

A Revision of the Subgenus *Megadysdercus* Breddin of the Cotton Stainer's Genus *Dysdercus* Guérin-Méneville (Hemiptera: Pyrrhocoridae) Based on Genitalia*

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Abstract.- The subgenus *Megadysdercus* Breddin is recognized among the other subgenera on the basis of male genitalia including pygophore, paramere and inflated aedeagus, and female genitalia including first and second gonocoxae, eighth and ninth paratergites and spermatheca. Except *D. argillaceus* and *D. oceanicus* not available to us all the taxa comprising *Megadysdercus* are distinguished on the basis of the above genitalial characters and in this light their phylogenetic relationships are also briefly discussed.

Keyword: *Megadysdercus*, *Dysdercus*, genitalia, Hemiptera, Pyrrhocoridae. phylogeny.

INTRODUCTION

The representatives of the genus *Dysdercus* Gueren-Menville are pests of malvacian plants, mainly cotton and are distributed in old and new world. Hussey (1929) described 77 species in the genus *Dysdercus*. Freeman (1947) revised the genus from old world and categorized the genus *Dysdercus* in four sub-groups and placed *D. philippinus* in group II B with *D. decussatus* Boisduval as its type species.

Freeman (1947), for the first time, introduced the characters of male and female genitalia by establishing two groups *i.e.* I. Primarily Ethiopian and II. With the only Ethiopian *D. festivus* (Gerstaecker) and Oriental, Australasian, Australo-Malayan and Oceanic species. He split this later into two subgroups. We wish to address here his IIB which appears endemic to Australasian, Australo-Malayan and Oceanic extending to south India which was recognized by Stehlik (1965b) as the subgenus *Megadysdercus* Breddin of the cotton stainer's genus *Dysdercus* with type species *D. mesiostigma* Distant. The male and female characters of most of the species, of which remained unknown, *D. papuensis* Distant and *D. simplex* (Walker) are given here new status as valid species.

The subgeneric groups of *Dysdercus* were established by Stehlik (1965a,b). He classified it into four distinct subgenera *viz.*, *Dysdercus* *sensu stricto*, *Neodysdercus* Stehlik, *Paradysdercus* Stehlik and *Megadysdercus* Breddin. The subgenus *Megadysdercus* Breddin, particularly in view of many of its unknown important male and female genitalial characters, is described in detail based on all its known species except *D. argillaceus* and *D. oceanicus* not available to us with special reference to its male genitalia including inflated aedeagus and female genitalia including spermatheca. In this light its relationship within its group and the phylogenetic relationships of the taxa it includes are also briefly discussed.

MATERIALS AND METHODS

For the study of male genitalia, particularly the inflation of the aedeagus, the techniques of Ahmad (1986) and Ahmad and McPherson (1990, 1998) were generally followed. For the inflation of aedeagus the pinned dry specimen, after removing the label, was plunged into boiling water in a beaker, for 4-5 minutes. The specimen was then slipped off the pin. The genital capsule (pygophore) was removed from the relaxed specimen under a binocular stereoscope microscope, using very fine watch maker forceps (5 or finer). The genital capsule was placed in 10% KOH and was warmed at 40°C for 5-10 minutes in a cavity block. The capsule was removed in tap water (room temperature) in a depression dish and was washed

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thoroughly. The fine forceps were used to hold the basal plate (attaching aedeagus to capsule) and then with the help of forceps the opening of phallosome was widened very carefully and the vesica was pulled out gently. This was done very carefully because the distal tip of vesica is very delicate and breaks off quickly.

For the dissection of the female spermatheca, the entire abdomen was warmed on a bench lamp (after completing the external view diagram of the ovipositor) for 15 minutes. The spermatheca was dissected under water after washing the specimen thoroughly. The components of male and female genitalia were preserved in glycerine in microvials pinned with the specimens. All measurements given are in millimeters and all illustrations are to the given scales.

RESULTS

In the inflated aedeagus Freeman (1947) noted in this group that second conjunctival appendages are forked. Freeman (1947) also illustrated the spermatheca of only *D. mesiostigma* and *D. decussatus* Boisduval. As a result of our study of male and female genitalia pygophore is ovate with vertical process having proximal armature well developed, paramere with apical teeth, spermathecal bulb always pear shaped and accessory gland short, straight and balloon like.

Dysdercus (Megadysdercus) Breddin (Fig. 1)

Type species: *D. (M.) mesiostigma* Distant
Ahmad *et.al.* 2003, 35(3): 177-180.

