

REDESCRIPTION OF ECONOMICALLY IMPORTANT GONOCERINE SQUASH BUG *CLETUS RUBIDIVENTRIS* (WESTWOOD) (HEMIPTERA: HETEROPTERA) FROM MURREE, PUNJAB, PAKISTAN WITH ITS PHYLOGENETIC RELATIONSHIP

Imtiaz Ahmad¹ and Navaid Rab²

Department of Zoology, University of Karachi, Karachi 7527, Pakistan

Department of Zoology, Govt. Degree Girls College PIB Colony Karachi, Pakistan

ABSTRACT

Economically important gonocerine squash bug species *Cletus rubidiventris* (Westwood) is redescribed in detail with special reference to its metathoracic scent auricles and male genitalia including pygophore, paramere and aedeagus and female genitalia including ovipositor and spermatheca. This species is compared with the other taxa known in this respect within its genus and its phylogenetic relationships in the light of these characteristics are also briefly discussed.

Key words: Heteroptera, Coreidae *Cletus rubidiventris* (Westwood), Redescription, relationships.

INTRODUCTION

Walker (1871) originally described *signatus* under *Coreus* in the squash bug family Coreidae. Distant (1902) synonymised *Coreus signatus* Walker with *Cletus rubidiventris* (Westwood). In the recent years Singh and Singh (1987), CABI (1997) and Mitchel (2000) have reported *Coreus signatus* Walker [= *Cletus rubidiventris* (Westwood)] and *Coreus bipunctatus* Westwood [= *C. stali* Distant; Rab (2003)] as pest of rice in Manipur, and ground nut in India and of Amaranth (*Amaranthus viridis*) and Purslane (*Portulaca oleracea*) in Pakistan, also reported by Ahmad (1979, 1980) and Ahmad *et al.* (1983). Chaudhry *et al.* (1966 and 1970) also reported *C. signatus* from different areas of NWFP, Punjab and Kashmir. In the present paper not only the confused taxonomic status of this taxon is addressed but also it is redescribed with special reference to some of its important and unknown characters like metathoracic scent auricles and male genitalia including inflated aedeagus and female genitalia including spermatheca. This species is also compared with those of the already described taxa and its relationships in this light within its genus *Cletus* Stål is also briefly discussed.

MATERIALS AND METHODS

The species of *Cletus* were collected by the present authors and their colleagues from all the four provinces i.e. Sindh, Balochistan, Punjab and Khyber Pakhtoonkha and Azad Kashmir and northern areas of Pakistan during 1968 through 2006.

The species from the areas of IndoPakistan Subcontinent were studied at different museums and collections lodged at different institutes and at departments of Zoology-Entomology of public sector universities in Pakistan, namely Natural History Museum, Pakistan Science foundation (PSF), Islamabad, National Insect Museum earlier at Pakistan Agricultural Research Council, Malir Halt Karachi and now lodged at NARC, PARC, Chakshahzad, Islamabad, Collection at Pakistan Forest Institute, Peshawar and at Common wealth Institute of Biological Control, Rawalpindi by the present authors. The species were also studied by the courtesy of Mr. Mick Webb incharge Hemiptera section, and other authorities of Natural History Museum, London (BMNH) and by the courtesy of Mr. I. Lansbury at Hope Collections Department of Zoology, University Museum Oxford by the first author.

The specimens were identified following the description and keys provided by Distant (1902), Ahmad *et al.* (1977) and Ahmad (1979 and 1980). For the study of male genitalia, particularly for the inflation of the aedeagus, the techniques of Ahmad (1986) and that of 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 by the pin. The genital capsule (pygophore) was then removed from the relaxed specimen under a binocular microscope, using very fine watchmaker forceps (5 or finer). The genital capsule was then placed in 10% KOH and was warmed at 40°C for 5 to 10 minutes in a cavity block. The capsule was then removed in tap water (room temperature) in a depression dish and was washed thoroughly. The above 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 then vesica was pulled out gently. This was done very carefully because the distal tip of vesica is very delicate and breaks off quickly.

For 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 out in tap water after washing the specimen thoroughly. The components of male and female genitalia were preserved in glycerine in microvials pinned with the specimen. The female abdomen after it was thoroughly dried with a filter paper was glued with the specimen. For description and for finalizing illustrations the conventional techniques specially those described by Ahmad et al. (2000) were generally followed.

