

## REVISION OF THE GENUS *CHRYSOCORIS* HAHN (HEMIPTERA: SCUTELLERIDAE) FROM INDIA

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### KEYWORDS

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Key to species

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### ABSTRACT

Genus *Chrysocoris* is one of the largest groups of Scutelleridae and it is represented by 21 species from the Oriental Region. This study includes nine species i.e. *C. andamanensis*, *C. dilaticollis*, *C. fascialis*, *C. marginellus*, *C. patricius*, *C. pulchellus*, *C. purpureus*, *C. stockerus* and *C. stollii* of the fourteen species from India, and therefore redescribed. The illustrations of the salient distinguishing characters including the thoracic scent efferent system and the genitalia are the highlights of the study.

### INTRODUCTION

The genus *Chrysocoris* Hahn (1834) (Hemiptera: Scutelleridae) containing metallic green or blue coloured bugs, always with variable number of black spots on their scutellum and pronotum and their body is convexed dorso-ventrally, with size generally ranging between 9-22mm; their venter is occupied with small, fine, pubescent hairs while the dorsum is occupied with fine punctations. It is closely related to *Calliphara* and *Eucorysses* but can be easily distinguished from the former in having broader scutellum leaving only the external margin of exocorium exposed and from the latter in its distinct tibiae, with basal halves cylindrical and with a longitudinal furrow dorsally in their apical halves. Species of *Chrysocoris* are mainly distributed in the Oriental Region with 21 species. All these are phytophagous but not economically important except for *C. stollii*. This genus is the largest in term of the number of species under Scutelleridae. According to Distant (1902), 14 species are known from India. Distant (1902) supplemented a brief account for these species focusing on their morphological characters. After him, no other taxonomical work done by any worker from India except the description of male genitalia of few species of *Chrysocoris* by Pawar (1971). Recently, Tsai *et al.* (2011) described two species of *Chrysocoris* i.e., *C. fascialis* and *C. stollii* in detail from Taiwan. So, the main objective of the present study is to provide an elaborated detail of available species of *Chrysocoris* from India i.e., *andamanensis*, *dilaticollis*, *fascialis*, *marginellus*, *patricius*, *pulchellus*, *purpureus*, *stockerus* and *stollii* regarding their redescription, focusing mainly on their external morphological characters, morphometry, external thoracic

scent efferent system and male and female genitalia. A key to the species enriched with these characters is also provided.

### MATERIALS AND METHODS

The specimens for the present study came from the collection from different agroecosystem and the voucher specimens available in the National Pusa Collection (NPC), Division of Entomology, Indian Agricultural Research Institute, New Delhi, and the Forest Research Institute (FRI), Dehradun. Examination of external structures was carried out using Nikon SMZ 10 and Leica MZ16A stereozoom microscopes fitted with a drawing tube. Male and female genitalia were dissected following methodology of Tsai and Redei (2010) and images taken under Leica 205FA stereozoom microscope attached with DFC 425 digital camera. Measurements were taken using a micrometer eyepiece. Each scale in the figures is 1 mm and the morphometry in text is in mm.

### RESULTS AND DISCUSSION

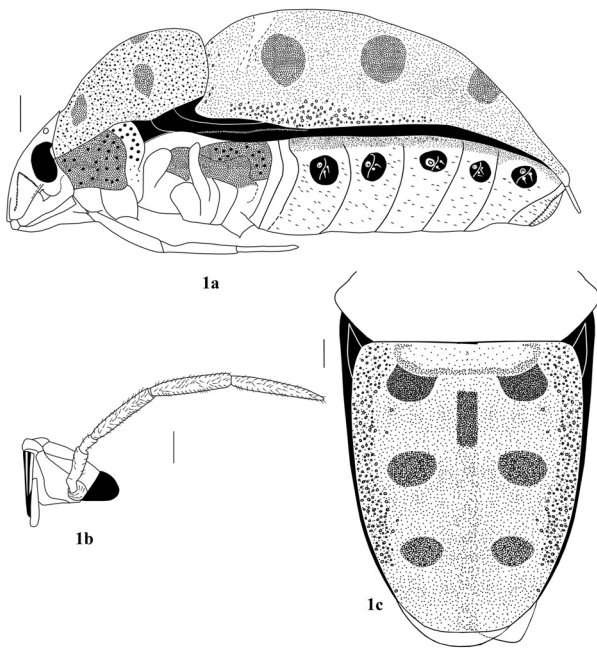
#### *Chrysocoris* Hahn

*Chrysocoris* Hahn, 1834: 38

Type species by monotypy: *Chrysocoris stollii* (non Wolff, 1801)

*Galostha* Amyot and Serville, 1843: 33; Stal, 1873:18

**Diagnosis:** Body metallic or brassy green (except *C. fascialis*) with black spots on dorsal and ventral sides, body dorso-ventrally convexed (Fig. 1a), size varies from 10 to 20mm; head short and declivent, lateral margins sinuate; eyes generally protruded laterally; basal antennal segment never extended



**Figure 1: Diagnostic characters of genus *Chrysocoris*; (1a) Body in lateral view (1b) ventral view of head attached with antenna and (1c) scutellum showing exocorium exposed**

beyond apex of head, II segment shortest among all (Fig. 1b); labium always extended beyond posterior coxae and never beyond IV abdominal segment (Fig. 1a); scutellum slightly convexed at base and it covers almost whole of the abdomen except the anterior margin of exocorium (Fig. 1c); external efferent system of metathoracic scent gland well developed; spermathecal bulb elongated, generally with apical end round; spermathecal duct dilation present, of variable shapes and size, pygophore always with strigil, conjunctiva with 3 pairs of appendages and paramere with its apical end C-shaped.

**Key to the studied species**

Abdomen with venro-lateral margins with purplish pink band.....2  
 Abdomen with venro-lateral margins without purplish pink band.....3  
 Body yellow to brown coloured; scutellum with a black transverse spot, extended between lateral margins; pump region of spermatheca indistinct but flanges not in proper sclerotized plate form.....*fascialis*  
 Body metallic colour to blue, sometime with golden tinge; scutellum possessed seven spots but no one transverse between lateral margins; well developed proximal and distal flanges enclosed the spermathecal pump region.....*stollii*  
 Body generally smaller than 12 mm in length.....*patricius*  
 Body generally bigger than 12 mm in length.....4  
 Pronotum with lateral margins laminate, 2<sup>nd</sup> pair of conjunctival appendages swollen with sclerotized apical tip.....*dilaticollis*  
 Pronotum with lateral margins not laminate, 2<sup>nd</sup> pair of conjunctival appendages neither swollen nor with sclerotized apical tip.....5  
 First pair of conjunctival appendages apically curved while second pair of conjunctival appendages with a subapical

sclerotized spine.....6  
 First pair of conjunctival appendages apically not curved and second pair of conjunctival appendages without any subapical sclerotized spine.....7  
 Stem of paramere robust and straight, phallosome cup-shaped.....*marginellus*  
 Stem of paramere normal, phallosome not in cup shaped.....*pulchellus*  
 Subquadrate stigmal spots present on III-VI ventral abdominal segment, 2<sup>nd</sup> conjunctival appendages blunt.....*stockerus*  
 Subquadrate stigmal spots absent, 2<sup>nd</sup> conjunctival appendages spinose.....8  
 Pronotum with 5 spots.....*purpureus*  
 Pronotum always with more than 5 spots.....*andamanensis*

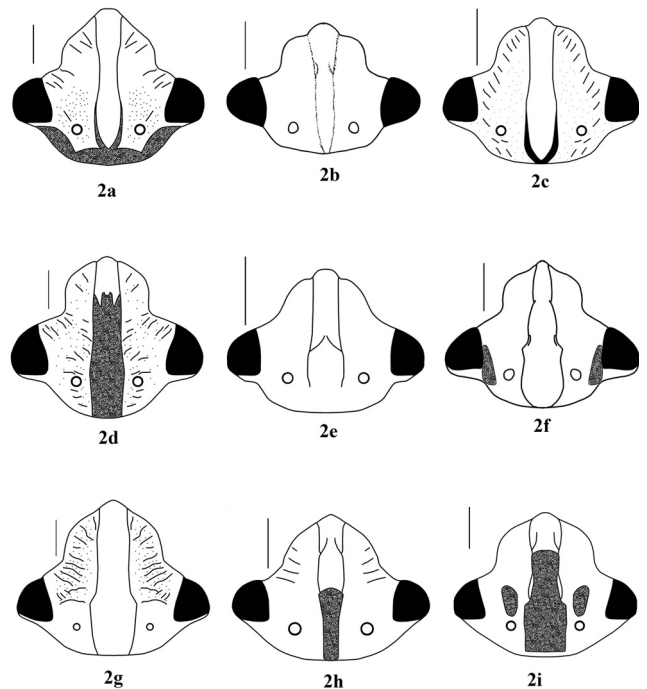
***Chrysocoris andamanensis* Atkinson**

(Figs. 2a, 3a, 4a, 5a, 6a, 7a, 8a, 9a; Plate III-A)  
*Chrysocoris andamanensis* Atkinson, 1887: 177

**Diagnosis:** Body metallic green or blue, basal area of head black, antero-lateral pronotal margins slightly depressed, pygophore with dorso-lateral setal patch, spermathecal duct dilation globular.

**Colour:** Dorsum metallic green or violaceous blue with black spots over pronotum and scutellum. First antennal segment, I and II labial segment ochraceous, II to IV antennal segment; III and IV labial segments brown to black, coxae, femora and tibiae black with violaceous tinge, tarsal segments black, body with fine and thick punctations except head.

**Head:**(Fig. 2a) slightly produced anteriorly, lateral margins of



**Figure 2: Dorsal view of head of *Chrysocoris* species; (2a) *C. andamanensis* (2b) *C. dilaticollis* (2c) *C. fascialis* (2d) *C. marginellus* (2e) *C. patricius* (2f) *C. pulchellus* (2g) *C. purpureus* (2h) *C. stockerus* and (2i) *C. stollii***

head deeply sinuated before eyes, breadth 1.2 xs to length, eyes protruded laterally and almost touched anterior pronotal angles, preocular distance 2x to postocular while interocular 2.12 xs to interocellar distance, ocelli placed more near to eyes than to each other.

**Antennae:** Five segmented; located ventrally on head near to eyes; II smallest; III segment 8.75x to II segment; IV longest and 1.1x to III segment; V subequal to IV segment, small black hairs over III and onward segment.

