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Illustration of the Morphologic Characters of the Sunn pest *Eurygaster integriceps* Puton, 1881 (Hemiptera: Scutelleridae) Collected from Erbil Governorate-Kurdistan Region-Iraq

Wand Khalis Ali[1] and Abdul-Qadir Salih Khidhir[2]

[1]*College of Education-Biology Department, Salahaddin University-Ebil, Iraq*
[2]*Ministry of Agriculture and Water Resources, Erbil-Directorate Research (Insect Museum), Iraq*

Abstract

A morphological study of the *Eurygaster integriceps* Puton, 1881 (Hemiptera: Scutelleridae) has been done in for the adult insects collected on wheat in some localities of Erbil Governorate-Kurdistan region-Iraq during 3rd April to 26th June 2016. Detail description of the adults has been illustrated for many important body parts such as head, antenna, mouth parts, rostrum, male and female genitalia also localities and date of collection were provided.

Keywords: Sunn pest; *Eurygaster integriceps*; Erbil; Kurdistan region–Iraq

Introduction

Scutelleridae (or shield-backed bugs) are phytophagous bugs within Pentatomoidea that are found in every zoogeographical zone but are most varied and numerous in the tropics and subtropics [1]. Diverse host plant relationships among Scutelleridae were seen in which, some feed on seeds, somatic tissues or fruits [2-5]. The family Scutelleridae belongs to Pentatomoidea, and is comprised of about 80 genera and 500 described species [6]. Scutellerids were first arranged at super generic level or family [7-11]. However, they have been considered as a subfamily of the Pentatomidae, and eventually returned to family status [12,13], whereas others have regarded it as a subfamily Scutellerinae under Pentatomidae [14] and separated them by U-shaped and very wide Scutellum which covering almost of abdomen and the sides of scutellum curved mesad at extreme base. Borror et al. [15] classified the Scutelleridae as a family under the terrestrial bugs suborder Geocoridae and mentioned that they are differ from the nearest family by the leaking of prominent tooth or lobe in front of the humeral angle of pronotum sides, they also mentioned that they are 8-10 mm in length. Schuh and Slater [16] confirmed its family status, with the four subfamilies viz., Eurygastrinae, Odontotarsinae, Pachycorinae and Scutellerinae, also Javahery et al. [17] treat Scutelleridae as a family. Moreover Brown and Eralp [18] mentioned that the Sunn pests are a common term for many different species of insect belonging to the suborder Heteroptera, recognized as serious pests of wheat and other cereal crops throughout the Near and the Middle East. Also Critchley [19] emphasized that insect belong to this group has a negative impact on cereal crops of the former USSR. Detailed description of the morphology of *Eurygaster integriceps* Puton was presented by numerous researchers [20-26], while in Iraq the family Scutelleridae have been very poorly studied and known only from a few faunal lists within the family pentatomidae [27-29] and the only taxonomic study for the Kurdistan region was done for some species of pentatominae by Abdulla BS [30] without any morphological detail for our studied species so the goal of this work was to redescribe *Eurygaster integriceps* Puton in detail with clarifying all its important diagnostic characters.

Materials and Methods

The study depends on 40 specimens of adult stage collected on wheat in some localities of Erbil Governorate-Kurdistan Region-Iraq, from the period of 3rd April to 26th June 2016 by hand picking from wheat fields then they were killed by freezing for 48 hrs, after that examined by using binocular dissecting microscope and the compound microscope in order to studying the body parts, The morphology of the adults were studied by using dissecting microscope, while for studding the minute parts microscope slide were prepared in which the solid parts (head, thorax and the abdomen) put in a small beaker contain KOH 10% and placed on fire with shaking for about ten minutes to dissolve all lipids of the body and destroying the muscles [30], after that it was placed in distilled water for five minutes in order to reduce the effect of the alkali. Mouthparts and abdomen were placed in ethyl alcohol 50% and dissected under microscope to obtain the minute parts, then transferred to ethyl alcohol 75% and 100% respectively for two minutes of both concentrations to dehydration of water, then placed in Xylol for two minutes, for translucency then placed in Canada balsam on slides to be ready for examination under microscope. A digital microscopic camera (AmScope10 megapixel) was used to photographing the samples and the scales of the adults were determined by using linear micrometer and fixing it with 1 mm.

