

## Taxonomic studies of *Kamalia harutai* Sugi (Dicranurini: Notodontidae: Lepidoptera) from India

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### Abstract

The external morphological characters including the male and female genitalia of *Kamalia harutai* Sugi have been studied and illustrated in detail. The external morphological characters such as the shiny white forewings and thorax, black abdomen with white dorsal line and white tip and particularly the male and female genitalic features completely conform to the characterization of the genus.

**Keywords:** notodontidae, *Kamalia*, *harutai* and genitalia

### Introduction

Sugi (1992)<sup>[7]</sup> described this species under genus *Cerura* Shrank in *Moths of Nepal*. Schintlmeister (2002)<sup>[4]</sup> proposed a new genus *Paracerura* and shifted it to the new genus. Kocak and Kemal (2006)<sup>[3]</sup> formulated genus *Kamalia* with *tattakana* Matsumura as its type species as a replacement name for genus *Paracerura* Schintlmeister. They recognized *Paracerura* as invalid name because it is junior homonym of *Paracerura* Deharveng and Oliviera in Collembola and placed the present species under genus *Kamalia* Kocak and Kemal. Later, Schintlmeister (2008, 2013)<sup>[5, 6]</sup> and Kobayashi and Nonaka (2016)<sup>[2]</sup> followed this nomenclature. Kobayashi and Nonaka (2016)<sup>[2]</sup> placed *Kamalia* Koçak and Kemal along with nine other genera under tribe Dicranurini of subfamily Notodontinae. Presently, the genus *Kamalia* Kocak and Kemal is represented by fifteen species distributed in Oriental and Australian regions. The external morphological characters such as wing maculation, venation, and the male and female genitalic features of *Kamalia harutai* Sugi have been studied in detail.

### Materials and Methods

The adult representatives of the present species were collected from different localities falling in the States of Arunachal Pradesh, Mizoram and Meghalaya. The collected material was treated as per standardized techniques in Lepidopterology. The terminology for naming different parts of genitalia has been followed after Klots (1970)<sup>[1]</sup>.

### Genus *Kamalia* Kocak and Kemal

*Kamalia* Kocak and Kemal, 2006, *Cent. Ento. St. Ankara*, 104: 1

### Type species

*Cerura tattakana* Matsumura

### Distribution

India: North-East India, North-West India; Australia; Bangladesh; Bhutan; China; Indonesia; Myanmar; Nepal; Taiwan; Thailand; Vietnam.

### Diagnosis

Medium to large sized moths; white in colouration having black markings. Labial palpi porrect and small. Antennae black, bipectinate, pectination along entire length of the flagellum. Forewing shining white with black markings; M<sub>3</sub> from lower angle of cell; M<sub>2</sub> well above middle of discocellulars; M<sub>1</sub>-R<sub>3</sub> well stalked from upper angle of cell; areole present. Hind wing whitish; Sc+R<sub>1</sub> conjoined with discal cell at its middle. Legs hairy; fore-tibia with an epiphysis; mid-tibia and hind-tibia, each with a pair of tibial spurs. Male genitalia with hood-like uncus; gnathos well developed; aedeagus with prominent processes at its distal end.

### *Kamalia harutai* (Sugi)

(Figs. 1-10)

*Cerura harutai*, Sugi, 1992<sup>[7]</sup>, *Moths of Nepal*, 13: 95.

*Kamalia harutai* Sugi: Schintlmeister, 2008<sup>[5]</sup>, *Palaeartic Macrolepidoptera*, 1: 125; Schintlmeister, 2013<sup>[6]</sup>, 11: 229.

