



## Taxonomic Studies on Three Species of Genus *Asota* Hübner (Erebidae: Lepidoptera) from Himachal Pradesh, India

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**ABSTRACT:** The present study has been undertaken from 04 districts i.e., Kangra, Mandi, Bilaspur and Hamirpur of state Himachal Pradesh. In all, 03 species i.e., *Asota ficus* (Fabricius), *A. caricae* Fabricius and *A. plaginota* Butler of genus *Asota* Hübner have been collected and taxonomically studied. The details on their distribution, diagnosis, adult description and their male and female genitalia have been given. The coloured photographs of adult moths, labial palpi, legs, wings and genitalia have also been given in the form of plates. The dichotomous key for these species is also provided.

**Keywords:** *Asota ficus* (Fabricius), *A. caricae* Fabricius, *A. plaginota* Butler, Lepidoptera, Erebidae, Punjab.

### INTRODUCTION

Genus *Asota* Hübner belongs to subfamily Aganainae of the family Erebidae and relationships of this subfamily have long been disputed (Kitching, 1984). Generally, the group has been treated as a separate family or subordinated within the Arctiidae based on venation and the bar-shaped retinaculum, but the lack of both a tymbal organ and pheromone glands associated with the anal papillae (Holloway, 1988) precludes the latter position (Kitching and Rawlins 1998). A relationship with Noctuidae was first suggested by Gardner (1941) based on larval characters. Kitching (1984) excluded them from the Noctuidae because aganaines have a prespiracular counter-tympanal hood, but the spiracle is actually between two weak hood-like structures (Holloway 1988). Minet (1986) included aganaines in Noctuidae because they possess both his proposed noctuid apomorphies. Additional features support placement of aganaines in Noctuidae (Kitching and Rawlins 1998). The forewing pattern includes an orbicular stigma which, although frequently obscured by other pattern elements on the upperside, is clearly visible on the ventral side (Holloway, 1988). The labial palps are upright, with an elongate, thin third segment.

Hampson (1892) studied all the three species under genus *Hypsa* Hübner. Though, the *Asota* Hübner has been split into several by some authors, Inoue *et al.*

(1982) have recognized *Lacides* Walker (type-species: *ficus* Fabricius) and *Psephea* Billberg (type-species: *caricae* Fabricius) as a distinct genus. Contrary to this, in view of apomorphic feature of a small oval yellow orange patch of scent scales anterior to the centre of the hindwing subcosta on the upperside in male in both *Lacides ficus* Fabricius and *Psephea caicae* Fabricius, they are considered as synonyms of *Asota* Hübner (Holloway, 1988). The latter generic name is followed in the present studies. Further, according to Scoble (1995), it is more appropriate to describe the presently collected material in Aganaine, which is characterized by long and upwardly pointed antennae (Common, 1970). Regarding the placement of the species, the consultation of literature shows that they belong to the genus *Asota* Hübner with the genera such as *Aganais* Boisduval, *Aspa* Walker, *Damalis* Hübner, *Euimata* Billberg, *Hypsa* Hübner, *Lacides* Walker and *Psephea* Billberg as its synonyms (Holloway, 1988). The examination of male genitalia reveals that the valve are simple and elongated, somewhat expanded apically with a single harpe at the end of sacculus. The aedeagus is short, broad, the vesica large, bearing a small group of cornuti or a single cornutus. The coremata are usually small and well developed. All the above characters conforms the diagnosis of genus *Asota* Huber. The congeneric nature of all the three species is further evident from female genitalia in which the

ductus bursae is poorly sclerotised towards base. By and large, the venation also depicts their congenericity as the closed discal cell is about half the length of the forewings in which an aerole is present.

## MATERIAL AND METHODS

Forty-seven examples (25 males and 22 females) of adult moths were collected by installing portable light traps at various agricultural fields of 05 different localities of Himachal Pradesh. The collected specimens were killed with ethyl acetate vapors. The dead specimens were pinned and stretched properly on stretching boards. The dried specimens were labeled and preserved in collection boxes of insect cabinets. The method proposed by Common (1970) and advocated by Zimmerman (1978) has been followed for the preparation of permanent slides of forewing and hindwings. For genitalic studies the abdomen was detached from the specimen and placed in a 10% solution of Potassium hydroxide (KOH) and boiled in a water bath. The dissections of genitalia were done with fine needles and forceps under a stereo zoom binocular microscope by gently pressing the anterior end of abdomen. The sclerotised external genitalia were

separated out. The genitalia then upgraded and stained with eosine and stored in glass vials containing clove oil. The line diagrams of wing venation have been drawn by the camera lucida. The coloured photographs of various morphological characters and genitalia were taken with the Leica microscope (MZ-16).

