JoTT Short Communication 4(2): 2398–2401

Genitalic studies of *Amerila eugenia* (Fabricius) (Lepidoptera: Arctiidae) from Karnataka, India

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Abstract: In this manuscript, external male and female genitalic characters of *Amerila eugenia* (Fabricius) have been studied and illustrated for the first time. Besides this, a dichotomous key for the separation of all four Indian species of this genus has been provided.

Keywords: *Amerila* Walker, Arctiidae, dichotomous key, *eugenia* (Fabricius), external genitalia, Lepidoptera.

Genus *Amerila* was proposed by Walker in 1855 for its type species *astreus* Drury from Bengal, India. It is a diverse old world tropical genus with distinctive facies such as shape of fore wing margin; small hind wings, with (in males) modified scales along the rather produced tornus; general colouration is white, pale pinkish-brown or dark brown with areas of pink on the abdomen and the legs; antennae with more (80) segments (Holloway 1988). Hampson (1894) synonymised the genus *Amerila* Walker under *Pelochyta* Hübner and later on Hampson (1901) treated *Amerila* under *Rhodogastria* Hübner. Strand (1919) catalogued five species under *Rhodogastria* Hübner, i.e., *astreus* (Drury), *eugenia* (Fabricius), *omissa* Rothschild, *rhodopa* (Walker) and *phaedra* (Weymer) from India. However, Hampson (1920) restricted *R. phaedra* (Weymer) to East Africa, thus, leaving four Indian species under the genus *Rhodogastria*. Watson et al. (1980) accepted *Amerila* Walker as a valid generic name and mentioned that the correct type species of *Rhodogastria* Hübner & *Amerila* Walker are *Phalaena amasis* Cramer, and *Sphinx astreus* Drury, respectively. Whereas, Arora & Chaudhary (1982) again referred to Strand (1919) and reassigned *astreus* Drury to the genus *Rhodogastria* along with the confirmation of five Indian species under it. On the other hand, Koda (1987) described the male and female genitalic attributes of *astreus* (Drury) and studied it under the genus *Amerila*. The same nomenclature was followed by Holloway (1988). Häuser & Boppré (1997) restricted the species *A. phaedra* Weymer to East and South Africa. Singh & Singh (1999) added another species i.e. *Amerila arthusbertrandi* (Guérin-Méneville) to the Indian fauna, once again, raising the number of species under *Amerila* to five. But this species seems to be a wrong identification of *Amerila omissa* (Rothschild). Recently Dubatolov (2010)reassigned the previously known four

Date of publication (online): 26 February 2012
Date of publication (print): 26 February 2012
ISSN 0974-7907 (online) | 0974-7893 (print)

Editor: P.C. Pathania

Manuscript details:
Ms # o2942
Received 08 September 2011
Final received 30 December 2011
Finally accepted 19 January 2012

Citation: Singh, N. & J. Singh (2012). Genitalic studies of *Amerila eugenia* (Fabricius) (Lepidoptera: Arctiidae) from Karnataka, India. *Journal of Threatened Taxa* 4(2): 2398–2401.

Acknowledgements: The authors are grateful to Dr. Honey Martin, Lepidoptera section, Natural History Museum (NHM), London for providing photographs of types of *Amerila eugenia* (Fabricius) and *Amerila rhodopa* Walker which helped in identification. We are thankful to Dr. K.Venkataraman, Director, Zoological Survey of India, Kolkata for providing necessary facilities. Dr. V.V. Dubatolov of Siberian Zoological Museum, Novosibirsk, Russia also gave his kind suggestions in identification of *A. eugenia* (Fabricius) and *A. rhodopa* Walker. The financial help provided by Department of Science and Technology (DST), Government of India, New Delhi in the form of a major research project entitled "Taxonomic revision of Indian Arctiidae (Lepidoptera)" is duly acknowledged.

