INTERNATIONAL JOURNAL OF AGRICULTURE & BIOLOGY
ISSN Print: 1560–8530; ISSN Online: 1814–9596
19–1334/2020/23–2–471–474
DOI: 10.17957/IJAB/15.1310
http://www.fspublishers.org

Short Communication

A New Species of Genus *Hadena* (Hadeninae: Noctuidae: Lepidoptera) from Southern Punjab, Pakistan

Zahid Mahmood Sarwar[1*], Ayub Iqbal Malik[1], Alia Hayat[2] and Ali Zeshan[3]
[1]*Department of Entomology, FAS&T, Bahauddin Zakariya University Multan, Pakistan*
[2]*Department of Entomology, University of Poonch, Rawalakot, AJK Pakistan*
[3]*Department of Entomology, University of Agriculture, Faisalabad*
[*]For correspondence: zmsarwar@bzu.edu.pk; zahidsarwarbzu@gmail.com
Received 29 August 2019; Accepted 24 October 2019; Published 16 January 2020

Abstract

The internal genitalic structures of a new species of the genus *Hadena*, *i.e*., *H. multanensis* sp. nov have been described and illustrated for the first time. The reporting of the species from Qadirpur town localities of District Multan with its new record from Pakistan. © 2020 Friends Science Publishers.

Keywords: Lepidoptera; Noctuidae; *Hadeninae*; *H. multanensis*

Introduction

Arthropods have great diversity and many are still not identified which is one of the most important and challenging scientific tasks. Biodiversity inventories of arthropods in different regions of the world have shown high diversity patterns, especially in Coleoptera and Lepidoptera (Erwin 1982; Brehm *et al*. 2005) The most well-known family of the order Lepidoptera is the family Noctuidae which is the largest family of insect pests containing more than 35,000–40,000 members (Holloway *et al*. 1987; Vajgand 2000; Volynkin 2012). The body of noctuid moths is covered with glossy hairy eyes and members are nocturnal. These moths are difficult to identify as many species of Noctuidae have similar wing markings (Paul *et al*. 2014). Noctuid moths are cosmopolitan in nature and they may attack any part of the plant such as the foliage, shoot, roots or fruits (Tayyab *et al*. 2006: Jagbir *et al*. 2013).

The family Noctuidae contains many genera out of which the genus *Hadena* is the most difficult to identify because their species lack spines on tibia but other genera have spines on tibia that are helpful tools for identification of genus *Hadena* (Hampson, 1892). This genus was described by Schrank 1802 and classified this genus into two groups, the M group and the N group According to the results species like *atriplicis, typica, chenopodii, pisi, oleracea, xanthographa, piniperda* and *deaurata* belong to group M while the other species *culosa, cucubali* and *lucipara* belong to group N.

Hubner (1816) described two species, *typica* and *cucubali*. then these two species were excluded by Ochsenheimer (1816) who emphasised that the species did not belong to *Hadena* but *cucubali* became the type of the original *Trubeule.* Ochsenheimer (1816) reviewed the genus *Hadena* and described 29 species in this genus, while Schrank (1802) described only 11 in the M and N groups. The families were re-established by Schrank (1802) and excluded all species of *Hadena* belonging to group M, but included all families of group N.

Grote (1876) reviewed the Hubner's classification and gave a different name to species, which were classified by Schrank as well as modifying the spellings of these species. Smith (1899) subsequently identified a new species as *Xylophasia runata* Smith (Lepidoptera: Noctuidae) and described this new species only on the basis of morphological characters by describing the genitalia of its male and female. Troubridge and Lafontaine (2002) revised and synonymised *Hadena hausta* Grote (Lepidoptera: Noctuidae) and *Hadena tonsa* Grote (Lepidoptera: Noctuidae) and described the species on the base of male and female genitalia. Troubridge and Lafontaine (2002) synonymised, *Hadena laevigata* (Lepidoptera: Noctuidae) (Barnes and Benjamin 1924) with *Hadena ectrapela* Smith (Lepidoptera: Noctuidae) (Smith and Dyar 1898), in addition to this, the genus of *Hadena mimula* Grote (Lepidoptera: Noctuidae) (Grote 1883) was changed to *Lacinipolia* McDunnough 1937.

