

A TAXONOMIC REPORT OF EIGHT NEWLY RECORDED AND LITTLE KNOWN SPECIES (LEPIDOPTERA) OF INDIA AND KASHMIR HIMALAYAN NOCTUIDAE

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ABSTRACT

Eight Noctuidae species; *Amphipyra herrichschaefferi* Hacker and Pek, *Catocala ammonfriedbergi* Kravchenko *et al.*, *Cucullia splendida* Cramer, *Lacanobia oleracea* (Linnaeus), *Lophotyna albosignata* Moore, *Characoma ruficirra* Hampson, *Simplicia caeneusalis* (Walker) and *Noctua orbona* Hufnagel are newly added to the Himalayan fauna and five to India. In addition, taxonomic notes of all the eight recorded, little known Noctuids are discussed with the description of male and female genitalia. Figures illustrating adults and both sexes' genitalia are also provided.

Keywords: Taxonomic, New records, Himalaya.

INTRODUCTION

Lepidoptera comprising butterflies and moths is one of the most economically important insect orders. This group is suitable for quantitative comparisons between insect faunas to be valid especially for their abundance, species richness, response to vegetation and climate, their ease of sampling using light traps, relatively advanced taxonomy and being common and well known insects due to very attractive colours and patterns on their wings. Family Noctuidae is of immense economic significance. Larvae of almost all species are phytophagous, and no parts of plants remain unexploited. Because of their phytophagous habits and high reproductive rate, many species are important pests [1].

Taxonomic studies on various groups of Insects are very much required in India. There are very few revisionary works being taken up by leading taxonomists in this country. An attempt has been made to review the entire work taken up on this family by eminent workers from different parts of the world. The perusal of relevant literature reveals that only few taxonomists have made an attempt to study this economically important group of moths in our country. Pioneer and earlier known workers

who have worked on the taxonomy of the family Noctuidae are Linnaeus (1758), Fabricius (1793, 1794) and Hubner (1805) [1-5]. These workers made significant contribution to the taxonomy of family Noctuidae. Hampson (1894) was a great worker who contributed tremendously to Indian Noctuidae. His "*Fauna of British India Moths*" included description of 1415 species pertaining to 273 genera. In comparison to limited taxonomic research on Indian Noctuidae, the family has been better attended to in other parts of the world.

Most of the collections lying in different National museums like Forest Research Institute (FRI), Dehradun, Indian Agricultural Research Institute (IARI), New Delhi and Zoological Survey of India (ZSI), Calcutta are still carrying old nomenclature. It is the need of the hour to conduct revisionary studies on various groups by conducting intensive and extensive collection cum survey tours from far flung localities of various states of India. After giving proper taxonomic treatment to various species the authentic identification is required. This becomes essential in view of the knowledge accumulated during the last 7-8 decades. Taxonomic revision of Noctuidae becomes utmost and very important.

With this background the state of Jammu and Kashmir was selected for the study on the taxonomy of family Noctuidae.

MATERIALS AND METHODS

During the last four years (2009-2013), 30 major collection tours and 25 of short duration were conducted in various localities situated in the state of Jammu and Kashmir falling in an altitudinal range of 1000-5500m. Various localities were systematically explored for the collection of adult representatives of family Noctuidae every year twice or thrice. Sampling was conducted at sites dominated by the most representative vegetation types of the region. Altitude of each site was measured with digital altimeter and enough attention was given to the areas above 2000m. Different types of insect trapping techniques with the help of portable light traps and vertical sheet methods were used. Procedures adopted by eminent taxonomists like Common (1970); Robinson (1976) and Zimmerman (1978) [6-9] were followed for the preparation of wing and genitalia slides of all adult representatives of Noctuidae. The microscopic examination of various morphological features was performed with the help of zoom binocular microscope fitted with an ocular grid. The photography of male and female genitalia was done with an Image processing unit, "Olympus" digital camera (7.2 MP, CA Media C-7070).