For illustrations an ocular grid was placed in an eyepiece of Wild Herberg binocular microscope. For completion of illustrations pencil drawings were transferred on a Bristol board and finalized with pelican black ink. All the materials examined including some determined specimens were deposited at the National Museum, Washington, D.C., USA (USNM), and some other determined specimens were deposited at Natural History Museum, Department of Zoology-Entomology, University of Karachi (NHMUK) and some other determined specimens were also deposited in the collection of the first author. The measurements are given in millimeters

RESULTS

Cletus rubidiventris (Westwood)

Coreus rubidiventris Westwood 1842, 2: 23.

Cletus rubidiventris, Distant 1902, 1:394

Cletus signatus Walker (part) 1871, 4:194, 39.

Cletus pallescens Walker (part) 1871, 4:195, 40.

Colouration: Body dull ochraceous, thickly punctate; except black anterolateral margins of pronotum; reddish brown, posterior boarder of pronotum; posteroapical portion of corium; clavus and anterior portion of corium grayish.

Head quadrangular; clypeus round; anteocular distance less or equal to remainder of head, anteocular distance 0.5 (0.4-0.5), length remainder of head 0.7 (0.5-0.7); width of head 1.4 (1.5-1.5); interocular distance 0.9; interocellar distance 0.47; antennae with basal segment almost equal to 3rd segment, length of antennal segments I 1.5, III 1.8, IIII 1.4 (1.5-1.4), IV 1.2; antennal formula IV<III=I<II; labium reaching 2nd coxae, basal segment $1\frac{1}{2}$ X longer than length of 4th segment and slightly longer than 2nd, length of labial segments I 0.9, II 0.8, III 0.5, IV 0.6; labial formula III < IV < II < I.

Thorax and Abdomen: Pronotum about 2x or more broader than long, humeral angles spinose and forwardly produced, anterolateral margins markedly concave, posterolateral margins slightly serrate, posterior lobes sub prominent; length of pronotum 2.0 (2.0-2.1); width 4.3 (4.2-4.4); scutellum triangular, slightly broader than long, length of scutellum 1.3, width 1.4 (1.3-1.4); connexiva distinctly exposed at repose; distance base scutellum- apex clavus 2.2 (1.9-2.2); apex clavus-apex corium 1.9 (1.9-2.1); apex scutellum-apex abdomen including membrane 4.9 (4.6-5.1). Total length male 9.1; female 9.35.