Results and Discussion

Family Scutelleridae Leach, 1815; Subfamily Eurygastrinae Amyot & Serville, 1843; Tribe Eurygastrini Amyot & Serville, 1843; Genus *Eurygaster* Laporte, 1833.

Members of this genus have a broad body and a length-to-width ratio of 1.56. The dorsal plate (scutellum) is curved and is as long as the abdomen, currently 19 species of *Eurygaster* are known worldwide [26], these comprise 14 species including one fossil from the palearctic region and five species from the Nearctic region. Of the Palearctic species only three *E. austriaca* Schranck, *E. integriceps* Puton, and *E.*

***Corresponding author:** Wand Khalis Ali, College of Education-Biology Department, Salahaddin University-Ebil, Iraq, Tel: 9647504899859; E-mail: wand2iq@yahoo.com

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maura L., cause damage to wheat and barley in the Near East, Middle East and in southwestern Asian countries [17,31]. The species *E. integriceps* Puton can be distinguished by the male genitalia from other similar species.

Morphological study of *Eurygaster integriceps* Puton, 1881: 119

Common names: Sunn Pest, Sunni Pest, Sunn pest, Sunn bug, cereal bug, Soun bug, Soune bug, Sunne pest, Suni pest, Senn bug, Sen pest, noxious pentatomid, wheat shield bug.

Material examined: Ainkawa: 3/4/2016, 5♂4♀, Ainkawa, 18/5/2016, 6♂5♀, Qushtappa, 5/4/2016, 5♂, Bnaslawa, 7/4/2016, 6♂4♀; Shamamk, 12/4/2016, 5♂.

Body: Body semi-elongate oval shaped, and varies from gray to creamy brown, to reddish or black, about 10-12 mm long and 6.1-7.1 mm wide, upper surface slightly concaved with the big scutellum covering almost all of the abdomen, underside of each connexival segment with a blackish spot, lower surface convex (Figures 1a and 1b).

Head: Head semi-triangular shaped, wider than long, about 1.8-2.6 mm long and 3.2-3.3 mm wide, rounded anteriorly, brown colored, opisthognathous with prominent laterally projected brown colored compound eyes (Figure 2a) and a pair of small, red, rounded ocelli settled near to posterior-inner sides of the compound eyes and situated behind the compound eyes on the dorsal surface of the head capsule and are settled more distant to each other than to compound eyes and the length between them about 1.3-1.4 mm (Figure 2b). Antennae five-segmented, located at the proximal side of the mandibular plates and hidden under the lateral edges of the pronotum, color of the antennal segments is pale brown except to the last segment which is dark brown to black, its length are: (0.6:0.7:0.5:0.7:1.1)mm respectively and the 3rd segment is the smallest (Figure 2c). Labrum elongate triangular, brown colored, ornamented with transverse grooves (Figure 3a), mandibles and maxillae are needle-like, brown colored, composing a tube within the Labium to suck the liquid food passing from the hypopharynx into the pharynx, Labium (Rostrum) arises from the underside of the head at the apex and comprise of four segments of unequal length which reaching beyond the posterior coxae, its segments length are (0.9:1.9:0.8:0.7) mm respectively (Figures 3b-3d). The length and proportion of the labial palp regarded as one of the diagnostic characters in which the 2nd segment of the labial palp is the longest, and the 3rd and 4th segment are sub equal, a constriction present near the proximal end of the 3rd segment, the first two segments are pale brown colored and the last two segments are dark brown. Clypeus elongated, convex, brown colored and ornamented with black scrapes. Grooves delimiting clypeus are parallel and extend singly up to margin (Figure 3f)

Thorax: Thorax with pronotum dorsally shield like, quite broader than long, about 3.1-3.3 mm long and 6.4-6.6 mm wide, pale brown colored and ornamented with black color punctures, a pair of hardness prominent at the anterolateral position, termed as callus, antero-pronotal angles rounded, lateral angles produced and obtuse, humeral angles semi-rounded, posterior angle semi-rounded, base convex generally termed as a disc which is punctured in middle of disc finely and densely, behind it two somewhat strong yellowish colored impressions, Scutum and prescutum black colored, Scutellum represents the largest part of the thorax about 6.3-6.7 mm long and 4.7-4.9 mm wide, nearly covers whole of the abdomen, pale brown colored, middle of Scutellum with longitudinal carina, decorated with spots of different color and size, rounded posteriorly (Figures 4 and 5).

