

Original Research Article

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Morphological and Genitalia Description of Peanut Seed Beetle *Caryedon serratus* Oliver (Coleoptera: Chrysomelidae, Bruchinae)

J. Manjunath^{1*}, K. Manjula², K.V. Hariprasad², T. Muralikrishna³,
T.N.V.K.V. Prasad³ and B. Ravindra Reddy²

¹Regional Agricultural Research Station, Nandyal-518502, Kurnool District, A.P., India

²S.V Agricultural College, Tirupati-517502, Chittoor District, A.P., India

³Institute of Frontier Technologies, Regional Agricultural Research Station, Tirupati-517502,
Chittoor District, A.P., India

*Corresponding author

ABSTRACT

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Peanut seed beetle is one of the major pest in stored groundnut pods and kernels in India. The morphological features head and pronotum, elytra, legs, abdomen and pygidium of *Caryedon serratus* was explained descriptively with the help of key notes and dissected and genitalia of male and female adult insect were depicted with camera lucida and genitalia characters are descriptions are explained.

Introduction

Peanut (*Arachis hypogaea* Linn) is an important cash and food crop in many parts of the tropics, particularly in semi-arid areas. The kernels of groundnut are utilized for direct consumption and also used for extraction of oil, which is an important cooking medium for several Asian countries. Asia with 63.1 per cent area produces 71.1 per cent of world production followed by Africa and North Central America with a per cent area and production of 31.3 and 3.7 and 18.6 and 7.5,

respectively. Although India and China are the world's largest producers of groundnut, they account for a small part of international trade (<4%) as most of their production is consumed domestically as groundnut oil.

Export of peanuts from India and China is less than 4 per cent of world trade and ninety per cent of Indian production is processed into peanut oil.

Only a nominal amount of handpicked selected grade groundnuts are exported.

There are important post-harvest insect pests among which *Caryedon serratus* (Oliver) is a primary feeder while, *Elasmolomus sordidus* (F.), *Ephestia cautella* (W.), *Corcyra cephalonica* (Staint) and *Tribolium castaneum* (Herbst) are secondary feeders. *E. sordidus* infestation starts after harvest when the moisture content is high. *C. serratus* belongs to the family Bruchidae which includes genera like *Callosobruchus*, *Caryedon*, *Bruchus*, *Acanthoscelides* and *Zabrotes* causing serious damage not only to the seeds of many forestry plants but also to numerous pulse grains during storage (Lefroy, 1909; Fletcher, 1914; Pruthi and Singh, 1943 and Mathur *et al.*, 1958). *Caryedon serratus* (Oliver) is one of the major and important storage insect species causing 20 per cent damage (Dick, 1987) to groundnut and prevalent in Asia, Greece, France, Italy and the north and west coasts of Africa. *Caryedon serratus* has wide host range which includes *Bauhinia monandra* K., *Prosopis juliflora* (SW.), *Acaia tomentosa* (Benth), *Tamarindus indica* L., *A. nilotica* L., *Cassia fistula* L., *Pongamia pinnata* L., *Hardwickia binata* R. In field condition, 6.8 per cent pod damage is noticed due to *C. serratus* in *A. nilotica* (Singal and Toky, 1990). Peanut stored in godowns was attacked by the bruchid, *Caryedon serratus* causing approximately 17-47% of the pods damage (Shukla and Rathore, 2007).

Caryedon gonagra is another species which infested on tamarinds The confusion between *C. gonagra* and *C. serratus* arose when Southgate and Pope (1957) when studying the type of *C. gonagra* wrongly assumed they were dealing with the peanut seed beetle and disregarded morphological differences documented by Mukerji *et al.*, (1957)

