

**COMPARATIVE ANATOMY OF THE FEMALE GENITALIA OF
GENERIC-LEVEL TAXA IN TRIBE AEDINI (DIPTERA: CULICIDAE).
PART XXII. GENUS *DOWNSIOMYIA* VARGAS**

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Abstract. A comparative, morphological analysis of the female genitalia of species included in genus *Downsiomyia* was conducted. The female genitalia of the genus are characterized and a comparison with other taxa is provided. *Downsiomyia* is divided into two groups. The type species of the genus, *Do. nivea* (Ludlow), is illustrated. Treatment of the genital morphology of the genus includes a composite description, detailed description of the type species, list of the species examined, list of published illustrations and/or descriptions of included species with their literature citations, and a discussion. The discussion section contains a list of the most distinctive female genital features of *Downsiomyia*, a comparison of these with other aedine genera, and other pertinent information.

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INTRODUCTION

This is the twenty-second in a series of papers by the author that describe the female genitalia of the generic-level taxa included in tribe Aedini of family Culicidae. Part I of the series (Reinert 2000a) included an introduction to the series, a brief historical background of published papers dealing with the subject, preparation techniques and anatomical terminology, part II (Reinert 2000b) dealt with genus *Psorophora* Robineau-Desvoidy, part III (Reinert 2000c) with genus *Udaya* Thurman, part IV (Reinert 2000d) with genus *Zeugomyia* Leicester, part V (Reinert 2000e) with genus *Aedes* Meigen, part VI (Reinert 2001a) with genus *Ayurakitia* Thurman, part VII (Reinert 2001b) with genus *Opifex* Hutton, part VIII (Reinert 2001c) with genus *Verrallina* Theobald, part IX (Reinert 2001d) with genus *Eretmapodites* Theobald, part X (Reinert 2002a) with genus *Heizmannia* Ludlow, part XI (Reinert 2002b) with genus *Haemagogus* Williston, part XII (Reinert 2002c) with genus *Armigeres* Theobald, part XIII (Reinert 2002d) with genus *Ochlerotatus* Lynch Arribalzaga, part XIV (Reinert 2002e) provided a key to genera recognized at that time, part XV (Reinert 2008a) with genus *Georgecraigius* Reinert, Harbach and Kitching, part XVI (Reinert 2008b) with genus *Phagomyia* Theobald, part XVII (Reinert 2008c) with genus *Dahlia* Reinert, Harbach and Kitching, part XVIII (Reinert 2008d) with genus *Hulecoeteomyia* Theobald, part XIX (Reinert 2008e) with genus *Danielsia* Theobald, part XX (Reinert 2008f) with genus *Rampamyia* Reinert, Harbach and Kitching, and part XXI (Reinert 2008g) with genus *Patmarksia* Reinert, Harbach and Kitching. Reinert et al. (2004, 2006 and 2008) conducted phylogenetic analyses of tribe Aedini and revised the classification of generic-level taxa. This paper covers the female genitalia of genus *Downsiomyia* Vargas, which was resurrected from synonymy with *Finlaya* Theobald by Reinert et al. (2004).

A comparative, morphological analysis of the female genitalia of *Downsiomyia* species was conducted, a characterization is given, two groups of species are designated, and a discussion including a comparison with other aedine taxa is provided. The format used includes a composite description, a detailed description and illustration of the type species, *Do. nivea* (Ludlow), a list of the species examined, a list of published illustrations and/or descriptions of species with their literature citations, and a discussion including the most distinctive features and other items of note.

MATERIALS AND METHODS

Female genitalia of genus *Downsiomyia* are considered here to include all structures caudad of abdominal segment VII. Segment VIII is included since its tergum and sternum are often modified in development and shape, and possess specialized setae.

Terminology used in the descriptions and illustration follows Reinert (2000a, 2008a) and the abbreviations used are found in the "List of Abbreviations Used in the Text and/or Figure" that precedes the figure. The morphological description is based on slide-mounted genitalia that were dissected from nonliving, dried females. Measurements and descriptions of female genital structures are based on specimens that were cleared, dissected, arranged in a dorsoventrally flattened position, and mounted in Canada balsam under glass cover slips on microscope slides. Ranges are based on the species (listed under "species examined" section) and the specimens that I have examined, therefore some variation may occur in species not seen. A phase contrast microscope was used because this was usually necessary to determine some structures, e.g., spermathecal eminence on the roof of the vagina. Measurements of structures (e.g., length and width of terga VIII and IX, sternum VIII, cercus, etc.) include only the pigmented and sclerotized areas and were made at 400X magnification using an ocular micrometer having a linear scale of 100 divisions that had been calibrated using a stage micrometer. The scale used in the illustration is in millimeters.

