process of tergum X lacking. Preanal appendages long, slender. Basal

segment of inferior appendage recumbent, about two times as long as tall. Distal segment nearly triangular in lateral view, apex slightly bent downward; mesal process straight with acute apex directed posterad; in ventral view apex slightly bent outward. Phallic apparatus elongate, tubular, gently curved ventrad in lateral view, slightly enlarged apically.

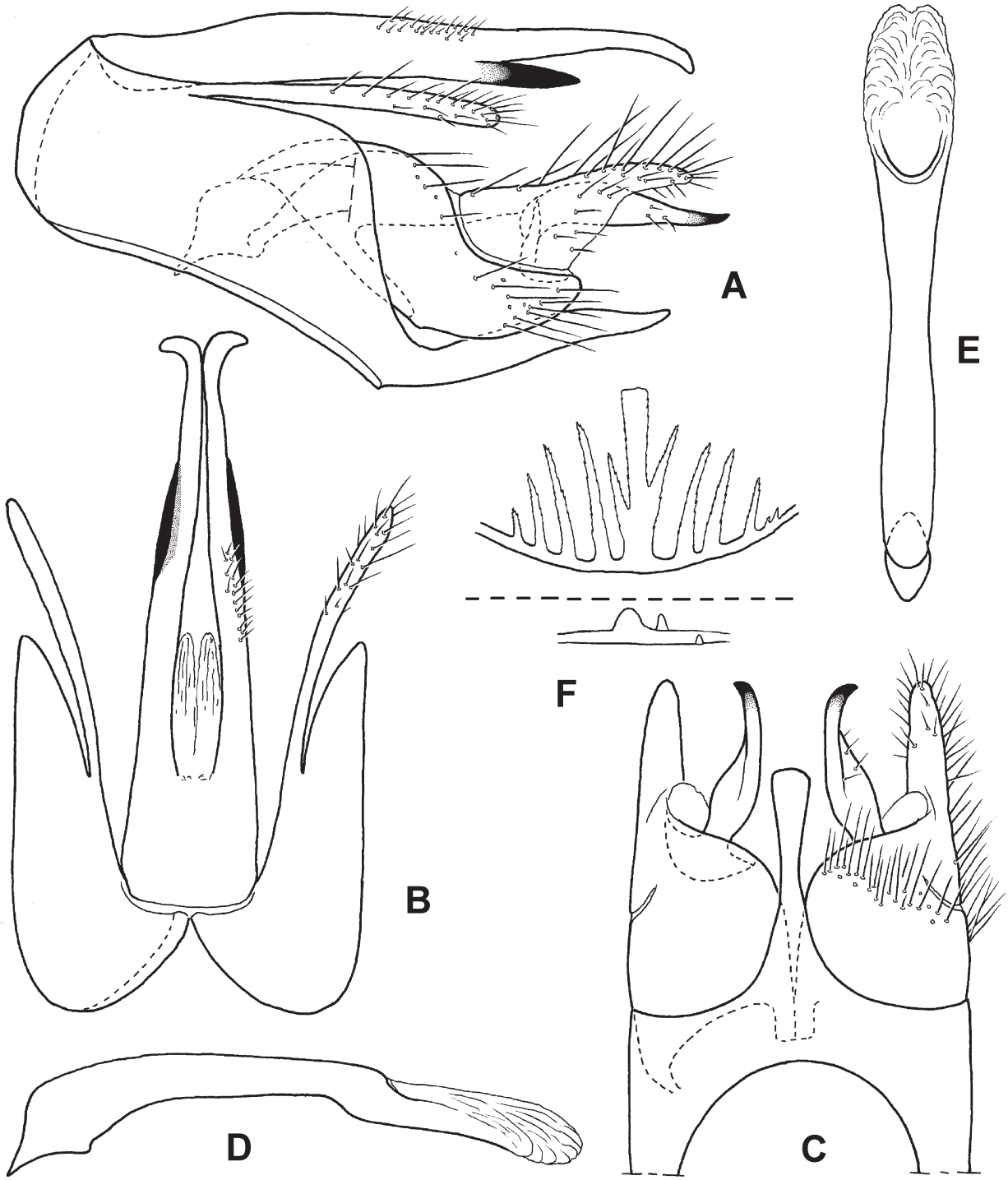


**Figure 3.** *Goera meyi* sp. n., male genitalia. A) Lateral; B) Dorsal; C) Ventral; D) Phallic apparatus, lateral; E) Phallic apparatus, dorsal; F) Processes of sternums V and VI, ventral.