Abbreviations: 1A - First anal vein; 2A - Second anal vein; AED - Aedeagus; ANT.APO - Anterior apophyses; CO - Costa; CRN-Cornuti; CRP.BU - Corpus bursae; CU - Cucullus; CU_1 - First cubital vein; CU_2 - Second cubital vein; DU.BU - Ductus bursae; DU.EJ- Ductus ejaculatorius; HRP - Harpe; JX - Juxta; M_1 - First median vein; M_2 - Second median vein; M_3 - Third median vein; PAP.A - Papilla Analis; PO.APO - Posterior apophyses; R_1 - First radial vein; R_2 - Second radial vein; R_3 - Third radial vein; R_4 - Fourth radial vein; R_5 - Fifth radial vein; RS - Radial Sector; SA - Saccus; SC - Subcosta; SC+R_1 - Stalk of SC + R_1; SIG - Signum; SL - Sacculus; TG - Tegumen; UN - Uncus; VES - Vesica; VIN - Vinculum; VLA - Valvula; VLV - Valva.

species to the Indian *Amerila*.

In the present work, the external male and female genitalia of *A. eugenia* (Fabricius) has been studied and illustrated for the first time. In addition to this, the other three Indian species of the genus *Amerila* were also interpreted in respect to their external morphological characters, which revealed that *A. astreus* (Drury) and *A. omissa* (Rothschild) are easily separable, but *A. eugenia* (Fabricius) and *A. rhodopa* Walker are morphologically similar, which can only be separated by the slightly different colour of their abdomen. From the literature (Rothschild 1914; Hampson 1920) it is also clear that the area of distribution of both these species is almost similar. Therefore, the examination of external male and female genitalia of *A. rhodopa* Walker is of utmost importance for further review of both these species. A dichotomous key to all the four Indian species of the genus *Amerila* Walker has also been formulated and included.

Materials and Methods

The members of the genus *Amerila* Walker were exclusively collected with the help of light traps (equipped with mercury bulb) at night. The collected moths were euthanized in glass jars, fumigated with ethyl acetate vapours. The dead specimens were preserved in ento boxes, fumigated with napethalene balls. Identification was done with the help of literature and confirmed by comparison with the photographs of types received from the Natural History Museum (NHM), London. For the preparation of permanent slides of fore and hind wings, the method proposed by Common (1970) and advocated by Zimmerman (1978) was followed. For the study of external male and female genitalia, the methodology given by Robinson (1976) was followed. The diagrams of genitalia were drawn with the help of a graph eye piece fitted in a stereo zoom binocular on graph paper and was photographed with the help of a Leica stereo-microscope equipped digital camera. The terminology given by Klots (1970) has been followed in the present study for nomenclature purposes.

Observations

Genus *Amerila* Walker

Walker 1855, *List Spec. Lep. Ins. Colln. Br. Mus.* 3: 725.

Type species: *Sphinx astreus* Drury, 1773, by subsequent designation by Hampson, 1900a; *Ann. S. Afr. Mus*. 2: 60 (cited as *astreas*).

Distribution: India, Old world tropics, Africa and Australia (Hampson 1894; Holloway 1988).

Diagnosis: Labial palpi upturned; antennae simple in both sexes with more segments (80); forewing with vein R_3 & R_4 anastomoses to form short areole, R_2 & R_5 from areole, M_2 & M_3 from lower angle of cell; hindwing small with vein Rs & M_1 originating from upper angle of cell, Cu_1 before lower angle of cell; hind tibia with two pair of spurs; male genitalia with uncus short, vinculum u-shaped, saccus present, valve rounded, harpe hook/plough-like, outer wall of valve bears a retractile scent lobe, juxta divided into a dorsal plate and a ventral pocket, aedeagus short and broad with tubular vesica bearing two cornuti, ductus ejaculatorius entering sub apically; female genitalia with corpus bursae membranous, signa present, basal half of ductus bursae sclerotized and second half membranous.