Materials and Methods

The experiment on morphological and genitalia studies was conducted at

Entomology laboratory, RARS, Nandyal, Andhra Pradesh, India during 2015-16 and 2016-17. The description were made for the characters viz., head and pronotum, elytra, legs, abdomen, pygidium and genitalia of male and female adult insect by using the keys developed by Davey (1958) and Delobel *et al.*, (2003). To study the genitalia of both male and female adult bruchids, distal portion of the abdominal segments of the adults were separated carefully and boiled in 10 per cent potassium hydroxide (KOH) solution for 10-15 min. Later the materials were washed with water to remove the alkali, and were kept in glacial acetic acid solution for dehydration. Subsequently these were transferred to carboxylol for further clearing of tissue. Different parts of genitalia were dissected and observed under stereo zoom microscope with a lense of 10x; 20x (eye piece) 1x; 3x (objectives). The genital parts were transferred onto a cavity slide with DPX mountant. These slides were kept in hot air oven set at temperature of 55°C, for 2 minutes drying. The genital parts were photographed by using microphotograph equipment (Magnus Image Projector System). Genital parts of both male and female *Caryedon* spp were also depicted by using camera lucida (Prism type).

Results and Discussion

Adult insects have a greyish brown color. The integument is reddish in colour with small, scattered black or dark brown spots, irregular spots. Antennae and legs (except hind femora and tibiae) slightly paler. Antennomeres 1 and 5-11 often darker on disk. Vestiture dense, but not quite covering integument, recumbent except for a few erect setae, specially on pygidium. Setae pale grayish colour over red parts of the integument and blackish or dark brown over dark spots.

Length and width of male adult insect of *C. serratus* was ranged from 6.85 to 7.34 mm and

2.32 to 2.44 respectively and length and width of female adult insect of *C. serratus* was ranged from 7.12 to 7.89 mm and 2.40 to 2.72 respectively.

Antenna

Both male and female antennal segments were 1-4, cylindrical, segments 5-10, serrate segment 11 oblong; segments 5-10 as long as antennomere 1 (9-10 slightly longer), but widened at apex; segment 11, 1.4 times longer than first segment, and about 2.5 times as long as wide.

Head and pronotum

Male and female head prognathous, short, constricted behind eyes; eyes bulging, sharp median longitudinal carina on frons. Maximum width of male is about 2.0 times width behind eyes and whereas maximum width of female head is about 1.7 times width behind eyes (Plate 1 and 2).

Length of head and pronotum of male adult insect was ranged from 2.02 to 2.11 mm and width ranges from 1.28 to 1.40 mm respectively. Female adult insect length of head and pronotum was ranged from 2.48 to 2.74 mm and width ranges from 1.42 to 1.52 mm respectively. In both male and female, sides of pronotum was almost parallel at base, straight or slightly concave, then abruptly converging at about two third of their length, disc feebly convex; punctures on disc irregularly spaced, setous. Pronotum often devoid of black spots.

Elytra

Length and width of male adult insect ranged from 3.67 to 4.01 mm and 1.43 to 1.59 mm respectively the length of elytra was about 1.5 times as long as their combined width. Female adult insect length and width was ranged from

4.11 to 4.22 mm and 1.62 to 1.78 mm respectively the length of elytra was about 2 times as long as their combined width. Both male and female adult insect elytra sides regularly convex; disc convex; punctured, punctures elongated, with setae (Plate 3 and 4).

Legs

There was no sexual dimorphism in legs of male and female adult insect, hind femora strongly incrassate at their widest (at base of first spine), 2.2 times longer than wide; meso ventral margin with series of 10-12 sharp teeth, with first tooth 1.5 to 2 times longer than second; hind tibiae strongly arcuate, with 5 carinae complete; apex of hind tibia with mucro about as long as tibial width at apex (lateral view) (Plate 5 and 6).

Abdomen

Male and female adult abdomen was 5 segmented and first segment 1.5 times wider than length without modified setae. 5th sternite was emarginate and deeply incurved anterior (Plate 7).

Pygidium

Male adult insect pygidium or sixth visible tergite black in colour with the apex dark brown, vertical and 1.2 times as long as width. Partially covered by elytra; general shape elongate, more strongly in males, extending at an angle of 30-40 degrees to the horizontal, surface flat or even convex, rigid with setae. Pygidium project downward and hidden by elytra.