Wings: Forewings semi-sclerotized, it divided into two parts by a transverse semi-circular furrow, proximal brown colored sclerotized one called corium (Co) and the distal portion membranous transparent colorless called membrane (Me), the corium is further divided into two areas usually referred to as embolium (Emb) and clavus (Clv), embolium occupies the costal margin, and is somewhat elongated, the corium is bound anteriorly by a radio-median vein (R+M) and posteriorly by a claval furrow (Clf), the corium narrow and not extending to anal margin of wing, the claval furrow, somewhat limited, elongated and similar to corium and embolium in texture and punctured, the distal portion of the membrane region contains nine longitudinal colorless veins beginning from the middle and attaining the outer margin of the wing (Figures 6a and 6b).

Hindwings entirely membranous, transparent and colorless except for the veins, their apical margin much thicker than the posterior, this gives the shape and also provides protection to the hind wings, anterior margin formed by costo-subcostal vein, next to this is an indistinct radio-median vein (R+M) running in the longitudinal axis, there are two incomplete wing folds and the first runs parallel to the second (Figure 6b).

Legs: The legs are brown colored, coxae are elongate rounded, trochanter are nearly triangular, fore-femorae are dilated medially and shorter than the middle and hind-femorae, hind-femorae are longest amongst all, tibiae flattened dorso-ventrally and more dilated distally, legs tarsi composed of three segments, covered with fine bristles or hairs, 3rd longest and second shortest, the distal tarsal segment is joined with pre-tarsus which is composed of two large black hooks like claws and sac like pulvillus in between, legs are ornamented with rows of moderate size of spines and covered by hairs (Figures 7a-7c).

Abdomen: Male abdomen first segment fused completely with the metathorax and cannot be distinguished clearly, and the second tergite also modified and reduced, while the 3rd tergite is comparatively broader than that of 2nd tergite. The 1st and 2nd abdominal sternites fused and each sternal sclerite on its lateral side hold two structures, the one single spiracle and just below it a paired structure called trichobothria, and the seventh abdominal segment is more rounded than the other, it is convex ventrally, while the eighth abdominal segment is cup-shaped surround the genital capsule, pale brown colored. The female abdomen is similar to the male in general appearance but it's wider than the male abdomen (Figures 8 and 9).

Male genitalia: The 9th segment in male modified into a quadrangular brown colored structure known as the pygophore or genital capsule in which the organs of copulation located within it, pygophore has two openings, the anterior proximal and the dorso-posterior distal, the latter larger and through copulation the aedeagus expanded through this opening, pygophore broader and cup-like. The 10th segment in the male is also modified into a quadrangular structure, termed proctiger in which the 11th segment located within it and makes the anal ring which extends during the process of excretion. While Phallus which is the main copulatory organ consists of a brown proximal basal plate and a distal sclerotized aedeagus which consists of phallosoma and holds dorsal membranous lobes, ventrolateral lobes and the thecal black appendages on either side of the proximal portion of the aedeagus, this thecal appendages regarded as an important diagnostic character which distinguish this species. A pair of dark brown colored, symmetric structures connected with the basal plate occurs called paramere or claspers, which are well developed and probably help in copulation (Figures 10a-10d).

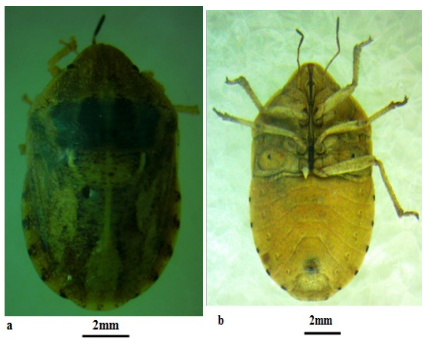

Figure 1: Male body of *Eurygaster integriceps* Puton; a. (Dorsal view); b. (Ventral view).