**Labium:** Four segmented, I segment smallest; II 2x to I; III 0.8x to II and IV segment 0.8x to III; total labial length 7.55 and extended upto II abdominal segment.

**Pronotum:** (Fig. 3a) convexed at base, anterior margin deeply sinuated, anterior pronotal angles obtuse and slightly produced anteriorly, lateral pronotal margins sinuated deeply just before lateral angles, distance between lateral angles 2.2x to anterior angles; 8 black pronotal spots, 3 variable sized small spots near anterior pronotal margin while 5 variable sized spots located in posterior row, 3 out of these large, elongated on disc towards posterior margin, 1 small spot at each lateral pronotal angles.

**Scutellum:** (Fig. 4a) with base convexed, oval in shape, anterior scutellar margin straight or slightly convexed; covered whole of the abdomen; length 1.5x to breadth, apex rounded, possessed 7 scutellar spots present, 6 in pair situated laterally and 1 elongate spot at middle more towards base.

**Legs:** with fore, middle and hind femora measured 3.9, 4.5 and 6.1, respectively, while fore, middle and hind tibiae measured 4.2, 4.6 and 5.9, respectively, tibiae and tarsal

segments possessed small and black hairs and very few on femora.

**External efferent system of metathoracic scent gland:** (Fig. 5a) with ostiole moderate sized, oval in shape, peritreme small and black, not grooved medially; evaporatorial surface extended upto mesothoracic segment.

**Abdomen:** Ventrally convexed throughout the length, a submarginal series of black spots present on all abdominal sternites except fused I and II segments; punctations very sparse and located only toward lateral sides; number and position of spiracles and trichobothria same as other species of this genus.

Male genitalia with pygophore (Fig. 6a) having posterior margin convex, lateral margins round, strigil present in patch form, inner margin invaginated on to lateral sides, proctiger elongated.

**Aedeagus:** (Fig. 7a) with vesica sclerotized and anteriorly sharp, I conjunctival appendages broad at base, medially bent while apically round; completely sclerotized; II pair longest, sclerotized at tip and at basal portion, medially membranous and wrinkled, III pair completed sclerotized, elongated apically spined; vesica hooked or notched apically, duct clear.

**Paramere:** (Fig. 8a) with robust stem, basal part broader to apical, not strongly sclerotized, blade curved upwardly and a tufts of hairs at the junction of base and stem.

Female genitalia with ovipositor having VIII paratergites fused distally, each eighth paratergite triangular, posterior margin almost straight; IX paratergites comparatively small and elongated, round toward inner side, first pair of gonocoxae with posterior margin straight, inner angle round.

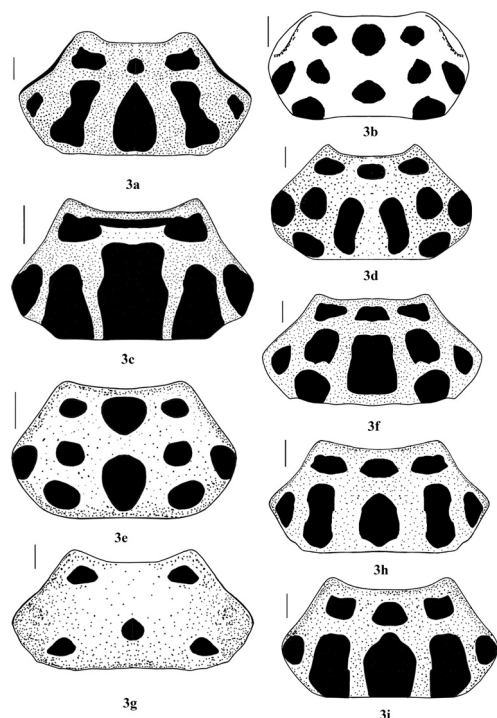


Figure 3: Pronotum of *Chrysocoris* species; (3a) *C. andamanensis* (3b) *C. dilaticollis* (3c) *C. fascialis* (3d) *C. marginellus* (3e) *C. patricius* (3f) *C. pulchellus* (3g) *C. purpureus* (3h) *C. stockerus* and (3j) *C. stollii*

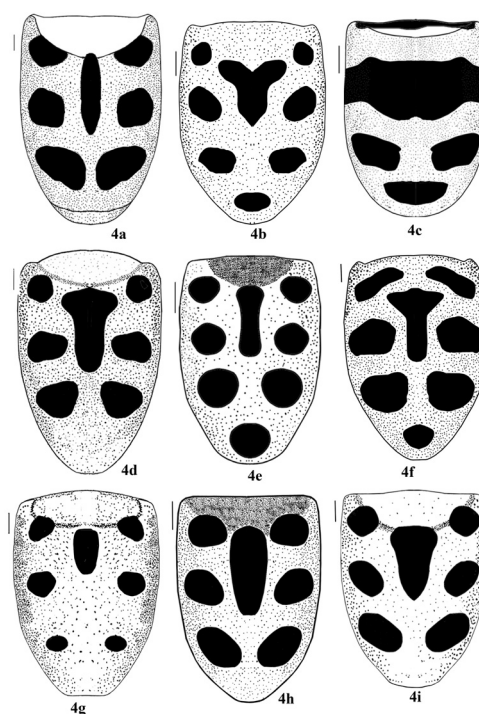
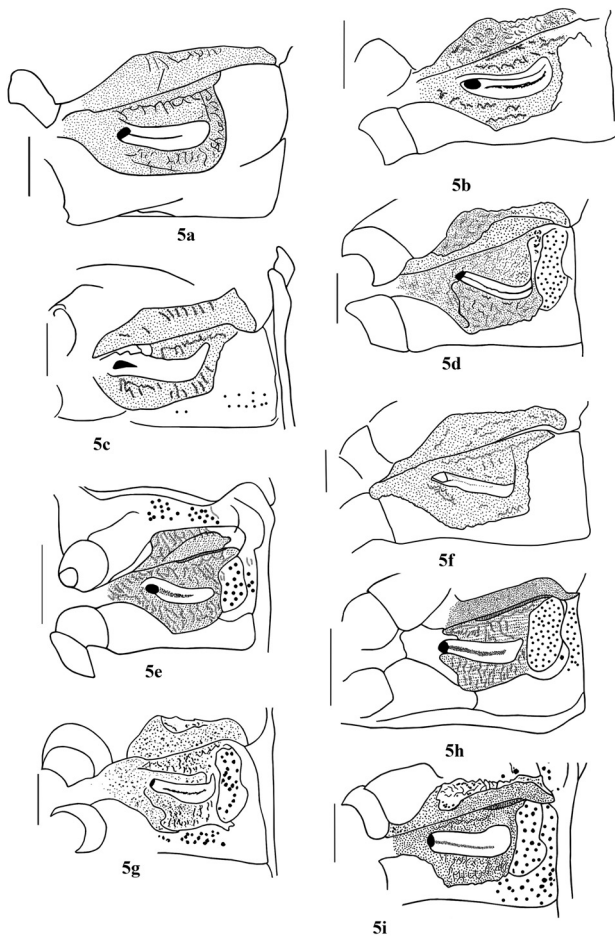


Figure 4: Scutellum of *Chrysocoris* species; (4a) *C. andamanensis* (4b) *C. dilaticollis* (4c) *C. fascialis* (4d) *C. marginellus* (4e) *C. patricius* (4f) *C. pulchellus* (4g) *C. purpureus* (4h) *C. stockerus* and (4i) *C. stollii*



**Figure 5:** External efferent system of metathoracic scent glands of *Chrysocoris* species; (5a) *C. andamanensis* (5b) *C. dilaticollis*; (5c) *C. fascialis* (5d) *C. marginellus* (5e) *C. patricius* (5f) *C. pulchellus* (5g) *C. purpureus* (5h) *C. stockerus* and (5i) *C. stollii*

**Spermatheca:** (Fig. 9a) with bulb somewhat elongated with apical end round, distal and proximal flanges of pump distinct; distal funnel shaped, broader than proximal; basal part of pump region membranous, distal spermathecal duct almost 0.5x to proximal, median spermathecal duct sclerotized and broad, more than 2x to proximal part, spermathecal dilation membranous, large and spherical in shape.

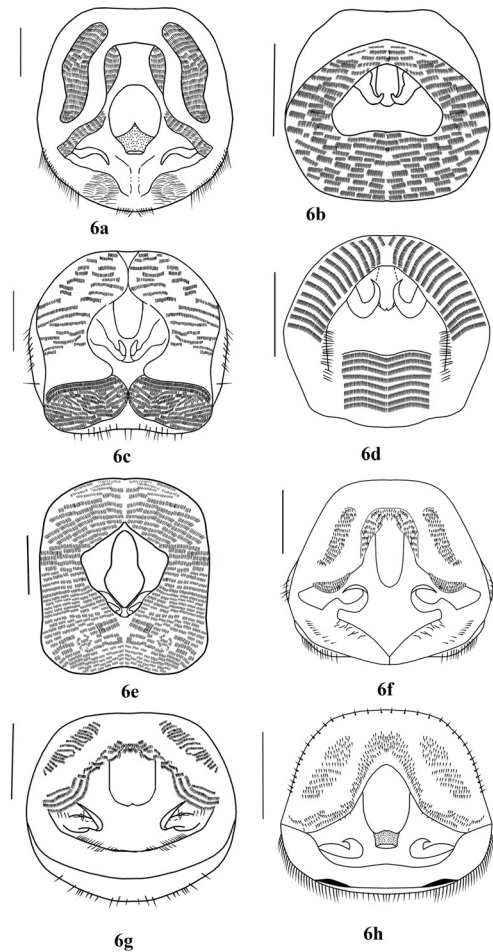
**Body size:** Female 20.5 and male 19.5 long

**Material examined (NPC):** 1♀ and 1♂, India: Andaman Island, 1♂, (without any data); Uttarakhand: Masoori, 1♀, ix-x.1920, coll. Mackenzie, host unknown.

**Comments:** Species described by Atkinson (1887) with detail on its morphological characters, after him Distant (1902) also studied the species in its morphological characters as well as its habitat and body size. Here an addition made to its morphometric characters, male and female genitalic characters alongwith detail description of morphological characters.