OBSERVATIONS

As mentioned earlier, Hampson (1894) made the most significant contribution on Indian Noctuidae. His monumental work in the form of a faunal treatise on the Noctuidae in the Fauna of British India, series, Moths, volume II & III was a unique contribution and laid basic foundation for taxonomy of Noctuidae in India. Hampson depended upon various morphological features like, antennae, eyes, labial palpi, wing maculation, wing venation, thorax, legs and abdomen to characterize various taxa. One of the serious drawback in his great work was that he could not study external male and female genital structures. An attempt has been made to describe these species-specific characteristics in all the species studied here in this manuscript. During the present studies, intensive and extensive collection-cum-survey tours were conducted in far-flung localities of Jammu and Kashmir. As many as 2356 adult Noctuid specimens were collected. A total number of 90 species of the family Noctuidae, referable to 58 genera and 15 subfamilies i.e., Acronictinae, Amphipyrinae, Calpinae, Catocalinae, Chloephorinae, Cucullinae, Euteliinae, Hadeninae, Heliiothinae, Hermaninae, Hypeninae, Noctuinae, Plusiinae, Sarrothripinae, Stictopterinae were captured from diverse localities of Jammu and Kashmir. The classification given by Lafontaine and Fibiger (2006) [10] has been adopted in the present research work. All these species were identified

with the help of literature and authentically confirmed by comparison with reference collections lying in the different National museum. Four genera *Simplicia* Guenee, *Lacanobia* Billberg, *Lophotyna* Hampson and *Characoma* Walker and 8 species viz., *Amphipyra herrichschaefferi* Hacker and Pek, 1998, *Catocala ammonfriedbergi* Kravchenko *et al.*, 2007; *Cucullia splendida* Cramer, 1777 *Lacanobia oleracea* (Linnaeus, 1858), *Lophotyna albosignata* Moore, 1881, *Characoma ruficirra* Hampson, 1905, *Simplicia caeneusalis* (Walker, 1879) and *Noctua orbona* Hufnagel have been recorded for the first time from Kashmir Himalaya and five from India.

Eight Species New to India And Kashmir Himalaya:

1. *Amphipyra herrichschaefferi* Hacker and Peks

Morrison, 1874, *Proc. Bost. Soc. Nat. Hist.*, 17 : 153.

Head, thorax and forewing clothed with brownish grey; antennae simple and ciliate; palpi porrect; forewing with a whitish speck at end of cell; indistinct subbasal, double crenulate antemedial and postmedial lines; indistinct single lunulate submarginal lines; orbicular and reniform indistinct; area beyond postmedial line whitish; hindwing reddish brown, cilia white slightly tinged with red brown; underside ochreous white suffused with brown.

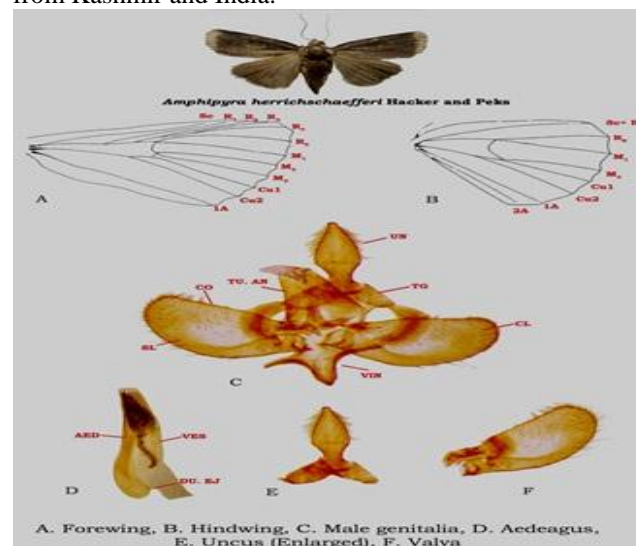
Male Genitalia: Uncus arrow head shaped; scaphium with tuba analis highly sclerotized very broad cone like; tegument short and broad; vinculum tube like highly sclerotized; saccus small; valvae flat and leaf like, fringed with fine hairs; costal margin nearly straight, distal margin curved; aedeagus short and stout; vesica composed of a patch of spicules, with s-shaped cornuti.

