



Studies on the genus *Ambulyx* Westwood (Lepidoptera: Sphingidae) from India

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ABSTRACT: The male and female genitalic features of three species of genus *Ambulyx* Westwood viz. *substrigilis* (Westwood), *obliterata* Rothschild and *moorei* Moore have been studied and illustrated in detail. The genus diagnosis has been updated and a key to the species has been formulated. © 2017 Association for Advancement of Entomology

KEYWORDS: *Ambulyx moorei*, *A. obliterata*, *A. substrigilis*, genitalia and sphingidae

INTRODUCTION

Rothschild and Jordan (1903) proposed the new genus *Oxyambulyx* for the placement of *substrigilis* Westwood and its allied species. Bell & Scott (1937) followed the same nomenclature. Earlier, Hampson (1892) discussed these species under genus *Ambulyx* Westwood. He even synonymized two other distinct genera i.e. *Dahira* Moore and *Clanis* Hübner under genus *Ambulyx*. Fletcher and Nye (1982) clarified the position and listed instances of the erroneous use of *Ambulyx* and synonymized *Oxyambulyx* as its junior synonym. Holloway (1987), Pittaway and Kitching (2000) followed the nomenclature recommended by Fletcher and Nye (1982). The same nomenclature has been adopted during the present studies. *Ambulyx* is most diverse in the Oriental Region from India to Sundaland but extends as far east as the Solomons (D'Abrera, 1986). Three species i.e. *substrigilis* (Westwood), *obliterata* Rothschild and *moorei* Moore have been studied in detail. The terminology for naming various

genitalic features has been followed after Klots (1970). The critical examination of morphological characters including genitalic features revealed that these species conform to a natural group.

GENUS *AMBULYX* WESTWOOD

Westwood, 1847, *Cabinet Oriental Ent.*, 1847: 61; Hampson, 1892, *Moths India*, 1: 77; Fletcher & Nye, 1982, *The generic names of the moths of the world*, 4: 9.

Oxyambulyx, Rothschild & Jordan, 1903, *Novit. Zool.*, 9: 192; Bell & Scott, 1937, *Fauna British India, Moths*, 5: 109-113.

Type species: *substrigilis* (Westwood)

Distribution: World-wide.

Diagnosis: Labial palpus upturned, surpassing lower level of frons. Head with sharp inter-antennal crest. Proboscis reaching beyond end of abdomen. Antenna with end segments compressed, bottle

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shaped or conical in lateral view; variable in length, but at least four times as long as proceeding one; two bristles at end and several others in lateral and ventral surface; dorsal surface of segment covered with appressed scaling. Forewing with apex acute; dorsal one-fourth portion of anal vein forked; Cu_2 from middle of cell; Cu_1 from well before lower angle; M_3 from angle of cell; M_2 from below middle of discocellulars; M_1 from upper angle of cell or stalked as M_1 (R_5 , R_4); $R_{(3+2)}$ from well before angle; discal cell less than half length of wing. Hind wing with both anals present; 2A forked at base; Cu_2 from beyond middle of cell; Cu_1 from well before lower angle; M_3 from lower angle of cell; M_1 and Rs from upper angle or stalked; discal cell one-third length of wing. Legs having mid tibia with one pair and hind tibia with two pairs of tibial spurs, inner ones longer; longer apical spur of hind tibia more than half length of first tarsal segment; tarsi spinose. Male genitalia with uncus undivided; apically bulbous, laterally compressed; saccular projection well developed, distal end well splayed; valva without friction scales. Female genitalia with basal half of ductus bursae usually guarded by well sclerotized genital plate.

**Key to the species of genus *Ambulyx*
Westwood:**

1. Male genitalia with aedeagus with sclerotized wedge-shaped serrate plates; hind wing with veins M_1 and Rs from upper angle of cell, not stalked; abdomen with medial line on dorsal side..... *substrigilis* (Westwood)
..... Male genitalia with aedeagus without such plates or projections; hind wing with veins M_1 and Rs stalked from upper angle of cell; abdomen without dorsal line2
2. Male genitalia with gnathos slightly notched at distal end; saccus reduced; forewing with a large antemedial spot; hind wing with veins Sc + R_1 anastomosing with cell beyond middle *obliterata* Rothschild
..... Male genitalia with gnathos bifid; saccus oblong, well developed; forewing with four antemedial spots, costal one large; veins Sc + R_1 anastomosing with cell up to middle *moorei* Moore

***Ambulyx substrigilis* (Westwood)**

(Figs. 1-5)

Sphinx substrigilis Westwood, 1848, *Cab. Or. Ent.*, 1848: 61.