McCabe (2003) described the diversity and taxonomy of *Hadena ligata* Moscher (Lepidoptera: Noctuidae) and identified one new specie belonging to another genus, *Dypterygia scabriuscula* Linnaeus (Lepidoptera: Noctuidae). Hacker and Gyulai (2013) revised the genus *Hadena* by providing a hierarchy of all taxa and their

taxonomic classification. Due to all these changes, present study was designed to identify one of the unidentified species of genus *Hadena*, on the basis of genitalic characters Species description was followed as per ICZN Rules.

Materials and Methods

The current study was conducted during 2015–2017 in different localities (Band Bosan, Qadirpur, Chowak Bahadar, Peran Gaib and Lutfabad) of Multan having GPS coordinates of 30^0 11'N, 71^0 27'E. In the selected sites, light traps were installed; the moths were picked out manually from the wire cages and later shifted to Department of Entomology, Bahauddin Zakariya University, Multan, Pakistan.

Processing of moths

The collected specimens were put in a potassium cyanide jar (potassium cyanide, plaster of Paris, few drops of water) for killing the specimens, then these were instantly soaked in wet butter paper up to 24 h to soften the all body parts along with both wings and the adult moths were stretched and pinned accordingly.

Fore and hind wings were detached from the abdomen by giving a gentle upward jerk and immersed into alcohol (70%) up to 1–2 min and then dipped in sodium hypochlorite (NaOCl) for 10–20 min for descaling. Washed both wing 2–3 time with distilled water. Afterwards, the wings were transferred into glacial acetic acid for 10 min and then dipped into carboxylol for 15 min followed by mounting on glass slides.

In order to study male and female genitalia, the abdomens of the specimens were separated from the body with help of fine forceps by avoiding damage to other body parts. Abdomens were dipped into 10% potassium hydroxide solution to relax the musculature sufficiently, while KOH crystals were removed by washing with distilled water 2–3 times. For the removal of male or female genitalia the dissection of abdomen was done with the help of fine forceps and needles under a stereoscope microscope. Genitalia were dipped into ascending concentrations of alcohol (50, 60 and 70%) for more clearance. The dissected genitalia were mounted permanently with Hoyer's medium on slides and these slides were placed horizontally up to 7–10 days to dry completely. Slides of genitalia were observed under a stereo-microscope with a camera attachment. The identification was done up to species level with the help of keys and available literature. The Photography of all body parts and dichotomous key were also provided (Dichotomous key was made for all species of genus *Hadena*, which have been already described globally).