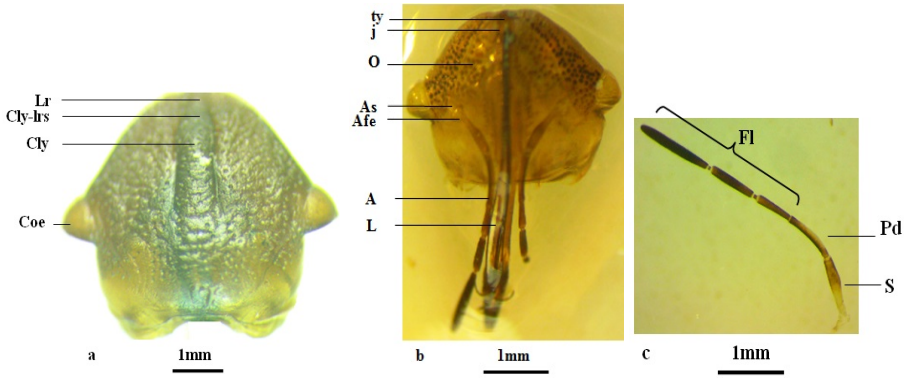

Figure 2: *Eurygaster integriceps* Puton; a. Head (Dorsal view); b. (Frontal view); c. Antenna. A: Antenna; Afe: Antifer; As: Antennal socket; Coe: Compound eye; Cly: Clypeus; Cly-lrs: Clypeo-labral suture; FI: Flagellum; j: Jungal lob; L: Labium; r: Labrum; O: Ocellus; Pd: Pedicel; S: Scape; ty: tylus.

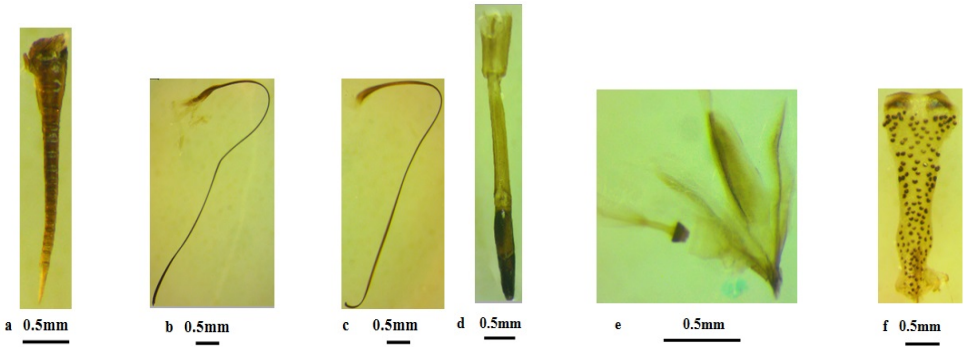

Figure 3: *Eurygaster integriceps* Puton; a. Labrum (Dorsal view); b. Mandible; c. Maxilla; d. Labium (Dorsal view); e. Hypopharynx; f. Clypeus (Dorsal view).

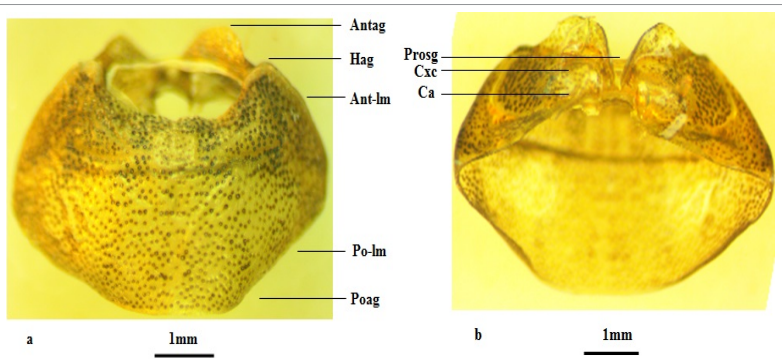

Figure 4: *Eurygaster integriceps* puton Prothorax: a. (Dorsal view); b. (Ventral view). Antag: Anterior angle; Ant-lm: Antero-lateral margin; Cxc: Coxal cavity; Hag: Humeral angle; Poag: Posterior angle; Po-Lm: Postero-Lateral margin; Prosg: Posternal groove; Ca: Callus.