### Type locality

Nepal

### Diagnosis

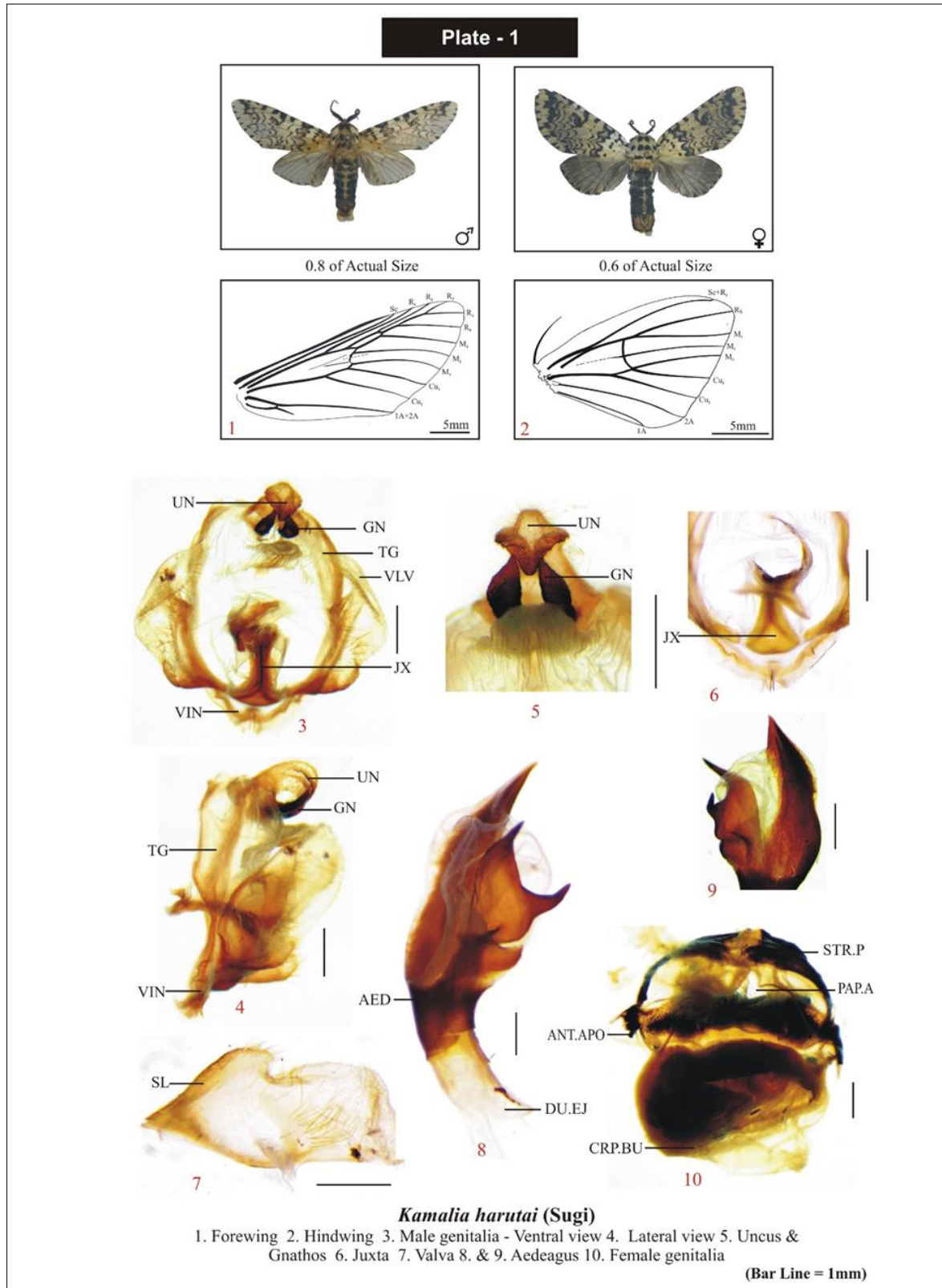
Head with vertex and frons white with few black scales below frons. Labial palpi porrect and small, dressed with black scales. Antenna black, bipectinate, pectination along entire length of the flagellum; scape dressed with white scales. Thorax, collar and tegula white; black spots on thorax and tegula; underside whitish with few black scales. Legs hairy, covered with white and black scales; fore-tibia with an epiphysis; mid-tibia and hind-tibia, each with a pair of tibial spurs. Abdomen black with a median white streak, sometimes with indistinct white bands; a white patch on distal end with semicircular mark on it; underside white.

### Wing maculation

Forewing with ground colour white; basal area with few black spots; costa with black streaks; subbasal dotted line; antemedial region two with highly wavy lines forming a band; medial and postmedial regions with curved black lines; termen with a series of black spots; underside whitish with fuscous patches on costa and near apex. Hind wing

whitish with few fuscous scales on apex, anal margin and discocellulars; outer margin with black spots; small

indistinct fuscous streak on tornus; underside white with black streaks on costa.



**Fig 1-10**

**Wing venation**

Forewing with discal cell more than half the length of the wing, closed; 1A from base of wing, anastomosing with 2A, covering one-third of anal margin; 2A from base of wing, reaching tornus; 3A absent; Cu<sub>2</sub> before three-fourth of cell; Cu<sub>1</sub> well before lower angle of cell; M<sub>3</sub> from lower angle of

cell; M<sub>2</sub> well above middle of discocellulars; M<sub>1</sub>-R<sub>3</sub> well stalked from upper angle of cell; R<sub>2</sub> well before upper angle of cell, sending a bar to common stalk of R<sub>5</sub>-R<sub>3</sub> to form an areole; R<sub>1</sub> beyond two-third of cell, not reaching apex; Sc from base of wing, not reaching apex. Hind wing with discal cell less than half the length of wing, closed; 1A from base

of wing running parallel to anal margin, reaching near tornus; 2A from base of wing, reaching tornus; 3A absent; Cu<sub>2</sub> from three-fourth of cell; Cu<sub>1</sub> and M<sub>3</sub> from lower angle of cell; M<sub>2</sub> from middle of discocellulars; M<sub>1</sub> and Rs stalked from upper angle of cell; Sc+R<sub>1</sub> from base of wing, conjoined with discal cell at its middle, reaching apex.

