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Research Journal of Agricultural Sciences
An International Journal

P- ISSN: 0976-1675
E- ISSN: 2249-4538

Volume: 13
Issue: 03

Res. Jr. of Agril. Sci. (2022) 13: 834–836

CARAS

Res. Jr. of Agril. Sci. (May-Jun 2022)
13(3): 834–836

ISSN: 0976-1675 (P)
ISSN: 2249-4538 (E)

www.rjas.org

Full Length Research Article

External Morphology of *Holotrichia serrata* (Fab) Adult (Coleoptera: Scarabaeidae)

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Received: 22 Mar 2022 | Revised accepted: 08 Jun 2022 | Published online: 16 June 2022

A B S T R A C T

The national pest white grub has been defined as larvae of Melolonthidae. *Holotrichia serrata* (Fab) is a species of a Scarabaeidae family. Last five years, they cause damage to the commercial crops such as sugarcane, maize, groundnut, potato, jowar etc. and economical or medically important trees. The present investigation, external morphology of *Holotrichia serrata* was carried out in field as well as in laboratory. The *Holotrichia serrata* (Fab) adults are reddish brown in colour, compact and medium in size. The ventral side is shining; labium and labrum are fully bristly. Antenna is a lamellate type. Tibial spurs are distinguished characteristics of male and female adults.

***Key words*:** Coleoptera: Scarabaeidae, *Holotrichia serrata*, Morphology, National pest, Taxonomy

White grub is known as a 'root feeder'. Adults of white grubs are also known as 'Chaffer Beetles' or 'May- June Beetles' because of their occurrence. The white grubs have included in the category of five national pests and a large sum of money is being spent on their control at national level. The world fauna of white grub exceeds 30,000 species [1], and there are about 1300 North American species [2]. The fauna of the Indian sub-region is very rich and diverse, but it is yet to be fully explored [3]. White grub has become serious pest of most agricultural crops, vegetables, ornamental plants, fruits, pastures, turf and meadow grasses, lawns, golf courses, and forest trees in different parts of the world [4-5].

They cause heavy damage to wide variety of wild and cultivated crops [6]. In India, *Holotrichia fissa*, *Holotrichia serrata* (Fab) and *Leucopholis lepidophora* have been found so far. This infestation has been recorded throughout the country and magnitude of the problem has been widespread over the past years. The *Holotrichia serrata* (Fab) species belongs to the family Scarabaeidae. The *Holotrichia* is one of the largest Melolonthidae genuses. The larvae of most of their species feed on the roots of cultivated crops and they cause to damage the crops [7]. The grubs feed on the tap roots of the seedlings and the damaged plants wilt and die [8]. The adults feed on the leaves of host plants like *Azadirachta indica*, *Ziziphus zizyphus*, *Acacia arabica* and *Acacia catechu* [9]. White grubs have become serious pest of agricultural crops, plantation crops, pastures, fruit and meadow grasses, lawns, golf courses and forest trees in different parts of the world [4-5].

Northern Western Ghats is having various forest types such as tropical evergreen, semi-evergreen, moist and dry deciduous and high-altitude shoals mingle with natural and man-made grasslands, in addition to stream valley projects mining areas and may other land uses; and also, most of agricultural area. The *Holotrichia serrata* (Fab) is a most abundant species found in the area of Khed Tehsil which is a part of Northern Western Ghats, Maharashtra, India [10]. The *Holotrichia serrata* adult have damage the commercial growing crops as well medically important host trees. External Morphology of *Holotrichia consanguinea* Blanchard (Coleoptera: Scarabaeidae: Melolonthinae) investigated [11] but on *Holotrichia serrata* (Fab) adults have no published information regarding morphology.

MATERIALS AND METHODS

Exterior survey was carried out at different locations of Northern western Ghats for the collection of beetles. They come out from soil for feeding or mating purpose during the time 19:00 to 21:00. After feeding or mating, they go down again into the soil up to next evening. Beetles were collected handpicked and/ or shaken from the host plants *Azadirachta indica* and *Acacia arabica* during their feeding or mating period at 19:30 to 20: 45 hr. at 22± 2°C. The present study was examined in the laboratory as well in field also.

The collected beetles were identified as per the standard key [12-14], stored, pinned and dried in the laboratory and used for morphological study [15]. The microscopic examination of

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different body parts viz. mouth parts, antennae, legs, wings and genitalia.