**Material Examined. Holotype** male: **Vietnam,** Quang Nam Province, Plato Tay Nguyen, Mt. Ngoc Linh, 900-1400 m, 15°02'N, 107°59'E, 10-25 August 1996, V. V. Siniaev, E. P. Afonin, leg. A. Schintlmeister (**MNHB**).

**Etymology.** This species is named for Dr. Wolfram Mey as a tribute to his past scholarly work on the genus *Goera* in particular, and the order Trichoptera in general.

***Goera disparilis*** Banks 1937
Fig. 4

**Material examined. Philippines**, Mindanao, Davao Province, Mount Apo, Batraeyon, altitude 8,000 feet, 14 September [year unknown], C. F. Clagg, holotype male (**MCZ 22048**).

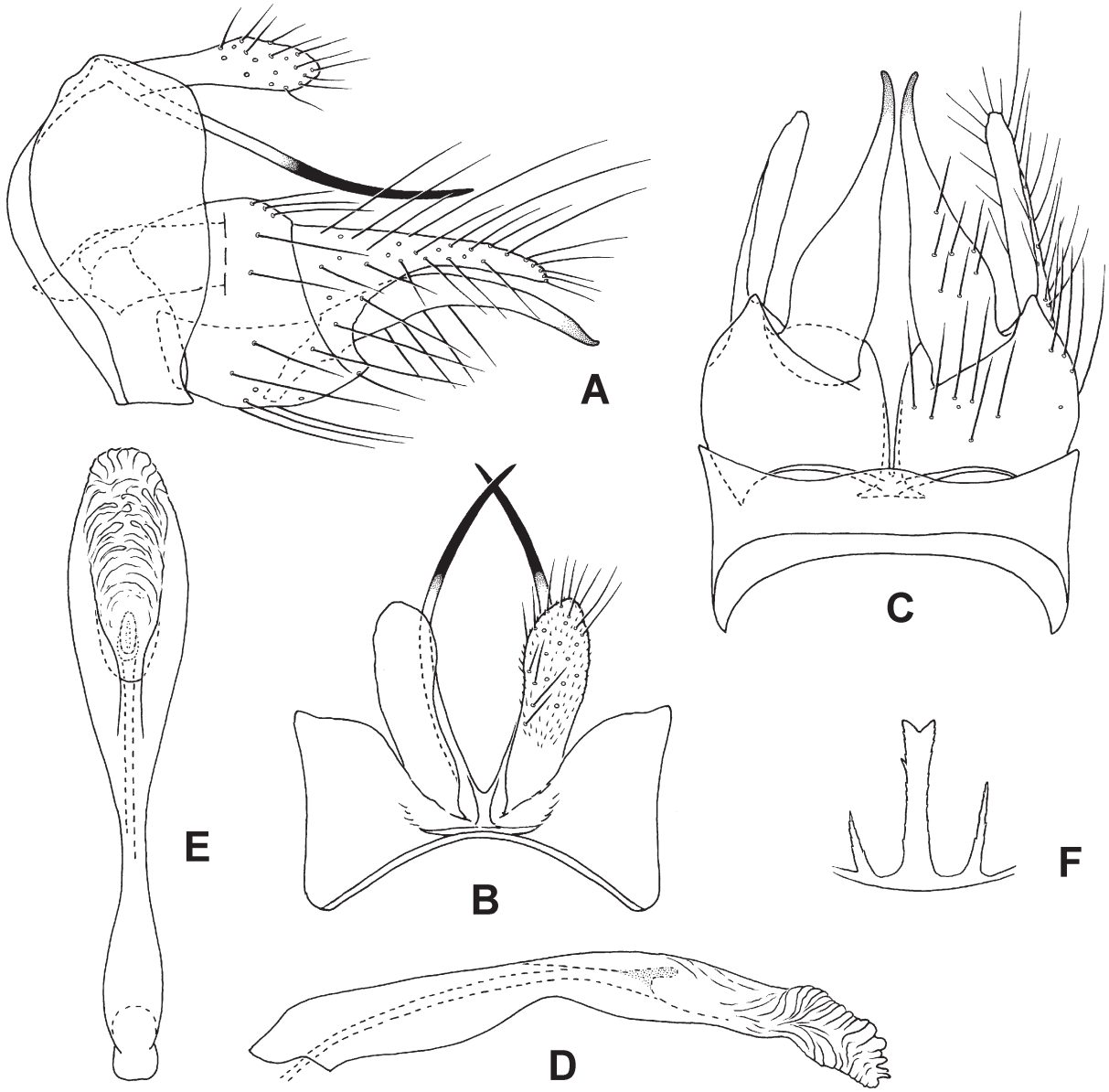


**Figure 4.** *Goera disparilis* Banks, male genitalia. A) Lateral; B) Dorsal; C) Ventral; D) Phallic apparatus, lateral; E) Phallic apparatus, dorsal; F) Process of sternum VI, ventral.

**Distribution.** Philippines.

***Goera jesbak*** Malicky 2009
Fig. 5

**Material examined. Philippines**, Palawan, Estrella Falls, 3 March 1995, A. Zwick, 1 male; Port Barton, great fall, 13 March 1995, A. Zwick, 1 male; Salakot Falls, road (300 m), 19 March 1996, light, A. Zwick, 4 males.