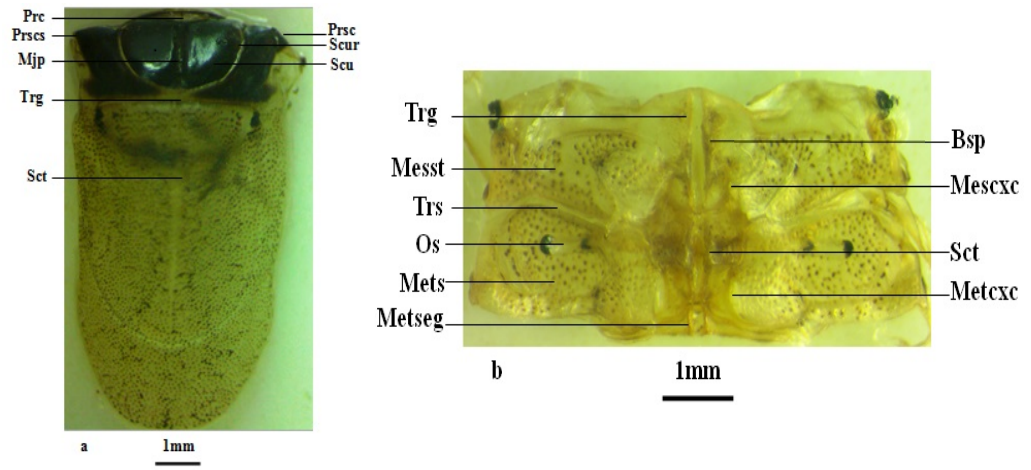

Figure 5: *Eurygaster integriceps* Puton; Meso and Metathorax: a. (Dorsal view); b. (Ventral view). Bsp: Basisternal process; Cxc: Coxal Cavity; Mescxc: Mesothorasic coxal cavity; Messt: Mesothorasic coxal cavity; Mjp: Major parapside; Os: Odoriferous structure (Ostiole); Prc: Prescota; Prscs: Prescutum suture; Prsc: Prescutum; Scu: Scutum; Scur: Scutal ridge; Sct: Scutellum; Trg: Transverse groove; Trs: Transverse suture.

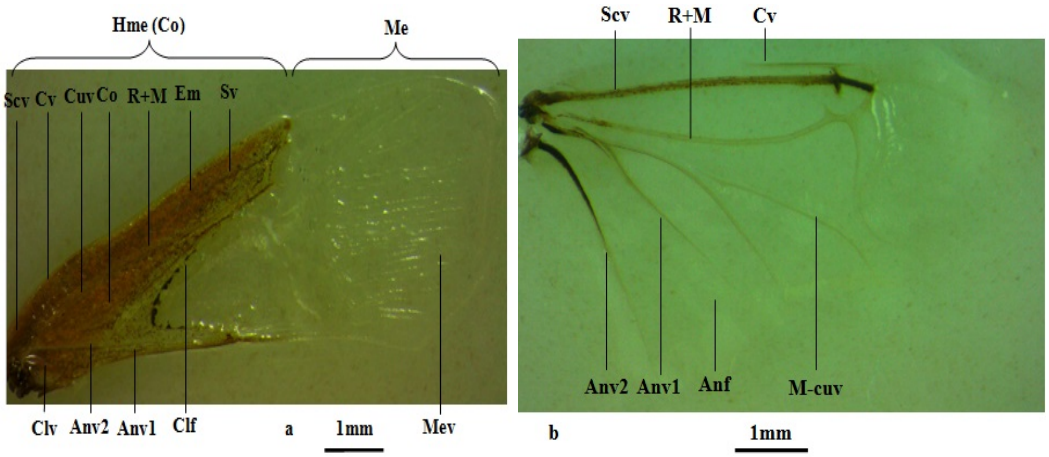

Figure 6: *Eurygaster integriceps* Puton; a. Fore-wing; b. Hind-wing. Anf: Anal fold; Em: Embolium; Anv1: 1st anal vein; Hme: hemelytron; Anv2: 2nd anal vein; Me: Membrane; Clf: Claval furrow; M-Cuv: Medio-cubital vein; Clv: Clavus; Mv: Membrane veins; Co: Corium; R+M: Radiomedian vein; CScv: Costo-subcoastal vein; S: Sector vein; Cv: Coastal vein; Sc: Subcosta vein.

