

**COMPARATIVE ANATOMY OF THE FEMALE GENITALIA OF  
GENERIC-LEVEL TAXA IN TRIBE AEDINI (DIPTERA: CULICIDAE).  
PART XV. GENUS *GEORGE CRAIGIUS* REINERT, HARBACH AND KITCHING**

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**Abstract.** A comparative, morphological analysis of the female genitalia of species included in genus *Georgecraigius* Reinert, Harbach and Kitching was conducted. A composite description of the female genitalia for the genus is provided. The type species of the genus, *Gc. atropalpus* (Coquillett), is described and illustrated. Female genital morphology of the two currently recognized subgenera, *Georgecraigius* and *Horsfallius* Reinert, Harbach and Kitching, are included. A list of the species examined in each subgenus is given and includes any published illustrations and/or descriptions with their literature citations. The discussion section contains the most distinctive features of the genus, a comparison of these with other aedine genera, and other pertinent information. Four additional terms used to describe female genital structures are introduced.

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## INTRODUCTION

This is the fifteenth 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 a brief historical background of published papers dealing with the subject and provided an introduction to the series, 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, and part XIV (Reinert 2002e) provided a key to genera recognized at that time. 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 *Georgecraigius* Reinert, Harbach and Kitching and the two included subgenera, *Georgecraigius* and *Horsfallius* Reinert, Harbach and Kitching. Genus *Georgecraigius* and its two subgenera were described as new by Reinert et al. (2006).

A comparative, morphological analysis of the female genitalia of genus *Georgecraigius* was conducted. A composite description of the genus is given, a detailed description and illustration of the type species, *Ge. atropalpus* (Coquillett), is provided, and a discussion including the most distinctive features, a comparison with other taxa, and other items of note is included. The female genitalia of the two subgenera are described. The format used for each subgenus includes a composite description, a description of the type species, a list of the species examined, and a list of published illustrations and/or descriptions of species with their literature citations.

## MATERIALS AND METHODS

Female genitalia of genus *Georgecraigius* 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) except for additional terms listed below. The abbreviations used are found in the "List of Abbreviations Used in the Text and/or Figure" that precedes the figure. Morphological descriptions are based on slide-mounted genitalia that were dissected from dead, 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 of each subgenus) and specimens that I have examined. 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 visible at 400X magnification. Measurements were made 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 was 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, the intersegmental membrane of sternum VIII was separated from the apical margin of the sternum and mounted with the insula and lower vaginal lip.

#### ADDITIONAL TERMINOLOGY USED TO DESCRIBE FEMALE GENITALIA

**Postgenital lobe ventral index (PGL ventral index)** = determined by dividing ventral length by ventral width.

**Postgenital lobe ventral width (PGL ventral width)** = width measured at 0.20 from apex of ventral surface.

**Postgenital lobe ventral width/cercus dorsal width ratio (PGL ventral width/Ce dorsal width ratio)** = width of postgenital lobe measured at distal 0.20 of ventral surface divided by width of cercus measured at midlength of dorsal surface.

**Tergum IX width/length ratio (IX-Te width/length ratio)** = width measured along straight line across widest part of sclerotized and pigmented area of tergum IX divided by distance measured to apex along a perpendicular line drawn from a straight line across base of sclerotized and pigmented area of tergum IX.

#### FEMALE GENITALIA OF GENUS *GEORGE CRAIGIUS* REINERT, HARBACH AND KITCHING

**Genus description.** *Segments VII and VIII.* Dorsoventrally flattened; intersegmental membrane between VII-Te and VIII-Te short to intermediate in length. *Tergum VIII.* Width greater than length; covered with minute spicules; moderately pigmented; base very slightly concave; apex broadly and gently rounded, with several moderately long, moderately stout setae; setae on distal 0.42-0.64; basolateral seta very short; numerous broad scales densely covering distal 0.59-0.79; VIII-Te index 0.60-0.75; VIII-Te/IX-Te index 4.78-7.10; length 0.26-0.40 mm; width 0.37-0.63 mm. *Sternum VIII.* Width greater than length; covered with minute spicules; moderately pigmented; base slightly concave; apex broadly rounded, with several short, nearly straight setae on median part and few moderately long setae on lateral part; several moderately long and few short setae on distal 0.60-0.81; setae 1-4-S long, in more or less diagonal line extending from basomesal area to apicolateral area, setal-S inserted some distance caudally from basal margin; basolateral seta absent; numerous broad scales covering distal 0.59-0.83; VIII-S index 0.73-0.89; length 0.29-0.42 mm; width 0.35-0.51 mm. *Tergum IX.* Short and relatively wide; comprised of 2 more or less ovoid, lightly to moderately pigmented, sclerotized, lateral plates connected by membrane mesally; covered with minute spicules; setae absent; IX-