#### ***Chrysocoris dilaticollis* (Guerin-Meneville)**

(Figs. 2b, 3b, 4b, 5b, 6b, 7b, 8b; Plate I-A and III-B)  
*Scutellera dilaticollis* Guerin-Meneville, 1830:160; Stal, 1868:12



**Figure 6:** External male genital capsule of *Chrysocoris* species; (6a) *C. andamanensis* (6b) *C. dilaticollis* (6c) *C. marginellus* (6d) *C. patricius* (6e) *C. pulchellus* (6f) *C. purpureus* (6g) *C. stockerus* and (6h) *C. stollii*

**Diagnosis:** Body metallic green or blue, jugal lobes subquadrate apically, antero-lateral margins laminate.

**Colour:** Dorsally metallic green, where generally the lateral margins of pronotum and base of scutellum with golden tinge, antennae, labium and tarsal segments black, femora, base of tibiae and abdomen ventrally ochraceous, while rest of tibial portion green.

**Head:** (Fig. 2b) declivent, lateral margins deeply sinuated before eyes, tylus extended beyond the jugal lobes; breadth 1.5x to length, central fascia present within anterior to posterior end; eyes much protruded laterally, preocular distance 2.2x to postocular, interocular distance 2.2x to interocellar, ocelli located more closer to eyes than to each other

**Antennae:** Five segmented; I antennal segment never extended upto apex of head; II segment smallest and only 0.3x to I; III longer than I and 2.4x to I; IV slender and broader amongst all and 1.3x to III segment while V longest amongst all and 1.4x to III; total antennal length 9.3.

**Labium:** Four segmented; I labial segment smallest; II longest and 1.3x to I; III and IV subequal and extended beyond the posterior coxae.

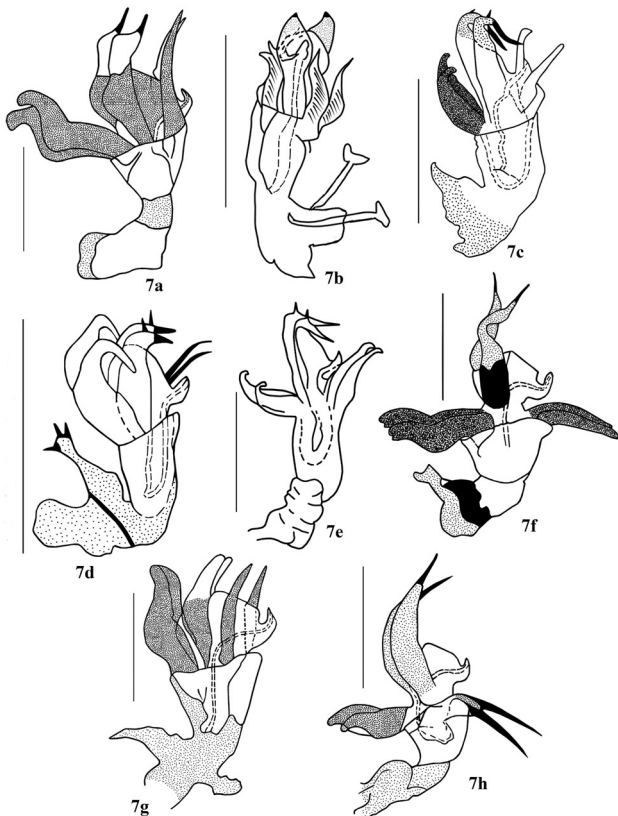


Figure 7: Aedeagus of *Chrysocoris* species; (7a) *C. andamanensis* (7b) *C. dilaticollis* (7c) *C. marginellus* (7d) *C. patricius* (7e) *C. pulchellus* (7f) *C. purpureus* (7g) *C. stockerus* and (7h) *C. stollii*

**Pronotum:** (Fig. 3b) with anterior margin straight, anterior angles broad, antero-lateral margins reflexed, lateral angle obtuse, breadth between anterior angles almost equal to medial pronotal length and 0.55x to lateral pronotal angles; ten black spots present on surface, three at anterior margin, one at each lateral angle, two at base, three at disc.

**Scutellum:** (Fig. 4b) convexed and covers whole of the abdomen, anterior margin straight, apical end round, length 1.5x to breadth, eight spots, six in pairs, more towards lateral side, one at sub apical, one Y-shaped before middle.

**External efferent system of metathoracic scent gland:** (Fig. 5b) with ostiole oval, open into transverse peritreme, anterior and posterior margins smooth, without any crenulations, exterior end round, grooved medially beyond half of the length; exterior end slightly curved towards anterior end; evaporatorial surface rugulose and extended to mesothoracic segment.

**Abdomen:** convexed on ventral side; abdominal length and breadth subequal; III to VII segment possessed a spiracle and a pair of trichobothria on each lateral side, a black round spot also present on the same segment, intersegmental suture between VI and VII convexed.

Male genitalia with pygophore (Fig. 6b) dorso-lateral margin bulged in middle, dorso-lateral surface concave through inside, having ventro-posterior margin curved, whole surface covered with scattered strigil; proctiger oval.

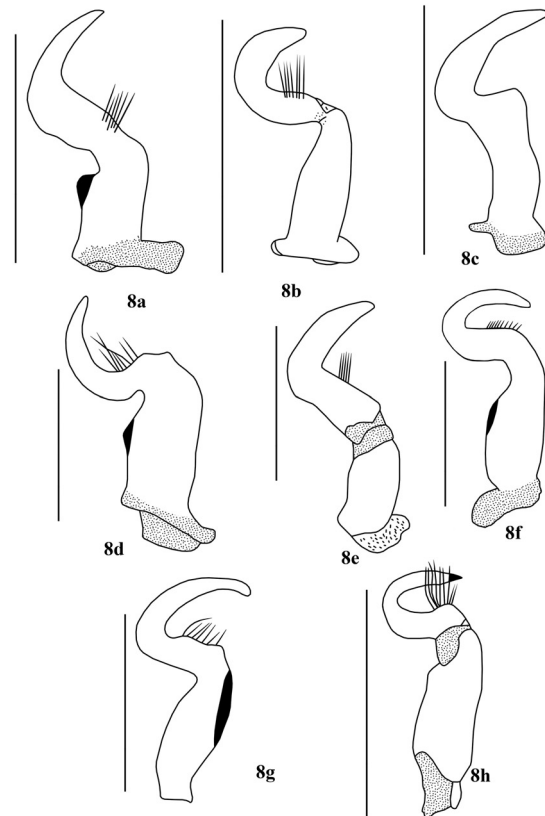


Figure 8: Parameres of *Chrysocoris* species; (8a) *C. andamanensis* (8b) *C. dilaticollis* (8c) *C. marginellus* (8d) *C. patricius* (8e) *C. pulchellus* (8f) *C. purpureus* (8g) *C. stockerus* and (8h) *C. stollii*

**Aedeagus:** (Fig. 7b) not heavily sclerotized with tubular phallosome, conjunctiva represented by three pair of appendages, I pair strongly sclerotized, except basal part, more or less on S-shaped; II pair completely membranous except tip, it is broader and longest, apically pointed, III pair also sclerotized and apically curved.

**Paramere:** (Fig. 8b) with strong stem, outer margin of stem curved, blade attached with stem by a membranous part, blade deeply curved and possess long and sparse setae at the base.

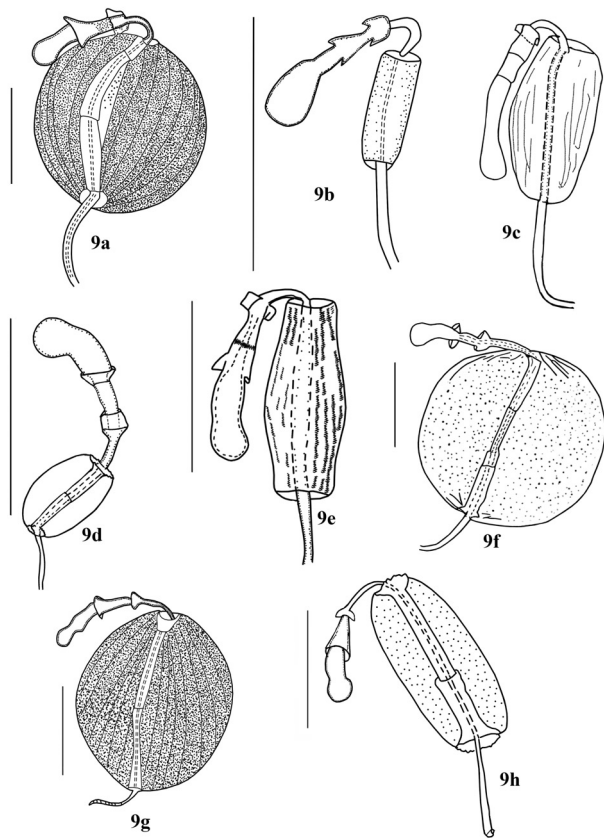
**Material examined (FRI):** 1♂; Myanmar: Insein, 1♂, 3.i. 1927, coll. D.J. Atkinson, host unknown.

**Comments:** Species described by Guerin-Meeneville under genus *Scutellera*. Distant (1902) studied the species in its morphological characters and found allied to *C. eques*. Here in the present study, focus given on its male genitalic characters alongwith morphological characters with emphasis on external thoracic efferent system of metathoracic scent glands.

#### *Chrysocoris fascialis* (White)

(Figs. 2c, 3c, 4c, 5c, 9b; Plate I-B). *Callidea fascialis* White, 1842:86 *Chrysocoris fascialis* var. *venustria* Kirkaldy, 1910: 110. *Lamprocoris giranensis* Matsumura, 1913:105; Tsai and Redei, 2009:46

**Diagnosis:** Body yellow to orange, pronotum with lateral angles subquadrate, scutellum generally with a transverse black band extended between lateral margins, proximal spermathecal duct longer than distal.



**Figure 9:** Spermatheca of *Chrysocoris* species; (9a) *C. andamanensis* (9b) *C. fascialis* (9c) *C. marginellus* (9d) *C. patricius* (9e) *C. pulchellus* (9f) *C. purpureus* (9g) *C. stockerus* and (9h) *C. stollii*

**Colour:** Dorsally yellow to ochraceous with black spots over pronotum and scutellum; base of head metallic green; coxae, trochanters and femora (except apices) yellow/ ochraceous; first labial segment, apices of femora, tibiae and tarsal segments brown to black while rest of the labial segments and antennae brown; abdomen ventrally ochraceous with brown stigmatal spots, laterally purplish pink band throughout the margins; body sparsely punctured.

**Head:** (Fig. 2c) small, lateral margins deeply sinuated near eyes before apex, tylus longer than jugal lobes and latter subquadrate; head breadth (2.8) 1.4x to length (2.0); preocular distance 1.2x to postocular, interocular 2x to interocellar distance and ocelli located nearer to eyes than to each other.

