A NEW SPECIES OF GENUS *MACDUNNOUGHIA* KOSTROWICKI (LEPIDOPTERA: NOCTUIDAE) FROM INDIA

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ABSTRACT: *Macdunnoughia kashmirensis* sp. nov. from Srinagar, Jammu & Kashmir (India) is described and recognized as a member of the *Macdunnoughia* species group. Superficially, the species closely resembles *Macdunnoughia confusa* (Stephens, 1850). A discussion of the discrimination of the two species *M. tetragona* (Walker, 1858), *M. confusa* (Stephens, 1850) along with new species are presented.

KEY WORDS: Lepidoptera, Noctuidae, *Macdunnoughia,* new species, India.

Noctuid moths (Noctuidae) with about 25000 known species (Fibiger, 1990) represent one of the most species-rich families of Lepidoptera. The genus *Macdunnoughia* was erected by Kostrowicki in 1961 and belongs to the family Noctuidae and subfamily Plusiinae. Ronkey et al. (2008) published the "Taxonomic Atlas" for Plusiinae, in which genus *Macdunnoughia* described with five species (*M. confusa*, *M. hybrida*, *M. crassisgna, M. purissima* and *M. tetragona*). In the manuscript, three species of *Macdunnoughia* have been described from Srinagar, Jammu and Kashmir (India). One species is described as new and two species viz. *M. confusa* and *M. tetragona* redescribed on the basis of male genitalia. The type specimens are deposited in NPC (Insect & Mites), Division of Entomology, IARI, New Delhi (India).

MATERIAL AND METHODS

All the specimens collected from Sher-e-Kashmir University of Agricultural Sciences & Technology, Srinagar (Jammu & Kashmir) by Ultra Violet light trap and brought to National Pusa Collection (NPC), Division of Entomology, Indian Agricultural Research Institute, New Delhi (India). The collected specimens were processed for preservation in NPC after relaxing, pinning and setting. For genitalic studies, abdomens were placed in 10% aqueous KOH and heated for 20 min at 90°C using a Dry Block Heizgerät-28000, then placed for 5 min in glacial acetic acid to remove the debris. The genitalia were subsequently stored in 70% ethanol. For photographs, the genitalia were placed on a slide in glycerol and covered with a cover slip. Photographs of antennae, lateral view of the mouthparts, scales and genitalia were captured using LEICA Application Suit ver. 2.8.2 software and a LEICA DFC-290 camera attached to a LEICA MZ16A stereozoom microscope. For external genitalia, the terminology follows Klots (1970) and Winter (2000). The specimens have been deposited in the National Pusa Collection (NPC), Division of Entomology, Indian Agricultural Research Institute, New Delhi, India.

DESCRIPTION

Genus *Macdunnoughia* Kostrowicki, 1961

Macdunnoughia Kostrwicki, 1961, *Acta Zoologica Cracoviensia* 6:402.
Type species : *Plusia confusa* Stephens, 1850

Synonym

Paraplusia Mukerji & Krishinamurthy 1955 : 295
Scleroplusia Ichinose, 1962 : 249

Key to three species of *Macdunnoughia* on the basis of male genitalia

1. Valvae broad, sacculus extension long 2
- Valvae broad, sacculus extension short spine like..... *Macdunnoughia tetragona*

2. Sacculus extension broad and pointed at apex; distinct projections at apex of vlavae.....*M. confusa*
- Sacculus extension broad and blunt at apex; no distinct projections at apex of valvae.....*M. kashmirensis* sp. nov.