## OBSERVATIONS

### Genus *Asota* Hübner

*Asota* Hübner, [1819] 1816, *Verz. bekannter Schmett.*, (11) 164.

**Type-species:** *Phalaena javana* Cramer.

**Distribution:** Throughout India, Ceylon and Burma, Africa, Malayan and tropical portions of Australian regions.

**Diagnosis:** Palpi upturned, the second joint reaching vertex of head, the third slender and variable in length. Antennae fasciculated in male, ciliated in female. Forewing with vein 5 from the lower angle of cell or just above it; 6 from upper angle or below it; the aerole short. Hindwing with vein 5 from just above lower angle of cell; 6 and 7 from upper angle.

**Key to the species of genus *Asota* Hübner:**

- |    |  |                                 |
|----|--|---------------------------------|
| 1. | Male with fasciculate cilia of antennae long, male genitalia with uncus somewhat broad basally, valve with saccular portion comparatively not well defined, aedeagus with single cornuti present apically; female genitalia with ductus bursae long .....  | <b><i>Ficus Fabricius</i></b>   |
| 2. | Male fasciculate cilia of antennae short, male genitalia with uncus narrower basally, valve with saccular portion very well defined, aedeagus with two long cornuti present basally; female genitalia with ductus bursae of moderate length or small ..... | 2                               |
| 3. | Male with vinculum U shaped, tegumen arms sclerotised; female with ductus bursae very small, simple .....  | <b><i>Caricae Fabricius</i></b> |
|    | Male with vinculum V shaped, tegumen arms membranous; female with ductus bursae of moderate length, inner surface scaled with fine crests .....  | <b><i>Plaginota Butler</i></b>  |

### *Asota ficus* (Fabricius)

*Noctua ficus* Fabricius, 1775, *Syst. Ent.*, 595.

#### (Plate-1, Figs. 2-9)

**Description:** Labial palpus grey, tipped with black; tegula with base yellow, a black spot on it; abdomen with dorsal spot almost obsolete; forewing with a yellow basal patch which extends along costa and in cell to two third length of cell, an orange spot outlined with black on costa, streaks in cell and on anal margin, two lines across inter-median interspace, rest of wing pale red-brown; hindwing bright orange-yellow; a black spot at the end of cell and a submarginal series of black spots.

**Male genitalia:** Uncus curved, beak-like, pointed at tip, broader at base, narrower towards tip, a bunch of hair like

setae on dorsal side; tegumen arms short, narrow, membranous, bell shaped; tuba analis long, prominent; vinculum broad, U shaped; saccus well developed, lightly sclerotised; valva simple, granulose, sparsely setosed, costa nearly straight, apex rounded, cucullus not defined, sacculus well developed, basal harpe well differentiated at the distal end of sacculus; juxta a rectangular plate; aedeagus of moderate length, broad, vesica large, scobinated, a large cornutus present apically.

**Female genitalia:** Ovipositor lobes rectangular, setosed, a fine scobinate secondary lobes ventrally between ovipositor lobes; both pair of apophyses well developed, almost of equal length; ostium bursae broad, rounded;

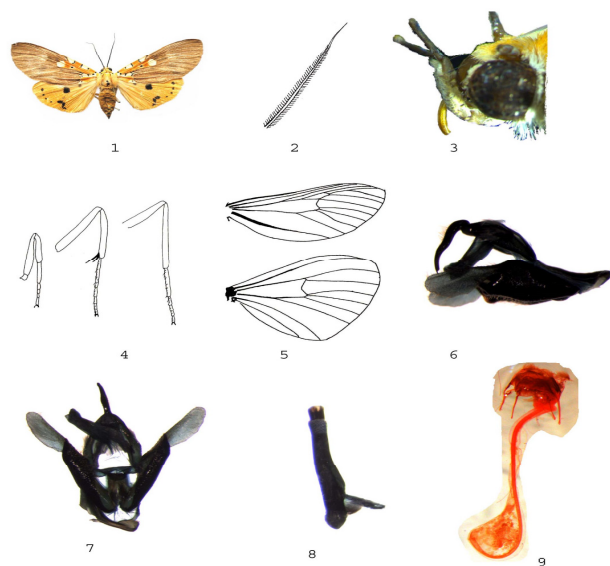
ductus bursae long, sclerotised; corpus bursae membranous, oval; signum absent.

