

New Characters with Special Reference to Male and Female Genitalia Providing the Basis for Phylogenetic Relationship of Caystrine Stink Bug *C. brunnescens* Distant (Hemiptera: Pentaomidae) from Lower Niger*

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Abstract.- Presently some new characters *i.e.*, metathoracic scent auricle and male genitalia including those of pygophore, paramere and inflated aedeagus and female genitalia including 1st and 2nd gonocoxae and spermatheca are described and illustrated. In the light of these new characters the phylogenetic relationships of *C. brunnescens* Distant is discussed within its subclade *C. nigriventris* (Germar)..

Key Words: Caystrini, Pentatomidae, Pentatominae, *C. brunnescens*.,

INTRODUCTION

Distant (1884) described new species *brunnescens* under new genus *Agabotus* from lower Niger followed by Distant (1909, 1910), Lethierry and Severin (1893), Kirkaldy (1909), Schouteden (1929) and Villiers (1952, 1967). However *Agabotus* was synonymised with *Caystrus* Stål by Linnavuori (1972) followed by Gillon (1972), Linnavuori (1974, 1982) and Meddler (1980). Linnavuori (1972) misidentified Distant's species (*brunnescens*) for his undescribed species which Linnavuori (1974) later described as *pseudobrunnescens* from Zaire, Democratic Republic of the Congo. Linnavuori (1974) in the same paper speculated that *C. brunnescens* (Distant) might be a junior synonym of *Caystrus basalis basalis* (Schouteden). Later Linnavuori (1982) keyed *basalis* and *brunnescens* together with lateral margins of pronotum straight and therefore he gave illustrations of head and pronotum of only *C. brunnescens* (Distant) but not of *C. basalis* Schouteden. Although in the same paper Linnavuori reproduced two views of paramere (style) of *basalis* already given by him (Linnavuori, 1972, 1974). This

clearly shows that neither metathoracic scent auricle nor male genitalia including pygophore, paramere and inflated aedeagus and female genitalia including 1st and 2nd gonocoxae and spermatheca of *C. brunnescens* (Distant) is given in the literature to date. Presently therefore these new characters are not only described here in detail but illustrated to throw light on the true phylogenetic relationships of *C. brunnescens* in its subclade *C. nigriventris* (Germar) of *Caystrus* Stål.

MATERIALS AND METHODS

Authentically determined specimens of *C. brunnescens* (Distant) were borrowed and the holotype was examined by the present first author during his visit of 2005, by the courtesy of Mr. Mick Webb incharge Hemiptera Section, Department of Entomology and the authorities of Natural History Museum London (BMNH). The techniques of Ahmad and Kamaluddin (1985) and Ahmad and Afzal (1979, 1989) for measurements and for examination of male genitalia including inflated aedeagus and female genitalia that of Ahmad (1986) and Ahmad and McPherson (1990, 1998) were generally followed. When the specimen got softened it slipped off the pin and its pygophore was removed under a binocular microscope. After the pygophore was boiled in 10% KOH, it was washed thoroughly in tap water. Using the fine watch maker forceps

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(no.5 or finer) for the inflation of the aedeagus. Illustrations of pygophore, paramere and inflated aedeagus and female genital plates including spermatheca were made in different views and then the components of the male and female genitalia separately were transferred into a microvial with a drop of glycerine and pinned with the insect. For the description generally the techniques of Ahmad and Afzal (1989) were followed. All the measurements are in millimeters and all the illustrations are to the given scales.

RESULTS

Caystrus brunnescens (Distant) (Fig. 1)

Agabotus brunnescens Distant 1884: 460; Letheiry and Severin, 1893: 112; Kirkaldy, 1909: 41; Schouteden, 1929: 60; Villiers, 1952: 304.

Caystrus brunnescens: Gillon, 1972: 290, 321; Linnavuori, 1972; 400, 413; 1974: 402, 407; 1982; 76-77.

