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Descriptions of Four External Male Genitalia of the Pyrrhocoroidea (Heteroptera) 【Research report】

星蝽總科四種雄性外性器 (異翅目) 【研究報告】

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Abstract

The external male genitalia of four currently available species i.e., *Physopelta guttata* (Burmeister) (Largidae), *Dindymus brevis* Blöte, *Dysdercus monostigma* Firby, and *Antilochus conquebertii* (Fabricius) (Pyrrhocoridae), are illustrated and described. The characteristic feature of these four external male genitalia is the amazing diversity of the genital plates.

摘要

本文繪圖·敘述大星蝽科*Physopelta guttata* (Burmeister)·與星蝽科*Dindymus brevis* Blöte, *Dysdercus monostigma* Firby·與*Antilochus conquebertii* (Fabricius) 之雄性外性器。此總科雄性外性器之特殊形貌為性板之驚人變異。

Key words: Pyrrhocoroidea, external male genitalia, morphology.

關鍵詞: 星蝽總科、雄性外性器、形態

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Descriptions of Four External Male Genitalia of the Pyrrhocoroidea (Heteroptera)

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ABSTRACT

The external male genitalia of four currently available species i.e., *Physopelta guttata* (Burmeister) (Largidae), *Dindymus brevis* Blöte, *Dysdercus monostigma* Firby, and *Antilochus conquebertii* (Fabricius) (Pyrrhocoridae), are illustrated and described. The characteristic feature of these four external male genitalia is the amazing diversity of the genital plates.

Key words: Pyrrhocoroidea, external male genitalia, morphology.

Introduction

The external male genitalia of Hemiptera was first comparatively studied by Singh-Pruthi (1925), and his fundamental view has undoubtedly prevailed to the present. Yang and Chang (2000) mentioned that "In the present study the external male genitalia of Hemiptera have been interpreted in the means the different from those of previous author's. This new interpretation is based on: 1) Singh-Pruthi's periandrium be judged as an evolutionary event independent of the aedeagus; 2) Singh-Pruthi's periandrium be discriminated as the undifferentiating phallobase and connective combination; 3) all the structure be termed uniformly throughout taxon and 4) the origin of all these structure be searched."

Descriptions of the external male

genitalia of the Heteroptera in Yang and Chang (2000) were preliminary with very poor and miscellaneous knowledge at that time. According to our current understanding, it is necessary to examine the anatomy of the external male genitalia and to provide as much detail as possible for each single taxon to promote the knowledge of the external male genitalia of the Heteroptera. This is thought to be critical information about phylogeny and evolution.

Materials and Methods

Four currently available species of the Pyrrhocoroidea were selected for study. *Physopelta guttata* (Burmeister), *Dindymus brevis* Blöte, *Dysdercus monostigma* Firby, and *Antilochus conquebertii* (Fabricius) were studied.

Abdominal segments I-XI were

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placed in a 10% solution of KOH until the organs became transparent, and then they were placed directly into glycerin on cavity slide glasses. Specimens were supported by cotton fibers in glycerin. The anatomical characters were studied by dissecting the external male genitalia in as much detail as possible. Figures were drawn with a drawing tube.

Results

Physopelta guttata (Burmeister)

(Largidae) Fig. 1.

Abdominal tergite VII with straight posterior margin, not produced caudad. Abdominal segment IX abruptly converging caudad and medially in lateral view; in dorsal view posterior margin straight. Posterior opening of abdominal segment IX for phallus diverging to dorsal aspect; opening for genital styles situated laterad below middle. Abdominal segment X triangular in dorsal view. Abdominal segment XI retracted into segment X. Genital plates very large, rod-like in lateral view; in anterodorsal view diamond-shaped.

Phallus directed dorsad within segment IX. Connective U-shaped in dorsal view. Support bridge with upper portion in dorsal view as cross bar of connective; lower portion in lateral view as narrow triangular plates below connective; other portions as figured. Ligamentary processes of support bridge between ejaculatory reservoir and phallobasal conjunctival processes sclerotized, terete-shaped. Support tube semicircular in lateral view. Phallobase tubular in lateral view, truncated at apex; in dorsal view without a pair of small projections in lateromedian portions. Phallobasal conjunctival processes 3 pairs, as figured. Ejaculatory reservoir difficult to discriminate from reservoir lumen. Reservoir lumen very long, spiraled twice before middle. Aedeagus long, partly membranous, coiled at apex, only small

portion exposed beyond apex of phallobase. Genital styles symmetrical in size and shape; left genital style dorsal view as figured; apices directed opposite.