Results

Key to studied species of genus *Hadena*

1. Fore wing blackish brown along with wing span 30–40 mm……..2
Forewing has blackish spot and darker grey in color, with wing span 12-23 mm.....***H. ectypa*** **Morrison 1875**
2. Hind wing almost smoky grey in color along with vestigial M2…… ……..…...….***thula*** **Strecker 1875**
Hind wing buffish, Blackening in color and prominent M2 is prsent.....3
3. White outline is present in Large claviform and fore wing has eye like spots...***perplexa*** **Denis Schiffermuller 1775**
Simple and short claviform is present just beneath the orbicular.....4
4. Fused stigmata is present forming white color patch and M2 is present.....***confusa*** **Hufnagel 1766**
Simple stigmata is present and vestigial M2 occur in hind wing.....5
5. Lighter penicular hairs are present on thorax and slight black blotches are present at the central of forewing.....***caesia*** **Denis and Schiffermuller 1775**
Dark brownish penicular hairs are present on the thorax and no any dark blotches are present in costa of fore wing.....6
6. Segmented abdomen with pointed tip, hind wing has darker and irregular outer margin.....
.....***capsincola*** **Denis and Schiffermuller 1775**
Simple abdomen with rounded end and hind wing outer margin is smooth.....7
7. The pronotum is Hump like, horizontal whitish lining are present on the forewing.....***albimacula*** **Borkhausen 1792**
Hump is not present on the pronotum, fore wing has blackish eye like spot.....8
8. Penicular hairs are present on tegument of male genitalia on both sides, ampulla of left valve is lobed shaped literally and 2-3 spine are present on crona.....***multanensis*****. sp.nov**
Tegument of male genitalia is simple and without penicular hairs and crona rounded, narrow neck and without spines.....9
9. Triangular juxta is present in male genitalia; Saw like structure occur on harp of left side.....***trifoli*** **Walker 1766**
Not triangular juxta in male genitalia; harp plane not saw-toothed laterally.....10
10. Juxta is small in male genitalia; v-shaped vinculum; Aedeagus has apical cornuti.....stigmosa **Christopher 1887**
Juxta is pair shape in male genitalia; u-shaped vinculum; Aedeagus has sub apically cornuti....***jahangiri*** **Schrank 1802**

Material examined

Punjab: Multan: *H. multanensis*. Band Bosan 04 ♂♂, 12.VI.2015, Chowk Bahadar 03 ♂♂, 17.VI.2015, Peran Gaib 02 ♂♂, 19.VI.2015 and Lutfabad 03 ♂♂, 27.VI.2015 Ayub Iqbal Malik. Specimens of already described species were also collected like, *H. trifoli* were collected from different localities of Multan such as Band Bosan 09 ♂♂, 03.V.2015, Chowk Bahadar 13 ♀♀, 07.V.2015, Peran Gaib 18 ♂♂ and ♀, 02.VII.2015 and Lutfabad 10 ♂♂, 10.VII.2015. *H. jahangiri* were collected from Band Bosan 12 ♀♀, 14.VII.2015, Chowk Bahadar 07 ♀, 08.VIII.2015, Peran Gaib 14 ♂♂,

Fig. 1: Adult of *Hadena multaniensis* Sp. Nov.

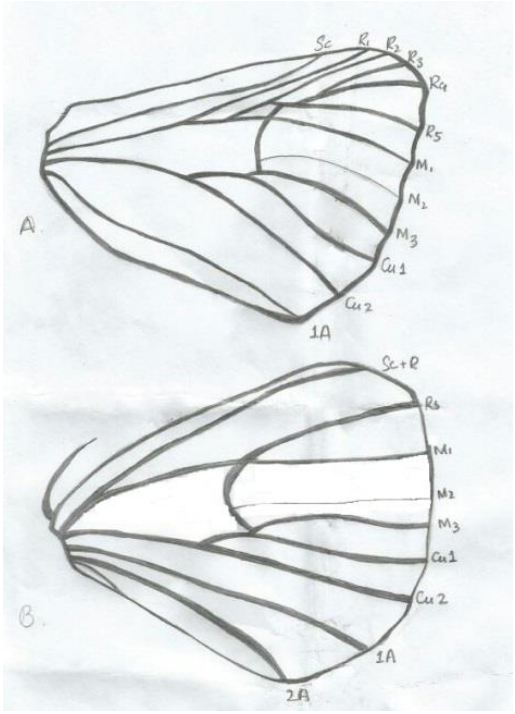

Fig. 2: (A) Fore wing and (B): Hind wing of *Hadena multaniensis* Sp. Nov**.**

21.VIII.2015 and Lutfabad 16 ♀♀, 04.VII.2015. Adults of *H. stigmosa* were also observed from Band Bosan 08 ♀♀, 24.VII.2015, Chowk Bahadar 15 ♂♂ and ♀, 27.VII.2015, Peran Gaib 11 ♀♀, 24.VII.2015 and Lutfabad 19 ♀♀ and ♂, 28.VIII.2015. *H. confusa* were examined from district Multan. Band Bosan 17 ♀♀, 05.IX.2015, Chowk Bahadar 13 ♂♂, 13.IX.2015, Peran Gaib 08 ♀♀, 18.IX.2015 and from Lutfabad 21 ♀♀ and ♂, 01.IX.2015.