Female Genitalia: Not Studied.

Material examined: **Bandipora:** Bagtore, 2467m, 2♂♂, 06.ix.2012; Dawar, 2434m; 1♂, 8.vii.2010, Izmar, 2500m, 3♂♂, 27.vi.2009, 7.ix.2012.

Distribution: Afghanistan, China.

Remarks: This species has been reported for the first time from Kashmir and India.



2. *Catocala ammonfreidbergi* Kravchenko et al.

(Fabricius, 1794, *Ent. Eyst.*, 3(2) : 55.)

Thorax covered with grey scales and hairs; abdomen pale brownish grey. Forewing pale grey, hardly irrorated dark grey, with yellowish tint; antemedial line oblique, undulated; postmedian line with v-shaped projection beyond cell, with a smaller one immediately dorsal to it, bending sharply, then in a vertical s-curve to dorsum; orbicular stigma absent; reniform stigma oval, dark outlined, with a pale patch. Hindwing scarlet, black median band hardly angled, evenly curved, not reaching dorsum; fringe yellowish white.

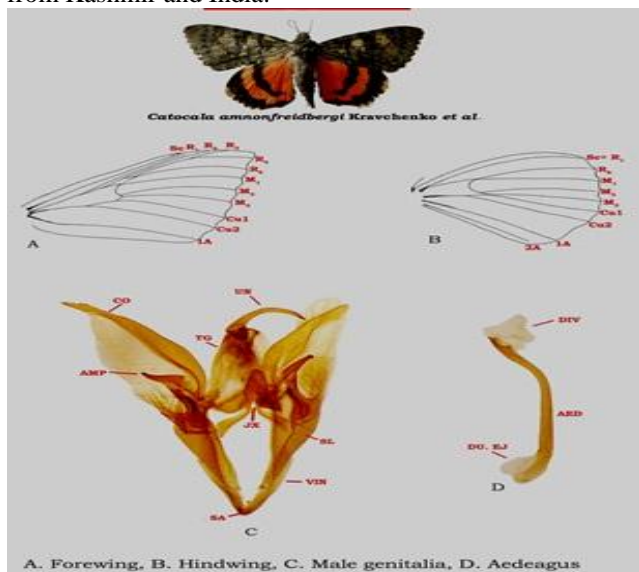
Male Genitalia: Uncus narrow, evenly curved, with small apiculus; scaphium a weakly sclerotized ridge; valvae strongly asymmetrical, the right valva longer than left, with much more heavily sclerotized costa widely extending beyond the membranous part; ampulla of right side tapering apically; left ampulla globular apically; vinculum v-shaped; tegumen broad and long; aedeagus straight in middle third, weakly angled towards base and curved distally; basal diverticulum irregular shaped, ductus ejaculatorius entering near base; cornuti absent.

Female Genitalia: Not Studied.

Material examined: Leh: Stakna, 3385m, 1♂, 5.viii.2010; Zanskar, 3605m, 2♂♂, 30.vii.2010.

Distribution: Isreal.

Remarks: This species has been reported for first time from Kashmir and India.



3. *Cucullia splendida* Stoll

Stoll, 1782, *Pap. Exot.*, 4: 242.

Forewing silvery blue green; inner margin ochreous from before middle to torus; head and thorax white tingled with grey or brown; tegulae with pure white medial band; discal cell approximately one-third length of wing, vein Sc slightly curved towards costa, hindwing white; veins and terminal half tinged with brown; cilia

white. hindwing with discal cell half the length of wing, vein Sc+R₁ connected with cell at base, straight, veins R₅ and M₁ approximated basally, then radiating; vein M₂ weak, veins M₃ and Cu₁ connate from lower angle of cell, veins Cu₂ from middle of lower angle of cell, veins 1A and 2A prominent and strong.