Te width/length ratio 3.43-4.42; length 0.04-0.07 mm; width 0.16-0.26 mm. **Insula.** Liplike; covered with short spicules; 2-4 moderately long setae laterally on each side, 4-7 total setae. **Lower vaginal lip.** Covered with short spicules; lightly to moderately pigmented; narrow; hinge moderately wide; without lower vaginal sclerite; ventral tuft present. **Upper vaginal lip.** Covered with minute to short spicules; heavily pigmented; narrow laterally, caudal part moderately wide and straight; upper vaginal sclerite moderately pigmented, small. **Spermathecal eminence.** Membranous; ill-defined but somewhat ovoid in outline. **Postgenital lobe.** Covered with short spicules; relatively broad; apex flat or with very shallow, median emargination; basal mesal apodeme short and curved; setae on distal 0.43-0.63 of ventral surface; PGL ventral index 1.34-1.62; PGL ventral width/Ce dorsal width ratio 0.90-1.19. **Proctiger.** Membranous; with several scattered minute spicules. **Cercus.** Covered with short spicules; relatively short; moderately wide; apex moderately to broadly rounded, with few short and few moderately long setae; dorsal surface without scales or with 1-4 adventitious scales; setae on distal 0.59-0.76 of dorsal surface; lateral and mesal margins slightly bowed; cercus index 1.93-2.38; Ce/dorsal PGL index 2.33-3.26; length 0.15-0.22 mm; width 0.07-0.11 mm. **Spermathecal capsules.** One large and 2 slightly smaller ones; heavily pigmented; spherical; with several to numerous small, spermathecal capsule pores near orifice. **Accessory gland duct.** Basal heavily pigmented area short.

**Type species description (*Gc. atropalpus*, Figure 1).** **Tergum VIII.** Setae on distal 0.62-0.64; scales on distal 0.71-0.79; VIII-Te index 0.60-0.65; VIII-Te/IX-Te index 5.39-7.10; length 0.37-0.39 mm; width 0.50-0.65 mm. **Sternum VIII.** Setae on distal 0.73-0.81; scales on distal 0.68-0.83; VIII-S index 0.77-0.83; length 0.39-0.42 mm; width 0.50-0.51 mm. **Tergum IX.** IX-Te width/length ratio 3.57-4.42; length 0.05-0.07 mm; width 0.22-0.26 mm. **Insula.** Normally 3 setae laterally on each side (rarely 2 or 4 setae on one side). **Postgenital lobe.** Apex normally with very shallow median emargination (rarely flat); PGL ventral index 1.35-1.62; PGL ventral width/Ce dorsal width ratio 0.90-1.17. **Cercus.** Index 2.00-2.24; Ce/dorsal PGL index 2.34-2.69; length 0.21-0.22 mm; width 0.10-0.11 mm.

**Discussion.** The following combination of features is most distinctive for the female genitalia of species belonging to genus *Georgecraigius*. Tergum IX is short, relatively wide, comprised of two more or less ovoid, sclerotized, lateral plates connected by membrane mesally, and setae are absent. Postgenital lobe width is greater than or slightly less than the width of the cercus at midlength (PGL ventral width/Ce dorsal width ratio 0.90-1.19). Insula is liplike and bears two or three moderately long setae laterally on each side (rarely four setae on one side). Both tergum VIII and sternum VIII have the width greater than the length and much of the surface is covered with broad scales. Cercus is short and relatively wide with the apex moderately to broadly rounded. Sternum VIII has a broadly rounded apex.