Colouration and general shape

Body light ochraceous with brownish punctures; eyes brownish; ocelli reddish; body oblong.

Head

Distinctly broader than long, antecular distance slightly shorter than remainder of head, paraclypei broad and long enclosing clypeus, lateral margin sinuate, apex of head rounded; antennae with basal segment slightly shorter than head apex, second segment slightly shorter than third, fifth longest, length of antennal segments I. 0.50 (0.45-0.50) II 0.90 (0.89-0.90) III 1.2 (0.95-1.2) IV 1.45 (1.25-1.45) V 1.8 (1.5-1.8), antennal formula $1 < 2 < 3 < 4 < 5$; labium just reaching hind coxae, second longest, fourth shortest, length of segments I 0.8 (0.7-0.8) II 1.2 (1.1-1.2) III 1.1 (0.9-1.1) IV 0.70; labial formula $4 < 1 < 3 < 2$ antecular distance 0.75 (0.65-0.8), remainder of head 1.0 (0.9-1.05), width of head 2.25 (2.25-2.4); interocular distance 1.25 (1.25-1.40); interocellar distance 0.75 (0.75-0.85).

Thorax

Pronotum distinctly less than 2.5x broader than long, anterior margin distinctly broader than

head width, anterior angles toothed, humeral angles sub acutely produced, lateral margin distinctly sinuated, length 2.2 (2.0-2.6), width 5.2 (5.0-5.9); scutellum longer than broad with narrowed subacute apical lobe, length 4.15 (3.8-4.6), width 3.2 (3.0-3.8); metathoracic scent gland ostiolar complex (Fig. 1B) with peritreme thumb-like, anteriorly narrowed and posteriorly broad reaching less than half of evaporatoria, ostioles very much developed slit-like, anterior and posterior margin of peritreme distinctly sinuated; distance base scutellum–apex clavus 3.4 (3.0-3.6); apex clavus–apex corium 1.9 (1.8-2.2); apex corium–apex abdomen including membrane 1.5 (1.5-1.8), apex scutellum–apex abdomen including membrane 3.0 (2.9-3.4).

Abdomen

Convex beneath, connexiva exposed at repose, abdomen shorter than membrane of hemelytra; total length 11.1 (10.4-12.35)

Male genitalia

Pygophore (Fig.1C) some what quadrangular, dorso median surface medially deeply concave with a large sclerotized process at inner lateral margin, lateral lobes narrowly truncately produced, ventromedian surface humped; paramere (Fig. 1D) F-shaped, lateral margin almost straight, apex markedly truncated, inner process devoid of hairs; aedeagus (Figs. 1E-F) having theca without thecal appendage, vesica very large apex inwardly curved, a pair of bilobed ventro lateral membranous conjunctival appendage with sclerotized tips.

Female genitalia

Female terminalia (Fig. 1G) with triangular shaped moderate first gonocoxae, inner and outer margins sinuated, slightly wide apart; ninth paratergites flipper-like large, slightly passing beyond fused posterior margin of eighth paratergites, later medially concave; second gonocoxae with posterior margin straight, posterior margin of proctiger markedly convex; spermatheca (Fig. 1H) with balloon-like median dilation, median sclerotized duct proximally dilated, proximal spermathecal duct about 2x the distal spermathecal duct, pump region tubular with straight lateral margin, bulb oval with two moderate equal sized finger like processes.