**Antennae:** Five segmented; I antennal segment never extended beyond apex of the head; II smallest and only 0.4x to I; III 4.7x to II while IV longest and broader among all; 1.2x to III; V subequal to III segment and apically tapered, total antennal length 4.4.

**Labium:** Four segmented; I and IV subequal; II longest and 1.6x to I; III 0.7x to II; total labial length 4.35 and extended upto the II abdominal segment.

**Pronotum:** (Fig. 3c) with anterior margin deeply sinuated, lateral margins slightly convexed before lateral angles, anterior pronotal angles anteriorly projected; distance between lateral angles 1.9x to anterior pronotal distance and 2.1x to medial

pronotal length; seven spots over surface which covered almost whole pronotal surface, two at anterior angles, connected through a transverse band, two at lateral angles and three at disc, the middle one almost quadrate in shape while adjacent one oblong.

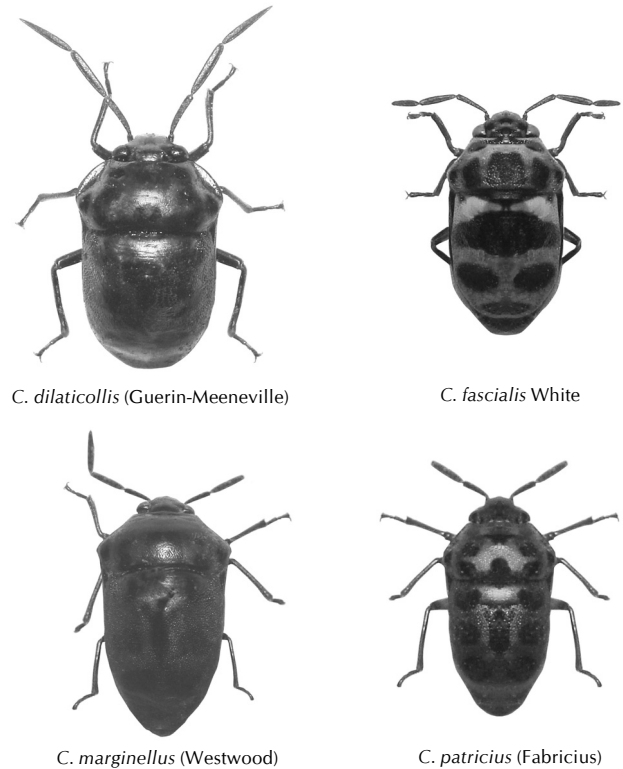
**Scutellum:** (Fig. 4c) not convexed at base, covered almost whole of abdomen, scutellar length 1.4x to breadth, anterior pronota margin almost straight while apex broad and round; four black spots on dorsum, a transverse, thick band like extended between lateral margins, two oval posterior to middle, more towards lateral side and one disc shaped located subapically.

**Legs:** with hind pair composed of subequal femora and tibiae, middle femora slightly bigger to corresponding tibiae while in tibiae of fore legs slightly bigger to its corresponding femora.

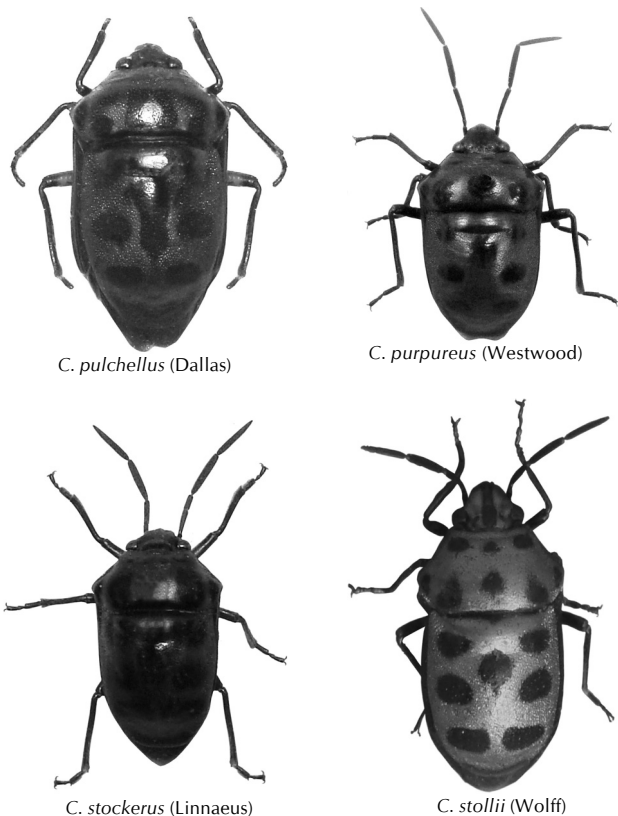
**External efferent system of metathoracic scent gland:** (Fig. 5c) with elongated ostiole, peritreme transversely elongated and slightly elevated upward, not grooved medially; evaporatorial surface moderately rugulose.

**Abdomen:** U shaped; anterior margin almost straight, a round to disc shaped black spot on each lateral side of abdomen from III-VII, on VI segment one more spot present adjacent to previous; five pairs of spiracles from III to VII segment and a pair of trichobothria posterior to each spiracle.

Female genitalia having ovipositor with VIII paratergites triangular and fused medially, IX paratergites small and bulbous, first pair of gonocoxae subquadrate with posterior middle angle round.



**Plate I:** Habitus of (IA) *Chrysocoris dilaticollis* (Guerin-Meeneville), (IB) *Chrysocoris fascialis* White, (IC) *Chrysocoris marginellus* (Westwood), (ID) *Chrysocoris patricius* (Fabricius)



**Plate II: Habitus of (IIA) *Chrysocoris pulchellus* (Dallas), (IIF) *Chrysocoris purpureus* (Westwood), (IIG) *Chrysocoris stockerus* (Linnaeus) and (IIH) *Chrysocoris stollii* (Wolff)**

**Spermatheca:** (Fig. 9b) with bulb elongated, distal end rounded, both flanges present but, not in sclerotized plate like and encloses short pump region; proximal spermathecal duct almost 1.6x to distal duct; spermathecal dilation slender, small and transparent, medial spermathecal duct sclerotized and can be seen easily through spermathecal dilation.

**Body size:** Female 11.2 long and 5.8 broad.

**Habitat:** Recorded on *Sambucus chinensis* (Ho 2003).

**Material examined (NPC):** 1♀; Myanmar: Maymyo, 1♀, 20.viii.1914, coll. Com. Ins. Ento, beans.

**Comments:** species is described under genus *Callidea* by White (1842). After him it is studied by Distant (1902) and Tsai *et al.* (2011). Here an attempt made to add the findings over existing literature. This species is remarkably different with others in its body colouration and the spot on the anterior collar and callus which are fused forming a broad fascia.

***Chrysocoris marginellus* (Westwood)**

(Figs. 2d, 3d, 4d, 5d, 6c, 7c, 8c, 9c, Plate I-C and III-C). *Callidea marginella* Westwood, 1837: 15; Stal, 1873: 21

**Diagnosis:** Body metallic green or blue, lateral pronotal angles obtuse, paramere with stem robust and straight, spermathecal pump flanges not very conspicuous.

**Colour:** Dorsally metallic green or indigo blue with black spots over dorsum, ventrally thorax metallic green while abdomen ochraceous or reddish ochraceous with lateral margin violaceous or black, submarginal abdominal series of broad,

transverse spots, green or bluish green. I segment ochraceous, while rest black.

**Head:** (Fig. 2d) declivent, lateral margins deeply sinuated, tylus longer than jugal lobes, breadth 1.4x to length; preocular distance, 1.5x to postocular, two median fasciae present between apex to base of head; eyes protruded laterally, touched anterior pronotal angles; interocular distance 2x to interocellar and ocelli placed more closer to eyes than each other.

**Antennae:** Five segmented; I antennal segment never extended beyond apex of head; II segment smallest and only 0.6x to I; III segment 4.3x to II; IV 1.6x to III while V longest amongst all and 1.2x to IV; total antennal length  $10.9 \pm 0.51$ .

**Labium:** Four segmented; I labial segment smallest; II longest and 1.9x to I; III and IV subequal and only 0.6x to the II; total labial length  $6.1 \pm 0.2$  and extended upto or beyond posterior coxae.

**Pronotum:** (Fig. 3d) with anterior margin deeply sinuated and anterior pronotal angles produced anteriorly; antero-lateral pronotal margins straight, not sinuated with lateral angles obtuse; breadth between anterior pronotal angles subequal to medial pronotal length while distance between lateral pronotal angles 4.2x to anterior; eleven spots on the dorsum, three at anterior margin, one at each lateral angles and remaining spots on disc.

**Scutellum:** (Fig. 4d) having base convexed with anterior scutellar margin convexed, covered whole of abdomen; scutellar length 1.4x to breadth, basal angle and scutellar apex rounded; seven spots present, six in pairs, more towards lateral sides and one elongated, broad and roughly T-shaped situated medially.

**External efferent system of metathoracic scent gland:** (Fig. 5d) with ostiole round to oval in shape, peritreme transverse with exterior end curved, sickle shaped, medially grooved to hold the secretion through ostiole, evaporatorial surface rugulose and extended upto mesothoracic segment.

**Legs:** With hind leg having femur 1.1 xs to corresponding tibia while in case of middle and hind legs, femora and tibiae subequal.

**Abdomen:** with breadth subequal to length or slightly broader; segment III to VII bear subquadrate spots on each lateral side and a black medial spot on the III segment; spiracle on III to VII segments and a pair of trichobothria just below each spiracle; VII intersegmental suture broadly V-shaped.

Male genitalia with pygophore (Fig. 6c) having posterior margin sinuated, strigils present in two patches on dorso-posterior region and also scattered on the dorsal surface; lateral margins also sinuated slightly; proctiger ovate, setae on ventral and lateral sides.

**Aedeagus:** (Fig. 7c) not highly sclerotized, having tubular phallosome; three pairs of conjunctival appendages present, I pair sclerotized and apically curved, II pair basally broad and membranous, apically thin and sclerotized and terminated in spine, and bear small spine before apical end, III pair comparatively short and stout with almost uniform thickness, apically tapering; vesica broad having apex notched.

**Paramere:** (Fig. 8c) robust, sickle shaped, blade curved, at the

junction of stem and blade a tuft of long setae present; stem broad and at middle margin bulged out laterally.