**Wing expanse:** 47-62 mm.

**Old distribution:** Throughout India, Ceylon (Hampson, 1892).

**Material Examined:** India: District Kangra, Palampur, 1300mASL, 12.vii.2009, 3♂♂, 2♀♀; Dist. Kangra, Dharamshala, 10.vii.2009, 1♂, 2♀♀; District Mandi, Mandi, 764mASL, 22.vi. 2010, 4♂♂, 5♀♀, coll. P.C. Pathania.

*Asota ficus* (Fabricius)



(1) Adult, (2) Antenna, (3) Labial palpi, (4) Legs (fore, mid & hind), (5) Wings (fore & hind), (6) Male Genitalia - Lateral view, (7) Dorsal view, (8) Aedeagus (9) Female Genitalia

**Plate-1.**

***Asota caricae* (Fabricius)**

*Noctua carcae* Fabricius, 1775. *Syst. Ent.*:596.

**(Plate-2, Figs. 2-9)**

**Description:** Labial palpus with black spots on first and second joints; forewing grey fuscous, a basal orange patch with two sub basal black spots, a series of three black spots on its outer edge, veins streaked with white, a small white spot at lower angle of cell; underside a small black spot at middle of discal cell; hindwing orange-yellow with black spot at end of cell, one beyond, one below CuA2, a submarginal irregular series of black spots.

**Male genitalia:** Uncus long, slightly curved, pointed at tip, bent at right angle, hair like setae on the dorsal side of uncus; tuba analis long, membranous; tegumen arms slightly narrower, bell shaped, sclerotised; vinculum broad, U shaped; saccus broad, well developed, valvae simple, elongated, coremata thick, long, costa very clear, rounded at apex, sacculus margin strongly convex, with a single, relatively basal harpe; juxta a rectangular plate; aedeagus small, straight, a pair of cornuti present, vesica large.

**Female genitalia:** Ovipositor lobes broad, long,

Pathania et al.,

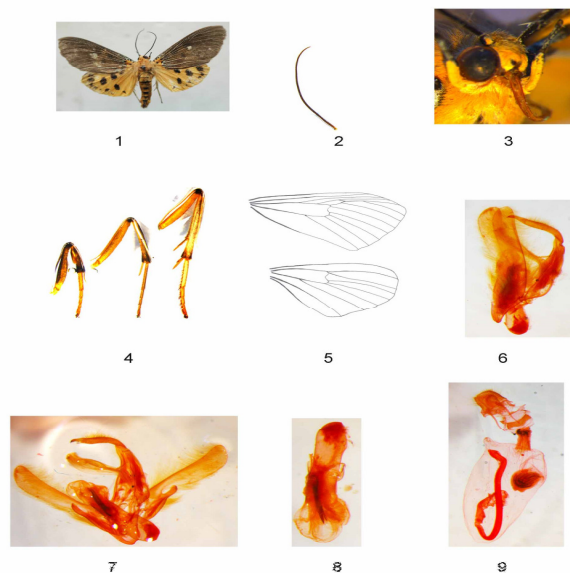
strongly setosed, a finely scobinate secondary lobes between them; both pairs of apophyses small, of equal length; ostium bursae broad, rounded; ductus bursae very small, membranous; corpus bursae bilobed, one lobe large, rectangular in shape, membranous, second lobe small, strongly sclerotised; signum absent.

**Wing expanse:** 44-58mm.

**Old distribution:** Throughout India, Ceylon.

**Material Examined:** India: District Kangra, Dharamshala, 1457mASL, 10.vii.2009, 3♂♂, 2♀♀; District Mandi, Mandi, 764mASL, 23.vi.2010, 2♂♂, 3♀♀; District Bilaspur, Bilaspur, 862mASL, 25.vi.2010, 2♂♂, 2♀♀, coll. P.C. Pathania.