Dindymus brevis Blöte (Pyrrhocoridae) Fig. 2.

Abdominal tergite VII with posterior margin triangularly produced caudad and medially. Abdominal segment IX with very short dorsal margin in lateral view, ventrocaudal portion produced caudad and quadrately; in dorsal view apex somewhat invaginated medially. Posterior opening of abdominal segment IX elongate oval in dorsocaudal view; opening for genital styles situated laterad below middle. Abdominal segment X quadrate in dorsal view. Abdominal segment XI retracted into segment X. Genital plates with broadly rounded dorsal margin in anterodorsal view, ventral margin deeply invaginated medially.

Phallus directed dorsad within segment IX. Connective U-shaped in dorsal view. Support bridge with upper portion as cross bar of connective; other portion not carefully examined. Ligamentary processes of support bridge between ejaculatory reservoir and phallobasal conjunctival processes sclerotized, terete-shaped. Capitulate processes present. Support tube terete-shaped in lateral view. Phallobase apex oblique in lateral view, dorsocaudal portion produced caudad; in dorsal view without a pair of small projections in lateromedian portions. Phallobasal conjunctival processes 3 pairs, as figured. Ejaculatory reservoir rounded in lateral view, easily discriminated from reservoir lumen. Reservoir lumen short, rather wide throughout its length, about 1/3 width of aedeagus at base. Aedeagus relatively short, not protruding beyond apex of phallobase. Genital styles symmetrical in size and shape; left genital style caudal view as figured; apices directed opposite.