**Female genitalia:** having VIII paratergites triangular with posterior margin convex, IX paratergites comparatively small. First pair of gonocoxae large and subquadrate with lateral margins convex and posterior margin sinuated slightly. **Spermatheca** (Fig. 9c) with bulb elongated and distally bulbous with round apex; proximal flange disc shaped while distal flange of pump indistinct; pump conspicuous; spermathecal dilation elongated, membranous and cylindrical.

**Body size:** Female 19.15 and male 18.8 long.

**Material examined (NPC):** 2♀♀ and 2♂♂; India: Karnataka: Bangalore, 1♂, 1903, coll. and host unknown; Maharashtra: Matheran (2500 ft), 1♂, iv.1903, coll. D.N., host unknown. Myanmar: Myitkyina, 1♀, 30.viii.-1.ix.1914, coll. T.B. Fletcher, host unknown. Sri Lanka: Hambantota, 1♀, 15.ii.1908, coll. T.B. Fletcher, host unknown.

**Comments:** External morphological characters of the species has been discussed by Distant (1902). Presently, an addition has been made to the existing literature in concern of its morphometry and male and female genitalia.

#### ***Chrysocoris patricius* (Fabricius)**

(Figs. 2e, 3e, 4e, 5e, 6d, 7d, 8d, 9d; Plate I-D and III-D). *Cimex patricius* Fabricius, 1798: 527; Stal, 1873, 20

**Diagnosis:** Body metallic green or blue, smallest species (9-12mm) of *Chrysocoris*, lateral pronotal angles obtuse, dors-posterior pygophoral region with setal patch, 1<sup>st</sup> conjunctival appendages apically C-shaped.

**Colour:** Dorsally metallic green or blue with golden reflection, central lobe to head and spots over pronotum and scutellum black. Base of I antennal segment, I and base of II labial segment, coxae, femora (except apices) and lateral margins of prosternum orange or reddish, remaining antennal and labial segments and tarsal segments dark brown to black, apices of femora, tibiae, stigmatal plates and sternum metallic green or blue, lateral margins of ventro-lateral abdomen purplish pink.

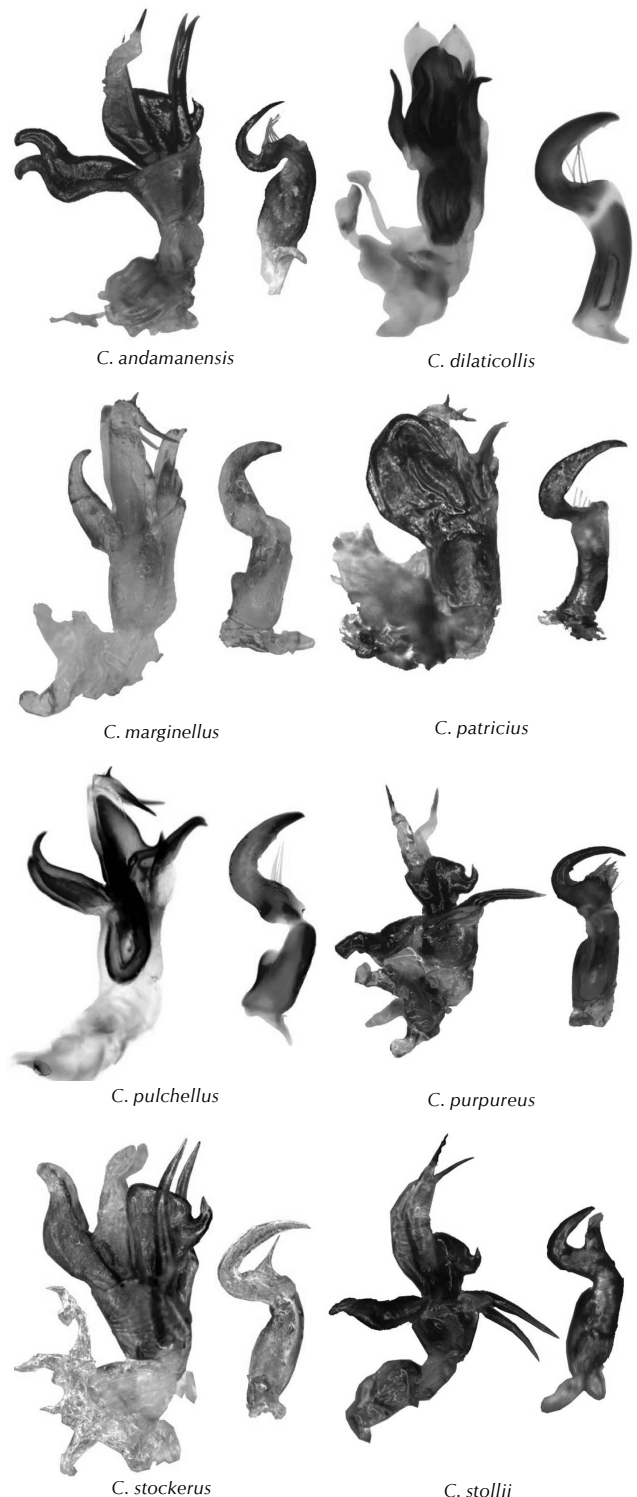
**Head:** (Fig. 2e) declivent, lateral margins sinuated deeply, tylus longer than jugal lobes; head breadth ( $2.54 \pm 0.097$ ) 1.4x to length ( $1.79 \pm 0.11$ ); eyes protruded laterally; preocular distance ( $0.81 \pm 0.08$ ) 1.7x to postocular ( $0.46 \pm 0.05$ ); ocelli placed nearer to eyes than to each other; interocular distance ( $1.03 \pm 0.37$ ) 1.3x to interocellar ( $0.8 \pm 0.05$ ) distance and ocelli placed more nearer towards eyes than to each other.

**Antennae:** Five segmented; attached ventrally on head, nearer to eyes, I antennal segment ( $0.64 \pm 0.07$ ) never extended beyond the apex of head; II ( $0.31 \pm 0.09$ ) smallest and only 0.5x to I; III ( $1.17 \pm 0.07$ ) 3.8x to II; IV and V segment flat while IV broadest of all segments, slightly grooved in middle and 1.4x to III; V ( $1.8 \pm 0.1$ ) longest and 1.1x to IV; small hairs on III and onward segment, in males the II segment very small almost half to the females, total antennal length  $5.48 \pm 0.31$ .

**Labium:** four segmented; I labial segment smallest ( $0.67 \pm 0.07$ ); II longest ( $1.1 \pm 0.15$ ) and 1.6x to I; III ( $0.76 \pm 0.07$ ) and IV ( $0.78 \pm 0.05$ ) subequal and only 0.7x to II segment; total labial length  $3.32 \pm 0.25$  and extended upto posterior coxae.

**Pronotum:** (Fig. 3e) convexed, anterior pronotal margin slightly sinuated, lateral margins straight, lateral pronotal angles broad

and obtuse; breadth between anterior pronotal angles ( $2.65 \pm 0.16$ ) subequal to medial pronotal length ( $2.62 \pm 0.12$ ) and only 0.5x to the breadth between lateral angles



**Plate III:** Images of male genitalia of *Chrysocoris* species; (IIIA) *C. andamanensis* (IIIB) *C. dilaticollis* (IIIC) *C. marginellus* (IIID) *C. patricius* (IIIE) *C. pulchellus* (IIIF) *C. purpureus* (IIIG) *C. stockerus* and (IIIH) *C. stollii*



( $5.32 \pm 0.25$ ); 10 black spots distributed over the surface, 3 at anterior margin, 5 at disc, in which 4 round in pairs and middle one oblong, one at each lateral angles.

**Scutellum:** (Fig. 4e) with base convex, covers whole of the abdomen, scutellar length ( $5.75 \pm 0.29$ ) 1.2x to breadth ( $4.62 \pm 0.29$ ), basal margin almost straight or convex and apical margin round, eight black spots over the surface, 6 round and in pairs located more towards lateral side, one spot circular located at base and one oblong almost at middle; punctures thick and, dense towards lateral sides while medially it is small and arranged sparsely.

**Legs:** With fore, middle and hind femora  $1.84 \pm 0.12$ ,  $2.1 \pm 0.11$  and  $2.59 \pm 0.11$ , respectively while fore, middle and hind tibiae  $2.07 \pm 0.09$ ,  $2.22 \pm 0.11$  and  $2.82 \pm 0.17$  long, respectively.

**External efferent system of metathoracic scent gland:** (Fig. 5e) with ostiole large, round to oval in shape, peritreme transverse and grooved medially upto half of the length, anterior margin concave; evaporatorial surface black and extended upto mesothoracic segment.

**Abdomen:** Ventrally subquadrate; breadth  $1.04x$  ( $4.66 \pm 0.31$ ) slightly more than abdominal length ( $4.49 \pm 0.16$ ), ventrally it possessed black spots at base and on each abdominal segment. A spiracle on each lateral side from III to VII abdominal segments and also on VIII paratergites, a pair of trichobothria posterior to each spiracle except VIII paratergites.

Male genitalia having pygophore (Fig. 4d) with ventral margin broad, bearing a large strigil of irregular rows of stout setae forming a central arc, dorsal border narrow and bearing two long narrow strigils on each side of a small membranous area composed of irregular rows of stout setae.

**Aedeagus:** (Fig. 7d) with phallosome cylindrical, basally narrow, three pairs of conjunctival appendages present, first pair flattened proximally, bent distally to sclerotized apices, second pair longest, membranous produced into sclerotized double spines at apices, third pair slender, with distal halves sclerotized and pointed, vesica swollen and basally attained hook shape.

**Paramere:** (Fig. 8d) stout with a long stem and a long hook pointed at tip, base of hook at its junction with the stem flattened, bearing a number of fairly stout setae.

Female genitalia having ovipositor with VIII paratergite triangular with a spiracle each near to lateral margin and more towards dorsal side, posterior margin straight, medially fused, IX paratergites small and lobe like, first pair of gonocoxae large and subquadrate, moderate setae on genitalic plate.

**Spermatheca:** (Fig. 9d) with bulb elongated and apex round; distal and proximal flanges of pump distinct and broad, proximal bulbous while distal flange disc shaped, proximal spermathecal duct longer and narrower than distal; spermathecal dilation transparent, small and cylindrical.