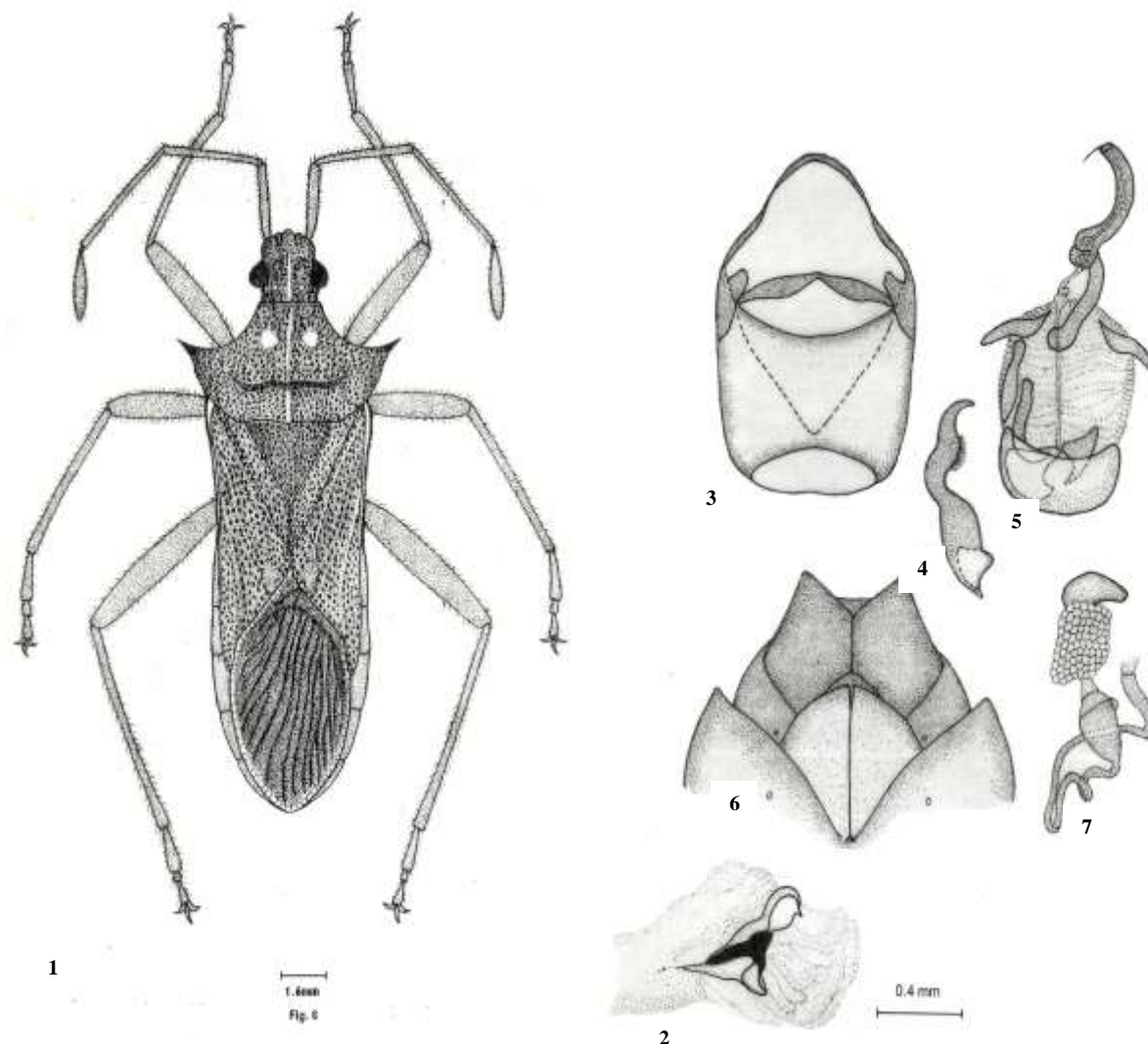
Male genitalia: Pygophore (Fig. 3) longer than broad, ventro-posterior margin markedly convex and narrowed posteriorly, lateral margins straight medially, dorso-posterior margin concave, pair of truncate processes present at inner dorso-lateral margin; paramere (Fig. 4) with short thick bluntly ending blade, medio-inner margin with setae, outer and inner margins above base convex; inflated aedeagus (Fig. 5) with asymmetrical number of conjunctival appendages, pair of spindle-shaped ventro-lateral conjunctival appendages, single sleeper-shaped and single sickle-shaped ventro-lateral conjunctival appendages present on the right side, vesica long, thread like, enclosed in sclerotized tube like structure.

Female genitalia: Terminalia (Fig. 6) with first gonocoxae triangular, closed to each other, apices acute, slightly apart, lateral margins convex; 8th paratergites with posterior margins concave; 9th paratergites broad, plate-like, medially narrowed, convex; spermatheca lobed, upwardly round with well developed proximal flange, median dilation cup-like, posteriorly proximal spermathecal duct coiled.

Holotype India Hope Collection, Oxford Museum, U.K., 10 males, 10 females; Pakistan: Punjab, Murree, 06/03/1969, on *Amaranthus viridis*, leg. Ahmad I., lodged at NHMUK, USNM and in Ahmad's Collection.

Comparative note: This species is most closely related to *Cletus brevirostratus* manuscript name (Rab, 2003) in having fourth antennal segment shortest and membranous conjunctiva with asymmetrical number of sclerotized appendages but it can easily be separated from the same in having basal antennal segment longest, ventro-posterior margin of pygophore medially convex, membranous conjunctiva with 4 appendages as compared to 2nd antennal

segment longest, ventro-posterior margin of pygophore medially inpushed, and membranous conjunctiva with 3 asymmetrical sclerotized appendages in *Cletus* sp.



Figs. 1-7. *Cletus rubidiventris* (Westwood).

Fig. 1 Dorsal view diagram; Fig. 2 Metathoracic scent auricle, ventral view; Fig. 3. Pygophore, dorsal view; Fig. 4. Paramere, inner view; Fig. 5. Inflated aedeagus, ventral view; Fig. 6. Female terminalia, ventral view; Fig. 7. Spermatheca, dorsal view.

DISCUSSION

Phylogenetic relationships

The present species *C. rubidiventris* appears to play sister group relationship with probably a new species of *Cletus* (Rab, 2003) as noted under its comparative note. Among other species of *Cletus* *C. bipunctatus* (= *C. stali*, Rab, 2003) appears to be distantly related with the above sister group species in sharing the apomorphy of having basal antennal segment longer, distinctly longer than third sharing the apomorphy of 4th antennal segment the shortest. *C. pipunematus* appears isolated and appears to play out group relationship with this sister group in having 4th antennal segment equal to or longer than 3rd antennal segment. *C. rubidiventris* and *Cletus* sp. appear neatly isolated from each other and *C. stali* entirely isolated among this complex could be seen highlighted in the comparative note of this species as shown in the cladogram (Fig. 8).