### Wing Expanse

Male: 60-70 mm; Female: 90 mm.

### Body length

Male: 29 mm; Female: 28 mm.

### Male genitalia

Uncus of medium size, slightly sclerotized, setosed, distal end curved, hood-like, walls at distal end sclerotized; gnathos highly sclerotized, both projections leaf-like, setosed, walls corrugated; tegumen U-shaped, slightly sclerotized, longer than vinculum; vinculum weakly sclerotized, saccus slightly produced, triangular; juxta well sclerotized, flask-shaped, distal end V-shaped with highly sclerotized walls. Valva simple, weakly sclerotized; sacculus with a setosed flap-like projection; setosed beyond middle Aedeagus with proximal end moderately sclerotized; ductus ejaculatorius entering directly; remaining part highly sclerotized, broad and divided; one arm large flap-like; other arm slightly curved, shield-like having narrow pointed projections distally; vesica without any distinct cornuti.

### Female genitalia

Corpus bursae large, globular, anterior one-third membranous, remaining highly sclerotized; ductus seminalis originating from lower region of corpus bursae; strigmatic plate highly sclerotized, broad in middle, narrowing towards lateral sides; anterior apophysis short, weakly sclerotized, broad at base with rounded apices; posterior apophysis long, narrow, almost 2X length of anterior ones; papilla analis triangular, small, setosed with micro and macro setae.

### Material examined

Arunachal Pradesh: Jenging, 13.v.2015, 2♀♀; Ramsing, 15.v.2015, 2♀♀; Sessa, 11.v.2013, 3♂♂; 12.v.2013, 1♂; Himachal Pradesh: Serighat, 10.viii.2013, 4♂♂; Meghalaya: Umtsor, 15.ix.2014, 1♂; Mizoram: Hmuifang, 03.ix.2015, 2♂♂; Hrangchal Kawn, 08.ix.2013, 1♂; Rabung, 17.ix.2015, 1♂; Thenzawl, 06.ix.2015, 1♂; 07.ix.2015, 1♂.

### Distribution

India: North-West India, North-East India; Bhutan; Nepal; Pakistan; Taiwan.

### Discussion

Schintlmeister (2002) [4] established genus *Paracerura* to accommodate the medium-large sized notodontid moths of Oriental region having shiny white forewings and thorax and black abdomen with white dorsal line and white tip. He recognized the known species of this genus in three groups on the basis of their male genitalic features, particularly the shape of the aedeagus. The *tattakana*-group is characterized by its long, slender and curved aedeagus. The members of the *harutai*-group have a prominent, well developed ("oversized") aedeagus and are generally smaller in size than the *tattakana*-group. The 3<sup>rd</sup> group contains only *P.*

*robusta* Schintlmeister, which is characterized by its unique processes of the valves. Kocak and Kemal (2006) [3] proposed a new name i.e., *Kamalia* as a replacement name for genus *Paracerura* Schintlmeister as they recognized *Paracerura* as invalid name because it is junior homonym of *Paracerura* Deharveng and Oliviera in Collembola. They placed the present this species under genus *Kamalia* Kocak and Kemal. This placement was followed by Schintlmeister (2008) [5] and Kobayashi and Nonaka (2016) [2]. Kobayashi and Nonaka (2016) [2] remarked Notodontinae as the largest subfamily in Notodontidae and recognized four tribes Neodrymoniaini Kobayashi, Stauroptini Matsumura, Dicranurini Duponchel and Notodontini Stephens. They placed *Kamalia* Koçak & Kemal along with nine genera namely *Cerura* Schrank, *Furcula* Lamarck, *Liparopsis* Hampson, *Pseudohoplitis* Gaede, *Shachia* Matsumura, *Harpyia* Ochsenheimer, *Dicranura* Reichenbach, *Neocerura* Matsumura and *Neoharpyia* Daniel under tribe Dicranurini.

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**Abbreviations:** 1A: First anal vein; 2A: Second anal vein; 3A: Third anal vein; AED: Aedeagus; ANT.APO: Anterior apophyses; CRP.BU: Corpus bursae; CU1: First cubital vein; CU2: Second cubital vein; GN: Gnathos; JX: Juxta; M1: First median vein; M2: Second median vein; M3: Third median vein; PAP.A: Papilla analis; R1: First radial vein; R2: Second radial vein; R3: Third radial vein; R4: Fourth radial vein; R5: Fifth radial vein; RS: Radial Sector; Sc: Subcosta; Sc+R1: Subcosta+First radial vein; SL: Sacculus; STR.P: Strigmatic Plate; TG: Tegumen; UN: Uncus; VIN: Vinculum; VLV: Valva.

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