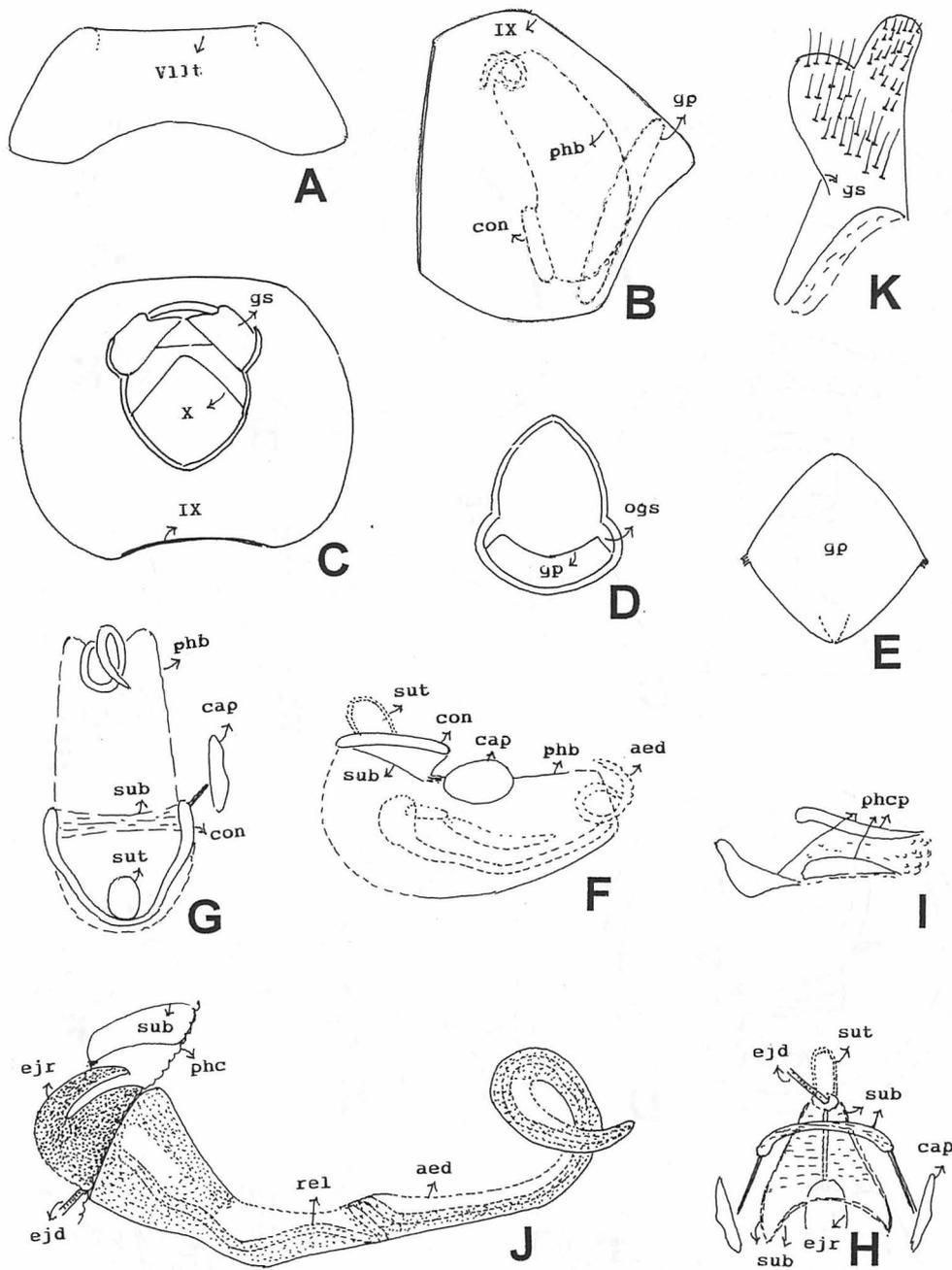


Fig. 1. *Physopelta guttata* (Burmeister). A. Abdominal segment VII, dorsal view; B. abdominal segment IX, lateral view; C. abdominal segments IX-X and genital styles, dorsal view; D. posterior opening of abdominal segment IX, dorsocaudal view; E. genital plates, anterodorsal view; F. phallus, lateral view; G. the same, dorsal view; H. support bridge and ejaculatory reservoir, dorsal view; I. phallobasal conjunctival processes, lateral view; J. ejaculatory reservoir and aedeagus, lateral view; K. left genital style, dorsal view. VII, IX, X, and XI, = abdominal segments VII, IX, X, and XI. ; aed, aedeagus; cap, capitata; con, connective; ejd, ejaculatory duct; ejr, ejaculatory reservoir; gp, genital plates; gs, genital styles; phb, phallobase; phc, phallobasal conjunctiva; phcp, phallobasal conjunctival processes; rel, reservoir lumen; sub, support bridge; sut, support tube.