The method of preparation of specimens followed Reinert (2000a). During dissection of the genitalia extra care should be taken when separating the insula and lower vaginal lip from sternum VIII as the insula often breaks off and remains attached to the apical intersegmental membrane of the sternum. To avoid this condition the intersegmental membrane of sternum VIII can be separated from the apical margin of the sternum and mounted with the insula and lower vaginal lip.

FEMALE GENITALIA OF GENUS *DOWNSIOMYIA* VARGAS

Genus description. Segments VII and VIII. Laterally compressed; intersegmental membrane between VII-Te and VIII-Te relatively short. **Tergum VIII.** Width greater than length; covered with minute spicules; moderately to heavily pigmented; base broad and gently concave; apex broadly rounded; apical margin with number of long stout and few short, slender setae; setae on distal 0.35-0.69; basal lateral seta present; numerous broad scales covering distal 0.70-0.88; VIII-Te index 0.50-0.76 (0.84 in *Do. nipponica* LaCasse and Yamaguti); VIII-Te/IX-Te index 2.13-3.16; length 0.26-0.36 mm; width 0.38-0.56 mm. **Sternum VIII.** Width greater than length; covered with minute spicules; moderately to heavily pigmented; base straight; apex with minute (0.01-0.06 of VIII-S length), median emargination separating pair of broad, flattened lobes or with pair of broad, flattened lobes with apicolateral areas slightly angled posterolaterally; apical margin with numerous short, curved, often narrowly lanceolate setae; moderate to numerous broad scales forming moderately large patches on distal 0.76-0.92 of lateral areas; numerous setae on distal 0.84-0.99; basal lateral seta normally absent; seta 1-S inserted relatively near basal margin; seta 2-S inserted posterior to seta 1-S; VIII-S index 0.81-0.94; length 0.32-0.46 mm; width 0.38-0.50 mm. **Tergum IX.** Moderately long; moderately to heavily pigmented; U-shaped, comprised of 2 narrow, finger-like, lateral lobes connected by very narrow, basal strip; 1-5 (usually 2-4) moderately long, slender setae apically on each lobe; 2-10 total setae; IX-Te width/length ratio 0.97-1.31 (very rarely less than 1.00); length 0.09-0.14 mm; width 0.10-0.16 mm. **Insula.** Liplike; somewhat depressed mesally; covered with short spicules; lightly to moderately pigmented; with 1-4 (usually 2 or 3) short to moderately long, slender setae on each side; 3-8 total setae. **Lower vaginal lip.** Moderately pigmented; narrow, without lower vaginal sclerite. **Upper vaginal lip.** Heavily pigmented; narrow, median caudal area somewhat flattened, upper vaginal sclerite very small, comprised of narrow, heavily pigmented strip along basomesal area of lip. **Spermathecal eminence.** Membranous; comprised of few wrinkled, circular folds. **Postgenital lobe.** Covered with spicules, some to most of those along lateral margins normally longer, stouter and many with basal denticles; relatively short; moderately broad; apex flattened or broadly rounded but usually with minute (0.02-0.08 of dorsal length), median emargination; few to several setae on distal 0.27-0.50 of ventral surface; basal mesal apodeme short; PGL ventral index 1.52-2.43; PGL ventral width/Ce dorsal width ratio 0.52-0.75. **Proctiger.** With few to several scattered minute spicules; membranous. **Cercus.** Covered with minute to short spicules; moderately pigmented; relatively short; broad; apical margin broadly oblique with 5-7 (usually 6) stout setae, long on mesal area and tapering in length to moderately long on lateral area and several short, curved, normally narrowly lanceolate setae; without scales; setae on distal 0.34-0.65 of dorsal surface; cercus index 1.45-1.89; Ce/dorsal PGL index 1.18-2.12; length 0.14-0.18 mm; width 0.08-0.11 mm. **Spermathecal capsules.** Nivea Group with one large capsule; Albonivea Group with one large and 2 medium capsules; numerous small spermathecal capsule pores near orifice. **Accessory gland duct.** Basal area moderately to darkly pigmented, relatively short.

Type species description (*Do. nivea*, Figure 1). **Tergum VIII.** Numerous broad scales covering distal 0.73-0.79, both dark and pale scales present; setae on distal 0.51-0.65; VIII-Te index 0.49-0.65; length 0.28-0.31 mm; width 0.51-0.56 mm. **Sternum VIII.** Apex with minute (0.02-0.04 of VIII-S length), median emargination separating broad, flattened lobes with lateral portions gently angled posterolaterally; broad scales in lateral patches on distal 0.76-0.81; setae on distal 0.94-0.98; VIII-S index 0.85-0.91; length 0.39-0.43 mm; width 0.44-0.47 mm.