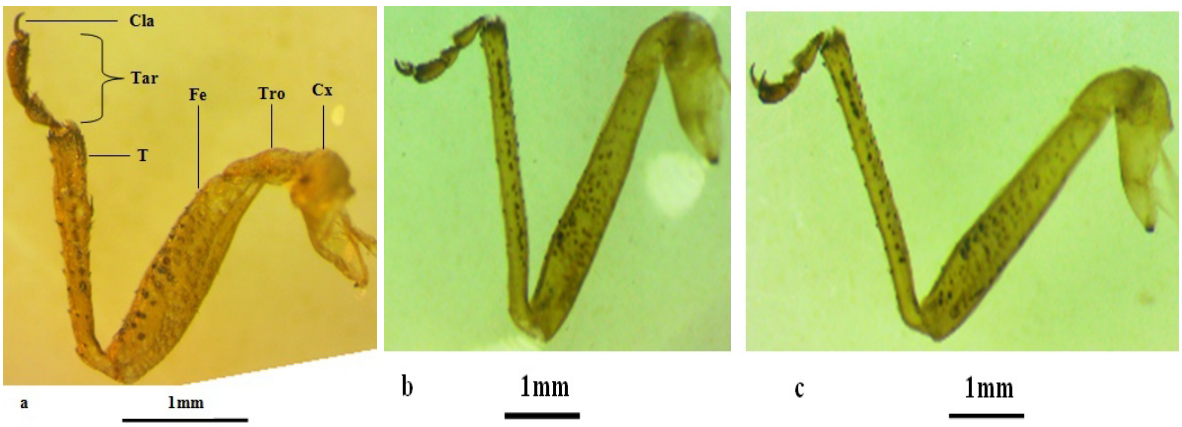

Figure 7: *Eurygaster integriceps* Puton; a. Foreleg; b. Midleg; c. Hindleg. Cla: Claw; Tar: Tarsus; Cx: Coxa; T: Tibia; Fe: Femur; Tro: Trochanter.

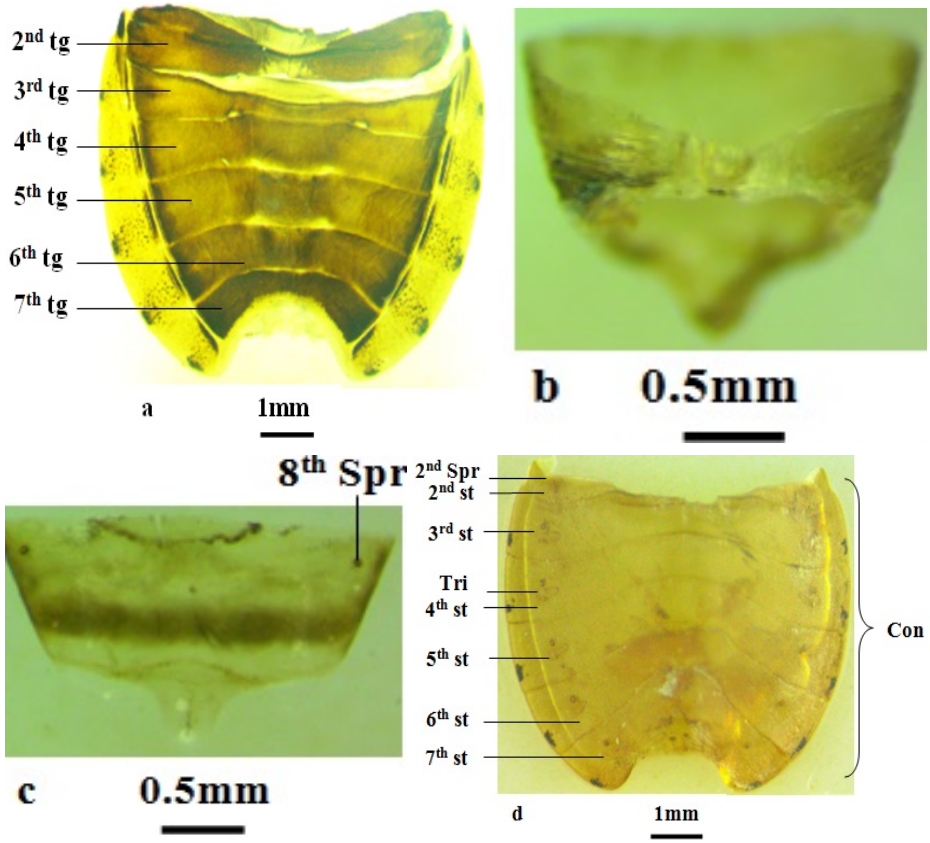

Figure 8: *Eurygaster integriceps* Puton; a. Male abdomen (Dorsal view); b. 8th abdominal segment (Dorsal); c. 8th abdominal segment (Ventral); d. Male abdomen (Ventral view). 2nd tg_7th tg: Tergites; Spr: Spiracle; 2nd st_7th st: Sternites; Tri: Trichobothria; Con: Connexivum.