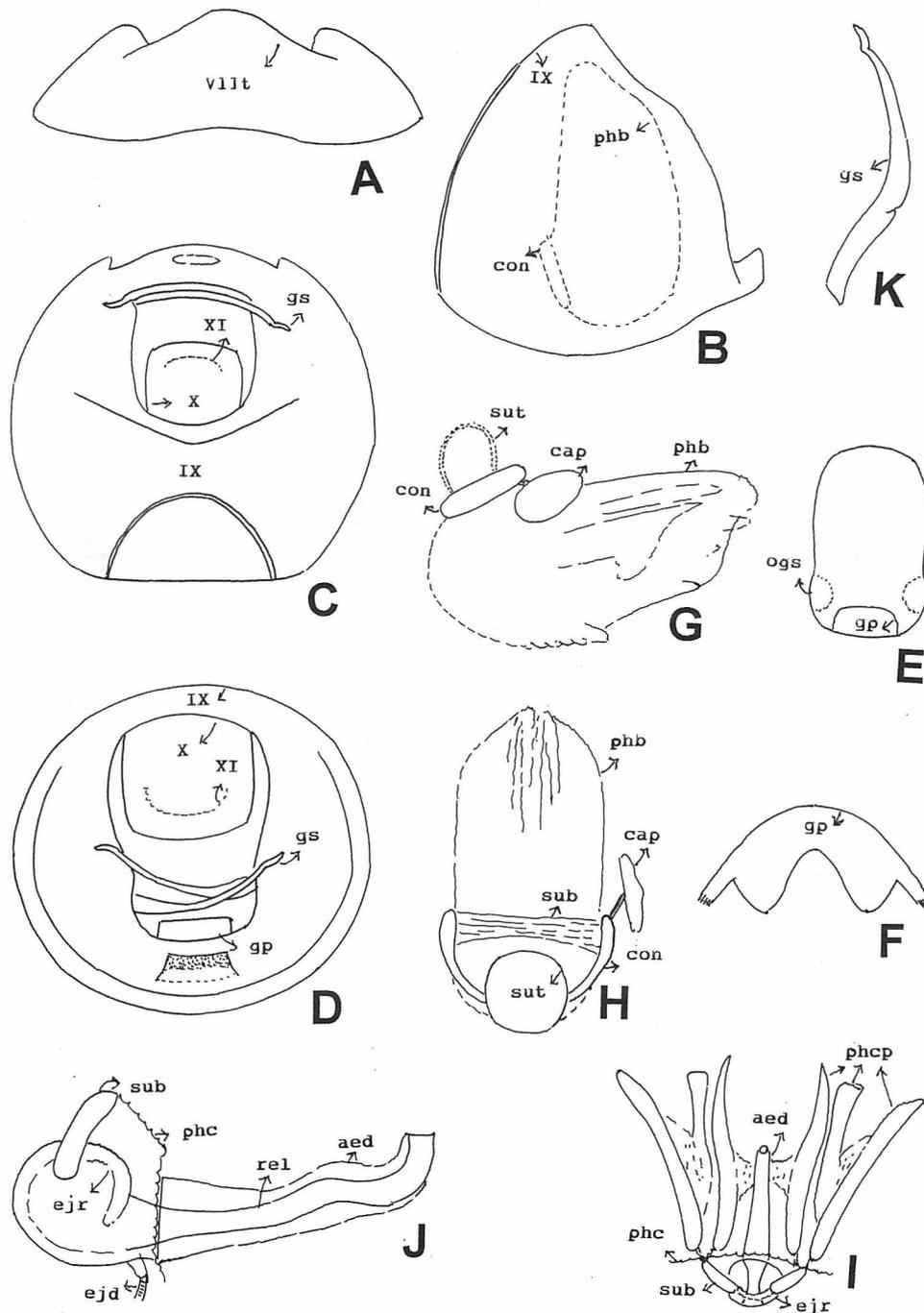


Fig. 2. *Dindymus brevis* Blöte. A. Abdominal segment VII, dorsal view; B. abdominal segment IX, lateral view; C. abdominal segments IX-XI, and genital styles, dorsal view; D. the same, dorsocaudal view; E. posterior opening of abdominal segment IX, dorsocaudal view; F. genital plates, anterodorsal view; G. phallus, lateral view; H. the same, dorsal view; I. ejaculatory reservoir, aedeagus, and phallobasal conjunctival processes, dorsal view; J. ejaculatory reservoir and aedeagus, lateral view; K. left genital style, caudal view. Abbreviations as in Fig. 1.

Dysdercus monostigma Firby
(Pyrrhocoridae) Fig. 3.

Abdominal tergite VII with posterior margin broadly produced caudad and rounded. Abdominal segment IX with very short dorsal margin in lateral view, caudomedian portion produced caudad; rounded in dorsal view. Posterior opening of abdominal segment IX elongate quadrate in dorsocaudal view; opening for genital styles situated at ventral margin laterad of opening. Abdominal segment X subquadrate in dorsocaudal view. Abdominal segment IX retracted into segment X. Dorsal portion of genital plates lobe-like in anterodorsal view, dorsomedian portion deeply and narrowly invaginated; ventral portion inverse λ -shaped.

Phallus directed dorsad within segment IX. Connective U-shaped in dorsal view. Support bridge with upper portion as cross bar of connective in dorsal view; other portion not carefully examined. Ligamentary processes of support bridge between ejaculatory reservoir and phallobasal conjunctival processes sclerotized, terete-shaped. Capitate processes present. Support tube terete-shaped in lateral view. Phallobase with truncated apex in lateral view; in dorsal view with a pair of small projections in lateromedian portions. Phallobasal conjunctival processes not carefully examined. Ejaculatory reservoir rounded, easily discriminated from reservoir lumen. Reservoir lumen short, wide, distinctly converging to apex, about 2/3 width of aedeagus at base. Aedeagus relatively short, not protruding beyond apex of phallobase. Genital styles symmetrical in size and shape; left genital style dorsocaudal view as figured; apices parallel, directed dorsad.

Antilochus conquertii (Fabricius)
Fig. 4.

Abdominal tergite VII in dorsal view with trapezoid posterior margin produced

caudad, apex truncated. Abdominal segment IX with very short dorsal margin in lateral view, posterior margin very long, nearly straight; transversely oval in dorsal view; rounded in caudal view. Posterior opening inverse T-shaped; opening for genital styles situated at median portion of ventral margin. Abdominal segment X semicircular in dorsal view. Abdominal segment XI retracted into segment X. Genital plates distinctly separated into 2 parts, upper part lobe-like, characteristically covering more than 1/2 ventral part of posterior opening of segment IX; ventral surface distinctly invaginated widely at apex and notched medially to receive genital styles; lower part chair-shaped, situated below base of phallobase, in dorsal view its arms with ligamentary processes connecting connective, its ventral margin fused with mid-ventral portion of abdominal sternite IX.