Procedure for preparation of permanent slide

The collected beetle was dipped overnight with KOH solution to get the musculature sufficiently relaxed. After that the KOH was removed by washing in distilled water for 2-3 times. The dissection was performed within a cavity block, with the help of fine forceps and needle under the Illuminated Magnavision microscope. The dissected body parts were transferred to glacial acetic acid in another cavity block and fuschin acid was used for staining. After 10-15 minute mounted parts were again washed with glacial acetic acid to remove excess stain. Then the washed-out mounted part was transferred to Carbo- Xylol for 15 minutes. After getting clear the body parts of specimen were mounted finally on a plain slide and thick specimen on cavity slider in DPX mounting and covered with cover slip.

Drawing and microscopic photography

For photography purpose, a binocular microscope was used for microscopic structure with required magnifications and a digital camera (Sony cyber shot) was used for taking the photographs of different body parts.

For drawing purpose, a binocular microscope was used for microscopic structure with required fine magnifications and different body parts were drawn on a plain drawing paper with the Camera Lucida.

RESULTS AND DISCUSSION

The present investigation was made asses the taxonomy or morphology of *Holotrichia serrata* (Fab) adults. The adults of *Holotrichia serrata* (Fab) were dull reddish brown in colour, compact, medium in size about 20±5 mm in length and 12±4 mm width. The body is divided into three different parts; head, thorax and abdomen.

The Head is composed of sclerotized segments contain compound eyes. In male adult antennae has nine segments and female has eight segments. Scape is well developed in the socket. The male pedicle is smaller than female which is long, slender and bristly. The terminal segment of flagellum is modified into three leaves like broad plates or club shape foliate capatulum. The *Holotrichia serrata* (Fab) adult shows biting and chewing mouth parts developed for to chewing and grinding the food material. Labrum is sclerite, semi transverse and more longitudinally. It often called as upper lip. The clypeus is short, sinuate and triangular in shape. The upper lip of edges covered with bristles. The small bristles were used for testing the various types of food. The mandible or jaws are highly sclerotized paired structure. The incising and grinding region is developed for to grind the carnivorous food. The outer sides of mandible were covered by bristles. A maxilla contains basal cardo, oblong or roughly triangular stipes. The larger galea and inner lacina are well developed. The paired structure of maxilla has been covered by bristles and possesses maxillary palp. Labium is often called lower lip. It consists of three components; mentum, prementum and submentum. Mentum is usually trapezoidal and broadly joined with the submentum. Submentum is an uppermost cover of the mentum. Prementum is a sub quadrate or broadened with numerous minute bristles. On the distal margin; the prementum bears with two pair of lobes. The inner and outer pair of lobes of prementum is shown as the glossae and paraglossae respectively. The labium is a fused structure that possesses a pair of three segmented labial palps. The labial palps were covered by minute bristles. The hypopharynx is bilobed structure, oblong in shape and well-developed salivary ducts at dorsal side. Laciniae move the food upward and hypopharynx rotate the food forward and backward (Fig 1).