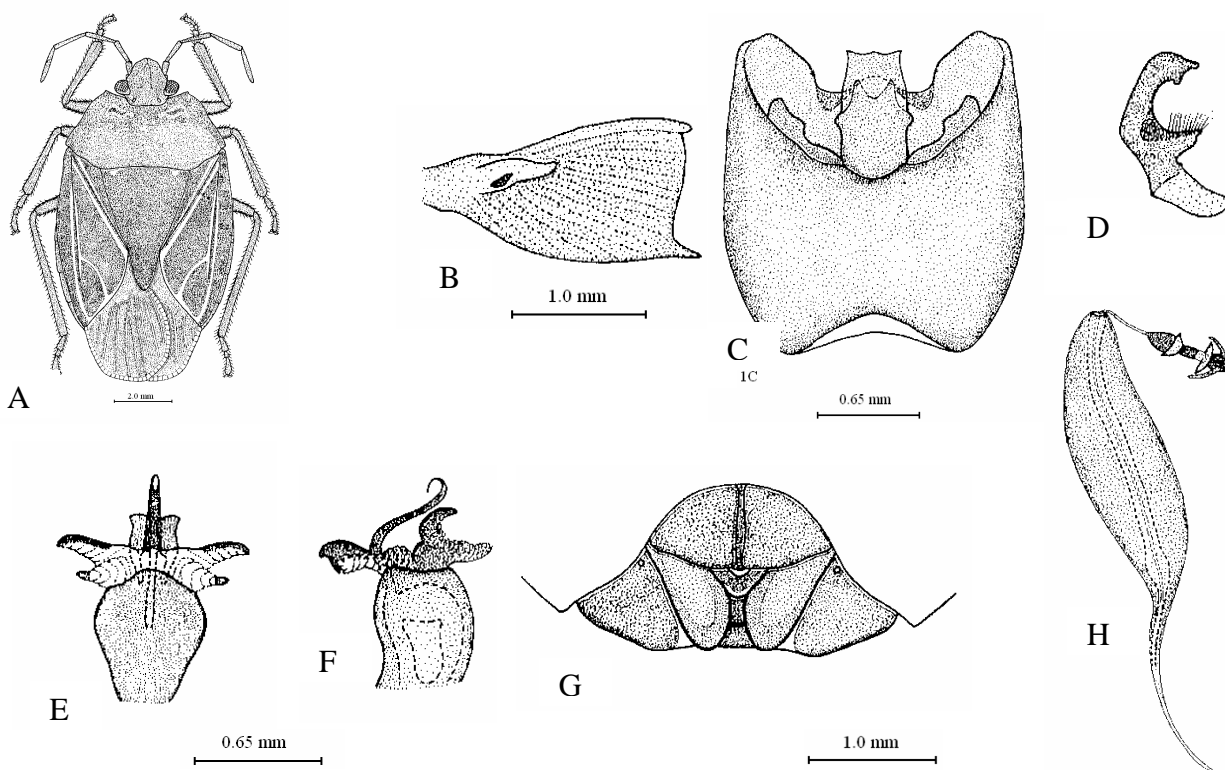


Fig. 1. *Caystrus brunnescens*: A, dorsal view; B, metathoracic scent auricle, ventral view; C, pygophore, dorsal view; D, paramere, inner view; E, inflated aedeagus, ventral view; F, same, lateral view; G, female terminalia, lateral view; H, spermatheca, lateral view.

Material examined

Nigeria: S. Nigeria, one male and two female, Forebes, deposited at BMNH.

Other materials

Two male and one female data same as above lodged at BMNH.

Comparative note

This species is most closely related to *C. basalis* and *C. minor* in having puncturing distinctly darker and scutellum narrow with a fine impunctate middle line but it can easily be separated from the same in having scutellum with apex acutely produced and paraclypei with apex truncated.

DISCUSSION

Linnavuori (1982) considered *basalis* and *minor* as two subspecies of *C. basalis* and Zahid

(2006) has treated these two taxa as independent species (present authors in preparation). In agreement with Linnavuori (1982), however, the present cladogram (Fig. 2) shows the two taxa most closely related and playing sister group relationship with each other. This subdivision of this subclade which is neatly held by the synapomorphies *i.e.*, lateral margins of venter contrastedly pale appears to fall into two subdivisions *i.e.*, *C. langei* (Breddin) subclade (Zahid and Ahmad, 2011) which appears to play out group relationship with the other subdivision, *i.e.*, *C. nigriventris* (Germar) subclade. The two subdivisions represented by Linnavuori's *niokanus*, *pseudobrunnescens* and *hipponax* and the other by *nigriventris*, *brunnescens*, *basalis* and *minor* appear to play sister group and out group relationship with each other and appear neatly held together by the synapomorphies such as lateral margins of pronotum at least slightly curved or