Amerila eugenia (Fabricius)

(Image 1)

Noctua eugenia Fabricius, 1794, *Ent. Syst*. 3(2): 19–20.

Rhodogastria fraterna Moore, 1884, *Trans. Ent. Soc. Lond*. 1884: 356.

Rhodogastria astreas (Drury), Hampson, 1901, *Cat. Lep. Het*., 3: 504.

Rhodogastria eugenia (Fabricius), Rothschild, 1914, *The Macrolepidoptera of the World,* 10: 236–263.

Rhodogastria eugenia (Fabricius), Hampson, 1920, *Cat. Lep. Het*., 2: 529.

Amerila eugenia (Fabricius), Dubatolove, 2010, *Neue Ent. Nach.,* 65: 1–106

Material examined: Two males, 14.x.03, Ganeshgudi, Karnataka, 480m; one female, 2.x.05, Malshej Ghat, Karnataka, 690m. ex. light trap, coll. Navneet Singh and J.S. Kirti.

Adult description: Male 52mm; female 52mm. Vertex and frons whitish, spotted with black. Antennae simple in both sexes, scape light crimson, flagella brown. Labial palpi upturned, irrorated with crimson scale, extremity of each segment with a black band, underside white. Collar and tegula white with black spots. Thorax with white and black spots. Abdomen crimson, proximal half of first segment white, lateral and sub lateral series of black spots, underside white. Forewing with ground colour whitish opaque, two