1. *Macdunnoughia tetragona* (Walker, 1858)

(Figs. 1, 2, 3, 10, 13, 14, 19, 20 and 21)

Plusia tetragona Walker, (1858), List Spec. Lepid. Insects Colln Br. Mus. 12: 932
Plusia semivitta Moore, 1867, Proc. zool. Soc. Lond. 63, pl. 6, f. 13
Puriplusia zayuensis Chou & Lu, 1982, Insects of Xizang, 2: 98

Alar expanse: ♂ 3.0cm ± 0.05 (n=3)

Male: Vertex, frons and thorax dark grey, thorax with a very large spreading tuft. Labial palpi upturned, second segment long, third segment small, reaching upto vertex of the head. Antennae simple in filiform, ciliated, reaching about 3/4th length of forewing. Abdomen dark brown, with three large dorsal tufts on basal segments. Forewing elongated, grayish, hooked at outer angle, metallic markings being more brassy, those near outer margin less diffused, the costal portion of the sub basal line silvery, the antemedial line angled below median nervure, the two portions of the Y-mark narrow and silvery. Hindwing dark fuscous-grey in colour; legs long, beset with long hairs, deep brown in colour. Epiphysis present on prothoracic leg tibia, mesothoracic leg with a pair of tibial spur and metathoracic leg with two pairs tibial spurs.

Wing venation: Forewing with Sc arising from base of wing, ending near 3/4th of costa, R_1 arising near 3/4th of discal cell, accessory cell present, R_2 arising from accessory cell, R_3 and R_4 long stalked, R_3 to costa, R_4 to termen, R_5 connate with R_3 and R_4, M_1 arising near upper angle of discal cell, M_1, M_2 and M_3 free, M_2 near to M_3 basally than M_1, CuA1, CuA2 free, CuA1 arising from lower angle of discal cell, CuA2 arising at 2/3rd of cell, discal cell elongated, closed. Anal vein 1A long and 2A small, separate; hindwing with R_1 running into Sc from base of wing, joined by a bar with discal cell, Rs and M_1, M_2, M_3 free, CuA2 arising near 2/3rd of discal cell, CuP not present, 1A+2A fused straight, 3A present, discal cell closed.

Material examined: India: West Bengal, Darjeeling, ♂ 19.v.1928 leg. Bose; Meghalaya, Shillong, Khasi Hills, ♂ viii.1919 leg. T.B. Fletcher; Uttarakhand, Ranichauri, ♂ 07.x.2007, leg. Rajesh Kumar.

2. *Macdunnoughia confusa* (Stephens, 1850)

(Figs. 4, 5, 6, 11, 15, 16, 22, 23 and 24)

Plusia confusa Stephens, 1850, List. Spec. Brit. Anim. Colln Br. Mus. 5 (Lepidoptera): 291
Plusia gutta Guenée, 1852, In Boisduval & Guenée, Hist. nat. Ins., Spec. gén. Lépid. 6 (Noct. 2) : 346
Plusia bigutta Staudinger, 1892, In Romanoff, Mém. Lépid. 6: 545
confusa ab. *aestiva* (Krulikowski, 1908)
Phytometra confusa ab. *deangulata* Strand, 1917; Arch. Naturgesch. 82 A (2): 49
Plusia gutta ab. *grisea* Dannehl, 1933, Ent. Z. 47: 20
Macdunnoughia confusa f. *brunnescens* Lempke, 1966, Ent. Ber. Amst. 26: 270
Macdunnoughia monosigna Chou & Lu, 1979, Entomotaxonomia 1: 18

