COMPARATIVE ANATOMY OF THE FEMALE GENITALIA OF GENERIC-LEVEL TAXA IN TRIBE AEDINI (DIPTERA: CULICIDAE). PART XVIII. GENUS *HULECOETEOMYIA* THEOBALD

John F. Reinert[1]

Center for Medical, Agricultural and Veterinary Entomology (CMAVE),
United States Department of Agriculture, Agricultural Research Service,
1600/1700 S.W. 23rd Drive, Gainesville, Florida 32608-1067 USA,
e-mail: John.Reinert@ars.usda.gov

Abstract. A comparative, morphological analysis of the female genitalia of species included in genus *Hulecoeteomyia* Theobald was conducted. The female genitalia of the genus are characterized and a comparison with other taxa is provided. The type species of the genus, *Hl. chrysolineata* (Theobald), 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 *Hulecoeteomyia*, a comparison of these with other aedine genera, and other pertinent information.

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[1]Also collaborator, Walter Reed Biosystematics Unit (WRBU), National Museum of Natural History, Smithsonian Institution, Washington, DC 20560-0165.

INTRODUCTION

This is the eighteenth 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 *Zeugnomyia* 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, and part XV (Reinert 2008a) with genus *Georgecraigius* Reinert, Harbach and Kitching, part XVI (Reinert 2008b) with genus *Phagomyia* Theobald, and part XVII (Reinert 2008c) *Dahliana* 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 *Hulecoeteomyia* Theobald, which was resurrected from synonymy with *Finlaya* Theobald by Reinert et al. (2006).

A comparative, morphological analysis of the female genitalia of *Hulecoeteomyia* species was conducted, a characterization is given, 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, *Hl. chrysolineata* (Theobald), 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 *Hulecoeteomyia* 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 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) and 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 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.

FEMALE GENITALIA OF GENUS *HULECOETEOMYIA* THEOBALD

Genus description. ***Segments VII and VIII.*** Laterally compressed; 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 nearly straight or rarely gently concave; apex broadly rounded, with several moderately long setae; setae on distal 0.44-0.86; basolateral seta very short; numerous broad scales densely covering distal 0.60-0.82; VIII-Te index 0.57-0.80; VIII-Te/IX-Te index 2.08-2.77; length 0.29-0.43 mm; width 0.38-0.66 mm. ***Sternum VIII.*** Width usually slightly greater than length, some species length slightly greater than width; covered with minute spicules; moderately pigmented; base normally nearly straight or rarely very slightly concave on median area; apex with small, median emargination separating broadly rounded lobes, with numerous short, curved setae; several moderately long and short setae on distal 0.84-0.94; setae 1-4-S long, in more or less diagonal line extending from basomesal area to apicolateral area, seta 1-S inserted some distance caudally from basal margin; basolateral seta present or absent; moderate number of broad scales on distal 0.70-0.89 (*Hl. nigrorhynchus* (Brug) and *Hl. sherki* (Knight) with reduced number of scales); VIII-S index 0.78-1.04 (usually 0.78-0.95); length 0.36-0.55 mm; width 0.42-0.58 mm. ***Tergum IX.*** Moderately long and moderately wide; comprised of 2 moderately long, moderately pigmented, lateral plates separated mesally by lightly pigmented area (*Hl. pallirostris* (Edwards) and *Hl. rizali* (Banks) with moderately pigmented, small, median strip connecting lateral plates); covered with minute spicules; 4-14 (usually 7-11) short setae distally on each plate, 9-25 (usually 16-21) total setae; IX-Te width/length ratio 0.82-1.18; length 0.11-0.20 mm; width 0.11-0.17 mm. ***Insula.*** Liplike; covered with minute to short spicules; with 3-8 (usually 3-5) short setae laterally on each side, 6-14 total setae. ***Lower vaginal lip.*** Covered with minute to short spicules; lightly to moderately pigmented; narrow; hinge moderately wide; without lower vaginal sclerite; ventral tuft present, small. ***Upper vaginal lip.*** Covered with minute to short spicules; heavily pigmented; narrow laterally and curved outward, caudal part somewhat broader and gently convex; upper vaginal sclerite moderately pigmented, small. ***Spermathecal eminence.*** Membranous; ill-defined with few minute spicules on mesal area. ***Postgenital lobe.*** Covered with short spicules; moderately wide; apex usually flat (some species with very shallow, median emargination); basal mesal apodeme short and curved; setae on distal 0.25-0.44 of ventral surface; PGL ventral index 1.89-2.42; PGL ventral width/Ce dorsal width ratio 0.71-1.00. ***Proctiger.*** Membranous; with scattered minute spicules. ***Cercus.*** Covered with minute to short spicules; moderately long; moderately wide; apex broadly rounded, with several short and few moderately long setae; dorsal surface normally without scales (*Hl. chrysolineata* and *Hl. pallirostris* occasionally with 1 scale on one cercus; *Hl. formosensis* (Yamada) and *Hl. reinerti* (Rattanarithikul and Harrison) with 2-6 scales/cercus); setae on distal 0.46-0.63 of dorsal surface; lateral margins more or less equal distance apart but slightly broader proximally; cercus index 1.91-2.43; Ce/dorsal PGL index 1.93-2.83; length 0.18-0.26 mm; width 0.08-0.11 mm. ***Spermathecal capsules.*** One large and 2 slightly smaller ones; heavily pigmented; spherical;