Male genitalia

Pygophore with vertical processes, ventral rim extended posteriad; posteriorly more or less conical, capsular lamella absent; paramere small or of moderate size with tooth like, reduced spur; inflated aedeagus with membranous conjunctival appendages large, conical, second pair of conjunctival appendages forked.

Female genitalia

First gonocoxae large; ninth paratergites

somewhat triangular and much larger than eighth, reaching beyond medially fused second gonocoxae latter separate, not as much broad as first gonocoxae; spermatheca with balloon shaped straight accessory gland, spermathecal duct long, convoluted with uniform width.

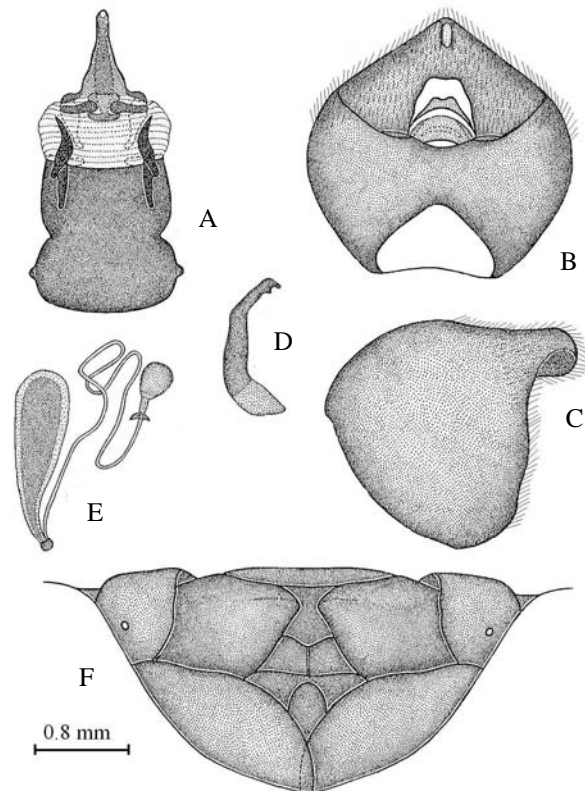


Fig. 1. *Dysdercus mesiostigma*; A, inflated aedeagus, ventral view; B, pygophore, dorsal view; C, pygophore, lateral view; D, paramere, lateral view; E, spermatheca, lateral view; F, female terminalia, ventral view.

D. (M.) decussatus Boisduval (Fig. 2)

Male genitalia

Pygophore (Fig. 2C,D) somewhat ovate, slightly broader than long, dorso-posterior margin concave, ventro-posterior margin convex, inner surface of latter inwardly directed with subrounded apex, vertical processes long, broad, arms conical, tip subacute; parameres (Fig. 2E) curved, of

moderate size, inner and outer margins sinuate, outer margin medially rounded, apex of the blade narrowest with two teeth-like projections inwardly, apical tooth large, sharp and curved, the one below very small, round, budlike; inflated aedeagus (Fig. 2A,B) with broadly rounded membranous dorso-lateral conjunctival appendages, pair of stout curved S-shaped third conjunctival appendages, pair of elongated fork shaped (with distinct forks) second conjunctival appendages, pair of first elongated conjunctival appendages.

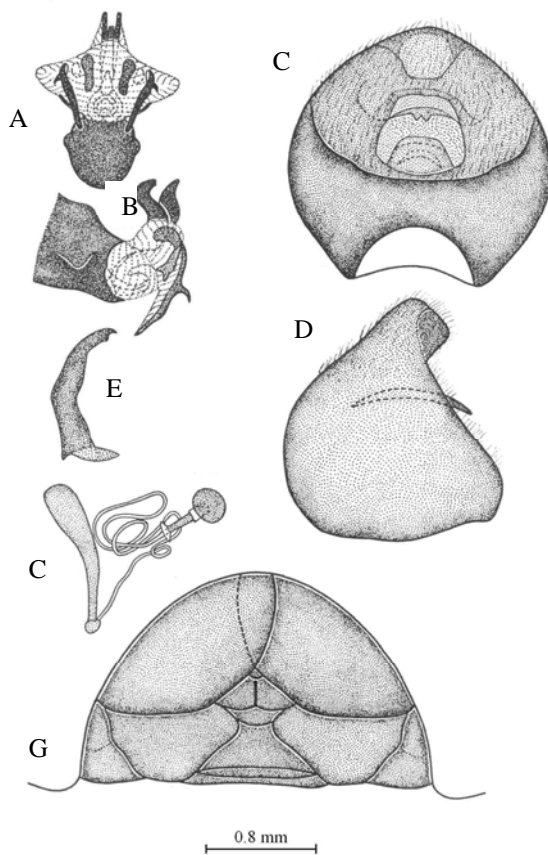


Fig. 2. *Dysdercus decussates*; A, inflated aedeagus, ventral view; B, inflated aedeagus, lateral view; C, pygophore, dorsal view; D, pygophore, lateral view; E, paramere, lateral view; F, spermatheca, lateral view; G, female terminalia, ventral view.