Alar expanse: ♂ 3.2cm ± 0.1 (n=13)
Male: Vertex, frons and thorax dark grey, thorax with a very large spreading tuft. Labial palpi upturned, second segment long, third segment small, reaching upto vertex of the head. Antennae simple in filiform, ciliated, reaching about 3/4th length of forewing. Abdomen dark brown, with three large dorsal tufts on basal segments. Forewing elongated, grayish, hooked at outer angle, metallic markings being more brassy, those near outer margin less diffused, the costal portion of the sub basal line silvery, the antemedial line angled below median nervure, the two portions of the Y-mark narrow and silvery. Hindwing dark fuscous-grey in colour; legs long, beset with long hairs, deep brown in colour. Epiphysis present on prothoracic leg tibia, mesothoracic leg with a pair of tibial spur and metathoracic leg with two pairs tibial spurs.
Wing venation: Forewing with Sc arising from base of wing, ending near 3/4th of costa, R_1 arising near 3/4th of discal cell, accessory cell present, R_2 arising from accessory cell, R_3 and R_4 long stalked, R_3 to costa, R_4 to termen, R_5 connate with R_3 and R_4, M_1 arising near upper angle of discal cell, M_1, M_2 and M_3 free, M_2 near to M_3 basally than M_1, CuA1, CuA2 free, CuA1 arising from lower angle of discal cell, CuA2 arising at 2/3rd of cell, discal cell elongated, closed. Anal vein 1A long and 2A small, separate; hindwing with R_1 running into Sc from base of wing, joined by a bar with discal cell, Rs and M_1, M_2, M_3 free, CuA2 arising near 2/3rd of discal cell, CuP not present, 1A+2A fused straight, 3A present, discal cell closed.
Material examined: India: Jammu & Kashmir, Srinagar, ix.1923, 3 ♂♂, leg. Fletcher; Jammu & Kashmir, Srinagar, 03-05.ix.2007, 10 ♂♂ leg. Rajesh Kumar.

3. *Macdunnoughia kashmirensis* sp. nov. Rajesh Kumar
(Figs. 7, 8, 9, 12, 17, 18, 25, 26 and 27)

Alar expanse: ♂ 3.35 ± 0.07 cm (n=2)
Male: Vertex, frons and thorax dark grey, thorax with a very large spreading tuft. Labial palpi upturned, second segment long, third segment small, reaching upto vertex of the head. Antennae simple in filiform, ciliated, reaching about 3/4th length of forewing. Abdomen dark brown, with three large dorsal tufts on basal segments. Forewing elongated, grayish, hooked at outer angle, metallic markings being more brassy, those near outer margin less diffused, the costal portion of the sub basal line silvery, the antemedial line angled below median nervure, the two portions of the Y-mark narrow and silvery. Hindwing dark fuscous-grey in colour; legs long, beset with long hairs, deep brown in colour. Epiphysis present on prothoracic leg tibia, mesothoracic leg with a pair of tibial spur and metathoracic leg with two pairs tibial spurs.
Wing venation: Forewing with Sc arising from base of wing, ending near 3/4th of costa, R_1 arising near 3/4th of discal cell, accessory cell present, R_2 arising from accessory cell, R_3 and R_4 long stalked, R_3 to costa, R_4 to termen, R_5 connate with R_3 and R_4, M_1 arising near upper angle of discal cell, M_1, M_2 and M_3 free, M_2 near

to M_3 basally than M_1, CuA1, CuA2 free, CuA1 arising from lower angle of discal cell, CuA2 arising at 2/3rd of cell, discal cell elongated, closed. Anal vein only 1A present; hindwing with R_1 running into Sc from base of wing, joined by a bar with discal cell, Rs and M_1, M_2, M_3 free, CuA2 arising near 2/3rd of discal cell, CuP not present, 1A+2A fused straight, 3A not present, discal cell closed.

Diagnosis: The *M. kashmirensis* differs externally from its close relatives, *M. confusa* by the lack of attachment with ovate silvery arm at the lower end of Y mark stigma which is always attached in the *M. confusa*. The male genitalia of *M. confusa* can be separated from *M. kashmirensis* by numerous projections present on apical portion of the valvae.

Material examined: ***Holotype***: India: Jammu & Kashmir, Srinagar, 05.ix.2007, ♂ leg. Rajesh Kumar. ***Paratype***: Jammu & Kashmir, Srinagar, 05.ix.2007, ♂ leg. Rajesh Kumar.

Etymology: The new species is named after the specific locality of "Kashmir" Jammu and Kashmir (India) from where two specimens were collected.

Discussion: This species were collected from western Himalayan region (Srinagar, Jammu & Kashmir) only. Rapid and divergent evolution of genitalia is common in several insect taxa. The characteristics of the male genitalia play the most important role in their taxonomic classification (Lafontaine, 1987; Fibiger, 1990; Fibiger, 1997). In this paper, we specifically described a new species on the basis of male genitalia. We observed the old specimens and recent collected specimens from the same location and explored the male genital structures of *M. confusa* and *M. kashmirensis*. So we found that the recently collected specimens are different in wing spotting and male genital features. On the basis of wing spotting and male genital difference, described it as new species.