Tergum IX. With 3-5 setae on each lateral lobe apically, 6-9 total setae; IX-Te width/length ratio 1.03-1.27; length 0.10-0.12 mm; width 0.11-0.14 mm. **Insula.** With 2-4 setae laterally on each side; 5-8 total setae. **Postgenital lobe.** Apex broadly rounded or flat; setae on distal 0.43-0.50 of ventral surface; PGL ventral index 1.73-2.16; PGL ventral width/Ce dorsal width ratio 0.60-0.75; ventral length 0.13-0.14 mm. **Cercus.** Apical margin with 6 stout setae; dorsal surface with setae on distal 0.47-0.52; cercus index 1.45-1.68; length 0.16-0.17 mm; width 0.09-0.11 mm. **Spermathecal capsule.** One large capsule.

Species examined. Female genitalia of the following species were examined: Nivea Group: *Downsiomyia albolateralis* (Theobald), *Do. dorseyi* (Knight), *Do. ganapathi* (Colless), *Do. harinasutai* (Knight), *Do. inermis* (Colless), *Do. laoagensis* (Knight), *Do. leonis* (Colless), *Do. litorea* (Colless), *Do. mikrokopion* (Knight and Harrison), *Do. mjoebergi* (Edwards), *Do. mohani* (Knight), *Do. nipponica*, *Do. niveoides* (Barraud), *Do. nivea*, *Do. novonivea* (Barraud), *Do. pexa* (Colless), *Do. pseudonivea* (Theobald), *Do. subnivea* (Edwards), *Do. vana* (Colless) and Albonivea Group: *Do. albonivea* (Barraud) and *Do. saperoi* (Knight).

Discussion. The following combination of features is most distinctive for the female genitalia of species belonging to genus *Downsiomyia*. Cercus is relatively short, wide, without scales and the apex is broadly oblique. Tergum IX is U-shaped, comprised of two narrow, lateral lobes that are narrowly connected at the base and each lobe has few setae at the apex. Tergum VIII has the width greater than the length, the apex is rounded and broad scales cover most of the surface. Sternum VIII has the width greater than the length, the apex has a minute, median emargination separating a pair of broad, flattened lobes and with moderate to large patches of broad scales on the lateral areas. Insula is liplike, somewhat depressed mesally, and possesses 1-4 (usually 2 or 3) moderately long, slender setae laterally on each side.

Two groups of species are designated for genus *Downsiomyia* and are based on the presence of only one large spermathecal capsule (Nivea Group) or one large and two slightly smaller spermathecal capsules (Albonivea Group).

Female genitalia of *Downsiomyia*, when compared to other generic-level taxa of Aedini with a liplike insula with setae in lateral patches, are easily differentiated, especially in the development of the U-shaped tergum IX and most species by the single large spermathecal capsule. Arrangement of the numerous broad scales on tergum VIII and sternum VIII is somewhat similar to species in *Hulecoeteomyia* and *Phagomyia* but development of the apical margin of sternum is different as well as numerous other genital characters. Development of tergum IX is somewhat similar to species of *Finlaya* but numerous other differences occur in other characters from these species. Species of *Rhinoskusea* Edwards and '*Aedes (Cancraedes)*' Edwards have a single large spermathecal capsule but have numerous other genital differences. Species of *Paraedes* Edwards have one group of species with a single large spermathecal capsule whereas another group of species have one large and two slightly smaller spermathecal capsules (see Reinert, 2000e) but *Paraedes* are easily distinguished by a tonguelike insula as well as other features of the female genitalia.

Published illustrations (1) and/or descriptions (2) of female genitalia. Nivea Group. *Downsiomyia albolateralis*: Lu and Li (1982) (1); *Do. leonis*: Reinert et al. (2004) (2), (2006) (2), (2008) (2); *Do. nipponica*: LaCasse and Yamaguti (1950) (1, 2); Hara (1957) (1?, 2?); Tanaka et al. (1979) (2); *Do. nippononivea*: Hara (1957) (1?, 2?); *Do. nishikawai*: Tanaka et al. (1979) (2); and *Do. nivea*: Reinert (2002d) (1); Reinert et al. (2004) (2), (2006) (2), (2008) (2); Reinert and Harbach (2006) (2). Albonivea Group. *Downsiomyia albonivea*: Reinert (2002d) (1). A question mark after a reference indicates the species identification is uncertain.