Whereas female pygidium sub-vertical and longer than width and pygidium can be seen in dorsal view projecting beyond the elytra. Fifth sternite wide, plate like not emarginate and not curved (Plate 8, 8a, 9 and 9a).

Plate.1 Head and Pronotum of *Caryedon serratus* adult male



Plate.2 Head and Pronotum of *Caryedon serratus* adult female



Plate.3 Fore wings of *Caryedon serratus* adult male



Plate.4 Fore wings of *Caryedon serratus* adult female



Plate.5 Hind legs of adult insect of *Caryedon serratus*



Plate.6 Hind leg of adult insect of *Caryedon serratus* (femur is 2.2 times longer than width and meso ventral first spine is 1.5 to 2.0 times longer than second spine)



Plate.7 Abdomen regions of female and male adult insect of *C. serratus* (Ventral view)

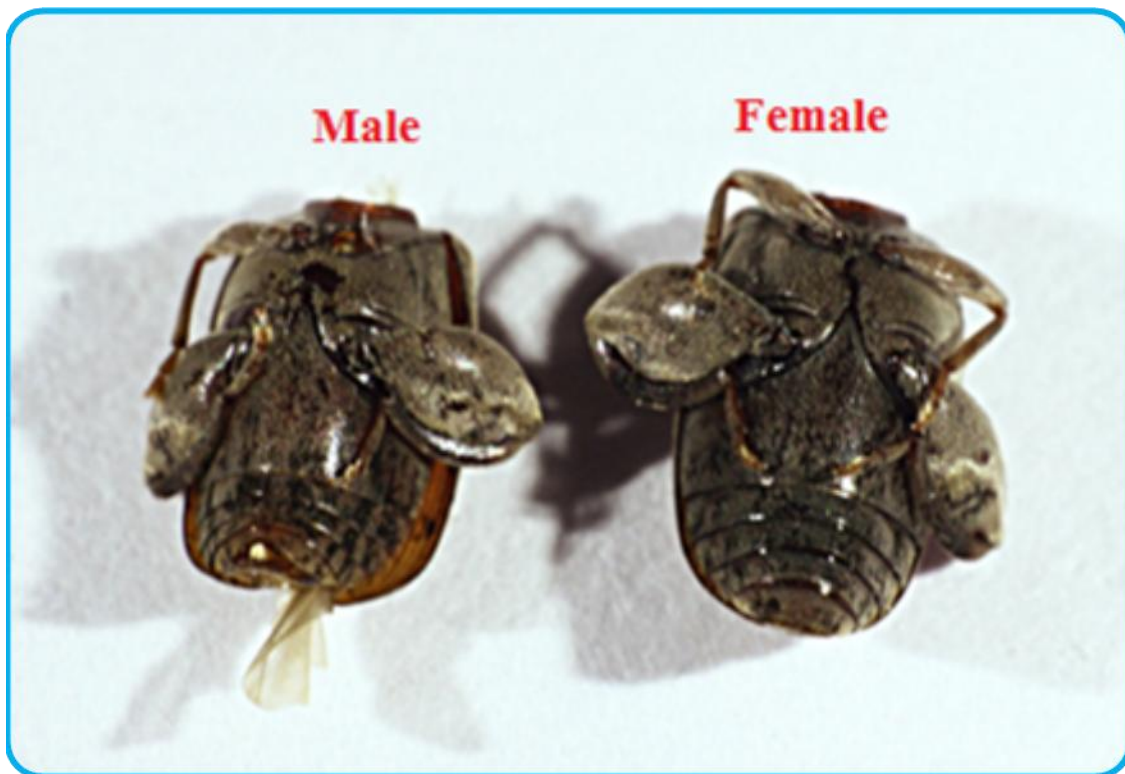


Plate.8 Lateral view abdomen region of male adult insect of *C. serratus*

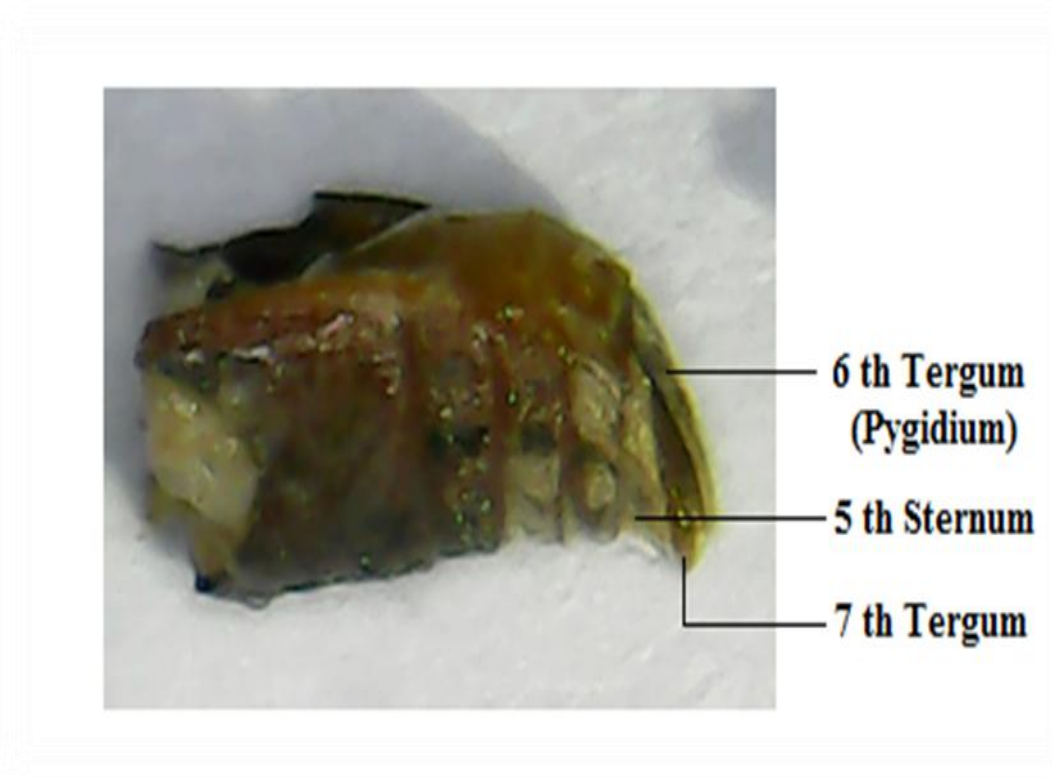


Plate.8a Lateral view abdomen region of male adult insect of *C. serratus* (Hand drawn)