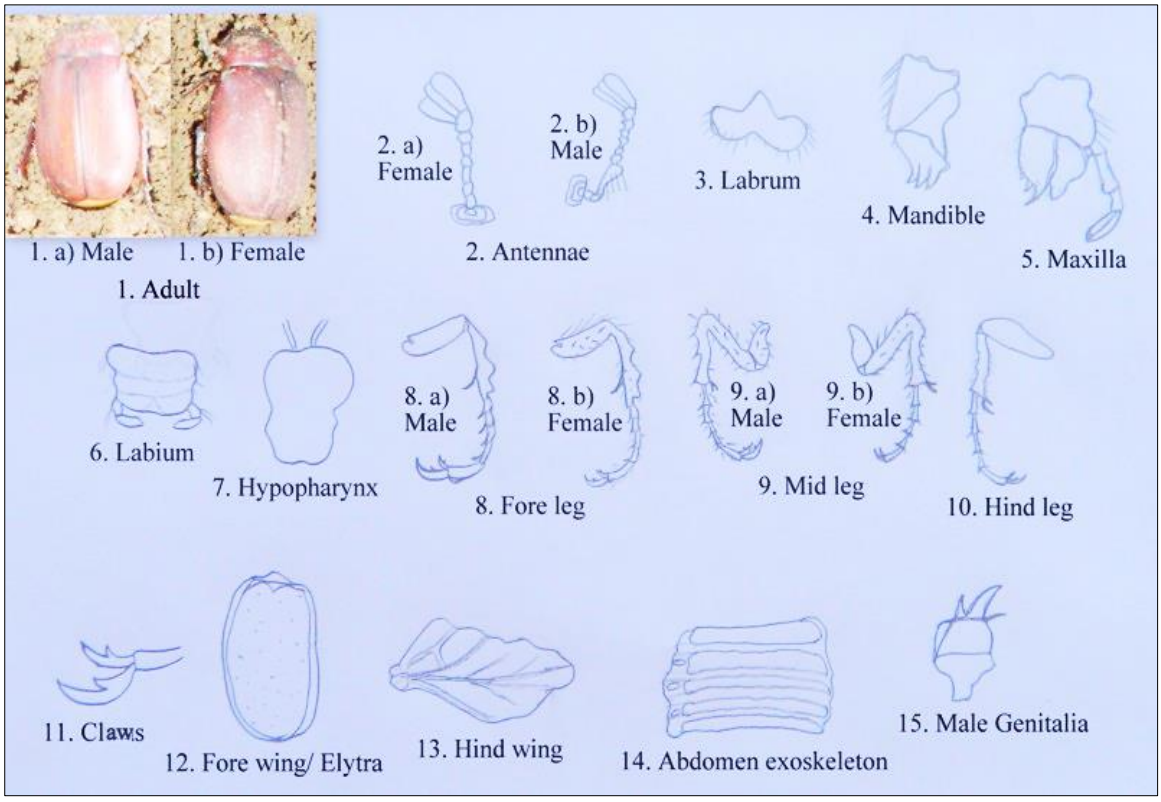

Fig 1 General external morphology of *Holotrichia serrata* (Fab) adult

The thorax is well developed. It is divided into three parts; prothorax, mesothorax and metathorax. Each thoracic segment consists pair of leg. The prothorax is well developed called as pronotum. meso and metathorax are reduced and

fused. The head is usually retracted into anterior margin of pronotum at rest and the triangular scutelum is showed between the elytra bases. Legs are well developed; adapted for walking and running. It is also supporting function for feeding and mating. The foreleg is located on prothorax. It is composed of six distinct segments; listed coxa, trochanter, femur, tibia, tarsus and metatarsus. Coxa is tubular, broad and triangular in shape. The trochanter is short, quadrangular in shape and lying in between coxa and femur. The large size femur is developed for leaping. The tibial generally long, slender, tubular and provided with the spines. It bears single spur at the middle. The pointed spur shows in male and in female adult, the tibial spur is blunt. The outer border of tibia is serrated and blunted. The tarsus is divided into five sub segments. The first five segments are equal and small in size. The distal end of tarsus is tubular and lobulated structure; bears with plantulae. The sub segmented metatarsus is long as compare to tarsus. It is developed for avoid the frictions on the smooth surface at running time. The claws are articulate with the semicircular and double pointed. Mid legs have been well developed coxa, trochanter, femur, tibia, tarsus and metatarsus. Femur is bristly. Two tibial spurs are present. Many more plantulaes are developed on tarsus at the dorsal end. The metatarsus is long as compare to the tarsus. The two claws are present at the end. Hind leg is six segmented structures. Femure is less bristly. The pointed long spurs are developed at the dorsal end of tibia. Four tarsi consist of plantulae. The double pointed claws are also present. The pairs of wings are developed only on meso and metathoracic segment. Wings are complete cover to the abdomen. Forewing is modified into elytra which are rectangular in shape, hardened, sclerotized and protect to the hind wing. Hind wing is evolved many venations developed on metathoracic segment. Hind wing is thin, transparent, partially pigmented fan like membranous structure. Blood vessels are clearly shown in the hind wing. Wings are developed for flight at the time of feeding and mating (Fig 1).

Abdomen is divided in to 5 to 7 segments. Reproductive organ developed on 5th abdominal sternum in male and 6th abdominal sternum in female. In female, sternum possesses large and small bristles are intermixed (Fig 1).