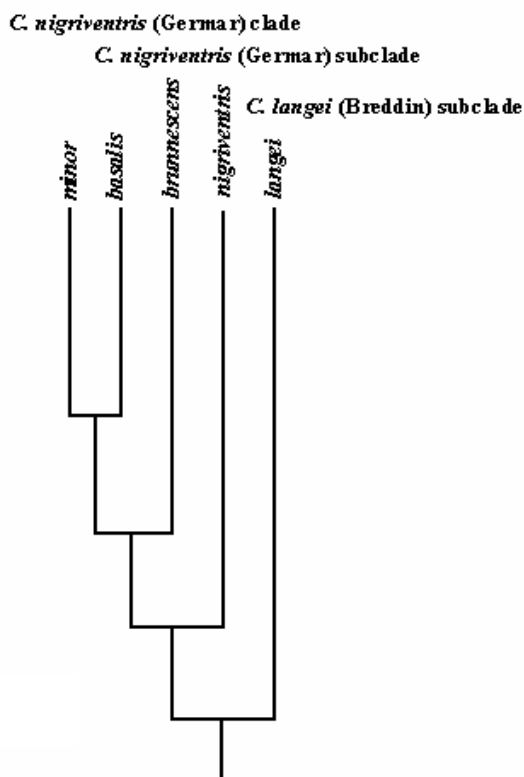


Fig. 2. Cladogram showing phylogenetic relationship of *brunnescens* with related species.

convex. In the first subdivision which is neatly held by the synapomorphies *i.e.*, humeral angles of pronotum slightly conical, *niokanus* appears to be isolated playing out group relationship with *pseudobrunnescens* and *hipponax* which appear to be closely related and playing sister group relationship with each other. This sister group appears to be neatly held together by the synapomorphic traits *i.e.*, apicoventral margin of pygophore in ventral aspect broadly and shallowly sinuate (Zahid and Ahmad, 2011). The other subdivision represented by *nigriventris*, *brunnescens*, *basalis* and *minor* appear to be neatly held together by the synapomorphies *i.e.*, puncturing distinctly darker and scutellum narrow with fine impunctate median line. In this subdivision *nigriventris* appears to play out group relationship with the rest of this subclade. *C. brunnescens* appears to be isolated playing out group relationship with *basalis* and *minor*, the later as noted above play

sister group relationship with each other and appear neatly held together by the synapomorphies *i.e.*, scutellum with apex subrounded.