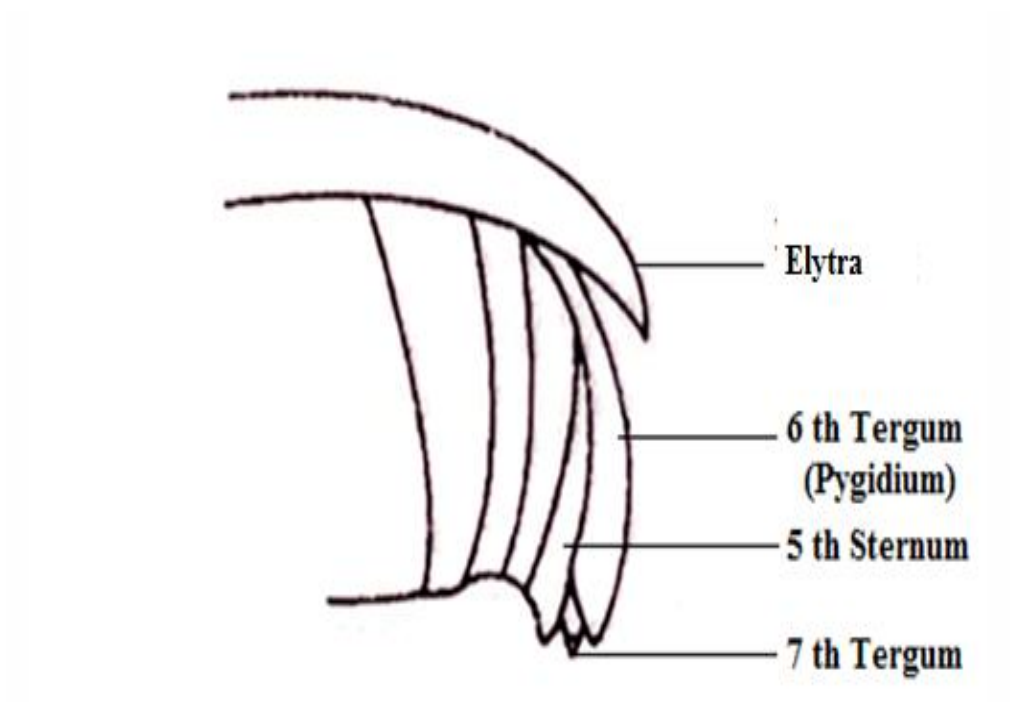


Plate.9 Lateral view abdomen region of female adult insect of *C. serratus*

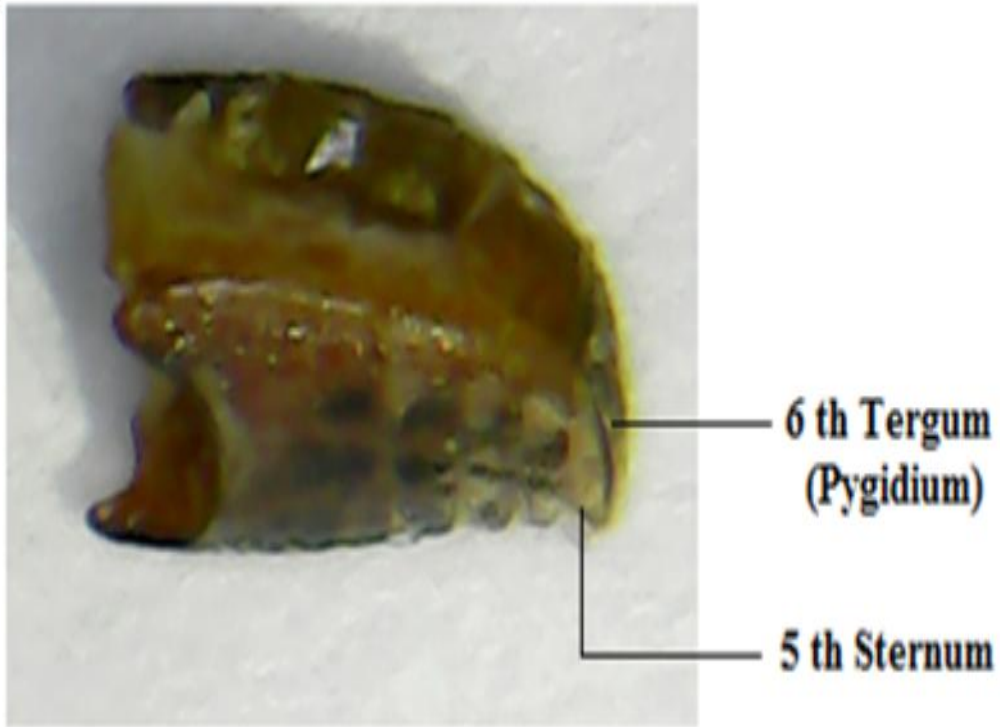


Plate.9a Lateral view abdomen region of female adult insect of *C. serratus* (Hand drawn)