CONCLUSION

The present study concluded that the family Scarabaeidae, the *Holotrichia serrata* (Fab) adult is compact and medium in size. The male *Holotrichia serrata* (Fab) adult is smaller than female. The pronotum and scutellum in male are smaller in size than female. In male, the lamellate antennae have nine segmented; post pedicle is large or distinct and covered with bristles but in female, lamellate antennae have eight segmented, small pedicles without bristles. Upper side of labrum is totally covered by bristles. Male legs are partially covered by bristles but female legs are fully covered by bristles. Tibial spurs in male are long, pointed and sharp but in female, tibial spurs are short and blunt. The metatarsus claws are double pointed or bidif and sharp. Metatarsus is long in male than female. The *Holotrichia serrata* (Fab) adult is one of the harmful agricultural pests and it does highly need to control or manage immediately.

Acknowledgement

Authors are thankful to Chairmen, Secretary K.T.S.P. Mandal's, Principal of Hutatma Rajguru Mahavidyalaya, Department of Zoology, Hutatma Rajguru Mahavidyalaya, Rajgurunagar and authorities of Savitribai Phule Pune University, Pune for providing necessary laboratory and facilities to complete this research work.

LITERATURE CITED

1. Mittal IC. 2000. Survey of Scarabaeid (Coleoptera) fauna of Himachal Pradesh (India). *Journal of Entomological Research* 24(3): 259-269.
2. Borror DJ, Delong DM, Triplehorn CA. 1976. *An Introduction to the Study of Insects* (4th Edition). Chicago, Holt Rinehart Winston. Book 36-49p.
3. Mishra PN, Singh MP. 1999. Determination of predominant species of white grub in Garhwali region of Uttar Pradesh hills (India). *Journal of Entomological Research* 23(1): 65-69.
4. Guppy JC, Harcourt GD. 1970. Spatial pattern of the immature stages and teneral adults of *Phyllophaga* spp. (Coleoptera: Scarabaeidae) in permanent meadow. *Canadian Entomologist* 102(11): 1345-1359.
5. Potter DA, Patterson CG, Redmond CT. 1992. Influence of turf grass species and tall fescue endophyte on feeding ecology of Japanese beetle and southern masked chafer grubs (Coleoptera: Scarabaeidae). *Jr. of Economic Entomology* 85(3): 900-909.
6. Misra SS, Chandla VK. 1985. White grubs infesting potatoes and their management. *Journal of Indian Potato Association* 16(1/2): 29-33.
7. Wolkott GN. 1993. An economic entomology of the West Indies. San Juan, Entomological Society of Puerto Rico. pp 688.
8. Bandara GD. 1990. Chemical control of the cockchafer grub (*Holotrichia serrata*) in teak nurseries. *Sri Lanka Forester* 19(3/4): 47-50.
9. Theurkar SV, Patil SB, Ghadage MK, Zaware YB, Madan SS. 2012. Distribution and abundance of white grubs (Coleoptera: Scarabaeidae) in Khed Taluka, part of Northern Western Ghats, MS, India. *Int. Res. Jr. of Biological Sciences* 1(7): 1-6.
10. Theurkar SV, Patil SB, Ghadage MK, Zaware YB, Madan SS. 2013. Occurrence of white grubs in ground nut growing area of Khed Taluka, part of Northern Western Ghats (MS), India. *International Research Journal of Recent Sciences* 2: 1-3.
11. Kangoo AM, Khan ZH, Ahmad S. 2011. External Morphology of *Holotrichia consanguinea* Blanchard (Coleoptera: Scarabaeidae: Melolonthinae). *Research Journal of Agricultural Sciences* 2(1): 146-147.
12. Veeresh GK. 1997. Studies on the root grub in Karnataka. University of Agricultural Science, Hebbal, Bangalore. pp 87.
13. Mittal IC, Pajni HR. 1977. New species belonging to Melolonthidae (Coleoptera: scarabaeid: Melolonthidae) from India. *Entomologist* 2(1): 85-88.
14. Khan KM, Ghai S. 1982. Taxonomical status of genus *Holotrichia* Hope (Melolonthidae: scarabaeid) with description of five new species from India along with re-descriptions of two poorly described species and a key to species. *Journal of Entomology* 23(1/2): 28-45.
15. Theurkar SV, Ghadage MK, Patil SB. 2013. New laboratory culture method for White Grub National pest, India. *International Research Journal of Biological Sciences* 2(5): 83-85.