Female genitalia

First gonocoxae (Fig. 2G) large, broad, with postero-inner margin sinuate; ninth paratergites somewhat triangular and much larger than eighth

paratergites and reaching beyond medially fused posterior margins of eighth paratergites, inner and outer margins sinuate, apical lobe broadly round, proximal inner lobe narrowly round, lobe like; second gonocoxae with convex posterior margin; proctiger posteriorly broad with posterior margin concave; spermatheca (Fig. 2F) with bulb somewhat ovate, globular, pump region very narrow, spermathecal duct much coiled, accessory gland slightly curved in the middle, swollen at the apex.

Dysdercus mesiostigma Distant (Fig. 1)

Male genitalia

Pygophore (Fig. 1B,C) somewhat conical, as broad as long, dorso-posterior margin slightly concave, slightly straight at apex, lobe like, rounded, vertical process long and broad at base, apex narrow, bifid with outer margin sinuate, medially round, inner margin medially concave, apically straight; paramere (Fig. 1D) with three teeth, two on inner side one on outer side, apical tooth largest and projected spine like; inflated aedeagus (Fig. 1A) with dorso-lateral round membranous conjunctival appendages and pair of stout third conjunctival appendages, pair of elongated fork shaped second conjunctival appendages with distinct forks, pair of first short conjunctival appendages, hammer shaped.

Female genitalia

First gonocoxae (Fig. 1F) large, broad overlapping with posterior margin weakly sinuate, inner margin convex; ninth paratergites somewhat conical apically pointing each other, posterior margin sinuate, inner and outer margins substraight, much larger than and reaching beyond fused posterior margins of eighth paratergites, inner and outer margins of latter sinuate, apical lobe broadly round, proximal inner lobe narrowly round, lobe like; second gonocoxae with convex posterior margin; proctiger posteriorly broad with posterior margin concave; spermatheca (Fig. 1E) with bulb somewhat ovate, globular, pump region very narrow, spermathecal duct much coiled, accessory gland slightly curved in the middle, swollen at the apex.

Dysdercus papuensis Distant
(Fig. 3)

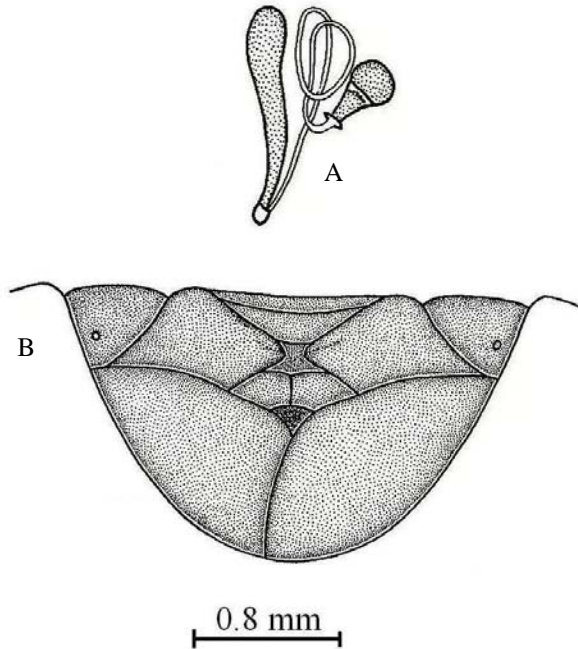


Fig. 3. *Dysdercus papuensis*; A, spermatheca, lateral view; B, female terminalia, ventral view.

Female genitalia

First gonocoxae (Fig. 3B) large, broad with posterior margin distinctly sinuate; 9th paratergites triangular in shape and slightly longer than eighth paratergites; second gonocoxae with posterior margin concave, proctiger broad with posterior margin concave; spermatheca (Fig. 3A) similar to that as in *decussatus* Boisduval but typical.