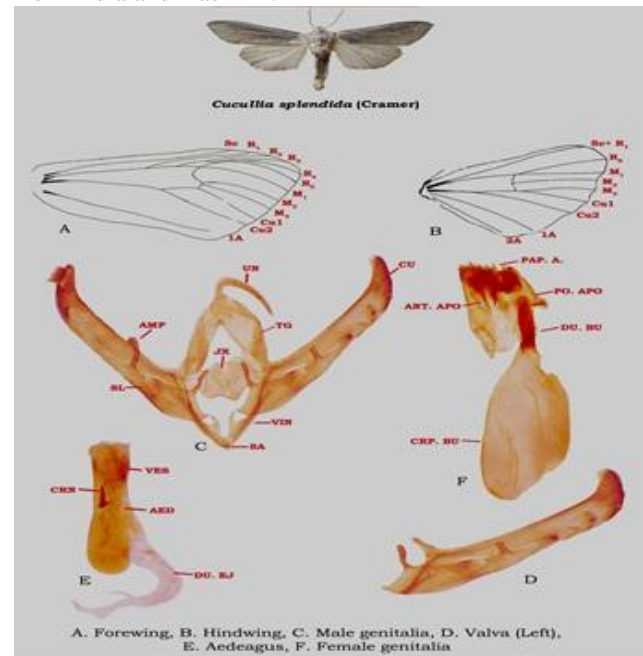
Male Genitalia: Uncus sickle shaped; tegument broad and flat; valva asymmetrical long and narrow curved apically; harpe absent; ampulla asymmetrical, right long and left short; vinculum broad; sacculus well differentiated; costa straight; cucullus pointed; juxta broad, often specialized, bifurcate dorso-lateral appendages; dentate bar of carina very strongly sclerotized; vinculum v-shaped; saccus present; sedaeagus long and cylindrical; cornuti in the form of a well sclerotized small spine, centrally located; ductus ejaculatorius entering from the lateral side.

Female Genitalia: Ovipositor lobes rounded broad with setae on inner surface, outer surface with long sparsely placed setae, each papilla triangular with blunt tips; anterior and posterior apophysis short, rod like and of equal length; ostium membranous; ductus bursae short, highly sclerotized and straight; corpus bursae bag like, elongate, funnel shaped near ductus bursae junction, broad centrally and proximal end bulged towards apex; without any signum.

Material examined: Kishtwar: Padder, 2800m; 1♂, 28.ix.2010. **Ramban:** Ramban, 1780m, 2♂♂, 26.ix.2010, 27.ix.2010. **Kupwara:** Lolab, 2500m, 2♀♀, 3.vii.2011. **Leh:** Hunder, 3300m, 3♀♀, 2♂♂, 5.vii.2010; Stakna, 3385m, 1♀, 2♂♂, 5.viii.2010.

Distribution: Russia; Siberia; Mongolia; Manchuria; Sarepta; Zeller; West Siberia; Tibet; Turkestan; Mangolia.

Remarks: This species has been reported for the first time from India and Kashmir.



4. *Lophotyna albosignata* Moore

Moore, 1881, *Proc. Zoo. Soc.*, : 355.

Forewing with whitish subbasal and antemedial lines, the latter oblique; head and thorax whitish, suffused with pale red-brown; abdomen with fuscous; orbicular and reniform ochreous with chestnut outline, latter with four white specks on its outer edge; a postmedial whitish line excurved beyond cell, area beyond it suffused with ochreous, with an indistinct submarginal chestnut line; cilia fuscous. Hindwing whitish, inner area suffused with fuscous.

Male Genitalia: Uncus short and strong curved; tegument short; costa highly curved; valvae well developed, asymmetrical, broad, cucullus with broad neck, ampulla strong, triangular, sclerotized; juxta shield-like structures; vinculum v-shaped well sclerotized; saccus thin line like; aedeagus long, concave in the middle, boat shaped, proximal part highly sclerotized, mouth like upper side toothed; vesica membranous with strongly sclerotized anterior part; vesica lack cornuti; ductus ejaculatorious entering from the lower end.