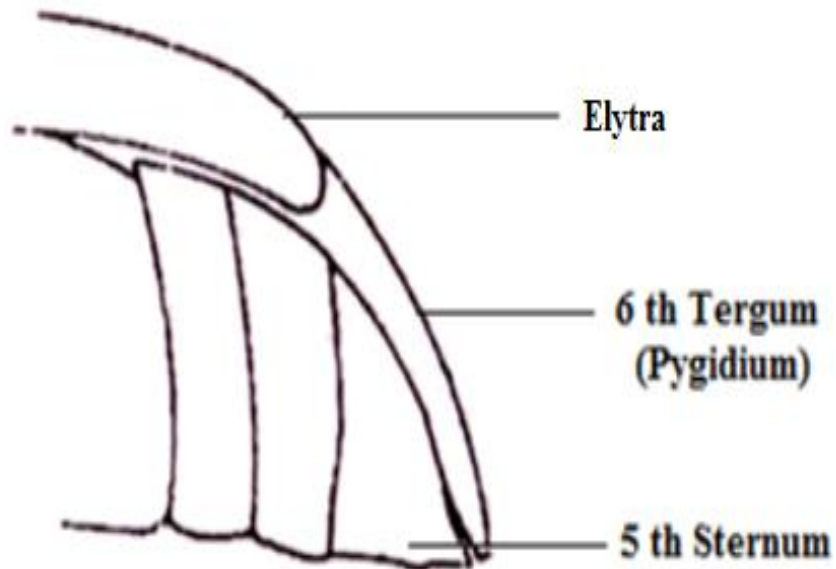


Plate.10 Male genitalia dissected from *Caryedon serratus*



Plate.10a Camera lucida drawing of male genitalia of *Caryedon serratus*

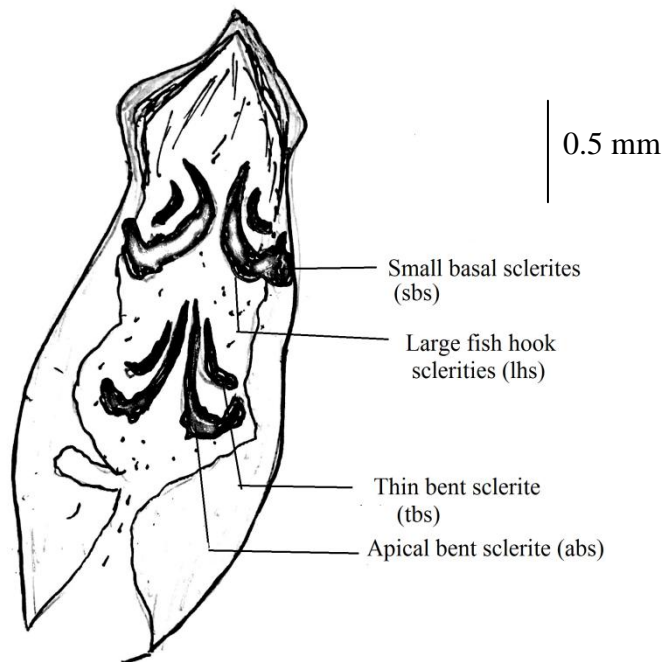
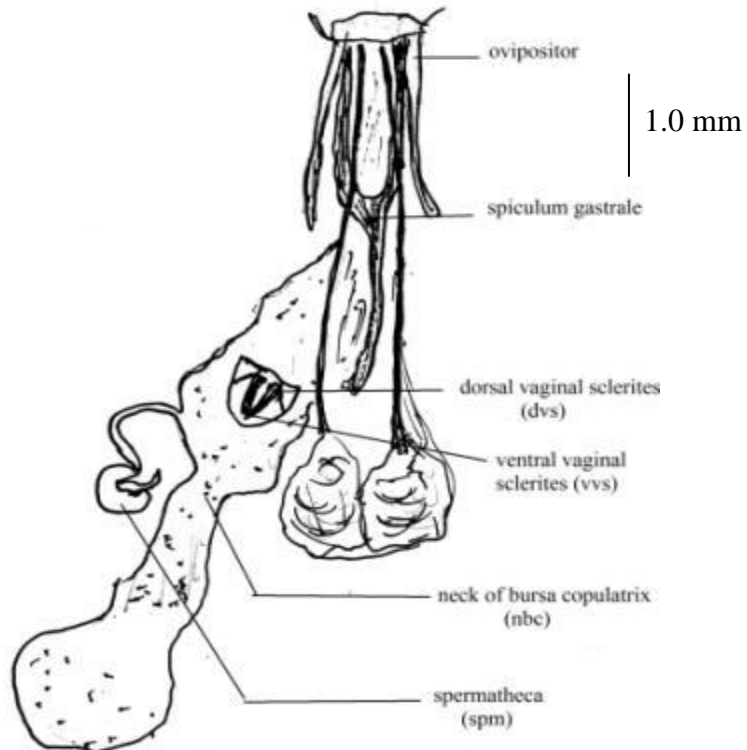