C. rubdiventris *Cletus* sp. *C. punctatus* (= *C. stali*)

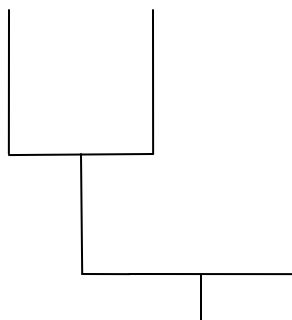


Fig. 8. Cladogram showing relationship of *C. rubdiventris* with its closest allies.

REFERENCES

- Ahmad (1979). A revision of the superfamilies Coreoidea and Pentatomoidea (Hemiptera : Pentatomorpha) from Pakistan, Azad Kashmir and Bangladesh. Part I. Additions and corrections of Coreid and Pentatomid fauna with phylogenetic considerations. *Kar. Ent. Soc. Suppl.* 4(1): 1-113.
- Ahmad (1980). Insect fauna of Pakistan and Azad Kashmir : Some groups within the Hemiptera. *Proc. 1st Pakistan Congr. Zool.* A: 115-155.
- Ahmad, I. (1986). A fool-proof technique for inflation of male genitalia in Hemiptera (Insecta). *Pakistan Journal of Entomology* 1(2): 111-112.
- Ahmad, I., N. Abbas and M.U. Shadab (1983). Biology and Immature Systematics of two gonocerines *Cletus bipunctatus* (Westwood) and *Cletomorpha hastata* (F.) (Coreidae:Coreinae) with reference to their relationships *Biologia*, 29(1) : 55-66.
- Ahmad, I., M.U. Shadab and A.A. Khan (1977). Generic and Suprageneric keys with reference to a checklist of coreid fauna of Pakistan (Heteroptera:Coreidae) with notes on their distribution and food plants. *Kar. Ent.Soc.Suppl.Z.* 1-49.
- Ahmad, I. and J. E. McPherson (1990). Male genitalia of the type species of *Corimelaena* White, *Galgupha* Amyot & Serville, and *Cydnoidea* Malloch (Hemiptera: Cydnidae: Corimelaeninae) and their bearing on classification. *Ann.Entomol. Soc. Am.*, 83(2):162-170.
- Ahmad, I. and J. E. McPherson (1998). Additional information on male and female genitalia of *Parabrochymena* Larivi Pre and *Brochymena* Amyot and Serville (Hemiptera: Pentatomidae). *Ann. Entomol. Soc. Am.*, 91(6):800-807.
- CAB International (1997). *Crop Protection Compendium: Module 1. South-East Asia and Pacific*. CAB International Wallingford, Oxon, UK.
- Chaudhry G.U., M.I. Chaudhry and S.M. Khan (1966). *Survey of insect fauna of Pakistan final Technical Report I*. Peshawar.
- Chaudhry G.U., M.I. Chaudhry and S.M. Khan (1970). *Survey of insect fauna of Pakistan final Technical Report II*. Peshawar.
- Dsistant, W.L. (1902). Fauna of British India. Rhynchota volume-1. Taylor and Francis, London.
- Mitchell, E.L. (2000). Chapter I. Leaf-footed bugs (Coreidae). In: Schaefer, C.W. and Panizzar (Eds.): *Heteroptera of Economic Importance*. CRC Press, Boca Raton, London, New York, Washington, D.C.
- Rab, N. (2003). "Morpho-taxonomic studies of the tribe Gonocerini Stal (Hemiptera: Coreidae: Coreinae) from Pakistan, Azad Kashmir and Bangladesh with their cladistic analysis". M.Phil. Thesis, Department of Zoology, University of Karachi, Pakistan.
- Singh M.P. and M.I. Singh (1987). First recorded incidence of rice bugs in Manipur, India. *Int. Rice Res. Newsl.* 12:31.
- Walker, F. (1867-1873). *Catalogue of the specimens of Hemiptera, Heteroptera in the collection of the British Museum*. Vols.I- VII.London.
- Westwood, J.O. (1842). *Catalogue of Hemiptera in the collection of the Rev. F.W. Hope*. Part 2. London.

(Accepted for publication September 2010)