***Hadena multaniensis* Sp. Nov.**

Diagnosis: Insects of this genus have broad and narrow wings. Upturned palpi with long hairs and third joint were small in length. Hairy eyes are the distinguishing character

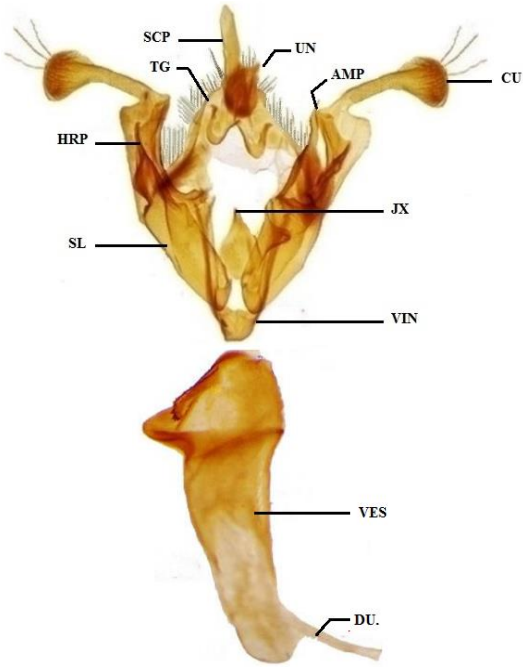

Fig. 3: (A): Male genitalia (B): Aedeagus of *Hadena multanensis* Sp. Nov.

which differentiates it from other genera. The male has a flattened and squarely-scaled thorax and ciliated antennae (Fig. 1). The proximal segment of the abdomen has dorsal tufts, which is an important feature of this genus. Tibia is without spine. Hind wings are wide and small, 3rd and 4th veins arising from a cell or with a very short stalk (Fig. 2).

Male genitalia: Scaphium is w-shaped at base but cylinder -shaped interiorly; uncus hook-like with a small neck, two long hairs are also present on the both sides of uncus; valve asymmetrical, tegument wide and long; peninsular hairs present; sacculus well developed; harpe of right valve is elongated and not digitate; left valve ampulla is with broad head, lacking teeth laterally; cucullus round with long narrow neck; dense hairs are present on corona which is also fringed with two or three long spine-like setae; vinculum broad and u-shaped; juxta triangular with tapering tip and broad base; aedeagus rod-shaped with broad head somewhat triangular in shape, vesica granulated; ejaculatorious ductus inserting from the lateral side (Fig. 3).

Female: Female of *H. multanensis* not found and total 12 paratypes of this species were collected from district Multan.

Discussion

Types: Holotype was trapped from Multan town with the help of light trap on 12 June 2015.

Etymology: The Name of species epithet is derived from the name of locality (Multan).

Remarks: The new species is very closely related to already describe species *i.e*., *Hadena trifoli* but differs from the subsequent remarks:

1. Tegument fringed with penicular hairs on both sides in *H. multanensis* but these hairs are absent on the tegument of *H. trifoli.*
2. 2-3 long spines like setae are present on crona in *H. multanensis* but no any type of setae are present on the crona of *H. trifoli.*
3. The ampulla of left valve is plane and without teeth in *H. multanensis* but in *H. trifoli* ampulla of left valve has teeth laterally.
4. Aedeagus broader and triangular shape on upper side in *H. multanensis* but Aedeagus of *H. trifoli* is narrow and rod-shaped.
5. Juxta is triangular with a broad base and tapering anteriorly in *H. multanensis* but Juxta has a broad tip in *H. trifoli*.
6. Cucullus with a long and narrow neck in *H. multanensis* but the cucullus neck is shorter in length in *H. trifoli.*

Acknowledgement

The authors would like to thank the Higher Education Commission of Pakistan for providing financial support of this study. The authors declare that they have no conflict of interest.

