Bio Bulletin

2(1): 1-5(2016)

(Published by Research Trend, Website: www.biobulletin.com)

ISSN NO. (Print): 2454-7913
ISSN NO. (Online): 2454-7921

Major pest, *Calopepla leayana* Latr. (Coleoptera: Chrysomelidae) of *Gmelina arborea* (Roxb.) from Meghalaya and Assam (India) with emphasis on illustrated biology

Rajesh Kumar, Preetirekha Chutia and G. Rajkhowa
Entomology Division, Central Muga Eri Research and Training Institute,
Central Silk Board, Ministry of Textiles: Govt. of India, Lahdoigarh 785700, Jorhat, Assam, India

(Corresponding author: Rajesh Kumar; rajesh.ento@gmail.com)
(Published by Research Trend, Website: www.biobulletin.com)
(Received 12 October 2015; Accepted 08 January 2016)

ABSTRACT: *Calopepla leayana* is monophagous species, which feeds only on *G. arborea* plant and is reported for the first time from Meghalaya, India with brief notes on biology. This plant is economically important for muga silkworms in addition to medicinal properties for human being considered as tertiary host plant for muga silkworms and distributed in N.E. India, Decan Peninsula, Foothills of N.W. Himalaya, Chittagong, Sri Lanka, Malaysia, Philippines. In the present study, the detailed photographic illustrated diagnostic feature with biology along with review of control measures and future strategies to control *C. leayana* has been discussed.

Keywords: *Calopepla leayana*, Assam, Meghalaya, North East India, muga silkworm.

INTRODUCTION

The *Calopepla leayana* Latr. (Synonyms: *Imatidium leayanum* Latreille *Cassida leayana* Olivier, *Calopepla leayana* ab*. nigriventris* Weise) a serious major pests of the economically important timber species, *Gmelina arborea* (Roxb.) (Synonyms: *G. rheedii* Hook, *Premna arborea* Roth, *P. tomentosa* Miq.) belong to the family Verbenaceae. *C. leayana* is monophagous species, which feeds only on *G. arborea* plant and is reported for the first time from Meghalaya, India with brief notes on biology (Kumar *et al*., 1995). Ahmed and Sarma (1990) studied the bionomics of defoliator, *C. leayana* on *G. arborea* from Dehra Dun, Uttarakhand. This plant is economically important for muga silkworms in addition to medicinal properties for human being considered as tertiary host plant for muga silkworms and distributed in N.E. India, Decan Peninsula, Foothills of N.W. Himalaya, Chittagong, Sri Lanka, Malaysia, Philippines (Srivastava and Thankgavelu, 2005; Bindroo *et al*, 2006). In this manuscript, biology and feeding behaviour of this beetle were studied and observed in field condition at Tura, Meghalaya. All the photographs of beetle and plant have been depicted in plates on the subject of feeding and biology.

MATERIALS AND METHODS

All the specimens were collected and preserved in well fumigated wooden boxes. Prior to collection, the beetles and their life stages along with damage symptoms were photographed in the field condition at Farm No. 3, CMERTI, Lahdoigarh, Jorhat, Assam and Sericulture Farm, Tura, Meghalaya. For field observations specimens and damage symptoms were photographed by Sony DSC R1 10.3 mega pixel from 2012 to 2015. The photographs were edited using software ACDSee 9.0 Photo Manager and prepared plate in 600 dpi using software Adobe Photoshop 7.0.

RESULTS

Calopepla leayana (Latreille, 1807) (Plate I and II)
Synonyms
Imatidium leayanum Latreille