Development of tergum IX is distinctive for *Georgecraigius* in the short, relatively wide, more or less ovoid, sclerotized, lateral plates connected by membrane mesally, and without setae. Some other aedine genera have tergum IX somewhat similarly developed, but with other differences, e.g., *Udaya* Thurman has two short, ovoid-shaped, sclerotized, lateral plates connected by membrane, but the plates bear setae and also the insula is tongue-like, and *Eretmapodites* Theobald has two short, wide lateral plates connected by membrane and are normally without setae on one or both plates but the insula is tongue-like. Some other genera in tribe Aedini have tergum IX without setae but the tergum is developed as a single plate that is differently shaped and other genital character differences exist, e.g., *Belkinus* Reinert, *Haemagogus* Williston, *Patmarksia* Reinert, Harbach and Kitching, *Verrallina* Theobald, and *Zeugnumyia* Leicester.

Female genital characters of all species of *Georgecraigius* examined are relatively uniform with few differences between subgenera as noted below. The combination of these characters can be used to separate the two subgenera.

## FEMALE GENITALIA OF *GEORGE CRAIGIUS* SUBGENERA

### SUBGENUS *GEORGE CRAIGIUS* REINERT, HARBACH AND KITCHING

**Subgenus description.** *Tergum VIII*. Index 0.60-0.71. *Sternum VIII*. Setae on distal 0.72-0.81. *Cercus*. Length 0.18-0.22 mm.

**Type species description** (*Gc. atropalpus*, Figure 1). See description above.

**Species examined.** *Georgecraigius atropalpus* and *Gc. epactius* (Dyar and Knab).

**Published illustrations (1) and/or descriptions (2) of female genitalia.** *Georgecraigius atropalpus*: Ross 1947 (1); Yamaguti and LaCasse 1951 (1, 2); Mohrig 1967 (1, 2); Zavortink 1972 (1); Reinert et al. 2004 (2), 2006 (2), 2008 (2); *Gc. epactius*: Reinert et al. 2006 (2), 2008 (2).

### SUBGENUS *HORSFALLIUS* REINERT, HARBACH AND KITCHING

**Subgenus description.** *Tergum VIII*. Index 0.73-0.75. *Sternum VIII*. Setae on distal 0.63-0.69. *Cercus*. Length 0.15 mm.

**Type species description** (*Gc. fluviatilis* (Lutz)). *Tergum VIII*. Setae on distal 0.53-0.64; scales on distal 0.68-0.74; VIII-Te index 0.73-0.75; VIII-Te/IX-Te index 6.88; length 0.29 mm; width 0.38-0.40 mm. *Sternum VIII*. Setae on distal 0.63-0.69; scales on distal 0.70-0.81; VIII-S index 0.73-0.89; length 0.29-0.32 mm; width 0.35-0.41 mm. *Tergum IX*. IX-Te width/length ratio 3.59-3.88; length 0.04 mm; width 0.16 mm. *Insula*. With 2 or 3 setae laterally on each side. *Postgenital lobe*. Apex flat or with shallow emargination; PGL ventral index 1.34-1.52; PGL ventral width/Ce dorsal width ratio 0.93-1.19. *Cercus*. Index 1.93-2.19; Ce/dorsal PGL index 2.33-2.95; length 0.15 mm; width 0.07-0.08 mm.

**Species examined.** *Georgecraigius fluviatilis*.

**Published illustrations (1) and/or descriptions (2) of female genitalia.** *Georgecraigius fluviatilis*: Zavortink 1972 (1); Reinert et al. 2006 (2), 2008 (2).