**Distribution.** Philippines.

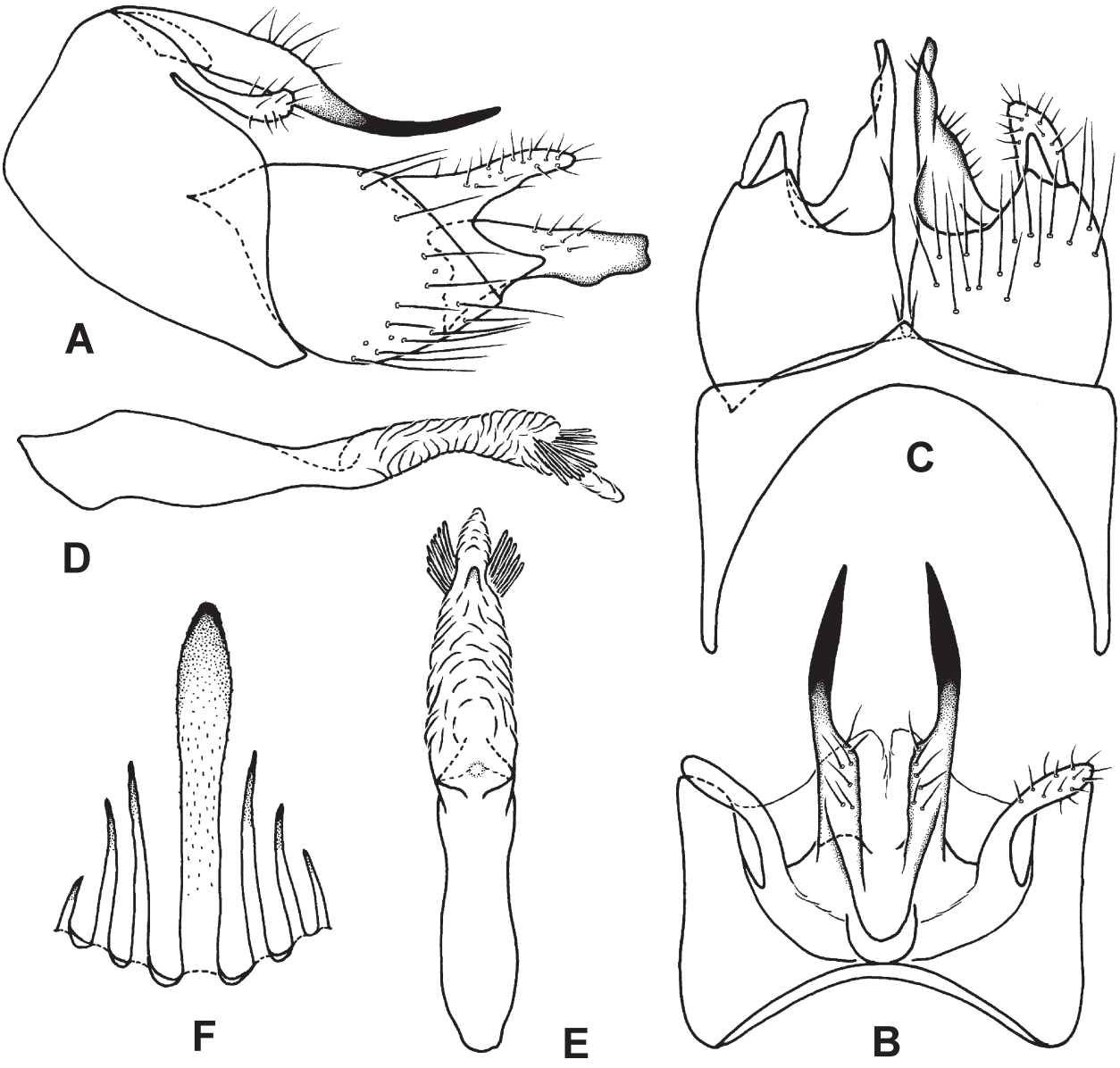


**Figure 5.** *Goera jesbak* Malicky, male genitalia. A) Lateral; B) Dorsal; C) Ventral; D) Phallic apparatus, lateral; E) Phallic apparatus, dorsal; F) Process of sternum VI, ventral.

***Goera octospina*** Banks 1920
Fig. 6

**Material examined. Philippines**, Luzon, Nueva Vizcaya, Imugin, C. F. Baker, holotype male (**MCZ 10883**); Luzon, Mountain Province, Chatol, 15 km SE Bontoc, 17°02'N, 121°03'E, cloud forest, 1600 m, 24 September 1988, K. Cerny, A. Schintlmeister, 1 male (**MNHB**).

**Remarks.** During the examination of the type specimen, we noted the similarity of the male genitalia of *G. octospina* with the type of *G. longispina*, as illustrated by Jacquemart (1966) and Malicky (2009). We suspect that *G. octospina* is a junior synonym of *G. longispina*. However, we were not able