REFERENCES

- AHMAD, I., 1986. A fool-proof technique for inflation of male genitalia in Hemiptera (Insecta). *J. ent. Soc. Kar.*, **1**: 111-112.
- AHMAD, I. AND AFZAL, M. 1979. Resurrection of the tribe Caystrini Stål (Heteroptera, Pentatomidae, Pentatominae) with description of two new genera from Oriental region. *Annot. Zool. Bot.*, **133**: 1-14.
- AHMAD, I. AND AFZAL, M., 1989. A revision of Myrocheini (Pentatomidae: Pentatominae) from Indo-Pakistan area. *Orient Insects*, **23**: 243-267.
- AHMAD, I. AND KAMALUDDIN, S. 1985. A new genus for *Caystrus aethiopicus* (Distant) (Pentatomidae: Pentatominae: Myrocheini) with redescription of *Myrochea aculeata* (Westwood) and their relationship. *Annot. Zool. Bot.*, **170**: 1-10
- AHMAD, I. AND MCPHERSON, J., 1990. Male genitalia of the type species of *Corimelaena* White, *Cydnoides* Malloch and *Galgupha* Amyot and Serville (Hemiptera: Cydnidae: Coriomalaeninae) and their bearing on classification. *Ann. ent. Soc. Am.*, **83**: 162- 170.
- AHMAD, I. AND MCPHERSON, J.E., 1998. Additional information on male and female genitalia of *Parabrochymena* Larivière and *Brochymena* Amyot and Serville (Hemiptera: Pentatomidae). *Ann. ent. Soc. Am.*, **91**: 800-807.
- DISTANT, W.L., 1884. On the Rhynchota collected by late Mr. W. A. Forbes on the Lower Niger. *Proc. zool. Soc. London*, **1884**: 458-461.
- DISTANT, W.L., 1909. Zoological results of the Ruwenzori Expedition, 1905-1906. 9. Rhynchota. *Trans. zool. Soc. London*, **19**: 67-84, pl. 2.
- DISTANT, W.L., 1910. Rhynchotal notes. LI. African Pentatomidae (continued). *Annl. Mag. Nat. Hist.*, **6**: 212-221.
- GILLON, D., 1972. Les Hémiptères Pentatomides d'une savane préforestière de Côte-d'Ivoire. *Ann. Univ. Abidjan*, **5**: 265-371.
- KIRKALDY, G.W., 1909. *Catalogue of the Hemiptera (Heteroptera) with biological and anatomical references, lists of foodplants and parasites, etc.* Vol. I. Cimicidae. Berlin, pp. 392.
- LETHIERRY, L. AND SEVERIN, G., 1893. *Catalogue général des Hémiptères Pentatomidae*, 1: Bruxelles, pp. 286.
- LINNAVUORI, R., 1972. Studies on African Pentatomidae. *Arq. Mus. Boca.*, **3**: 395-434.
- LINNAVUORI, R. 1974. Hemipterological studies. *Ann. Nat. Hist. Mus. Wien.*, **78**: 393-413.

- LINNAVUORI, R.E., 1982. Pentatomidae and Acanthosomatidae (Heteroptera) of Nigeria and the Ivory Coast, with remarks on species of the adjacent countries in West and Central Africa. *Acta Zool. Fenn.*, **163**: 176.
- MEDLER, J.T., 1980. Insects of Nigeria-check list and bibliography. *Mem. Am. Ent. Inst.*, **30**: 1-919.
- SCHOUTEDEN, H., 1929. Hemiptera-1. Coptosomatides et Pentatomides. pp. 57-65. In: *Voyage au Congo de S.A.R. le Prince Léopold de Belgique (1925)*. *Rev. Zool. Bot. Afr.*, **17**:1-252.
- VILLIERS, A., 1952. La réserve naturelle intégrale du Mt. Nimba. Fascicule 1. XIV. HémiptPres HétéroptPres terrestres. *Mém. Inst. Franç. Afri. Noir.*, **19**:289-309.
- VILLIERS, A., 1967. Contribution B la faune du Congo (Brazzaville). Mission A. Villiers et A. Descarpentries. LXVII. HémiptPres Pentatomidae. *Bull. Inst. Franç. Afr. Noir.*, (A) **29**: 1784-1811.
- ZAHID, M., 2006. *A revision of the tribes Caystrini Stål and Myrocheini Stål (Heteroptera: Pentatomidae: Pentatominae) with a revision of their type genera Caystrus Stål and Myrochea Stål of the world with special reference to their cladistic analysis*. Ph.D. thesis, University of Karachi, Karachi.
- ZAHID, M. AND AHMAD, I., 2011. A Review of Caystrine subgroup *Caystrus langei* Breddin (1899) with special reference to the species described by Linnavuori i.e., *C. hipponax*, *C. niokanus* and *C. pseudobrunnescens* (Hemiptera: Pentatomidae: Pentatominae) from Ethiopian and Palaearctic regions. *Int. J. Biol. Biotech.*, **8**: 33-40.

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