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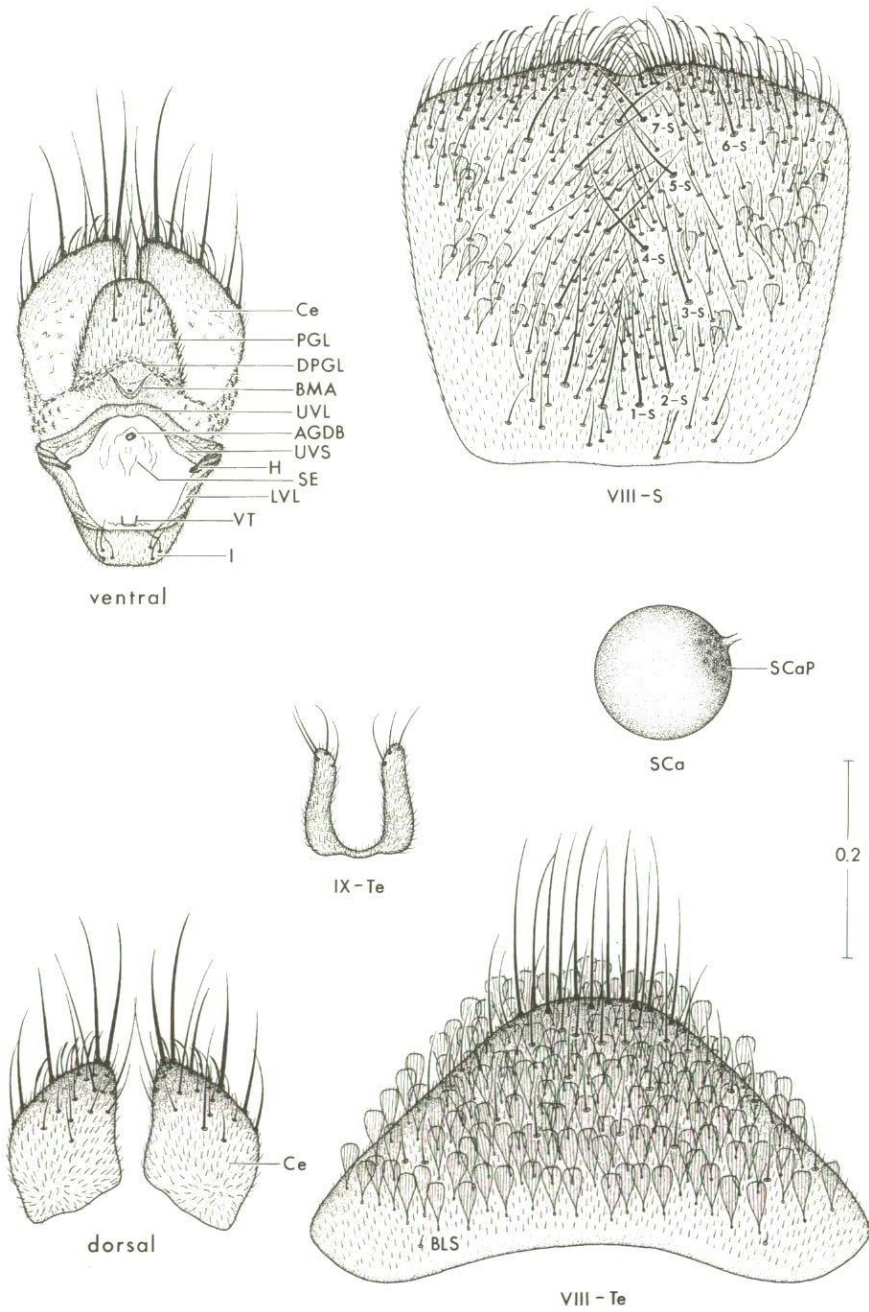
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FIGURE 1. FEMALE GENITALIA OF *DOWNSIOMYIA NIVEA***LIST OF ABBREVIATIONS USED IN THE TEXT AND/OR FIGURE**

AGDB	= accessory gland duct base
BLS	= basal lateral seta
BMA	= basal mesal apodeme
Ce	= cercus
DPGL	= line of attachment of Pr to dorsal surface of PGL
H	= hinge
I	= insula
IX-Te	= tergum IX
LVL	= lower vaginal lip
mm	= millimeter
PGL	= postgenital lobe
SCa	= spermathecal capsule
SCaP	= spermathecal capsule pore
SE	= spermathecal eminence
UVL	= upper vaginal lip
UVS	= upper vaginal sclerite
VIII-S	= sternum VIII
VIII-Te	= tergum VIII
VT	= ventral tuft
1-7-S	= Seta 1-7-S

Fig. 1



Downsiomyia nivea

SYSTEMATIC INDEX

Valid generic and specific taxa are italicized, other taxa are in Roman type. Boldface page numbers are those which began the primary treatment of the taxon.

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