**Body size:** Female  $10.42 \pm 0.17$  and male  $10.13 \pm 0.38$  long.

**Habitat:** Recorded on *Santalum album* (Chatterjee, 1934); maize, jatropha (personal observation).

**Material examined (NPC):** 19♀ and 20♂♂; India: Delhi: IARI, 1♀, 15.x.1936, coll. Shaffi, host unknown; 1♂, 19.viii.1939, jwar, 1♂, 26.viii.1939, Lucern; 1♂, 18.viii.1939, coll. P. Mukerjee, *Sesamum indicum*; 1♀, 6.viii.1940, coll. H.U. Khan,

jwar; 1♂, 6.iv.1940, coll. R. Saran, gram; 1♂, 12.x.1940, coll. Mohan Singh, soybean; 1♂, 19.viii.1941, coll. P. Mukherjee, methi; 1♂, 7.vi.1941, coll. P. Mukerjee, cowpea; 1, 4.iii.1944, coll. Jagram, hollyhock; 1♀, 9.xii.1946, coll. Sadiq, potato leaves; IARI, 1♀, 29.viii.1946, coll. K.P. Sharma, host unknown; IARI, 1♀, xi.1949, coll. unknown, cucurbits; 1♂, 4.ii.1952, coll. S.C. Kumar; host unknown; 1♂, 22.v.1955, coll. S. Singh, in light trap; Farm area, 1♂, 15.ii.1955, coll. N.N. Batra, mint; C.C.A. farm, 1, 8.ix.1956, coll. D.N.S., maize; 1♂, 20.v.2007, coll. S. Parveen, mango; 1♀, 6.v.2007, coll. S. Parveen, vegetables; 1♂, 15.v.2009, coll. S. Parveen, weeds; 1♀, 15.v.2009, coll. S. Parveen, rice; 1♀, 7.x.1950, coll. Bhim Singh, jwar; Uttar Pradesh: Aligarh, 1♀, 1♂, 28.viii.2007, coll. S. Parveen, in light trap; Banaras, 1♀, 17-18.ix.1919, coll. S. Misra and G.D. Austin; Kanpur, 1♀, 23.x.1914, coll. Fletcher, host unknown; Mathura, 1♀, 29.viii.2007, coll. S. Parveen, light trap; Mainpuri, 2♀, 5♂♂, 5.ix.2007, coll. S. Parveen, light trap; Tundla, 4♀, 2♂♂, 1.ix.2007, coll. S. Parveen, light trap. Sri Lanka: Tenasserim, 1♀, 10-12.i.1922, coll. Sharma, host unknown.

**Comments:** The species is different to others in its small body size (9-11mm). Here, the detail added to its morphometry, male and female genitalic characters alongwith the extended description of morphological characters over the earlier literature limited to its morphology.

#### *Chrysocoris pulchellus* (Dallas)

(Figs. 2f, 3f, 4f, 5f, 6e, 7e, 9e; Plate II- A and III-E). *Callidea pulchella* Dallas, 1851: 25; Distant, 1902: 59

**Diagnosis:** Body metallic green or blue, a round to oblong spot near eye region, lateral pronotal angles acute, 1<sup>st</sup> pair of conjunctival appendages apically curved, spermathecal duct dilation oblong.

**Colour:** Dorsally bright bluish or brassy green, antennae, rostrum and sternum black, margins of sternum brassy green, base of head beneath and abdomen ochraceous, femora (except apices) reddish ochraceous, their apices, tibiae and all tarsal segments black.

**Head:** (Fig. 2f) with lateral margins deeply sinuated; tylus surpasses the jugal lobes; a central fascia present within anterior to posterior margin, a black oval spot near to eye present; breadth ( $3.6 \pm 0.16$ ) 1.5x to length ( $2.4 \pm 0.23$ ), preocular distance ( $1.1 \pm 0.07$ ) 1.8x to postocular ( $0.61 \pm 0.01$ ), eyes produced laterally, interocular distance ( $2.2 \pm 0.11$ ) 2x to intercellular ( $1.1 \pm 0.07$ ); ocellus placed more closer to eyes than to each other.

**Antennae:** Five segmented; attached ventrally nearer to eyes; I antennal segment ( $0.9 \pm 0.08$ ) never extended beyond apex of head; II smallest ( $0.37 \pm 0.1$ ); III ( $2.25 \pm 0.22$ ) almost 6x to II while IV ( $2.76 \pm 0.3$ ) and V subequal ( $2.65 \pm 0.36$ ); total antennal length  $8.9 \pm 0.85$ .

**Labium:** Four segmented; I labial segment smallest ( $1.03 \pm 0.06$ ); II ( $2 \pm 1.32$ ) longest and 1.9x to I; III ( $1.3 \pm 0.07$ ) and IV ( $1.23 \pm 0.07$ ) subequal; total labial length  $5.56 \pm 0.25$  and extended upto II-III abdominal segment.

**Pronotum:** (Fig. 3f) with anterior margin depressed slightly, anterior angles produced forward; lateral angles normal, antero-lateral margins slightly convexed; distance between posterior angles ( $7.97 \pm 0.58$ ), 2x to distance between anterior

angles ( $3.86 \pm 0.23$ ) while medial pronotal length ( $4.06 \pm 0.27$ ) almost same as that of latter; surface possessed ten black spots of variable size, 3 at anterior margin, one at each posterior angles, 2 at base, 2 on disc and one largest subquadrate placed centrally.

**Scutellum:** (Fig. 4f) oval, having anterior margin slightly convexed, anterior angles notched, apical end round; length ( $9.75 \pm 0.82$ ) 1.4x to breadth ( $6.86 \pm 0.72$ ); possessed eight variable sized black spots, 6 in pairs more towards lateral sides, one round to oval located towards scutellar apex and one Y-shaped or elongated placed medially.

**External efferent system of metathoracic scent gland:** (Fig. 5f) having oval or round ostiole which releases its secretion in transverse peritreme, its exterior end raised laterally from evaporatorial surface, grooved medially throughout the length, evaporatorial surface rugulose and extended upto mesothoracic segment.

**Legs:** With fore, middle and hind femora  $3.5 \pm 0.1$ ,  $4.1 \pm 0.21$  and  $4.48 \pm 0.44$  long, respectively while fore, middle and hind tibiae  $3.87 \pm 0.08$ ,  $4.11 \pm 0.13$  and  $5.01 \pm 0.49$ , respectively.

**Abdomen:** convexed ventrally, length ( $7.6 \pm 0.75$ ) 1.1x to breadth ( $6.9 \pm 0.77$ ), a black shaded with brassy green stigmata spot on each lateral side from III to VII segment and one medial on III segment present, arrangement of spiracles and trichobothria same as other species of this genus.

Male genitalia having pygophore (Fig. 6e) with dorso-posterior margin concave, postero-lateral angles round, dorso-medial surface concave; strigils scattered in irregular plates on whole surface; proctiger elongate, ventro-posterior margin deeply sinuated.

**Aedeagus:** (Fig. 7e) with phallosome slender; not strongly sclerotized, three pairs of conjunctival appendages present, I pair strongly sclerotized, basally broad while apically tapered and curved before apex; II pair long, basal portion sclerotized, rest membranous excepts apical end which is spinose, it bears a short sclerotized spine before end; III pair sclerotized, apical end spinose and curved; vesica strong, elongate and notched where gonopore exit.

**Paramere:** (Fig. 8e) with stem comparatively short to blade, basal part broader, stem and blade joined with membranous part, blade curved and a tuft of setae present on inner margin.

Female genital with ovipositor having VIII paratergites subquadrate with inner margin concave, dorsally fused, IX paratergite comparatively small and thumb shaped; first pair of gonocoxae large and subquadrate with posterior margin almost straight; small setae present on ovipositor.

**Spermatheca:** (Fig. 9e) with bulb elongated, apical end round, flanges of spermathecal pump present, pump region nearer to distal flange broader than to proximal, distal flange of pump comparatively broader and in disc shape, a sclerotized band present in between two flanges; distal and proximal spermathecal ducts almost same in their length and breadth; spermathecal dilation elongated, medially somewhat broader, membrane translucent.

**Body size:** Female  $15.06 \pm 0.47$  and male  $13 \pm 0.8$  long.

**Habitat:** It is recorded on sandalwood (Chatterjee 1934).

**Material examined (FRI):** 5♀ and 3♂; India: Tamil Nadu:

Jawalagiri, North Salem, 2♀, 18.v.1930, coll. unknown, sandal, [1♂, 10.vii.1930, 1♂, 18.vi.1930, 1♀, 12.vii.1930, 1♀, 29.vi.1930]. Jawalagiri; North Salem: 1♂, 12.vii.1930, coll. unknown, sandal; Jawalagiri; North Salem: 1♀, 18.vi.1930, coll. unknown, sandal.

**Comments:** The species is allied to *C. marginellus* but different in its smaller size, in having the antennae much broader and thicker. The species studied in its morphometrics, morphological characters and genitalia.

#### ***Chrysocoris purpureus* (Westwood)**

(Figs. 2g, 3g, 4g, 5g, 6f, 7f, 8f, 9f; Plate II-F and III-F). *Callidea purpurea* Westwood, 1837: 15; Stal, 1868: 10

**Diagnosis:** Body metallic green to blue, head devoid of any marking, lateral pronotal angles acute, 1<sup>st</sup> pair of conjunctival appendages bifurcated.

**Colour:** Dorsally metallic green with black spots over pronotum and scutellum; head, pronotum, scutellum, and sternum metallic green; first antennal segment, labium, coxae, trochanters, femora (except apices) tibiae and abdomen ochraceous, rest of antennal segments, apices of femora and tibiae metallic green or violaceous blue; small black punctures over pronotum and scutellum

**Head:** (Fig. 2g) declivent, lateral margins deeply sinuated before eyes; tylus surpasses jugal lobes, breadth ( $4.05 \pm 0.13$ ) 1.2x to length ( $3.31 \pm 0.21$ ), preocular distance ( $1.51 \pm 0.07$ ) 2x to postocular ( $0.74 \pm 0.09$ ); eyes protruded laterally, ocelli located near to eyes than to each other; interocular distance ( $2.53 \pm 0.13$ ) 2x to interocellar ( $1.25 \pm 0.1$ ).

**Antennae:** Five segmented; I antennal segment ( $1.18 \pm 0.91$ ) never extended beyond apex of head; II ( $0.44 \pm 0.05$ ) and only 0.4x to I; III 5.8x to II; IV longest amongst all and 1.4x to III; V ( $2.86 \pm 0.27$ ) 0.9x to IV; total antennal length  $10.13 \pm 1.27$ .