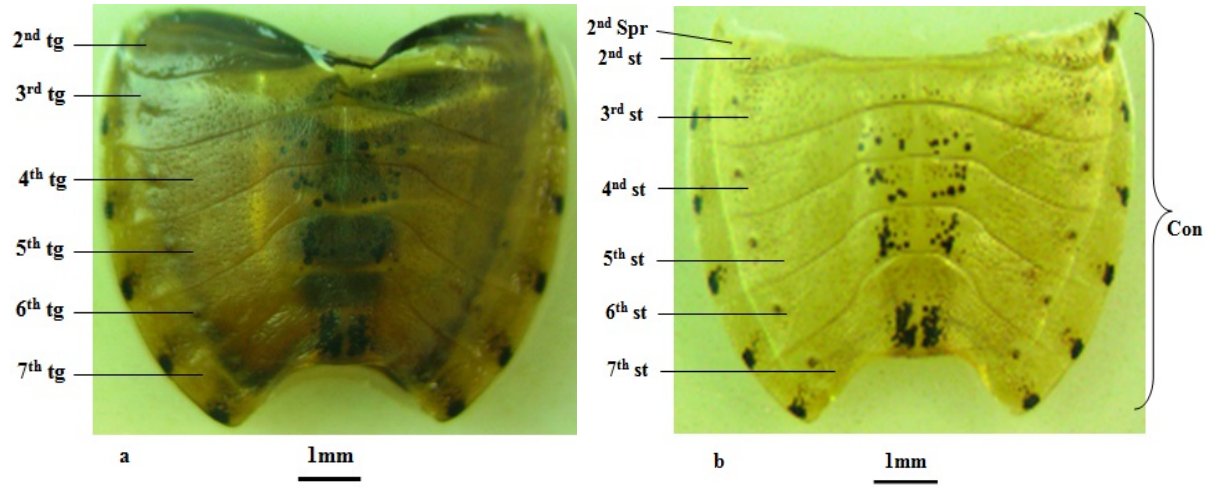

Figure 9: *Eurygaster integriceps* Puton, female abdomen: a. Dorsal view; b. Ventral view. 2nd tg_7th tg: Tergites; Con: Connexivum; 2nd st_7th st: Sternites; Spr: Spiracle.

Female genitalia: Female genitalia are composed of the 8th and 9th abdominal segments, it's collectively known as an ovipositor. The eighth paratergite is paired, triangular and bears a spiracle on its anterolateral surface, while the ninth paratergites comparatively small. Spermatheca simple and obvious from the dorsal view of the female genitalia as pale brown appendages (Figures 11a and 11b).

Remarks: This species differs from all the other similar species through its body dimension, grooves delimiting the clypeus which are parallel extended singly up to margin, and the prothorax (prontotum) shape especially the shape of both lateral side of the prothorax which is clearly curved in compared with all the other similar species of the genus *Eurygaster*, another important