The difference found morphologically in *M. confusa* (attached speck with Y-mark on forewing) and *M. kashmirensis* (separate speck with Y-mark on forewing). Another difference found in male genitalia valvae, in which the valvae of M. confusa have numerous distinct projections while the valvae of *M. kashmirensis* have smooth rounded and only one indistinct projection. The sacculus extension found pointed at apex in the *M. confusa* and blunt in *M. kashmirensis*. The other characters of male genitalia i.e. saccus, harpae and aedeagus were also compared, but could not find any major differences in these characters, except in valvae and sacculus extension. On the basis of these characters, we described this as new species.

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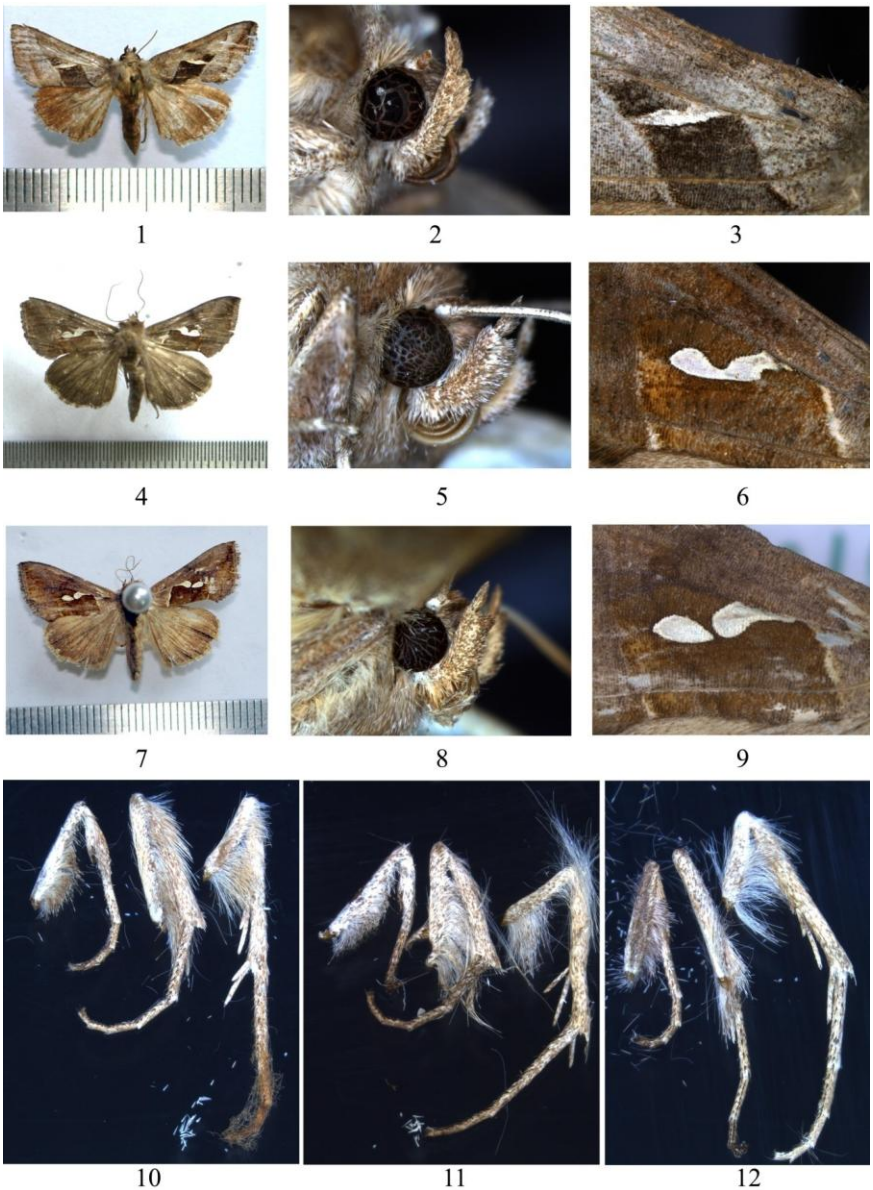
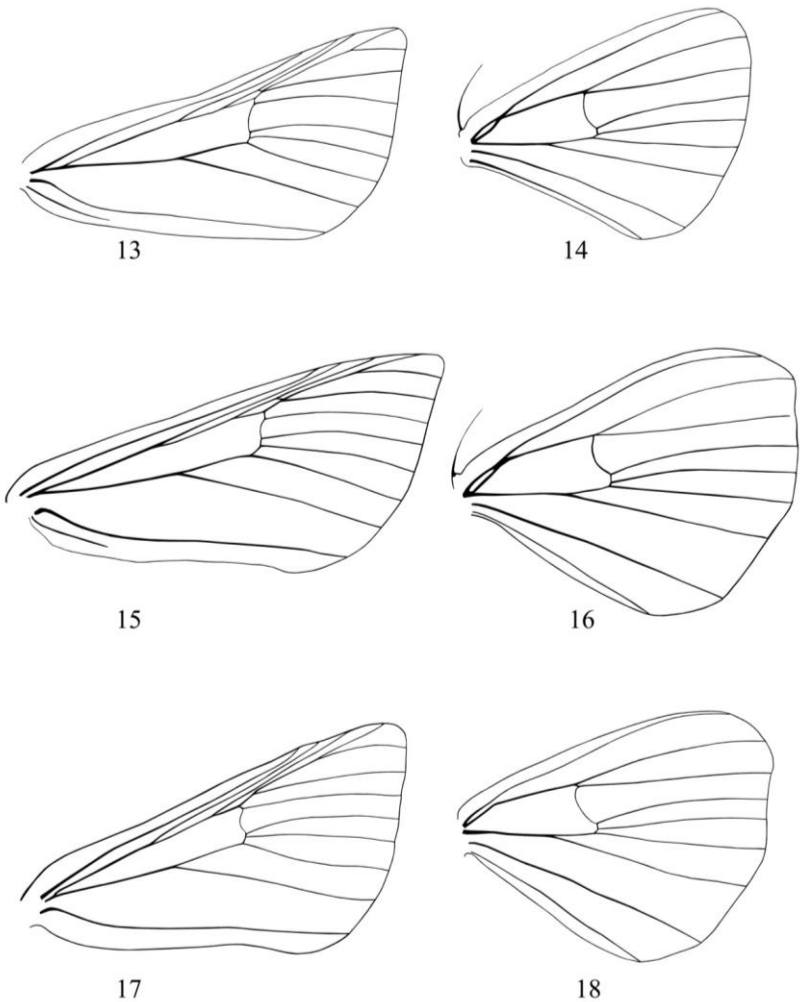
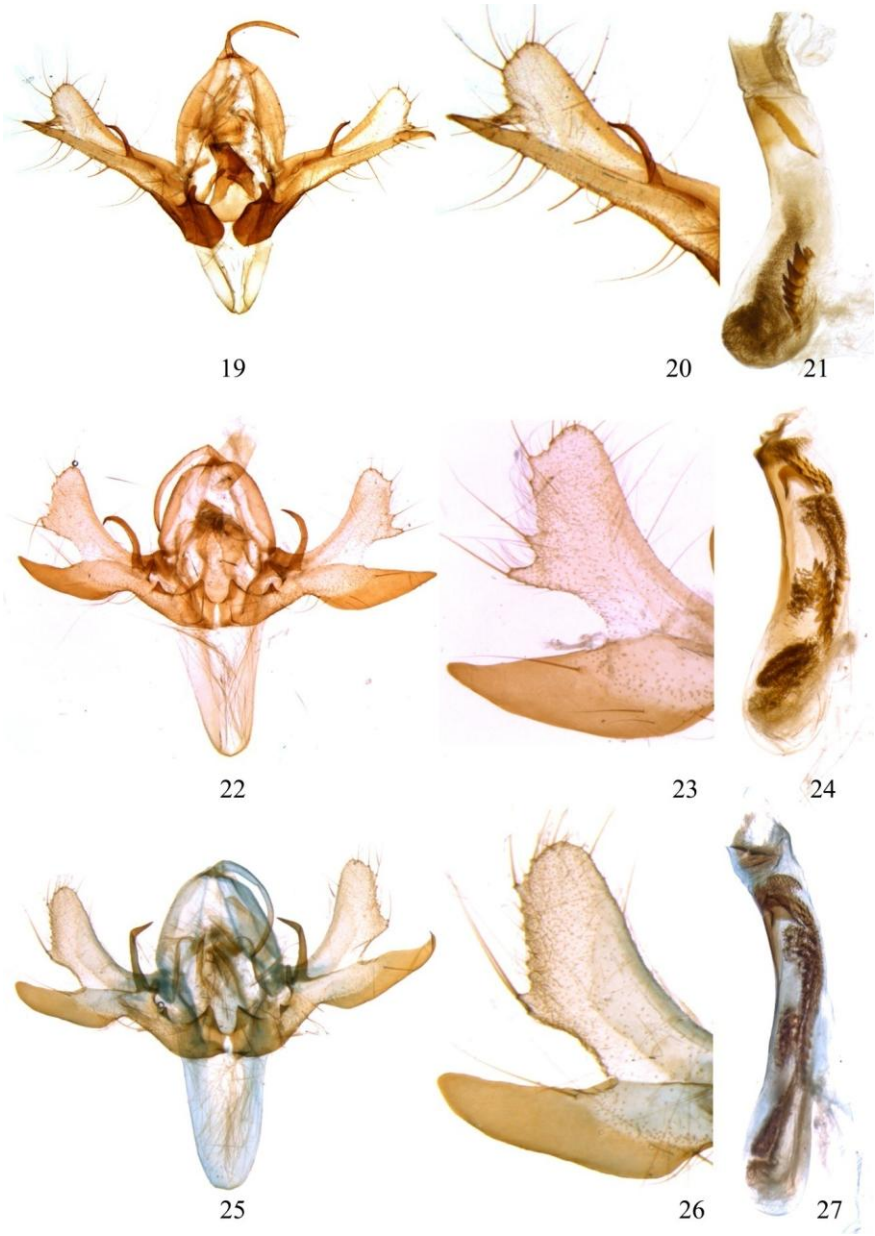