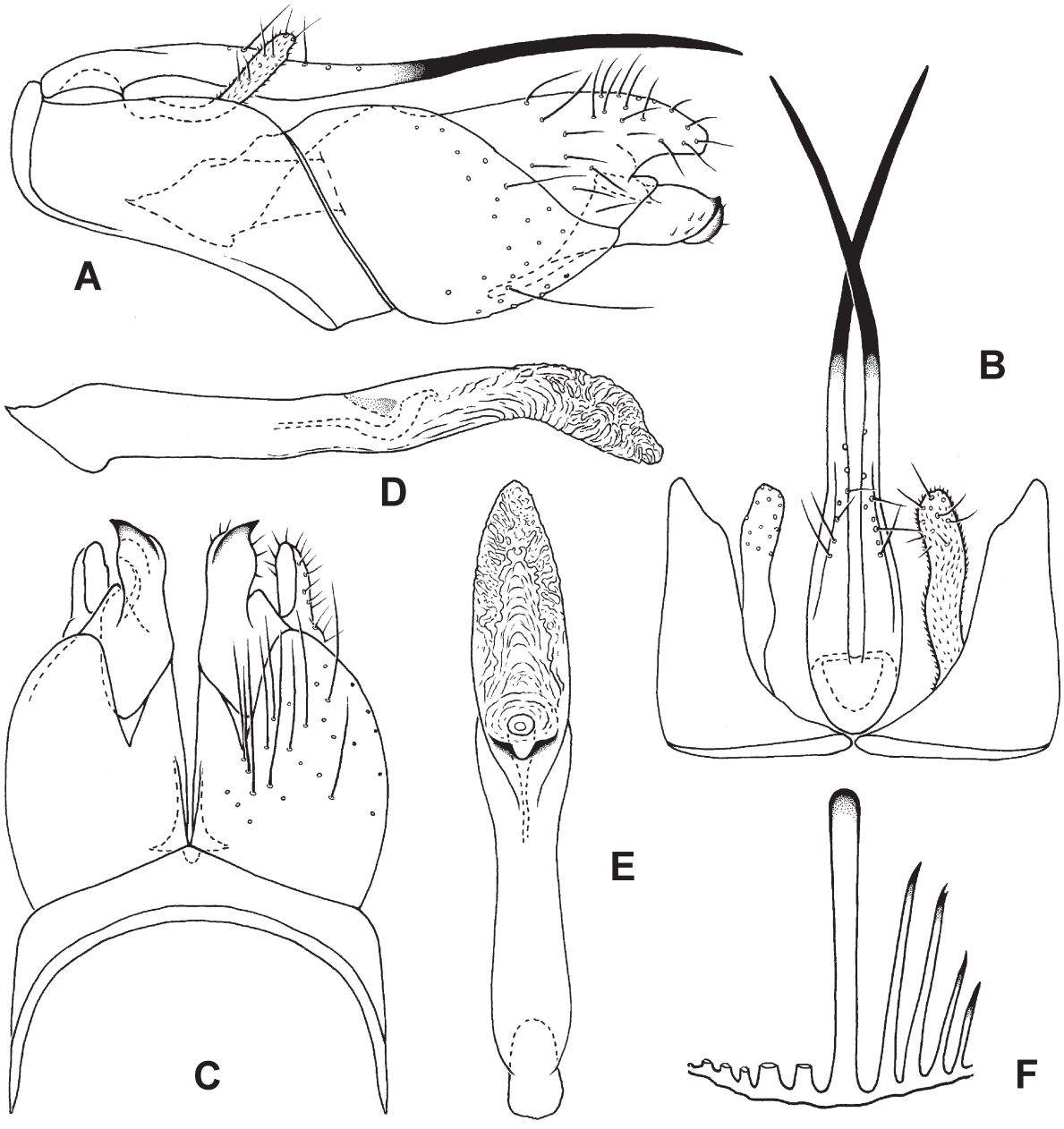


**Figure 6.** *Goera octospina* Banks, male genitalia. A) Lateral; B) Dorsal; C) Ventral; D) Phallic apparatus, lateral; E) Phallic apparatus, dorsal; F) Process of sternum VI, ventral.

to get the type material of *G. longispina* to confirm this. We were informed by a curator at the Royal Belgian Institute of Natural Sciences that the type is currently missing. Thus, we hesitate to formalize this synonymy.

**Distribution.** Philippines.

***Goera tagalica*** Banks 1931
Fig. 7

**Material examined. Philippines**, Luzon, Mt. Makiling, Baker, holotype female (**MCZ 16417**).

**Distribution.** Philippines.

***Goera uniformis*** Banks 1931
Fig. 8

**Material examined. Thailand**, "Siam, Trang, 24 April 1924, I.H.N. Evans, male holotype (**MCZ 16470**); **Vietnam**, Gia Lai Province, An Khe District, Azun River, Tram Lap, 3 km NE forestry building, UV light, 21 June 1996, D. Currie, J. Swann, 1 male (**ROM 961076**).