with several small, spermathecal capsule pores near orifice. ***Accessory gland duct.*** Basal darkly pigmented area narrow, short.

Type species description (*Hl. chrysolineata*, Figure 1). ***Tergum VIII.*** Setae on distal 0.44-0.74; scales on distal 0.78-0.81; VIII-Te index 0.63-0.69; VIII-Te/IX-Te index 2.15-2.60; length 0.30-0.33 mm; width 0.47-0.49 mm. ***Sternum VIII.*** Setae on distal 0.89-0.92; scales on distal 0.77-0.81; VIII-S index 0.92-0.94; length 0.40-0.42 mm; width 0.42-0.43 mm. ***Tergum IX.*** IX-Te width/length ratio 0.87-1.10; length 0.12-0.14 mm; width 0.12-0.14 mm. ***Insula.*** With 5 setae on each side laterally, 10 total setae. ***Postgenital lobe.*** Apex normally flat, occasionally with very shallow, median emargination; setae on distal 0.25-0.34 of ventral surface; PGL ventral index 1.89-1.90; PGL ventral width/Ce dorsal width ratio 0.88-0.94. ***Cercus.*** Setae on distal 0.46-0.51 of dorsal surface; index 2.11-2.34; Ce/dorsal PGL index 2.55-2.83; length 0.18-0.20 mm; width 0.08-0.09 mm.

Species examined. *Hulecoeteomyia chrysolineata*, *Hl. formosensis*, *Hl. harveyi* (Barraud), *Hl. japonica japonica* (Theobald), *Hl. jugraensis* Leicester, *Hl. koreica* (Edwards), *Hl. nigrorhynchus*, *Hl. pallirostris*, *Hl. reinerti*, *Hl. rizali*, *Hl. saxicola* (Edwards), and *Hl. sherki*.

Discussion. The following combination of features is most distinctive for the female genitalia of species belonging to genus *Hulecoeteomyia*. Sternum VIII has the apex with a small, median emargination separating broadly rounded lobes bearing numerous short, curved setae and with the base normally nearly straight or rarely very slightly concave on median area. Tergum VIII is densely covered with broad scales on the distal 0.60-0.82, the width is greater than the length, the apex is broadly rounded, and the base is nearly straight or rarely gently concave. Cercus is moderately long, moderately wide, and the apex is broadly rounded. Postgenital lobe is moderately wide and the apex is normally flat or with a very shallow, median emargination.

Female genitalia of *Hulecoeteomyia* species bear some similarity to some other aedine genera with a liplike insula bearing setae in lateral patches, i.e., cercus is somewhat like that in species of genus *Dahliana* Reinert, Harbach and Kitching and a few species of genus *Howardina* Theobald. Tergum VIII has a dense covering of broad scales over most of the surface and the overall shape is similar to genera *Finlaya* Theobald, *Gymnometopa* Coquillett, *Kenknightia* Reinert, and most species of "*Ochlerotatus* (*Protomacleaya*)" Theobald. The development of the postgenital plate is somewhat like subgenus *Pseudoskusea* Theobald of *Ochlerotatus* and some other species of genera *Howardina* and *Ochlerotatus s.l.* However, species of all these genera have numerous other female genital characters that are different from those of *Hulecoeteomyia* species.

Hulecoeteomyia includes species previously placed in the Chrysolineatus Assemblage of *Ochlerotatus* (*Finlaya*) (*sensu* Reinert (2002d).

Published illustrations (1) and/or descriptions (2) of female genitalia. *Hulecoeteomyia chrysolineata*: Reinert (2002d) (1, 2), Reinert et al. (2004) (2), (2006) (2); *Hl. japonicus japonicus*: Hara (1957) (1, 2); Mohrig (1967) (1, 2); Reinert et al. (2006) (2); *Hl. jugarensis*: Reinert et al. (2006) (2); *Hl. koreica*: LaCasse and Yamaguti (1950) (1); *Hl. pallirostris*: Tewari and Hiriyan (1996) (1, 2), *Hl. reinerti*: Rattanarithikul and Harrison (1988) (1, 2); and *Hl sherki*: Reinert et al. (2006) (2).