**Labium:** four segmented; I labial segment smallest ( $1.09 \pm 0.06$ ); II longest ( $2.26 \pm 0.11$ ) and almost 2x to I while III ( $1.92 \pm 0.14$ ) and IV ( $1.7 \pm 0.13$ ) 1.7x and 1.6x, respectively to I segment; total labial length  $6.97 \pm 0.45$  and extended upto II abdominal segment.

**Pronotum:** (Fig. 3g) convexed, more towards base, anterior margin slightly sinuated, lateral margins straight, breadth at lateral angles ( $9.82 \pm 0.33$ ) 2.36x to anterior pronotal angles ( $4.15 \pm 0.24$ ), and length at middle  $4.16 \pm 0.24$ , lateral pronotal angles obtuse; five black spots over surface, two at antero-lateral portion, and two at the posterior end while one at middle but more towards the posterior margin.

**Scutellum:** (Fig. 4g) slightly convexed at base, anterior margin convex while apical end truncated, covers whole of the abdomen, length ( $10.6 \pm 0.5$ ) 1.2x to breadth ( $8.95 \pm 0.6$ ), seven black spots, six round located towards lateral side in pair while oblong spot and placed at middle near to base.

**Legs:** with fore, middle and hind femora  $3.62 \pm 0.24$ ,  $4.02 \pm 0.31$  and  $5.53 \pm 0.35$ , respectively while fore, middle and hind tibiae  $3.96 \pm 0.25$ ,  $4.01 \pm 0.21$  and  $5.42 \pm 0.35$ , respectively; small hairs distributed all over the legs.

**External efferent system of metathoracic scent gland:** (Fig. 5g) with ostiole small, sunken, peritreme transverse, elevated upward, slightly grooved throughout the length; evaporatorium extended to mesothoracic region, surface is divided into two

colour zone *i.e.*, black and yellow, black surface sulcated with fine punctations while yellow surface is smooth.

**Abdomen:** ventrally convexed; breadth ( $8.09 \pm 0.9$ ) 1.1x to length slightly ( $7.34 \pm 0.45$ ), a black round spot on each ventro-lateral sides, small punctures towards lateral margins but medially it is smooth, arrangement of spiracles and trichobothria same as other species of this genus.

Male genitalia having pygophore (Fig. 6f) with dorso-posterior angle round, inner margin invaginated on its lateral and posterior side, strigils present in patches on dorsal surface.

**Aedeagus:** (Fig. 7f) with theca distally broad, I pair of conjunctival appendage sclerotized and apically cleft or bifurcated, II pair semisclerotized, anteriorly sclerotized and spinose; 3<sup>rd</sup> sclerotized and apically tapered, vesica completely sclerotized, apically notched before gonopore.

**Paramere:** (Fig. 8f) sickle shaped, stem broad, blade curved and strongly sclerotized, small setae at the base of blade.

Female genitalia having ovipositor with VIII paratergites triangular, fused dorsally, IX paratergites small, anterior margin convexed, elongated; first pair of gonocoxa subquadrate, lateral margins round, posterior margins sinuate, postero-anterior angles round.

**Spermatheca:** (Fig. 9f) with bulb apically round, distal and proximal pump flanges in disc shaped, pump region small, distal and proximal spermathecal ducts almost subequal or previous slightly shorter than proximal, spermathecal dilation spherical and big, texture of dilation not transparent.

**Body size:** Female  $18.28 \pm 0.51$  and male  $17.84 \pm 0.97$  long.

**Habitat:** Recorded on *Acacia auriculiformis* (Meshram *et al.*, 1992), *Populus deltoides* (Roychoudhury *et al.*, 1994; Prabhakar *et al.*, 2008)

**Material examined (NPC):** 10♀ ♀ and 8♂♂; India: Andhra Pradesh: Guntur, 3♀ ♀ 1♂♂, 10.ii.1960, coll. Baldev, mango; Nandyal, 1♀, 27.ix.1912, coll. T.V.R., host unknown; KARNATAKA: Beeravalli, 1♀, 10.viii.1909, coll. C.N., host unknown; 3♂♂, coll. Pooniah, xii.1913, host unknown; Madhya Pradesh: Chindrawara, 1♂, 21.iv.1908, coll. C.W.M., host unknown; Maharashtra: Nagpur: Maharaj bagh, 6.ii.1914, coll. C.S.M., cotton; 1♀, 6.ii.1914, cotton; Nagpur, 1♀, 10.i.1919, coll. A.G.R., cotton; Nagpur, 1♀, 1♂♂, 2.v.1920, coll. Ghosh, orange; Puna, 1♀, 15.xi.1907, cotton; Tamil Nadu: Palnis, Rodai Kanal (7000 ft), 24.viii.1921, coll. Fletcher, host unknown; Malabar: Tellicherry, 1♂, 3.viii.1907, coll. T.V.R., wild castor. Myanmar: Mandalay, 1♀, 4.ix.1914, coll. Fletcher, host unknown; Mandalay division: Maymyo (3300 ft), 1♂, 19.viii.1914, coll. Fletcher, host unknown.

**Comments:** allied to *C. pulchellus* but externally different in having spots over pronotum and the arrangement of the setal patches over pygophore. The present study focused on its morphological characters, morphometry, male and female genitalia over the earlier study which was restricted to external features only.

#### ***Chrysocoris stockerus* (Linnaeus)**

(Fig. 2h, 3h, 4h, 5h, 6g, 7g, 8g, 9g; Plate II-G and III-G). *Cimex stockerus* Linnaeus, 1758: 441; Stal, 1873: 20

**Diagnosis:** Body metallic green or blue, generally a black

elongate spot from base to middle, lateral pronotal abgles tapered, 1<sup>st</sup> pair of conjunctival appendages blunt, spermathecal duct dilation globular.

**Colour:** Dorsally metallic green or indigo blue, with black spots over pronotum and scutellum. Head beneath, sternum, apices of femora, tibiae and round spots on ventro-lateral margins of abdomen shining brassy green. Basal margin of head beneath, I antennal segment, base of I labial segment, coxae, trochanters, femora (except apices), posterior margin of meso and metasterna, and abdomen ochraceous; rest of the antennal and labial segments and all tarsal segments brown to black, a large quadrate spot at base, stigmatal spots, inner lateral spots and apex of abdomen black.

**Head:** (Fig. 2h) declivent, with breadth ( $3.39 \pm 0.25$ ) more than length ( $2.65 \pm 0.35$ mm), lateral margins before eyes deeply sinuated, tylus longer than jugal lobes, preocular distance ( $1.23 \pm 0.06$ ) almost 1.8x to postocular distance ( $0.67 \pm 0.12$ ). Eyes projected laterally, ocelli located below eyes, nearer to eyes than to each other ( $1.13 \pm 0.07$ ), eyes  $2.15 \pm 0.08$  apart.

**Antennae:** five segmented, attached beneath head, near to eyes; I antennal segment ( $1 \pm 0.11$ ) longer than II ( $0.74 \pm 0.97$ ); later smallest amongst all; III ( $1.85 \pm 0.1$ ) 2.2x to II; IV ( $2.32 \pm 0.28$ ) 1.2x to III and V ( $2.48 \pm 0.24$ ) longest and almost 3.35x to II; the latter two segments flat and slightly grooved medially; total antennal length  $8.4 \pm 0.9$  and covered with small bristles.

**Labium:** Four segmented; I labial segment smallest; II longest and 1.7x to I; III slightly longer than IV; total labial length  $5.8 \pm 0.33$  and extends upto II or III abdominal segment.

**Pronotum:** (Fig. 3h) convexed at base, anterior margin slightly sinuated, anterior angles acute while lateral obtuse, distance between lateral pronotal angles ( $8.11 \pm 0.9$ ) 2.27x to that of anterior ( $3.56 \pm 0.25$ ), while central pronotal length ( $3.55 \pm 0.36$ ) subequal to the later; eight spots on surface, 3 somewhat transverse spots near anterior margin, 3 large irregular sized discal spots near base and a single on each lateral pronotal angle.

**Scutellum:** (Fig. 4h) with anterior margin almost straight, basally convexed, projecting posteriorly, covered almost whole of the abdomen, apically round, length ( $9 \pm 0.78$ ) 1.3x to breadth ( $6.91 \pm 0.52$ ). Seven spots present on dorsal surface; 6 round spot arranged in pairs located more towards lateral scutellar margins and one elongated present centrally.

**Legs:** with fore, middle and hind femora  $3.31 \pm 0.18$ ,  $3.42 \pm 0.23$  and  $4.24 \pm 0.24$ , respectively while fore, middle and hind tibiae  $3.35 \pm 0.17$ ,  $3.34 \pm 0.22$  and  $4.2 \pm 0.22$ , respectively.

**External efferent system of metathoracic scent gland:** (Fig. 5h) with ostiole oval, peritreme transverse and elevated, grooved medially upto exterior end, evaporatorial surface rugulose and surface seemed distinct from sternum.

**Abdomen:** with ventral surface convex medially, breadth ( $7.13 \pm 0.4$ ), almost 1.1x to length ( $6.42 \pm 0.46$ ), spiracles located on lateral sides and below a pair of trichobothria from III to VII abdominal segments, small hairs distributed all over the surface and more at genital plates.

Male genitalia having pygophore (Fig. 6g) with posterior margin

possessed small setae, proctiger oval to quadrangular, patches of strigils at anterior and latero-posterior margins, ventrally cup shaped, ventro-lateral pygophoral angles round.

**Aedeagus:** (Fig. 7g) with phallosome cup shaped and distally broad, 3 pairs of conjunctival appendages present, I pair completely sclerotized, medially broader with distal end round, II pair semisclerotized, apically membranous, III pair sclerotized and distally tapered; vesica completely sclerotized and curved dorsally and bears the gonopore.

**Paramere:** (Fig. 8g) consists of a long broad stem and a curved blade at distal end, the proximal inner edge of the blade beset with dense setae.

Female genitalia having ovipositor with VIII paratergites small, triangular, fused dorsally; IX paratergites small, inner margin round, unlike VIII paratergites not fused; first pair of gonocoxae large and somewhat quadrangular, small setae on plates.

**Spermatheca:** (Fig. 9g) with bulb elongated but distally round; distal and proximal pump flanges separated by a distinct pump region; spermathecal dilation large and spherical; within dilation present sclerotized rod through which passed spermathecal duct; proximal spermathecal duct small and narrow.

**Body size:** Female  $16.4 \pm 0.9$  and male  $14.01 \pm 0.6$  long.

**Habitat:** Recorded on *Zizyphus oenoplia*, *Canthium didymium*, *Santalum album* (Chatterjee 1934), *Santalum album* and *Lantana* (Beeson 1941), *Jatropha curcas* and *Ricinus communis* (Miller 1934).