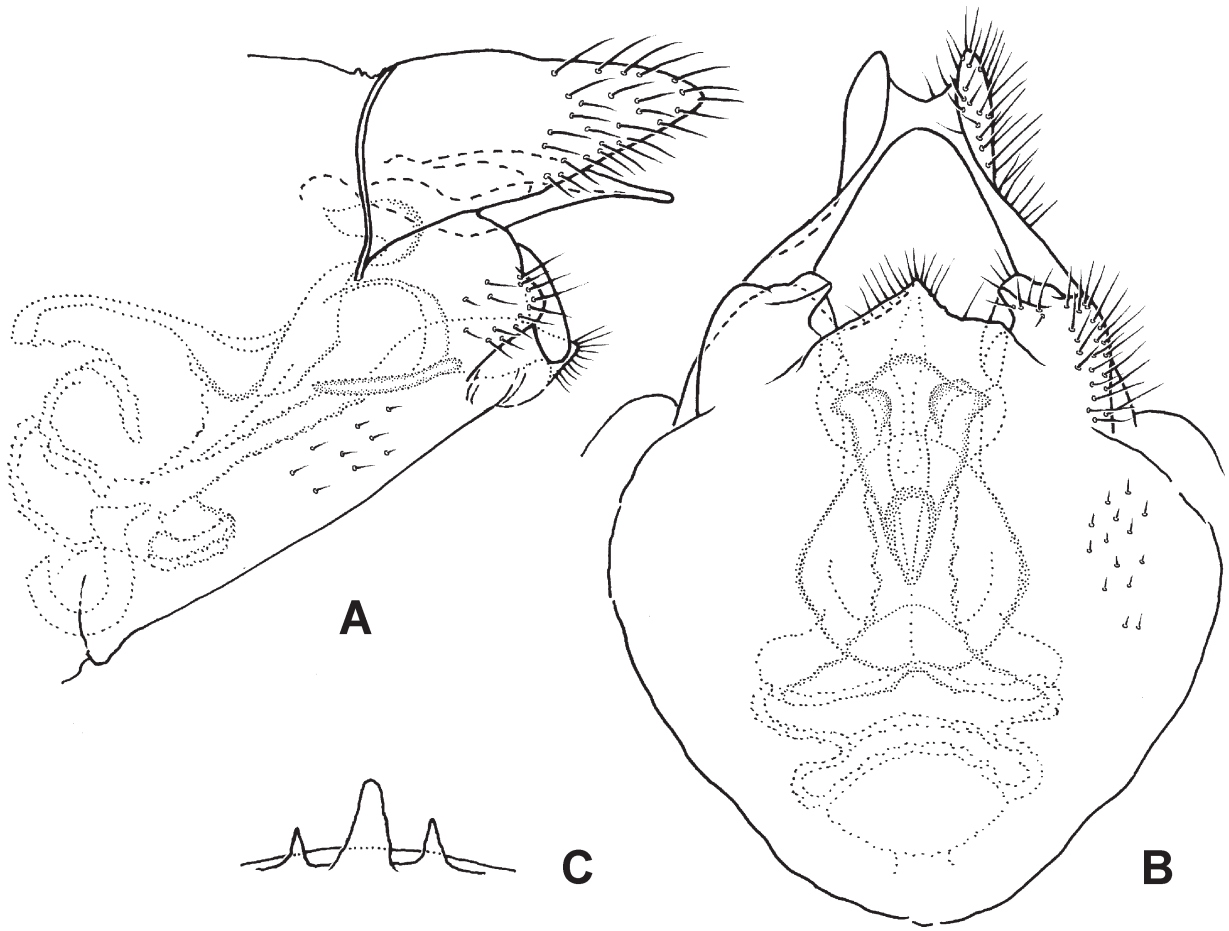


**Figure 7.** *Goera tagalica* Banks, female genitalia. A) Lateral; B) Ventral; C) Process of sternum VI, ventral.

**Distribution.** Indonesia (Sumatra), Malaysia, Thailand, Vietnam (Gia Lai).

**Remarks.** Armitage and Arefina-Armitage (2009) recorded *G. tarumana* from Vietnam for the first time. During the course of the current study, we noted that the type of *G. uniformis* was identical to *G. tarumana*. This supports the proposed synonymy of these species, which will be presented in the near future (H. Malicky, personal communication).