Phallus directed dorsad within segment IX. Connective U-shaped in dorsal view. Support bridge in dorsal view with upper portion as cross bar of connective; other portion not carefully examined. Ligamentary processes of support bridge between ejaculatory reservoir and phallobasal conjunctival processes sclerotized and terete-shaped. Capitate processes present. Support tube terete-shaped in lateral view. Phallobase with truncated apex in lateral view; in dorsal view with a pair of small projections in lateromedian portions. Phallobasal conjunctival processes 3 pairs, as figured. Ejaculatory reservoir oval, easily discriminated from reservoir lumen. Reservoir lumen rather long, narrow, same width throughout its length, twisted near middle, about 1/5 width of aedeagus at base. Aedeagus relatively long, abruptly narrowed after middle, not protruding beyond apex of phallobase. Genital styles symmetrical in size and shape; caudal view as figured; apices parallel, directed dorsad.

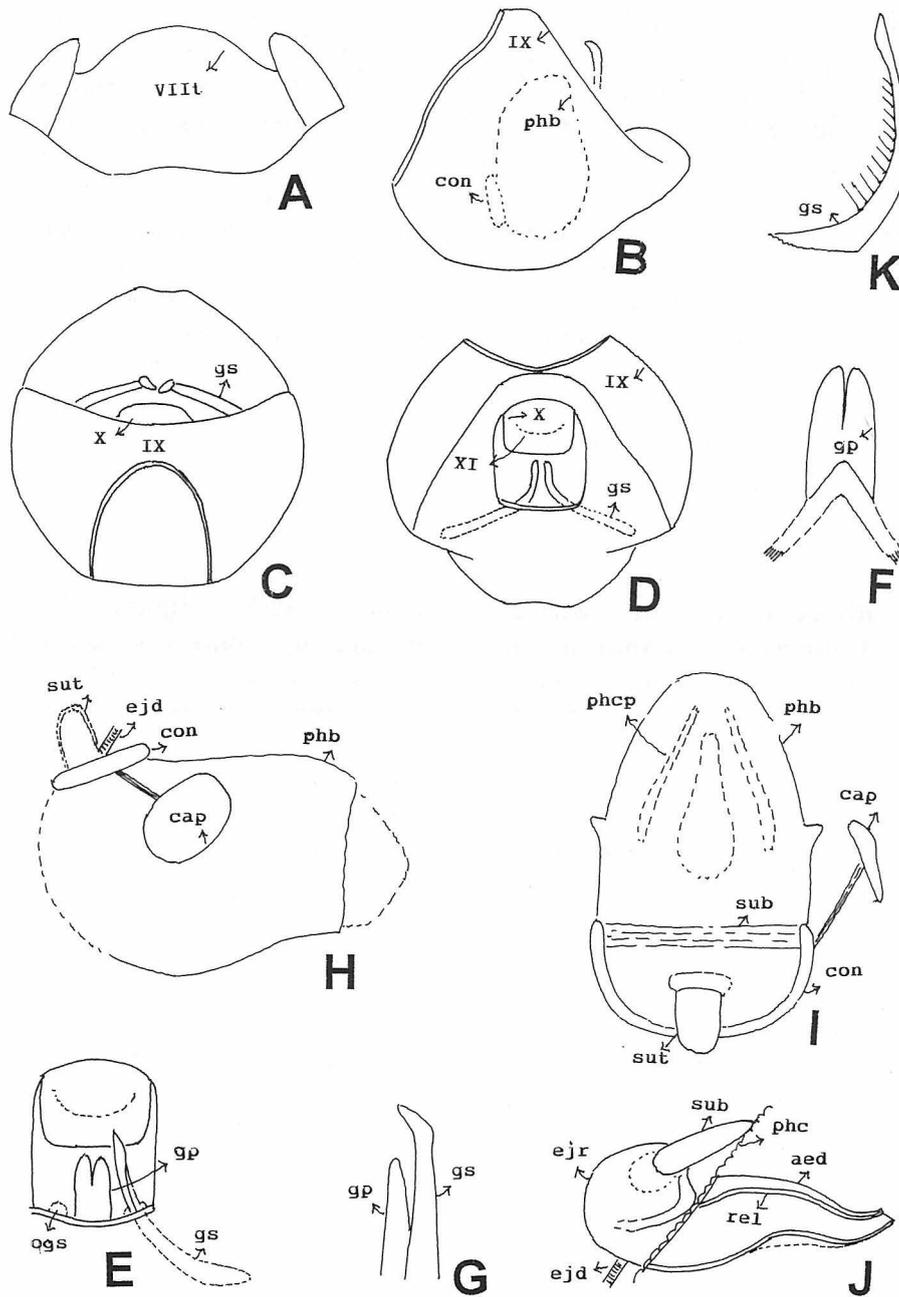


Fig. 3. *Dysdercus monostigma* Firby. A. Abdominal segment VII, dorsal view; B. abdominal segment IX, lateral view; C. abdominal segments IX-XI and genital styles, dorsal view; D. the same, dorsocaudal view; E. posterior opening of abdominal segment IX, dorsocaudal view; F. genital plates, anterodorsal view; G. apices of genital plates and genital styles, lateral view; H. phallus, lateral view; I. the same, dorsal view; J. ejaculatory reservoir and aedeagus, lateral view; K. left genital style, caudal view. Abbreviations as in Fig. 1.