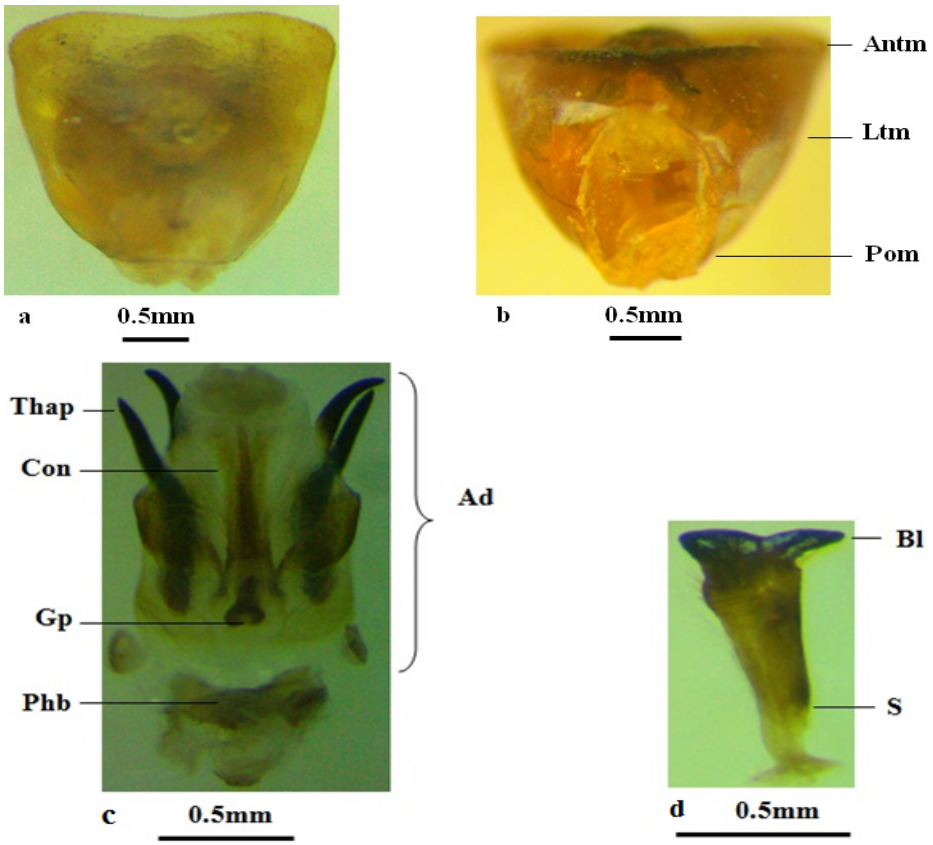

Figure 10: *Eurygaster integriceps* Puton; male genitalia: a. Pygophore (Ventral view); b. Pygophore (Dorsal view); c. Phallus; d. Paramere. Ad: Aedeagus; Gp: Gonopore; Antm: Anterior margin; Ltm: Lateral margin; Bl: Blade; Phb: Phallobase (Basal plate); Thap: Thecal appendages; Pom: Posterior margin; Con: Conjunctiva; S: Stem.

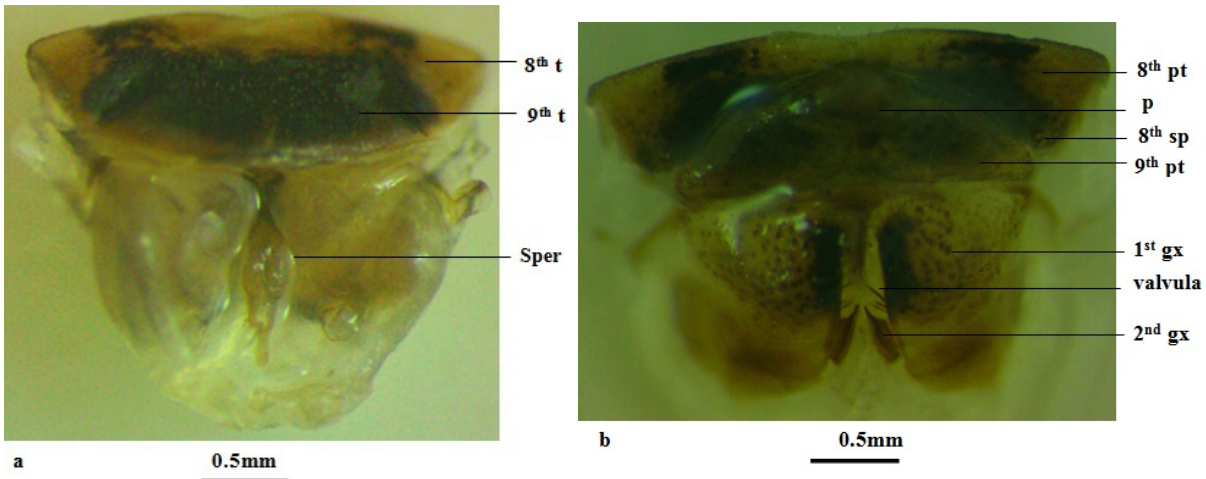

Figure 11: *Eruygaster integriceps* Puton; a. Female genitalia (Dorsalview); b. Female genitalia (Ventral view). 1st gx: 1st Gonoxocite; 8th t: 8th Tergite; 2nd gx: 2nd Gonoxocite; 9th t: 9th tergite; 8th pt: 8th Paratergite; P: Proctiger; 9th pt: 9th Paratergite; Sper: Spermatheca; 8th sp: 8th Spiracle; Va: Valvula (gonapophysis).

distinguished character for this species is its male genitalia as its shown in Figures 10c and 10d.

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