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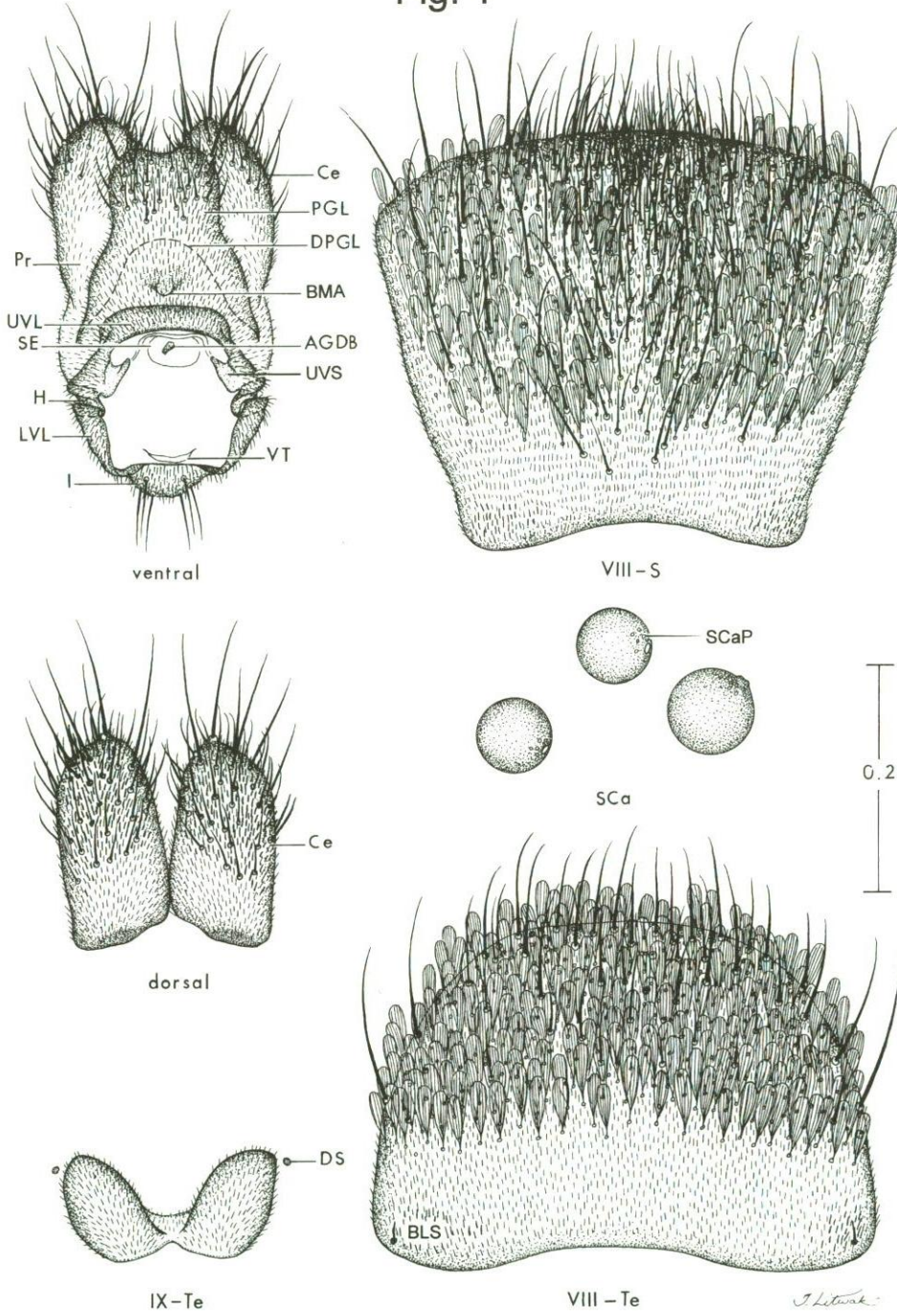
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**FIGURE 1. FEMALE GENITALIA OF *GEORGE CRAIGIUS ATROPALPUS*.****LIST OF ABBREVIATIONS USED IN THE TEXT AND/OR FIGURE**

AGDB	= accessory gland duct base
BLS	= basolateral seta
BMA	= basal mesal apodeme
Ce	= cercus
DPGL	= line of attachment of Pr to dorsal surface of PGL
DS	= dorsal sphere
H	= hinge
I	= insula
IX-Te	= tergum IX
LVL	= lower vaginal lip
mm	= millimeter
PGL	= postgenital lobe
Pr	= proctiger
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



Fig. 1



*Georgecraigius atropalpus*

## 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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