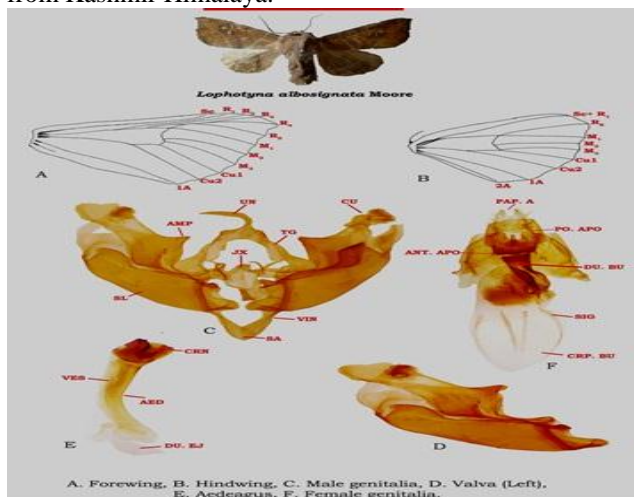
Female Genitalia: Papillae analis thin and long, densely fringed with hairs; anterior apophyses half the length of posterior apophyses; ostium bursae funnel shaped, broadened, sclerotized; ductus bursae strong, broad and short, highly sclerotized; corpus bursae elongate fusiform, proximal end highly sclerotized with numerous wrinkles, distal end membranous without wrinkles; four long longitudinal rows of signum present.

Material examined: Baramulla: Affarwatt, 4000m, 2♀♀, 3♂♂, 21.vii.2011; Gulmarg, 2843m, 3♀♀, 2♂♂, 10.vi.2009, 15.vi.2012; Kangdori, 3200m, 2♀♀, 1♂, 2.ix.2010; Tangmarg, 2400m, 1♀, 1♂, 3.ix.2010.

Budgam: Doodpather, 2900m, 3♀♀, 4.vi.2009, 20.vi.2012; Yousmarg, 2600m, 1♀, 1♂, 21.v.2009.

Distribution: Europe; Armenia, Asia Minor, Persin, W. Turkistan; Japan, Korea.

Remarks: This species has been reported for the first time from Kashmir Himalaya.



5. *Lacanobia oleracea* (Linnaeus)

Linnaeus, 1858, *Syst. Nat.* 10 : 517.

Head and thorax dull red-brown; abdomen ochreous brown. Forewing rather dull red-brown; veins and costal area irrorated with white; a small white tuft at base faint traces of a waved white subbasal line from costa to submedian fold; an indistinct antemedial line excurved in interspaces and angled inwards on median nervure and vein 1; claviform rufous; orbicular small, irregularly rounded, with whitish annulus; reniform indistinctly defined by brown, open above, with an orange spot in its upper part; traces of an oblique medial line from lower angle of cell to inner margin; postmedial line indistinct, dentate, often produced to a series of white points on veins, subterminal line white, indistinct towards costa; cilia with a fine pale line at base. Hindwing yellowish white, slightly tinged with brown; veins and terminal area suffused with brown; underside with costal and terminal areas slightly irrorated with brown and tinged with purplish pink, a small discoidal spot and curved postmedial series of striae on veins.

Male Genitalia: Uncus short, apically strongly curved, pointed terminally; tegument moderately broad, roundly margined, mounded at the junction with uncus; valve very broad at base, sclerotized; cucullus spoon shaped with long neck and rounded apically; carina with dentate bar and most often with a strong acute tooth-shaped process ventrally, saccus broad; armed with strong and long harpe; curved apically; juxta broad, ampulla short finger like; vinculum v-shaped highly sclerotized; saccus small; aedeagus short and stout, with two small spines one medial and second subapically; distal end contained a number of cornuti packed with each other; vesica membranous; ductus ejaculatorious enters from lateral side.