*Asota caricae* (Fabricius)



(1) Adult, (2) Antenna, (3) Labial palpi, (4) Legs (fore, mid & hind), (5) Wings (fore & hind), (6) Male Genitalia - Lateral view, (7) Dorsal view, (8) Aedeagus, (9) Female Genitalia

**Plate-2.**

***Asota plaginota* (Butler)**

*Hypsa plaginota* Butler, 1875, *Trans. Ent. Soc.*, 1875 (4): 320.

**(Plate-3, Figs. 2-9)**

**Description:** Labial palpus with black spots on first and second joints; forewing brownish fuscous, a basal orange patch with two sub basal black spots, two black spots on its outer edge, veins streaked with white, a large white spot at lower angle of cell, underside a black spot at middle of discal cell; hindwing orange-yellow with black spot at end of cell, one beyond, one below CuA2, a submarginal irregular series of black spots.

**Male genitalia:** Uncus long, slightly curved, pointed at tip, bent at right angle, hair like setae on the dorsal side of uncus; tuba analis long, prominent, membranous; tegumen arms narrow, membranous; vinculum broad V shaped; saccus well developed; valvae simple, long, coremata very long, well developed; sacculus margin strongly convex, with a relatively single basal harpe;

juxta a rectangular plate; aedeagus small, broad, straight, a pair of cornuti present, vesica large.

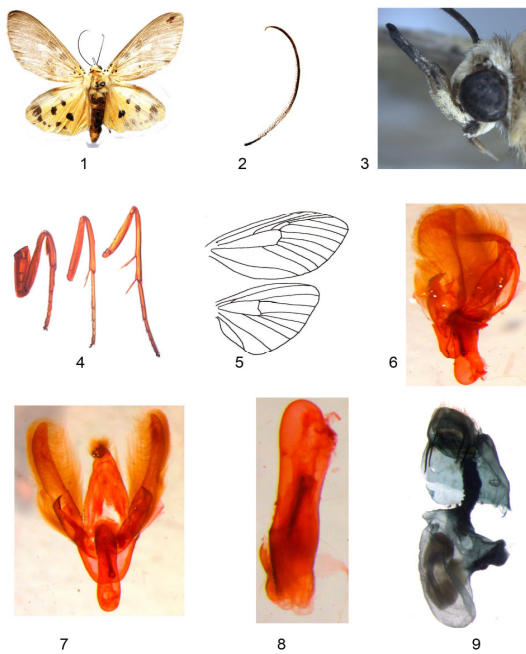
**Female genitalia:** Ovipositor lobes short, broad, beset with setae, a finely scobinate secondary lobes between them; both pairs of apophyses small, of equal length; ostium bursae small, rounded; ductus burase of moderate length, slightly sclerotised, inner surface of ductus burase scaled with fine crests; corpus burase membranous, bilobed, one lobe large, elliptical in shape, membranous, second lobe small, sclerotised; signum absent.

**Wing expanse:** 52-61mm.

**Old distribution:** Throughout India, Ceylon.

**Material Examined:** India: District Kangra, Kangra, 786mASL, 8.vii.2009, 5♂♂, 3♀♀; District Kangra, Dharamshala, 1457mASL, 11.vii.2009, 3♂♂, 2♀♀; District Hamirpur, Hamirpur, 19.vi.2009, 2♂♂, 1♀, coll. P.C. Pathania.

*Asota plaginota* Walker



(1) Adult, (2) Antenna, (3) Labial palpi, (4) Legs (fore, mid & hind), (5) Wings (fore & hind), Male Genitalia (6) Lateral view (7) Dorsal view, (8) Aedeagus, (9) Female Genitalia.

### Plate 3.

## CONCLUSIONS

The surveys from 05 different localities of 04 districts Himachal Pradesh led to the collection of 47 examples (25 males and 22 females) of 03 species i.e., *Asota ficus* (Fabricius), *A. caricae* Fabricius and *A. plaginota* Butler of genus *Asota* Hübner have been identified. The

species *A. ficus* is more in abundance and *A. caricae* is less represented in the areas. All the species are congeneric to the genus *Asota* Huber showing that male genitalia valve are simple and elongated, somewhat expanded apically with a single harpe at the end of sacculus. Aedeagus is short, broad, the vesica large, bearing a small group of cornuti or a single cornutus. The coremata are usually small and well developed and female genitalia in which the ductus bursae is poorly sclerotised towards base and also forewings with closed discal cell is about half the length and aerole is also present.

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**Conflict of Interest.** None.

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