Ambulyx substrigilis, Walker, 1856, *List. Lep. Ins. B.M.*, 8: 122; Moore, 1865, *Proc. Zool. Soc. London*, 1856: 793; Butler, 1877, *Trans. Zool. Soc. London*, 9: 579; Hampson, 1892, *Moths India*, 1: 77. Fletcher & Nye, 1982, *The generic names of the moths of the world*, 3: 9. D'Abrera, 1986, *Sphingidae Mundi*, 1986: 55.

Oxyambulyx substrigilis, Rothschild and Jordan, 1903, *Novit. Zool.*, 9: 202; Bell and Scott, 1937, *Fauna British India, Moths*, 5: 131.

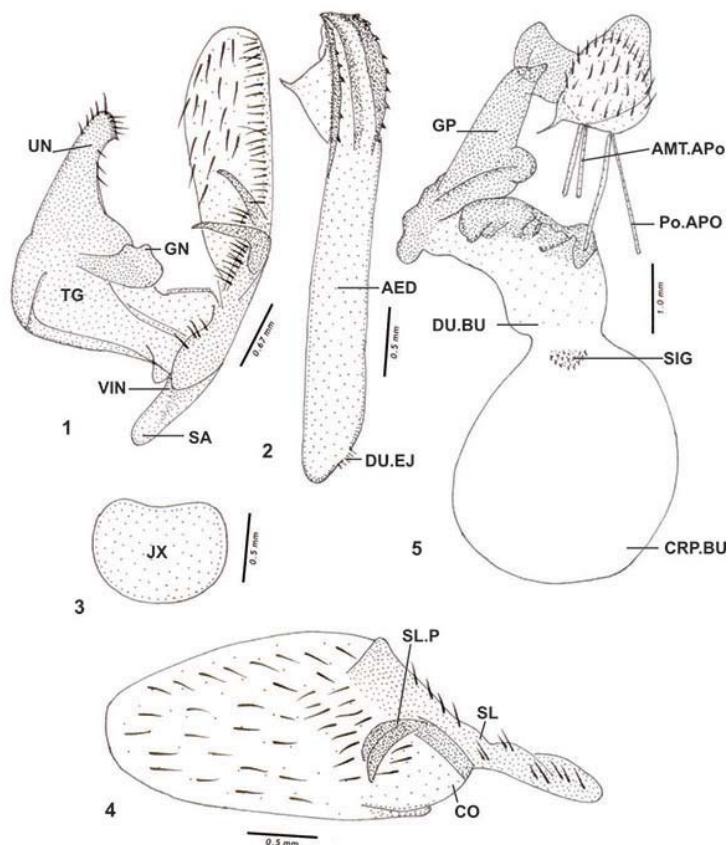
Wing Expanse: Male: 110 mm; Female: 120 mm.

Male genitalia: Uncus of moderate size, distal half laterally compressed, bulbous, tip highly sclerotized, beaked, setosed; gnathos reduced, semi-sclerotized; tegumen more than 2X length of vinculum, inverted U-shaped, slightly sclerotized; vinculum slightly sclerotized; saccus with rounded ending; juxta rounded, distal end emarginate in middle, slightly sclerotized; transtilla short, nearly membranous. Valva simple, extending well beyond level of uncus, costa not demarcated; sacculus moderately sclerotized, setosed; saccular projection broad, bifid, one arm broad, another one sickle-shaped, narrow, well sclerotized; distal half of valva broad, semi-membranous, setosed. Aedeagus long, well sclerotized; distal end having three wedge-shaped long, well sclerotized plates, two with serrate edges; vesica with semi-sclerotized small projection.

Female genitalia: Corpus bursae large, membranous; signum semi-lunulate; ductus bursae with anterior half broad, sclerotized, basal half narrow guarded by well sclerotized genital plate; anterior apophyses shorter than posterior ones, both pairs having rounded semi-membranous apices; papilla analis ovoid, fringed with short setae.

Material Examined: Arunachal Pradesh: West Kameng Distt., Bomdilla, 14.IX.1990, 1♂. Assam: North Cachar Hills, Jatinga, 03.IX.1991, 2♂♂;

PLATE - 1

*Ambulyx substrigilis* (Westwood)

1. Male genitalia - lateral view; 2. Aedeagus; 3. Juxta - Ventral view;
4. Valva - Ventral view; 5. Female genitalia

05.IX.1991, 1♂; 06.IX.1991, 1♂. Karnataka: Bhagwati, 14.XI.2003, 1♂; Jog falls, 20.VII.1991, 1♂; 16.XI.2003, 1♂. Meghalaya: Jowaii, 14.IX.1991, 1♀.