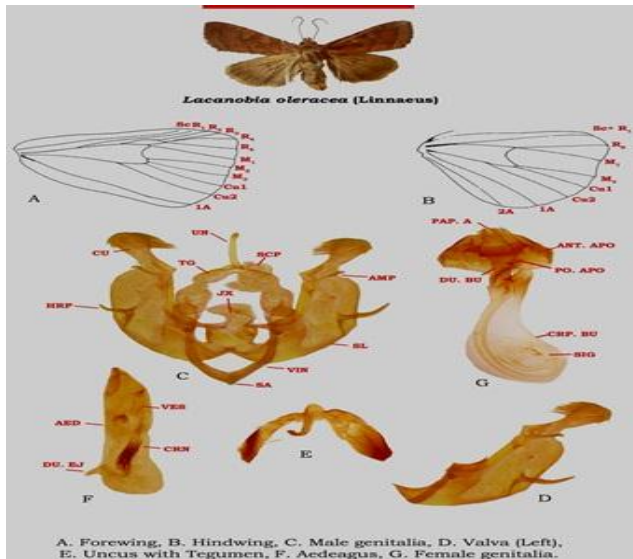
Female Genitalia: Ovipositor lobes short, triangular, well developed, fringed with long and short setae; posterior apophyses longer than anterior apophyses; both strong and sclerotized; ductus bursae short and broad funnel like, highly sclerotized; corpus bursae elongated, falks like with long neck; proximal end with longitudinal wrinkles, distal portion membranous; bean shaped 2 signum.

Material examined:

Budgam: Doodpather, 2900m, 1♂, 20.vi.2012; Yousmarg, 2600m, 3♂♂, 21.v.2009. **Ganderbal:** Baltal, 3300m; 7♂♂, 21.viii.2011, 5.vii.2012; Thajiwas, 3200m, 2♀♀, 04.vii.2012.

Distribution : England; France; Germany; Asia Minor.

Remarks: This species has been reported for the first time from Kashmir Himalaya.



6. *Simplicia caeneusalis* (Walker)

Walker, 1859, *List. Spec. Lep. Ins. Br. Mus.*, 16: 94.

Head and thorax light brown; abdomen dark brown; palpi prominent and upturned; first segment short; second segment longest; third tapering towards apex reaching vertex of head; articulated antennae/central swelling in males; filiform in females; forewing light brownish; subbasal, antemedial, medial, and postmedial indistinct lines; submarginal line straight and yellowish white; orbicular and reniform spots indistinct; fore tibia produced into a sheath; an elongated first tarsal segment; hindwing fuscous brown, with very indistinct antemedial, postmedial marginal fuscous bands; an obtusely submarginal line; underside suffused with fuscous brown.

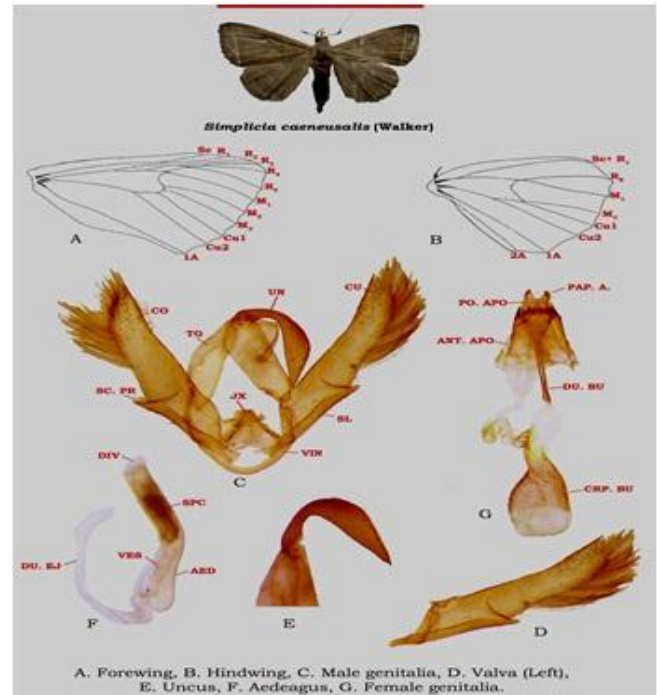
Male Genitalia: Uncus linguiform, birds head shaped, broad in centre and pointed at apex with short spine; tegument long and broad; valve narrow and long, with dense and strongly covered hairs at apex; sacculus well differentiated, with a triangular out growth from ventral margin; juxta rounded; vinculum broad u-shaped; saccus wanted; corona with pointed apex, triangular fringed with dense long hairs; aedeagus long, curved at medial, proximal part highly sclerotized; ductus ejaculatorius entering from the posterior end; vesica highly sclerotized proximally; vesica with numerous tiny spinules.