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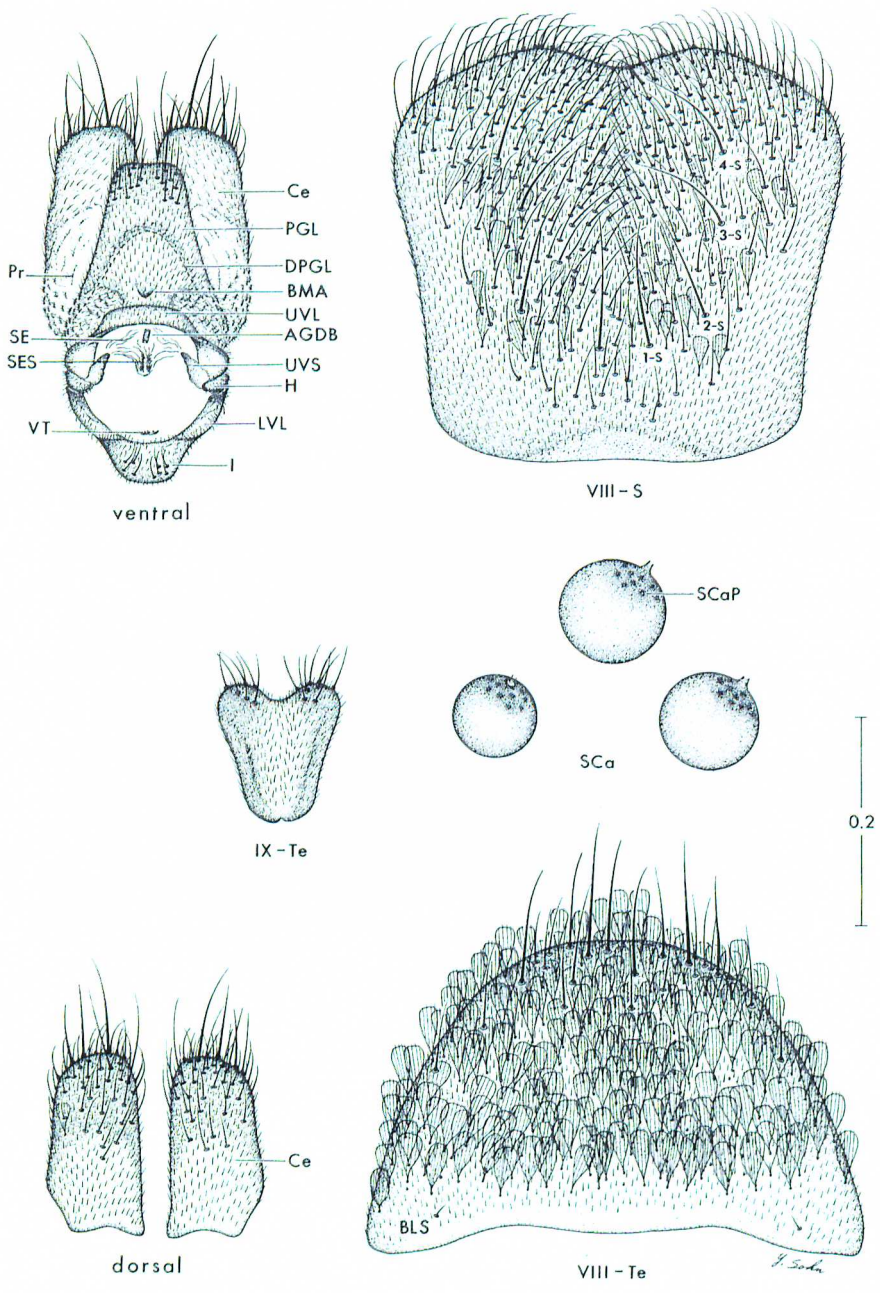
FIGURE 1. FEMALE GENITALIA OF *HULECOETEOMYIA CHRYSOLINEATA*

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
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
SES	= spermathecal eminence spicules
UVL	= upper vaginal lip
UVS	= upper vaginal sclerite
VIII-S	= sternum VIII
VIII-Te	= tergum VIII
VT	= ventral tuft
1-4-S	= Seta 1-4-S

Fig. 1



Hulecoeteomyia chrysolineata

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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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