Distribution: India - North West Himalayas, Arunachal Pradesh, Assam, Meghalaya, Sikkim; Else-where: Bangladesh, Bhutan, Borneo, Malaysia, Nepal, Philippines, Sri Lanka, Sumatra, Thailand and Vietnam.

Remarks: As discussed earlier, Fletcher and Nye (1982) revived the present species under its original genus. It is distinct from other two species examined in the present studies i.e. *obliterata* Rothschild and *moorei* Moore due to the origin of veins M_1 and R_s in hindwing and wedge shaped

sclerotized projections in aedeagus. The collection of this species from two localities of Karnataka is its new distributional record from South India.

***Ambulyx obliterata* Rothschild**

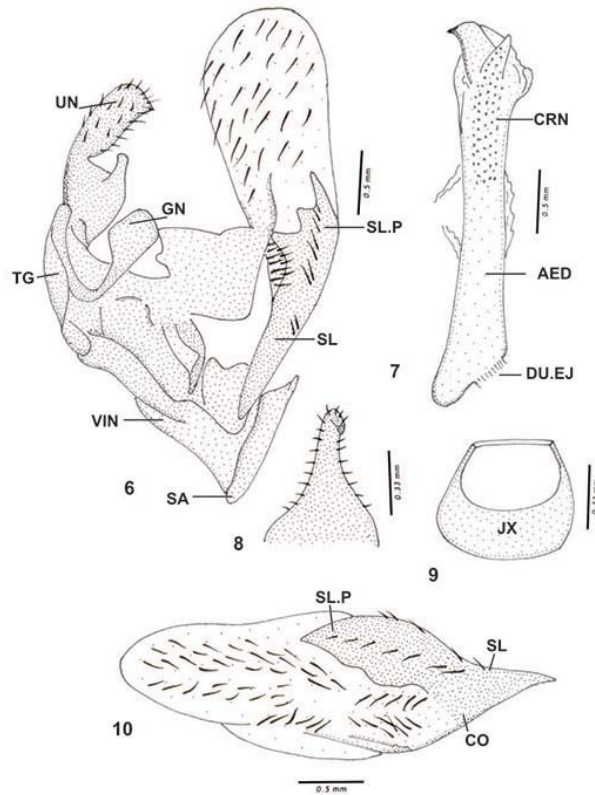
(Figs. 6-10)

Ambulyx liturata obliterata Rothschild, 1920, *Ann. Mag. nat. Hist.*, **9**(5): 479.

Ambulyx obliterata Rothschild: Diehl, 1982, *Heterocera Sumatrana*, 1: 17, pl. 2: 18-19; Holloway, 1987, *Moths Borneo*, **3**: 129, pl.14: 11; Inoue *et al.*, 1997, *Moths of Thailand*, 2: 31-32.

Wing Expanse: Male: 100 mm; Female: Not examined.

PLATE - 2

*Ambulyx obliterata* Rothschild

6. Male genitalia - lateral view; 7. Aedeagus; 8. Uncus - Ventral view;
9. Juxta - Ventral view; 10. Valva - Ventral view

Male genitalia: Uncus having broad basal portion, distal portion laterally compressed, setosed with short setae, semi-sclerotized, beaked pointed tip; gnathos small, squarish, well sclerotized having slightly notched tip, extending up to level of base of uncus, subscaphium present; juxta with proximal end rounded, distal end strongly emarginate, semi-sclerotized; transtilla broad, triangular. Valva long, extending well beyond level of uncus; costa narrow, setosed, semi-sclerotized; sacculus well sclerotized having a well developed saccular projection, distal half with two lateral, outgrowths and one long projection having few long setae in the middle, distal portion of valva ovoid, semi-membranous, setosed. Aedeagus of moderate size, proximal end produced, distal end having a sclerotized plate with short pointed spur on one side; vesica armed with minute denticles.