Female Genitalia: Ovipositor lobes short, with hairs; anterior apophyses larger than posterior apophysis nearly double the length; ostium funnel like; ductus bursae long slender highly sclerotized; corpus bursae elongated, flask like; distal portion membranous; proximal part highly decorated with numerous small granules.

Material examined: Bandipora: Dawar, 2434m, 7♀♀, 16♂♂, 10.vi.2009, 8.vii.2010.

Distribution: Europe; Persin, Turkistan; Japan; Coreia; China; Australia, America.

Remarks: This species has been reported for the first time from Kashmir and India.



7. *Noctua orbona* Hafnagel

Hafnagel, 1766, *Berl. Mag.*, 3 : 304.

Head, thorax and abdomen coloured not crested; orange-yellow in colour like the hindwings. Forewings pale ochreous to dark brown, umber or fuscous; almost plain; reniform defined; orbicular defined; claviform undefined; hindwings terminally dark-banded, yellow, or orange; conspicuously patterned; dark outer band contrasting spectacularly with brightly coloured inner part; with a clear discal mark, or without a clear discal mark; without transverse lines; vein 5 of hindwings strong distally; arising nearer to vein 6 than to vein 4; convergent on vein 4 near their bases.

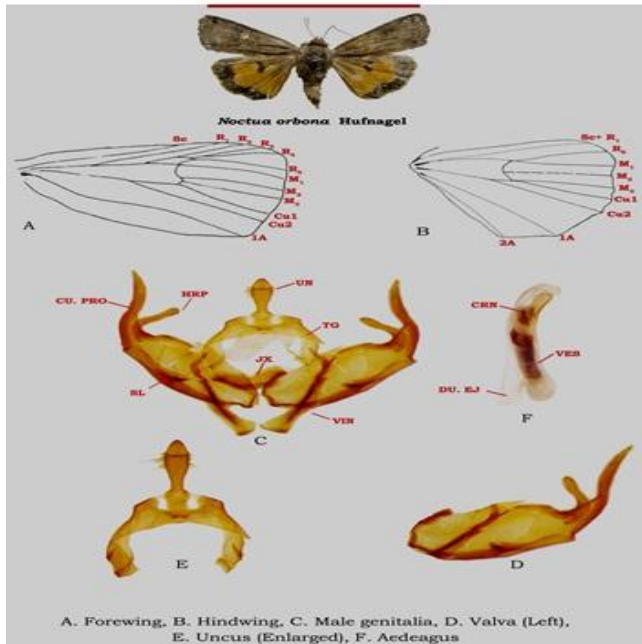
Male Genitalia: Uncus short, thumb like; tegument short and broad with flat arms anteriorly; socci well developed at the base of uncus; valve relatively short, broad at base; sacculus highly sclerotized tubular; harpe long, strong, medially curved, finger like; cucullus very elongate strong long tube shaped; cucullar extension pointed at apex; vinculum strong tubular; saccus wanting; aedeagus cylindrical-tubular, curved at centre; vesica darkly sclerotized, with few small cornuti; ductus ejaculatorius projects laterally from distal end of vesica.