Plate.11 Female genitalia dissected from *Caryedon serratus*



Plate.11a Camera lucida drawing of female genitalia of *Caryedon serratus*



Male genitalia

Internal sac with four pairs of sclerites and a large apical group of dense spines. First pair of sclerites in the form of large hooks (lhs); second pair small, located near base of former(sbs); third pair (tbs) thin and pointed, strongly curved; fourth pair (abs) with base hardly enlarged and regularly thinned in to a sharp point. Group of apical spines large, composed of both large and long spines mixed with much smaller ones. Ventral and dorsal valves of median lobe approximately of the same shape, ending in a slightly acute angle. Apex of lateral lobes densely pubescent (Plate 10 and 10a).

Female genitalia

Genitalia of *C. serratus* was pear-shaped, very thinly dorsal vaginal sclerites (dvs) and strong ventral vaginal sclerites (vvs) on saccular bursa copulatrix, numbers of denticulate structures on surface of bursa copulatrix, ovipositor 2.5 times longer than wide, weakly sclerotized stylus with 2 short setae.

First pair of baculum elongate, almost 2 times longer than 2nd pair. Apodeme of spiculum gastrale extending to apex of genitalia. Plate of spiculumgastrale longer than apodeme. Apex of ovipositor with 2 protuberances. Spermatheca (spm) C-shaped (Plate 11 and 11a).

With the above descriptions of morphological characters of peanut seed beetle populations collected from 24 different areas of Rayalaseema districts, the test insect was identified as *Caryedon serratus*. No other species of *Caryedon* was noticed from the collected populations.

The results were agreement with Khalil, (1970), described the characters of *C. serratus* as body length is 4.7 mm. The pygidium is very large that the elytra do not cover it, the elytra are deeply striated, and the antennae consists of eleven segments with no clubs, tarsi are four segmented; hind femur is broader than hind coxa, and have crest of stout spines on the distal

third of the ventral margin; the hind tibia is strongly curved. According to Singh (1977) and El Atta (1993), the insect has prognathous head type, the body length exceeds 6 mm. The hind femur with strong tooth in the middle followed by 10 – 14 smaller teeth, the pygidium is with a thin median line of golden setae throughout its length. The antennae are equally serrated in both males and females.

The results were positively agreement with Bahera *et al.*, (2016) studied *C. serratus* morphology and reported that the length is 0.40 to 0.55 cm, the width is 0.30 to 0.40 cm in case of males. Where as in females, the length is 0.65 to 0.70 cm and width is 0.45 to 0.50 cm.

They also stated that the antenna is 12 segmented, serrate. The length of elytra varied from 0.45 to 0.50 cm and width 0.15 to 0.20 cm. Hind femur enlarged and last tarsomere bifurcated. Sontakke *et al.*, (1995) reported that *C. serratus* has serrated antenna, dark irregular markings on elytra and broad hind femur that bears conspicuous comb of spines. Biswas and Maity (1996) recorded the length of *C. serratus* as 0.40 to 0.70 cm and width as 0.30 to 0.50 cm with small markings on elytra.

The genitalia of male and female of *C. serratus* explained in the present study are agreed with the results of Anton and Delobel (2004). They reported that in female *C. serratus*, dorsal vaginal plate is shorter and wider, posterior side of ventral vaginal plate is regularly rounded, bursa copulatrix elongated, with narrow base and spines in anterior half.

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