Dysdercus philippinus Herrich-Schäffer
(Fig. 4)

Male genitalia

Pygophore (Fig. 4A,B) somewhat ovate, slightly broader than long, dorso-posterior margin concave, ventro-posterior margin convex, inner surface of latter inwardly directed with sub rounded apex, vertical process long and broad, arms conical in shape, tip sub acute; paramere with (Fig. 4E) parameral shaft short, oblique, neck short, curved,

head with transverse crest reduced, two teeth-like projections on inner surface, apical tooth, small, sharp and curved, distal tooth thumb shaped; inner and outer margins convex; inflated aedeagus (Fig. 4C,D) with broad dorso-lateral membranous conjunctival appendages, pair of large curved S-shaped dorsal conjunctival appendages, pair of elongated lobe-like ventral conjunctival appendages, and pair of ventro-lateral trilobed conjunctival appendages.

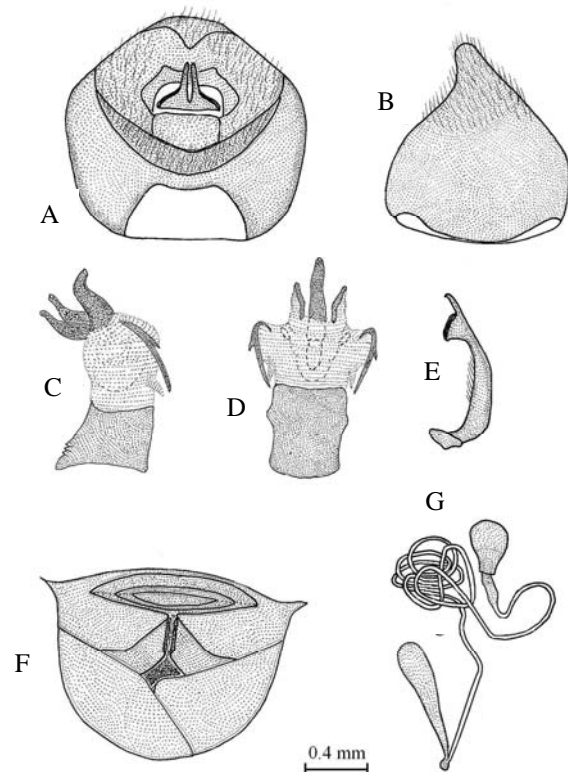


Fig. 4. *Dysdercus philippinus*; A, pygophore, dorsal view; B, pygophore, lateral view; C, inflated aedeagus, lateral view; D, Inflated aedeagus, ventral view; E, paramere, lateral view; F, female terminalia, ventral view; G, spermatheca lateral view.

Female genitalia

First gonocoxae (Fig. 4F) large, broad, with postero-inner margins sinuate; ninth paratergites somewhat triangular and much longer than eighth paratergites; second gonocoxae with convex posterior margin; proctiger broad with posterior

margin concave; spermatheca (Fig. 4G) with prominent proximal flange, bulb somewhat ovate, pump region tube-like, spermathecal duct highly convoluted, much longer with accessory gland, latter balloon-like.

Dysdercus simplex (Walker)
(Fig. 5)

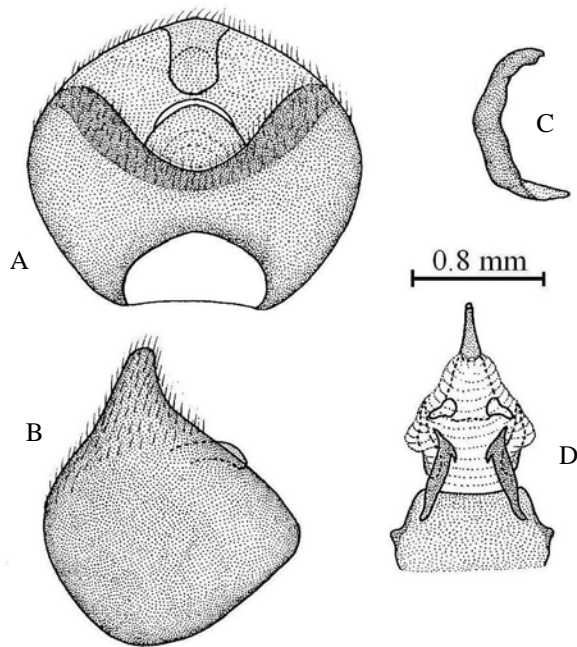


Fig. 5. *Dysdercus simplex*; A, pygophore, dorsal view; B, pygophore, lateral view; C, paramere, lateral view; D, inflated aedeagus, ventral view.

Male genitalia

Pygophore (Fig. 5A,B) somewhat spherical, slightly broader than long, dorso-posterior margin concave, ventro-posterior margin convex, inner surface of latter inwardly directed with rounded apex, vertical process long and broad, arms conical in shape, tip sub acute; paramere (Fig. 5C) curved with two teeth-like projections on inner surface, apical tooth larger and curved, inner and outer margins distinctly sinuate; inflated aedeagus (Fig. 5D) with less prominent dorsolateral membranous conjunctival appendages, and pair of large S-shaped dorsal conjunctival appendages, pair of large plate-like, rectangular ventral conjunctival

appendages, pair of ventro-lateral trilobed appendages.