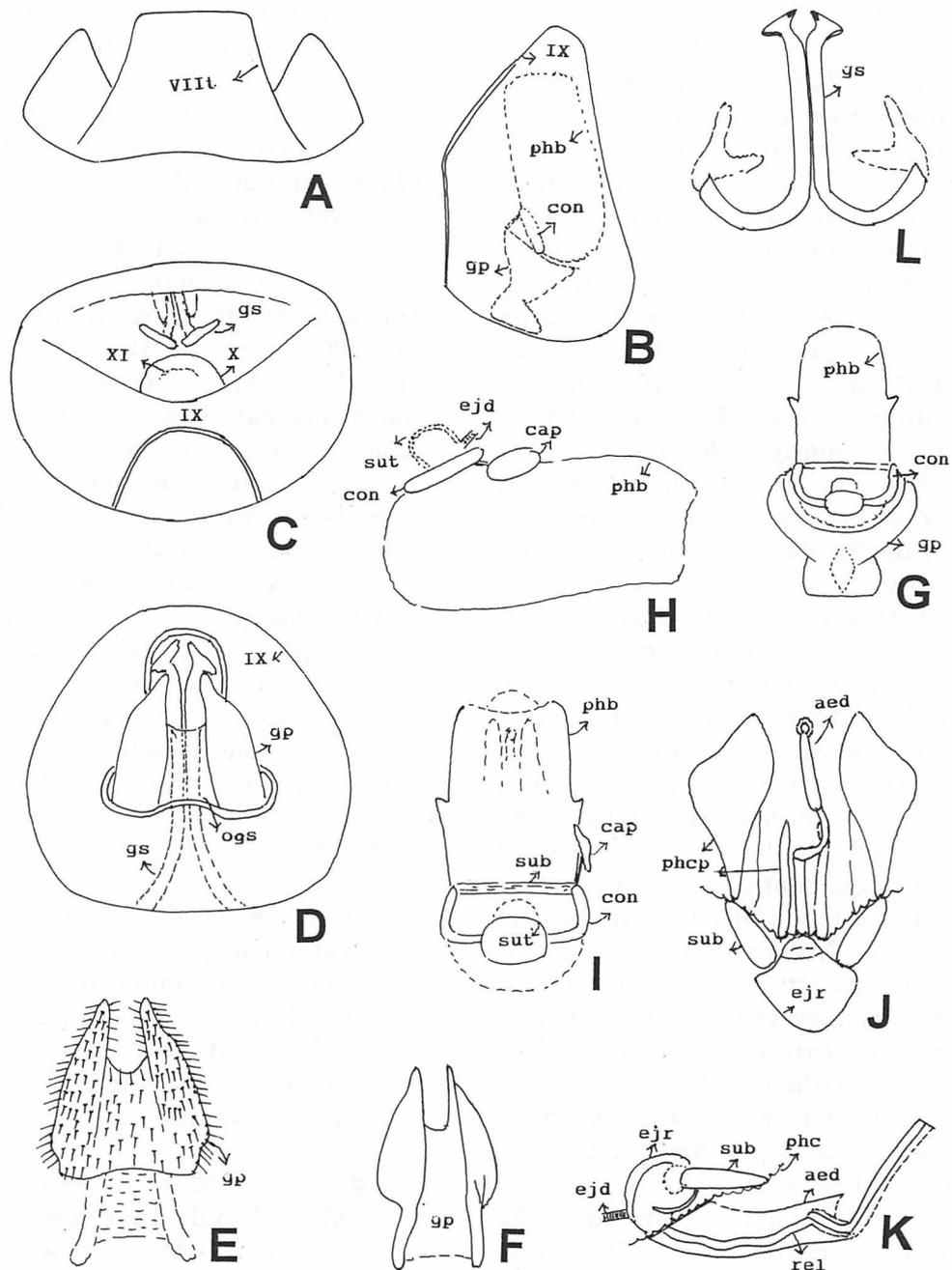


Fig. 4. *Antilochus conquebertii* (Fabricius). A. Abdominal segment VII, dorsal view; B. abdominal segment IX, lateral view; C. abdominal segments IX-XI, and genital styles, dorsal view; D. the same, dorsocaudal view; E. upper part of genital plates, dorsocaudal view; F. the same, slightly left of ventroanterior view; G. phallus and lower part of genital plates, dorsal view; H. phallus, lateral view; I. the same, dorsal view; J. ejaculatory reservoir, aedeagus, and phallobasal conjunctival processes, dorsal view; K. ejaculatory reservoir and aedeagus, lateral view; L. genital styles, dorsocaudal view. Abbreviation as in Fig. 1.

Discussion

1. Singh-Pruthi's lateral outgrowths of the ejaculatory reservoir

Singh-Pruthi (1925) described on page 161 that "*Largus refipennis* Lap. Ejaculatory reservoir rounded with lateral outgrowths in the dorsolateral regions."; and on page 162 "*Antilochus conquebertii*. Conjunctiva with three pairs of appendages in dorsal, disto-lateral and latero-ventral regions, corresponding to appendage No.1,2,3 in the previous family. The second pair partially fused to the dorso-lateral region of the globular ejaculatory reservoir." According to Fig. 4J in this investigation, his dorsolateral region of the globular ejaculatory reservoir should be the lateral outgrowths of the ejaculatory reservoir.

In this investigation, all four species bore Singh-Pruthi's lateral outgrowths. They are rod-like, sclerotized, and connected anteriorly with the ejaculatory reservoir and posteriorly with the aedeagus and phallobasal conjunctival processes by ligamentary processes which pass through the phallobasal conjunctiva. This kind of "position in relation to neighboring structure or organs" of Remane's homology criterion appeared in *Triatoma rubrafasciata* De