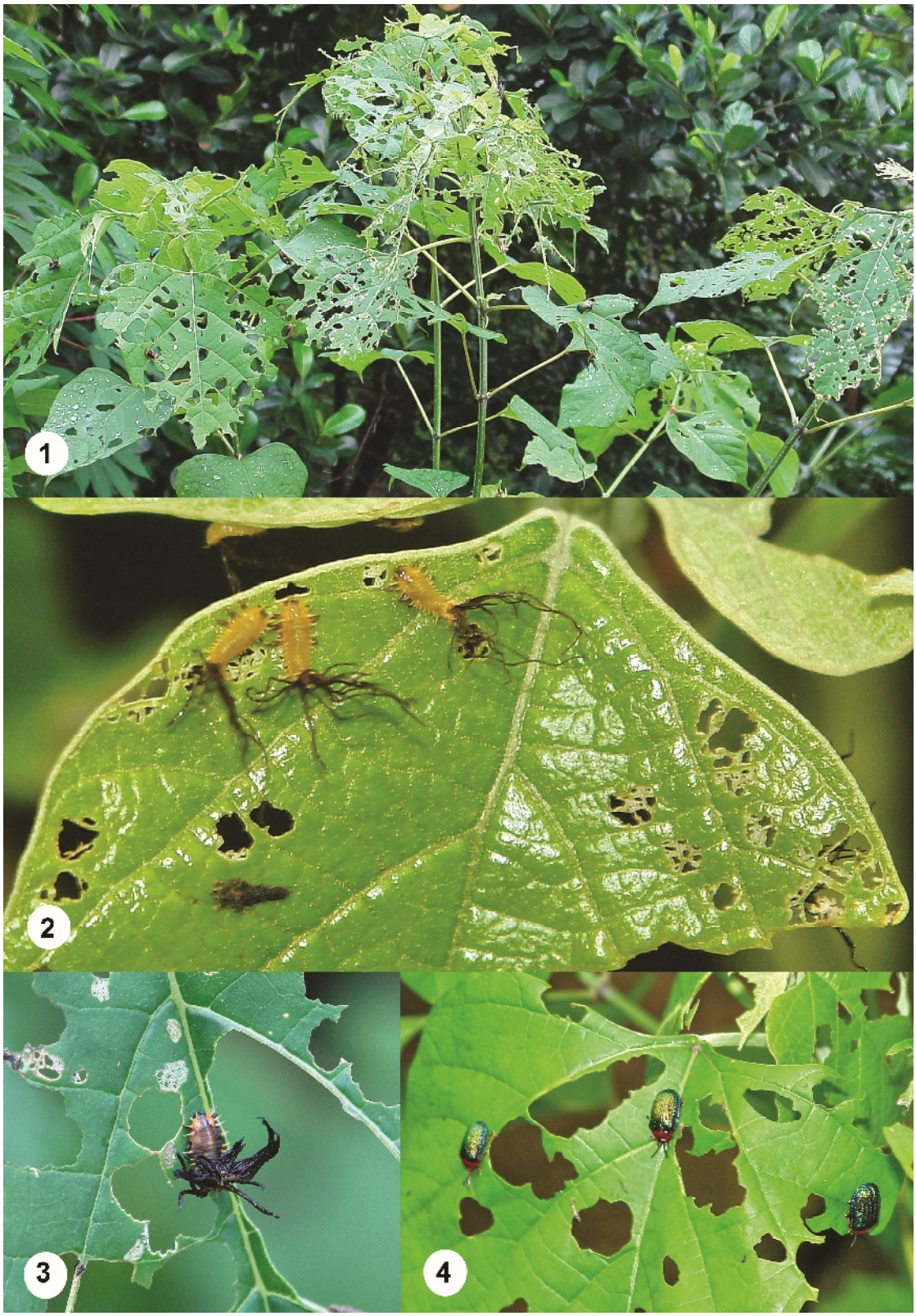

Plate I. *Calopepla leayana* Latr. (Coleoptera: Chrysomelidae) on *Gmelina arborea* (Roxb.) (Family Verbenaceae)-Damage: Fig. 1. Damage symptom of complete plant, 2. Damage caused by II instar grub, 3. Damage caused by II instar grub, 4. Damage caused by adults.

Cassida leayana Olivier
Calopepla leayana ab. Nigriventris Weise
Common Names: Defoliator (gamar, gamhar, yemane), yemane tortoise beetle.
This plantation crop was found in forest area in the Sericulture farm at Tura, Meghalaya (India) and Farm No. 3, CMERTI, Lahdoigarh, Jorhat Assam. During rainy season May – September (2012 to 2015), It was observed that the beetles come out from the soil and sit on plant trunk in group (Fig. 4, 5).