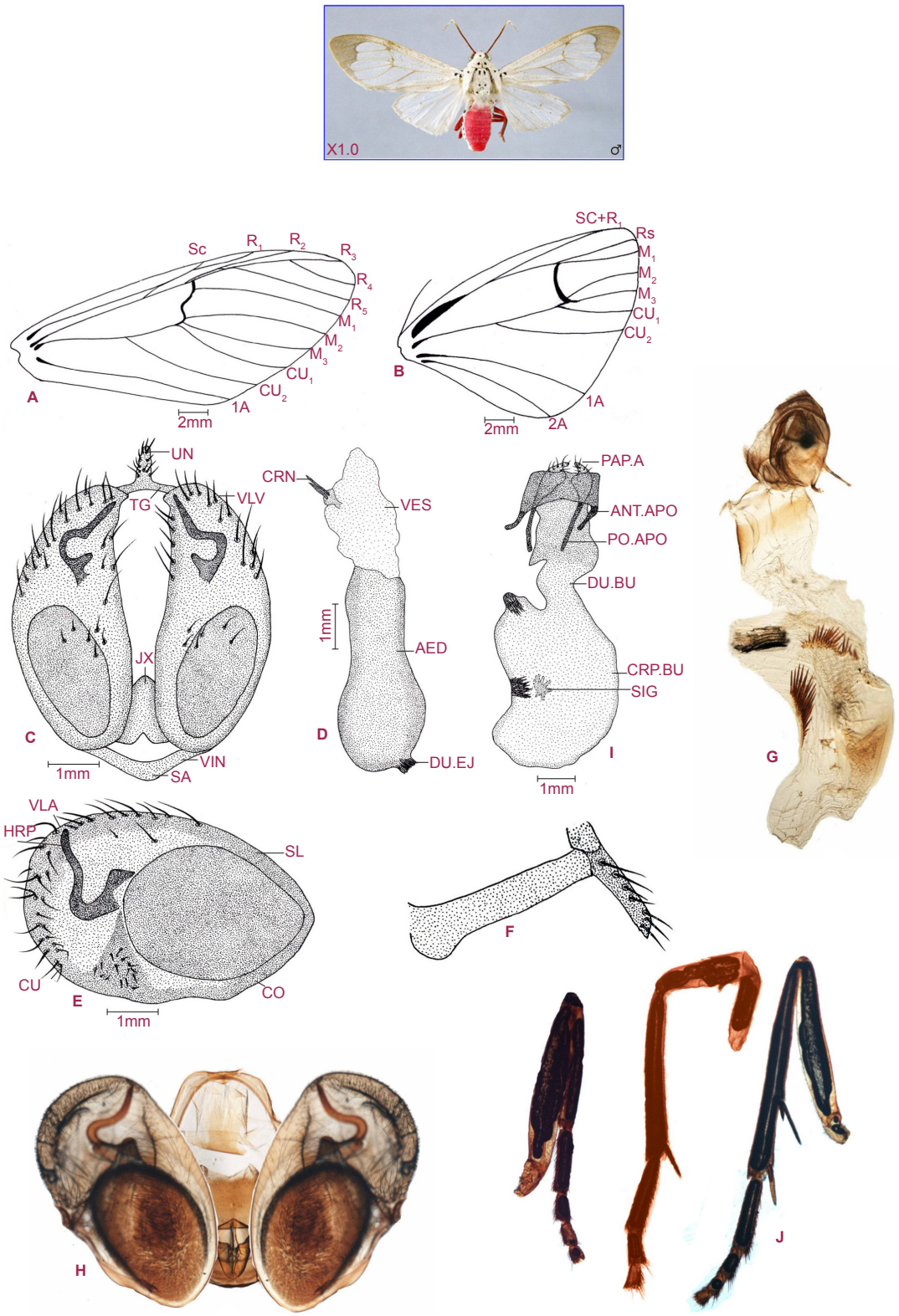

Image 1. *Amerila eugenia* (Fabricius).
A - Forewing; B - Hindwing; C & H - Male genitalia; D - Aedeagus; E - Valva (right); F - Uncus with Tegumen (lateral view); G & I - Female genitalia; J- from left to right: fore leg, mid leg & hind leg.

Key to the Indian species of the genus *Amerila* Walker

1. Forewing with a prominent dark brown band at discocellulars 2
- Forewing without any brown band at discocellulars 3

2. Abdomen crimson, aedeagus with vesica shorter, juxta simple ..... *astreus* (Drury)
- Abdomen white, apical and sub apical segments crimson, base with few crimson and pale rufous scales, aedeagus with vesica relatively much longer, juxta complex, partly divided into two .... *omissa* (Rothschild)

3. Abdomen carmine, aedeagus with vesica membranous, with two spines ..... *eugenia* (Fabricius)
- Abdomen red (genitalia not studied so far) ..... *rhodopa* Walker

basal black spots, costal area suffused with brown, an apical brown patch - broad at vein M_2 and narrowing towards vein CU_2, inner area tinged with brown. Veins as in genus. Hind wing with ground colour brownish-white, costal area suffused with brown scales. Veins as in genus. Legs: Coxae and femora crimson on upper side, under side fringed with white, hind tibia and tarsi covered with white scales, mid tibia with single pair and hind tibia with two pair of spurs.

Male genitalia: Uncus short and broad, gradually narrowing towards tip, setosed with short setae, sclerotized, tip pointed; acrotergite absent; tegumen longer than uncus, broad v-shaped; vinculum as long as tegumen, u-shaped, uniformly sclerotized; saccus weakly developed. Valve rounded with costa narrow and linear, weakly sclerotized; sacculus well differentiated; harpe well sclerotized, plough like; cucullus and valvula not differentiated; tip of valvae rounded, laden with small setae; outer wall of valvae with well developed retractile scent glands. Transtilla weakly sclerotized; aedeagus short and broad at base, slightly narrowing towards tip; vesica membranous, with two well sclerotized spines; ductus ejaculatorius entering subapically.

Female genitalia: Corpus bursae membranous, two signa present; ductus bursae short and broad, first half sclerotized; anterior apophyses shorter than posterior apophyses; papilla analis setosed with well defined setae.

Distribution: Punjab, central and southern India (Hampson 1920; Dubatolov 2010), Ganeshgudi, Malshej Ghat, Karnataka (present study).

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