References

Brehm G, LM Pitkin, N Hiltand, K Fiedler (2005). Montane Andean rain forests are a global diversity hotspot of geometrid moths. *J Biogeogr* 32:1621–1627

Barnes W, FH Benjamin (1924). *Contributions to the Natural History of Lepidoptera of North America*, 5: 100–101

Erwin TL (1982). Tropical forests: Their richness in Coleoptera and other arthropod species. *Coleopt Bull* 36:74–75

Grote AR (1876). Arctic Lepidoptera in the White Mountains. *Psyche J Entomol* 21:131–131

Grote AR (1883). On genus *Stiria*, with new genera and species of Noctuidae. *Papilio* 3:29–33

Hubner J (1816). *Verzeichniss Bekannter Schmettlinge*, p: 431. Sic Augsburg

Hampson GF (1892). *The Fauna of British India including Ceylon and Burma*, p: 527. Taylor and Francis Ltd, London

Holloway J, D Bradley, DJ Carter (1987). CAB International Institute of Entomology, London. Guides to Insects of Importance to Man. *Lepidoptera* 1:262

Hacker HH, P Gyulai (2013). Supplement to the revision of the genus *Hadena* Schrank, 1802 by Hacker (1993, 1996). *Espernia* 18:225–253

Jagbir SK, AD Mudasir, ZH Khan (2013). Species diversity and abundance in subfamily Catocalinae (Noctuidae: Lepidoptera) from Kashmir Himalaya. *Ann Entomol* 31:1–8

McDunnough J (1937). Notes on North American Noctuid Genera. *Can Entomol* 69:58–66

McCabe TM (2003). *Hadena ligata* Möschler (Lepidoptera: Noctuidae): distribution and revised taxonomy. *Zootaxa* 260:1–4

Ochsenheimer F (1816). *Die, Schmetterlinge von Europa*. Vol. 4, p: 224. Leipzig, Gerhard Fleischer

Paul AC, BP LeRu, VDB Johnnie, S Fritz (2014). Ecology of the African maize stalk borer, *Busseola fusca* (Lepidoptera: Noctuidae) with special reference to insect-plant interactions. *Insects* 5:539–563

Schrank FP (1802). *Fauna Bioca. Durchgedachte Geschichte der in Baiern Einheimischen und Zahmen Thiere*, p: 412. Sweyter band. Zweyte Abtheilung. J.W. Krüll, Ingolstadt

Smith JB, HG Dyar (1898). Contributions toward a monograph of the lepidopterous family Noctuidae of boreal North America, a revision of the species of *Acronycta* [sic] (Oschsenheimer) and of certain allied genera. *Proc. US Natl Museum* 21:1–194

Smith JB (1899). Some new species of *Hadena*. *Can Entomol* 31:257–265

Troubridge JT, JD Lafontaine (2002). Revision of species of the "*Oligia"semicana* group (Lepidoptera: Noctuidae) with descriptions of a new genus and 12 new species. *Can Entomol* 134:157–191

Tayyab M, S Anjum, Shazia, A Muhammad (2006). Biodiversity of lepidopterous insect in agro-forest area of Bahawalpur. *Pak Entomol* 28: 5–9

Vajgand DK (2000). Slaved fauna (Lepidoptera: Noctuidae) in Sombor, (Serbia) with particular reference to the population dynamics of the most numerous species. *Master's Thesis*, p: 125. University of Novi Sad, Serbia

Volynkin AV (2012). A review of the genus *Dasypolia* Guenèe, 1852 from the Russian part of the Altai Mountain Country, with description of two new species (Lepidptera: Noctuidae). *Zootaxa* 3478:416–428