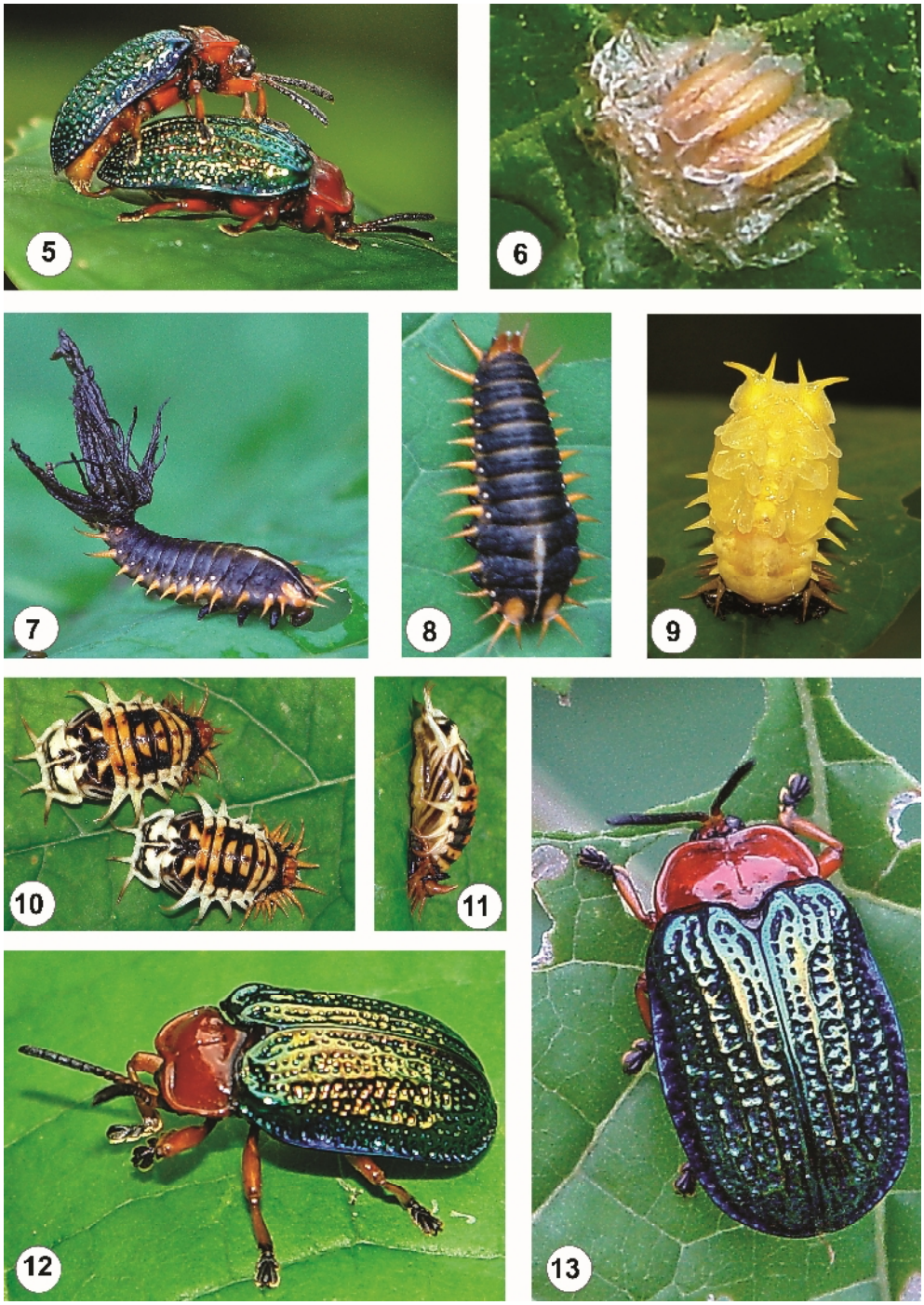

Plate II. *Calopepla leayana* Latr. (Coleoptera: Chrysomelidae)-Biology: Fig. 5. Lateral view of mating, 6. Eggs laid on upper surface of leaf, 7-8. Last instar grub, 9. Grub just turned to pupa yellow color, 10. After 2 hours pupae colors turned into multicolor, 11. Lateral view of pupa, 12. Latero-dorsal view of female adult, 13. Dorsal view of female adult.

Feeding behaviour: The beetle and grubs feed voraciously on the leaves and leave behind veins intact. The beetles were found in group of 4-6 full grown adults feeding on the trunk of the plant. The male were larger than the female and infatuated cephalic and prothoracic horn, but females never infatuate with horn. Males of *C. leayana* were generally larger than females, but sometimes observed (Figs. 4, 5). The biology and life cycle of *Calopepla leayana* were studied in the laboratory, and under field conditions at Farm No. 3, CMERTI, Lahdoigarh, Jorhat Assam. It has been observed that the beetles come out from hibernation in May and lay their eggs on the upper side of leaves of *G. arborea.* The mating period was observed for 20 to 30 minute in the field condition (Fig. 5), and eggs are laid upper surface of leaves as an ootheca. One female lays up to 15-20 oothecae containing 30-70 eggs (Fig. 6). The pupae were observed in the field condition and found that within one hr the pupae turned into multicolor from yellow (Figs. 9, 10, 11). Three generation has been observed in one year, but it depends on abiotic and biotic factors.

CONTROL MEASURES

Biological control: Singh *et al*. (2006) observed that *Brachymeria excarinata* Gahan (Hymenoptera : Chalcididae) found to be a promising biocontrol agent of *Calopepla leayana* Latr. (Coleoptera : Chrysomelidae), in northeastern India. In field, it was successfully parasitised 44.55% pupae of *C. leayana* but altogether killed 86.4 % of them (41% died of its stinging). In the laboratory experiments 38.82% pupae were successfully parasitised and 91.18 % were killed. Singh *et al*. (2006) was also studied the biology of parasitoid and its developmental time from egg laying to adult emergence, which was found to be 11 days 17 hours ±17.24 hours. Ovipositional behaviour including courtship and mating, host searching and preference, drilling and oviposition, was observed. Singh et al. (2006) found that longevity was to be 125.11 ± 26.49 days in females and 127 ± 34.59 days in males.