Female Genitalia: Not studied.

Material examined: Baramulla: Affarwatt, 4000m, 3♂♂, 21.viii.2011, Gulmarg, 3000, 1♂, 10.vi.2009, 15.vi.2012; Kongdori, 3300m, 2♂♂, 2.ix.2010; Tangmarg, 2500m, 3♂♂, 3.ix.2010.

Distribution : British Isles; N. France; Scotland; Belgium; Holland; Germany; Denmark; Sweden.

Remarks: This species has been reported for the first time from Kashmir and India.



8. *Characoma nilotica* Hampson

Hampson, 1905, *Ann. Mag. Nat. Hist.* 16 (7) : 540.

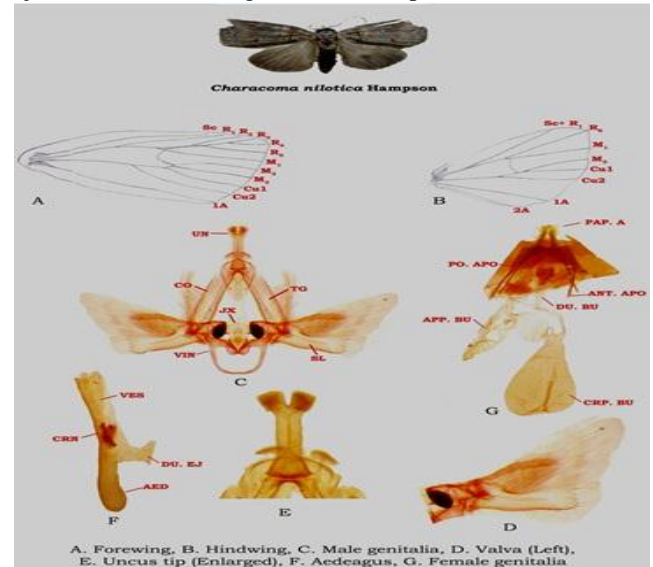
Head and thorax mixed rufous and some black scales, tegulae with slight dark line near tips; antennae fuscous except towards base; fore tibiae with some black points, tarsi black ringed with white, mid tarsi black at tips; abdomen fuscous light brown; paler at base, ventral surface white. Forewing white tingled in parts with rufous and irrorated with fuscous; subbasal line black, waved from costa to submedian fold, a black streak before it in cell; antemedial line black; hindwing semihyaline white veins, costa and termen tingled with brown.

Male Genitalia: Uncus very much elongate, upturned straight, bifid apically and bearing a tuft of long hairs at the tip; tuba analis prominent; scaphium well developed; tegumen with elongate arms; vinculum broad u-shaped; valvae short, not well developed; sacculus moderately developed with a fringe of long hairs; development of a darkly scaled process from the transtilla; aedeagus moderately long, broad at the anterior and posterior end,

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tapering at the center; vesica with a large v-shaped spine-like median sclerotized carnuti at the center; ductus ejaculatorious entering at the middle portion.



Female Genitalia: Ovipositor lobes short, sclerotized and setosed; anterior and posterior apophyses nearly of same length, strong tubular, sclerotized; genital plate circular without any notches; ostium bursae, simple; ductus bursae very long; corpus bursae elongate ballon like; well developed appendix bursae; signum absent; bulla seminalis small and membranous.

Material examined: Srinagar: Shalimar, 1627m, 2♀♀, 2♂♂, 21.iv.2009.

Distribution: Japan; Borneo; N.E.Himalaya.

Remarks: This species has been reported for the first time from Jammu and Kashmir.

It is tangible and first step ahead in the staired pathway to the taxonomic revision of Noctuidae. Much more can be achieved with more intensive and extensive collection-cum-survey tours in more localities of this state. Future studies should be encouraged along with other important aspects like ecotaxonomy, molecular taxonomy along with morphological systematics.

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