Geer (Reduviidae, without the ejaculatory reservoir) too. That is the support bridge connecting the aedeagus and phallobasal conjunctival processes by ligamentary processes which pass through the phallobasal conjunctiva. If this investigation is correct, Singh-Pruthi's lateral outgrowths of the ejaculatory reservoir should be a reasonably modified support bridge.

2. Genital plates of *Antilochus conquebertii*

In *Dysdercus monostigma*, the genital plates had the upper part situated between the parallel apical portions and above the level of the genital styles. In

Antilochus conquebertii, the upper part of the structure entirely agreed with Remane's homology criterion: "position in relation to neighboring structure or organs" as in *D. monostigma*. That is why this structure is termed the genital plates although they are situated below the level of the genital styles.

A chair-shaped structure gave me a good deal of trouble. I had never found this strange structure in any other taxon of 1800 species of Hemiptera. Herein, I can do nothing but describe it. 1) In morphological dorsal view (Fig. 4G) its arms have ligamentary processes connecting to the connective at the regions where other Heteroptera connectives connect with the genital plate by ligamentary processes; and 2) its ventral margin is fused with the mid-ventral portion of abdominal sternite IX. That is as in other genital plates.

According to the above two inferences, the structure is judged to be the lower part of the genital plates.

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星蟬總科四種雄性外性器（異翅目）

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摘 要

本文繪圖，敘述大星蟬科 *Physopelta guttata* (Burmeister)，與星蟬科 *Dindymus brevis* Blöte, *Dysdercus monostigma* Firby，與 *Antiloehus conquebertii* (Fabricius) 之雄性外性器。此總科雄性外性器之特殊形貌為性板之驚人變異。

關鍵詞：星蟬總科、雄性外性器、形態