Figures 1-12. *Macdunnoughia tetragona* (Walker): 1. Habitus photograph, 2. Lateral view of mouth parts, 3. Enlarged view of fore wing spot, 10. Legs (Fore, Middle and Hind); *M. confusa* (Stephens): Figs. 4. Habitus photograph, 5. Lateral view of mouth parts, 6. Enlarged view of fore wing spot, 11. Legs (Fore, Middle and Hind); *M. kashmirensis* sp. nov. Rajesh Kumar: Figs. 7. Habitus photograph, 8. Lateral view of mouth parts, 9. Enlarged view of fore wing spot, 12. Legs (Fore, Middle and Hind).



Figures 13-18. *Macdunnoughia tetragona* (Walker): 13. Fore wing venation, 14. Hind wing venation; *M. confusa* (Stephens, 1850): 15. Fore wing venation, 16. Hind wing venation; *M. kashmirensis* sp. nov. Rajesh Kumar: 17. Fore wing venation, 18. Hind wing venation.



Figures 19-27. *Macdunnoughia tetragona* (Walker): 19. ventral view of male genitalia, 20. enlarged view of valva, 21. Aedeagus; *M. confusa* (Stephens, 1850): 22. Ventral view of male genitalia, 23. Enlarged view of valva, 24. Aedeagus; *M. kashmirensis* sp. nov. Rajesh Kumar: 25. Ventral view of male genitalia, 26. Enlarged view of valva, 27. Aedeagus.