DISCUSSION

The species of the subgenera *Megadysdercus* and *Paradysdercus* Stehlik appear to be sister groups. Both share apomorphies of the presence of vertical processes in the pygophore and distinct accessory gland in the spermatheca. In both the spermathecal duct is short, at least not very long and not remarkably coiled and both are distributed in the Oriental and Australian regions (*Paradysdercus* included *D. festivus* (Gerstaecker) which is Ethiopian in distribution) and species of *Megadysdercus* extend their zoogeographical range in eastern Palaearctic (Japan) and Oceanic regions. In the species of *Paradysdercus* the spermathecal bulb appears round, globular, accessory gland recurved or coiled and parameres large and stout. These characters also appear to be shared by the Ethiopian species of an other subgenus *Neodysdercus* Stehlik which lacks vertical processes of the pygophore. It appears that species of *Paradysdercus* originated from the Ethiopian region and extended in the Oriental up to the Australo-Malayan region. *Megadysdercus* appears to be highly advanced with a short mostly straight balloon shaped accessory gland, spermatheca with spermathecal bulb pear shaped and spermathecal duct longer and more coiled, paramere of small to moderate size with short teeth and pygophore mostly conical or ovate. In these south east Asiatic and Australian species, those of Ethiopian species of the single genus *Neodysdercus* form a single clade. Although these species lack the vertical processes of the pygophore but these share the appomorphies having separate accessory gland which is distinctly balloon like and curved and pygophore with apex conical.

The *Megadysdercus* (Fig. 6) subclade also falls into two subclades the first of which is represented by *argillaceus*, *mesio stigma* and *oceanicus* which appear to be neatly held together by the synapomorphic characters *i.e.* vertical processes with long and narrow arms having tip round or subround. In this subclade *mesio stigma* appears to be entirely isolated playing out group and

sister group relationships with the rest of the subclade represented by *argillaceus*, and *oceanicus* which appear neatly held together by the synapomorphic characters *i.e.* vertical processes long, narrow with broad base and with arms narrow having tip round.

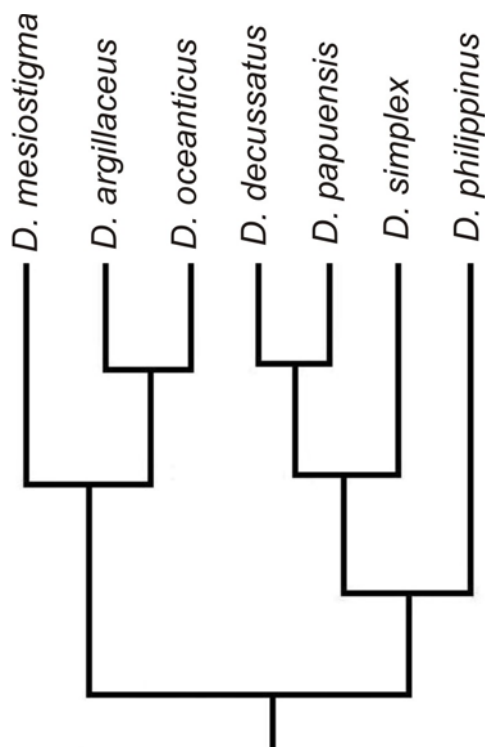


Fig. 6. Cladogram showing phylogenetic relationships of *Dysdercus* (*Megadydercus*) species.

The second subclade (Fig. 6) represented by *decussatus*, *papuensis*, *philippinus* and *simplex* appears neatly held together by the synapomorphic characters *i.e.* vertical processes long and broad, arms conical in shape with tip sub acute. In this subclade *philippinus* appears to be entirely isolated playing out group and sister group relationships with the rest of the subclade represented by *decussatus*, *papuensis* and *simplex* which appears neatly held together by the synapomorphic characters *i.e.* parameral second tooth short. Among

the rest of the subclade *simplex* again appears to be entirely isolated playing out group and sister group relationships with the rest of the subclade represented by *decussatus* and *papuensis* which appear neatly held together by the synapomorphic characters of pygophoral lateral margin as shown in Figure 2C and typical first gonooxae as shown in Figures 2G and 3B.

CONCLUSION

The subgenus appears to be endemic much advanced and *D. papuensis* and *D. simplex* appear to have independent status much different from *D. decussatus*.

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