**Material examined (NPC):** 7 and 12; India: Maharashtra: Pune, 1, 14.xii.1918, coll. Fletcher, host unknown. Sri Lanka: Arawa (Madulsima), 900ft, 1♀, 9.xii.1908 (1♂, 11.xii.1908; 1♀, 10.xii.1908; 1♀, 13.i.1909), coll. T.B. Fletcher, host unknown; Hambantota, 1♀, 4♂♂ (1♂, 16.xi.1907; 1♂, 9.i.1909; 3♂♂, 1♀, 6.ii.1909; 1♀, 7.ii.1909; 1♂, 30.xii.1908), coll. T.B. Fletcher, host unknown; Welibama, 1♂, 21.i.1908, coll. T.B. Fletcher, host unknown.

**Comments:** it is studied by Distant (1902) in brief and then in detail by Mushtaq (1996) from Pakistan. The present study deals with all taxonomically important characters and it is at par with the earlier literature.

#### ***Chrysocoris stollii* (Wolff)**

(Fig. 2i, 3i, 4i, 5i, 6h, 7h, 8h, 9h; Plate II-H and III-H). *Cimex stollii* Wolff, 1801: 48. *Scutellera stockerus* Guerin-Meneville, 1838: 159. Misidentification (Stal, 1873:21). *Callidea porphyricola* Walker, 1867: 29; Distant, 1899:39

**Diagnosis:** Body metallic green or blue, ventro-lateral margins of abdomen purplish-pink, spermathecal duct dilation cylindrical.

**Colour:** Dorsally metallic green or dark purplish blue, bear black spots over pronotum and scutellum, ventral surface purplish blue or black with green spots on sternum while abdomen brown to ochraceous, lateral margin pink or purple and black stigmata spots; antenna, III and IV labial segments brown; coxae, trochanters, femora (except apices) I and II labial segment ochraceous, apices of femora, tibia and tarsal segments black, ventrally; minute punctures on body except head, dense towards lateral sides of different body parts.

**Head:** (Fig. 2i) declivent, with breadth ( $3.6 \pm 0.2$ ) 1.4x to length ( $2.65 \pm 0.25$ ), lateral margins near eyes deeply sinuated, tylus extended beyond jugal lobes; preocular distance ( $1.15 \pm 0.1$ ) 1.5x to postocular ( $0.75 \pm 0.8$ ); interocular distance ( $2.21 \pm 0.16$ ) almost 2x to ineroocular ( $1.13 \pm 0.1$ ); and ocelli placed closer to eyes than to each other; two fascias from anterior to middle, another from base to middle of the head and one oval spots located near to each eye, lateral surface wrinkled.

**Antennae:** five segmented, ventrally located on head, near to eyes; I antennal segment ( $0.88 \pm 0.05$ ) never extended beyond apex of head; II ( $0.37 \pm 0.05$ ) smallest amongst all and only 0.4x to I; III ( $1.77 \pm 0.1$ ) 4.8x to II; IV ( $2.31 \pm 0.11$ ) 1.4x to III; V ( $2.49 \pm 0.1$ ) slightly longer than IV; total antennal length  $7.84 \pm 0.41$ ; small hairs present (except I and II segment).

**Labium:** Four segmented; I segment smallest ( $0.89 \pm 0.1$ ); II longest ( $1.89 \pm 0.2$ ) and 2.1 xs to I; III ( $1.45 \pm 0.08$ ) and IV ( $1.31 \pm 0.09$ ) subequal and almost 0.7x to II labial segment; total labial length  $7.83 \pm 0.32$  and extended upto II abdominal segment.

**Pronotum:** (Fig. 3i) with base convexed, distance within anterior pronotal angles ( $3.56 \pm 0.41$ ) subequal to breadth of head ( $3.6 \pm 0.2$ ) and 0.47x to lateral angles ( $7.57 \pm 0.74$ ), latter obtuse, possessed eight black spots on the surface, 3 small spots near anterior pronotal margin while 3 large, subquadrate or irregular sized spots at disc, extended to posterior pronotal margin and one round shaped at each lateral pronotal angle.

**Scutellum:** (Fig. 4i) slightly convexed at base; covered almost whole of the abdomen, length ( $8.25 \pm 0.78$ ) 1.22x to breadth ( $6.76 \pm 0.33$ ), seven spots present on the surface, 6 in pairs, round to oval shaped, placed more towards lateral margin, one oblong V-shaped at middle, dense punctuation toward lateral sides.

**Legs:** With fore, middle and hind femora  $3.08 \pm 0.21$ ,  $3.27 \pm 0.11$  and  $4.22 \pm 0.24$ , respectively while fore, middle and hind tibiae measured  $3.27 \pm 0.19$ ,  $3.15 \pm 0.15$  and  $4.48 \pm 0.26$ , respectively.

**External efferent system of metathoracic scent gland:** (Fig. 5i) with ostiole large oval, peritreme transverse with distal end curved and extended upto lateral margin of evaporatoria, grooved medially throughout the length; evaporatoria extended upto half of the mesothoracic segment, surface rugulose with minute and dense punctations.

**Abdomen:** with almost equal in its length ( $6.71 \pm 0.41$ ) and breadth  $6.58 \pm 0.53$ , ventrally convexed; round to subquadrate stigmatal plate from II to VI segment at each lateral side; a pair of spiracles present from III to VII segments at each lateral side and just posterior to it a pair of trichobothria present. In case of female abdomen III to VII segment toothed or spined posteriorly on lateral side.

Male genitalia having pygophore (Fig. 6h) with dorsal border semicircular; bearing patch of strigil, laterally on each side and another such patch extended along lower side of dorsal border; ventral margin flattened, bearing scattered setae; proctiger ovate with scattered setae.

**Aedeagus:** (Fig. 7h) with phallosome not heavily sclerotized, 3pairs of conjunctival appendages present, first pair flattened

and apically spinose, second pair membranous but apices sclerotized, third pair long, proximal half not sclerotized but, distal half strongly sclerotized; vesica curved apically, basally attached to ejaculatory reservoir.

**Paramere:** (Fig. 8h) highly sclerotized, dorsally hook shaped and bear a tuft of setae at the base of hook and stem stout.

**Female genitalia** having **ovipositor** with VIII paratergites triangular, posterior margin almost straight; IX paratergites comparatively small and in lobe shaped; medial end round; first pair of gonocoxae sub quadrate, posterior margin slightly sinuated.

**Spermatheca:** (Fig. 9h) with bulb apically round, distal and proximal pump flanges disc shaped, distal comparatively bigger than proximal; pump not sclerotized; distal spermathecal duct smaller than proximal duct; spermathecal dilation oblong and membranous; sclerotized rod distinct.

**Body size:** Female  $15.6 \pm 0.32$  and male  $13.6 \pm 0.32$  long.

**Habitat:** It has been recorded on *Calotropis procera* (Verma et al., 1978), *Emblia officinalis* (Meshram and Garg, 1999), *Costus speciosus* (Swamy et al., 1993) *Adhatoda vasica* (Swamy and Rajagopal, 1995) *Jatropha curcas* (Shankar and Dhyan 2006; Ambika et al., 2007), *Pennisetum typhoides* (Dhiman and Kumar 2008), litchi (Hill 1983; Ghosh 2008) etc. This species has been found polyphagous and reported from different parts of the country like Bihar, Delhi, Kerala, Uttar Pradesh, Uttarakhand, West Bengal, etc. (Personal observation).

**Material examined (NPC):** 35 ♀♀ and 48♂♂; India: Andhra Pradesh: Hyderabad, 1♂, 5.vi.1941, coll. A.S.R., cotton; Bihar: Pusa, 1♂, 2.viii.1915, (1♀, 20.viii.1915), coll. T. Ram; Pusa, 1♀, 28.viii.1915, coll. U. Bahadur, weeds; Pusa, 1♀, 10.i.1916, coll. Boy, (1♀, 27.ix.1915), host unknown; Pusa, 1♀, 12.iii.1915, coll. Md. S., *Justicia* hedge; (1♂, 25.vi.1916, coll. D. Nandan, host unknown; Pusa, 1♂, 8.iv.1918 (1♂, 11.iv.1918), coll. Fletcher, host unknown; Delhi, 1♂, 1♀, 29.iii.1938, coll. A. Singh, hollyhock; 1♂, 20.viii.1940, coll. M.G.R. Menon; host unknown; 1♂, viii.1945, coll. Jag Ram, grass; IARI, 1♂, 15.x.1953, coll. G.C. Sharma, host unknown, IARI, 1♀, 20.x.1960, coll. M. Ram, kitchen garden; IARI, 19♀♀, 35♂♂, coll. S. Parveen, jatropha; Maharashtra: Nagpur, 1♂, 15.i.1919, coll. A.G.R., cotton; West Bengal: Maldah, 9♀♀, 3♂♂, 5.xi.2008, coll. S. Akhtar, weeds.

**Comments:** Species described in 1801 from India and diagnostically different to others having purple margin on lateral sides of venter, spiracles II-VII each surrounded by black round spot. Among all available species, *C. stollii* has been studied in detail by many authors regarding its morphological (Distant 1902; Tsai et al., 2011), embryological (Singh and Singh 1966; Singh 1968a; Deb et al., 1983; Roychoudhury et al., 1987), physiological (Singh 1968b; Chakravorty and Samui 1980) characters etc.

## DISCUSSIONS

Here nine species of the genus *Chrysocoris* has been redescribed in detail regarding its external morphological characters (e.g., head, pronotum, scutellum, external efferent system of metathoracic scent glands and pygophore), internal

characters (e.g., aedeagus, paramere and spermatheca), morphometry and host plant record. These species almost alike in their body colouration except *C. fascialis*, but externally they can be distinguished mainly on the basis of body size, extension of labium, presence of strigils on pygophore etc. Internally species are diagnostically different on the basis of their genitalic characters like structure of aedeagus, paramere and spermatheca. These species are morphologically discussed by Distant (1902) while Pawar (1971) studied male genitalic characters for few species. A detailed work for *C. stockerus* given by Ahmad and Mushtaq (1977) and for *C. fascialis* and *C. stollii* by Tsai et al. (2011). The results of the present study are in line with available literature. The earlier work only related with their external morphological characters but not with their all taxonomically important characters. Here, the main focus is to compile all taxonomically important characters alongwith their morphometry and tried to supplement the available literature for the genus *Chrysocoris*.

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