Entomopathogenic fungus*:* Singh *et al*. (2002) tried two pathogenic fungus *viz*., *Beauveria bassiana* and *Metarhizium anisopliae* on different larval instars and adults of *Calopepla leayana* and found all the larvae as well as adult stages of *C. leayana*, causing white and green muscardine disease to the larvae, respectively. He observed that *B. bassiana* was found more virulent as compared to *M. anisopliae*.

The I-instar larvae were more susceptible to both the fungi, but susceptibility gradually decreased with the increasing age of the larvae. However, the adult mortality was more in comparison to V-instar larvae.

DISCUSSION

The insect is a serious pest in pure *Gmelina arborea* plantations in India, Myanmar (Garthwaite, 1939; Beeson, 1941), and Bangladesh (Baksha, 1997). The pest normally causes damage to about one-third of the leaf surface area in natural conditions and in small plantations. The results in a loss in increment that has not yet been quantified. In certain places, for example pure plantations at Namtu, Myanmar where the insect appeared as epidemic, whole plantations had to be disregarded and abandoned in spite of vigorous control measures adopted by way of hand-picking and trapping operations (Garthwaite, 1939). A similar case in monoculture plantations of *G. arborea* over a large area, abandoned as a result of serious defoliation by this beetle, has been reported from north-east India. In the present study, the detailed photographic illustrated diagnostic feature with biology has been reported.

FUTURE SCOPE FOR CONTROL MEASURES

In future the studied can be made for controlling this pest through potential biological control agent, entomopathogenic nematodes and entomopathogenic fungus or some eco-friendly biopesticides. In spite of this, latest technology *viz*., LED (Light Emitting Diode) traps with different wavelength and different colour can be tried for controlling this pest, which is eco-friendly method and pesticide free. As it is recorded as tertiary food plant of muga silkworm (Antheraea assamensis, Helfer), can be utilized for silkworm rearing.

ACKNOWLEDGEMENT

The authors are thankful to Dr. V.V. Ramamurthy, Principal Scientist, Identification Service, Division of Entomology, Indian Agricultural Research Institute, New Delhi 110012 for identification of this beetle.

REFERENCES

Ahmed, SI and Sen-Sarma, PK 1990. Bionomics of *Calopepla leayana* Latr (Coleoptera: Chrysomelidae), a serious defoliator of *Gmelina arborea* Roxb. plantations in India. *Indian Forester.* **116** (1): 71-82

Baksha, MW 1997. Biology, ecology and control of gamar defoliator, *Calopepla leayana* Latr. (Chrysomelidae: Coleoptera) in Bangladesh. *Bangladesh Journal of Forest Science*. **26**(2): 31-36.

Beeson, CFC 1941. The ecology and control of the forest insects of India and neighboring countries.1961 reprint. Govt. of India, New Delhi. 767pp

Bindroo, BB, Singh, NT, Sahu, AK and Chakravorty, R. 2006. Muga Silkworm Host Plants. Indian Silk, **4**: 13-17

Garthwaite, PF 1939. On the biology of *Calopepla leayana* Latr. (Chrysomelidae: Col.) and the possibilities of control. *Indian Forest Records (Entomology)*. **5**: 237-277.

Kumar, M Shylesha, AN and Thakur, NSA 1995. Occurrence of *Craspedonta leayana* (Latr.) (Chrysomelidae: Coleoptera) on *Gmelina arborea* in Meghalaya. *Insect Environment*, **1**(3): 17-18.

Singh, S., Barman, H.K. and Barthakur, N.D. 2002. Pathogenicity of entomogenous fungi on *Calopepla leayana* (Coleoptera: Chrysomelidae), a major insect pest of Gamhar, *Gmelina arborea*. *Annals of Forestry*, **10**(2): 351-355.

Singh, S, Barman, HK, Deka, B and Rajak, B 2006. Bio-ecology of *Brachymeria excarinata* Gahan (Hymenoptera: Chalcididae), a pupal parasitoid of *Craspedonta leayana* (Coleoptera: Chrysomelidae), a major defoliator of *Gmelina arborea* in North-East India. *Annals of Forestry*, **14**(2): 306-316.

Srivastava, PK and Thangavelu, K 2005. *Sericulture and Seri-Biodiversity*. Associated Publishing Company, Post Box No. 2679, Karol Bagh, New Delhi 110005. pp. 1-254.