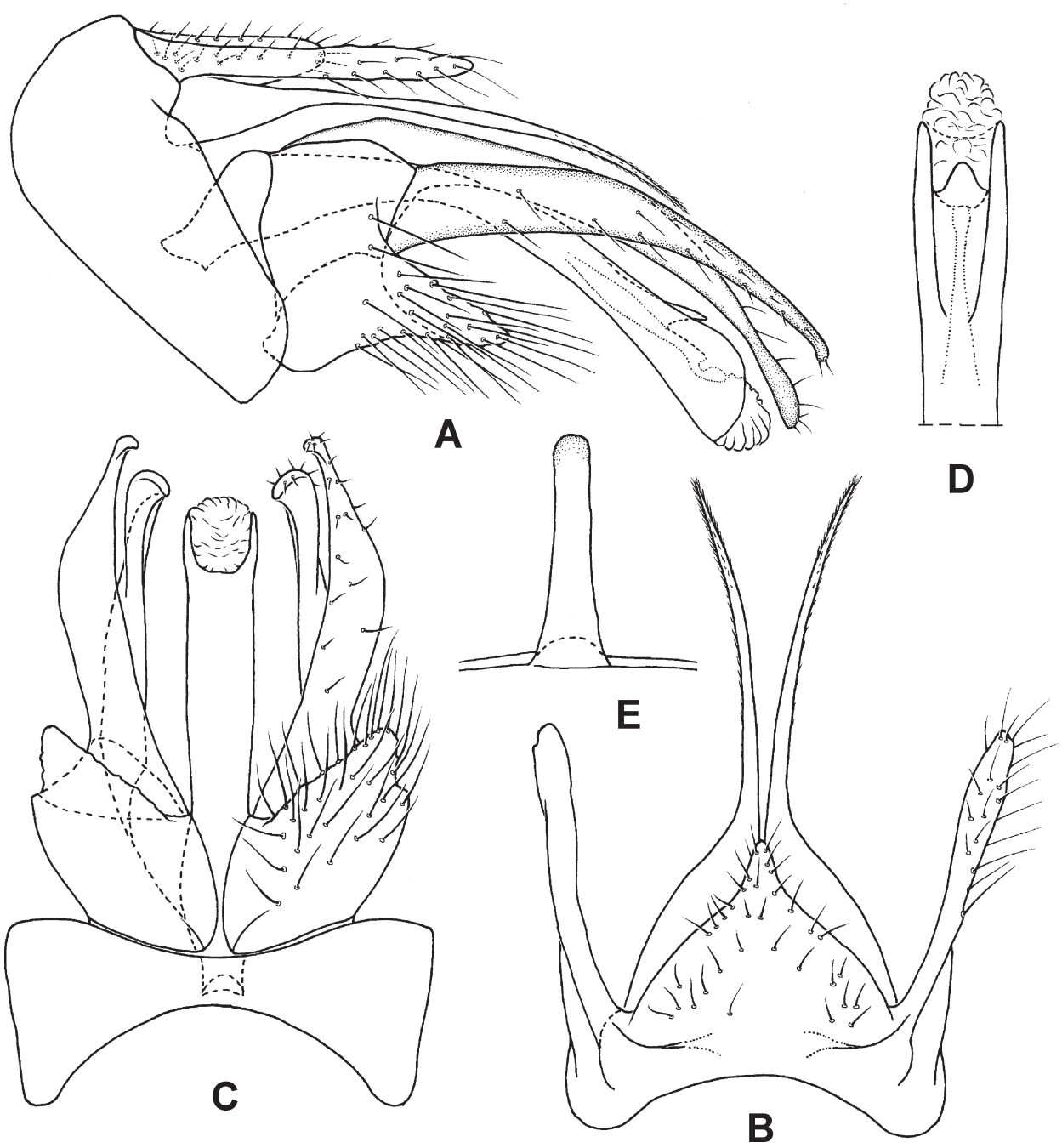


**Figure 8.** *Goera uniformis* Banks, male genitalia. A) Lateral; B) Dorsal; C) Ventral; D) Phallic apparatus, apical portion, dorsal; E) Process of sternum VI, ventral.

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