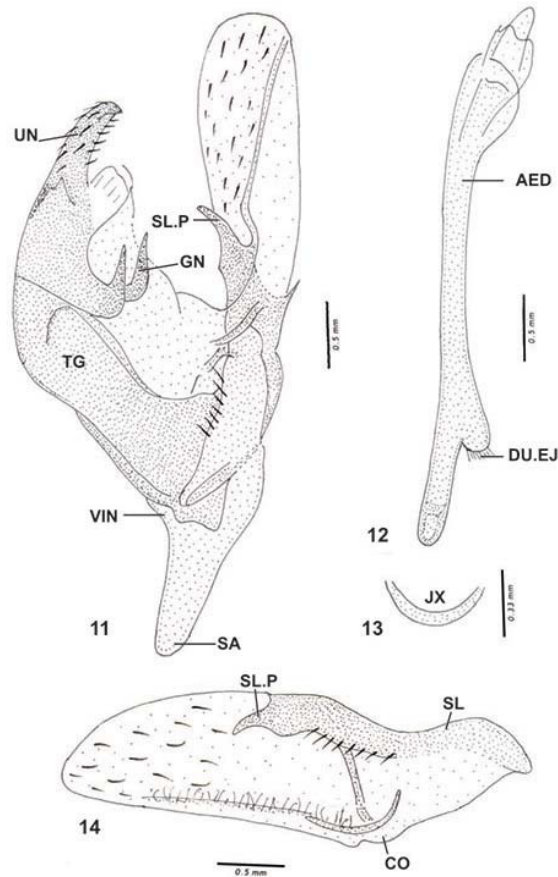
Material Examined: Assam: North Cachar Hills, Jatinga, 03.IX.1991, 2♂♂; 06.IX.1991, 7♂♂.

Distribution: Borneo; Peninsular Malaysia; Sumatra.

Additional Distribution: India: Assam.

Remarks: It is characterized by large single antemedial spot in forewing and the wings are much lighter than in *liturata* Butler. Rothschild (1920) described it as a subspecies of *liturata* Butler, but Diehl (1982) upgraded its status as distinct species. Holloway (1987) and Inoue *et al.* (1997) followed him in this regard. It is characterized by large single antemedial spot in forewing and the wings are much lighter than in *liturata* Butler. Reporting of the present species from Assam is its first record from India.

PLATE - 3

*Ambulyx moorei* Moore

11. Male genitalia - lateral view; 12. Aedeagus;
13. Juxta - Ventral view; 14. Valva - Ventral view

***Ambulyx moorei* Moore**

(Figs. 11-14)

Ambulyx moorei Moore, [1858], in Horefield & Moore, *Cat. Lepid. Insects Mus. East-India Co.*, 1: 266; Kitching & Spitzer, 1995, *Tinea*, 14: 178; Inoue *et al.*, 1997, *Moths of Thailand*, 2: 35.

Ambulyx subocellata Felder, 1874, *Reise Ost. Fregatte Novara, Lep.*, 1874: 76; Holloway, 1987, *Moths Borneo*, 3: 82.

Oxyambulyx subocellata Felder, Rothschild and Jordan, 1903, *Novit. Zool.*, 9: 203; Bell and Scott, 1937, *Fauna British India, Moths*, 5: 136-138.

Wing Expanse: Male: 92-102 mm; Female: Not examined.

Male genitalia: Uncus well developed, broad at base, moderately sclerotized, setosed with small setae, curved, distal end highly sclerotized with beaked, pointed tip; gnathos simple, slightly sclerotized proximal half, distal half bifid, both arms narrow, well sclerotized with pointed tip; tegumen broad, inverted U-shaped, semi-sclerotized; vinculum narrow, shorter than tegumen, well sclerotized; saccus well developed, oblong; juxta narrow, semi-lunulate, semi-membranous; transtilla oblong, rounded semi-sclerotized. Valva quite long, extending well beyond level of uncus; costa narrow, semi-sclerotized; sacculus narrow, long, well sclerotized having a short saccular projection with swollen proximal half, narrow, falcate, short distal half, a backwardly pointing hook-like projection near costa, well sclerotized; distal portion of valva semi-membranous, setosed. Aedeagus narrow, proximal

end produced thumb-like, distal half broad, semi-sclerotized; vesica having rows of small denticles representing cornuti.

Material Examined: Arunachal Pradesh: West Kameng Distt., Bomdilla, 14.IX.1990, 1♂. Assam: North Cachar Hills, Jatinga, 03.IX.1991, 2♂♂; 06.IX.1991, 1♂; 07.IX.1991, 2♂♂. Karnataka: Bhagamandalam, 25.XI.2003, 1♂; Ganeshgudi, 13.XI.2003, 1♂; 14.XI.2003, 1♂; 15.XI.2003, 1♂. Himachal Pradesh: Sarahan, 17.VI.2000, 1♀.

Distribution: India - East Himalayas (Arunachal Pradesh, Assam), South India (Karnataka); Elsewhere: Borneo, Java, South China, Malaysia, Sumatra, Thailand and Vietnam.

Additional Distribution: Himachal Pradesh.

Remarks: Kitching and Spitzer (1995) synonymized the familiar name *subocellata* to *moorei* and described *Ambulyx moorei* Moore as a valid species. Inoue *et al.* (1997) followed the same nomenclature. The species under reference can be easily distinguished from other allied species due to the presence of four ocellate antemedial spots in forewing. It is being reported from North India for the first time.

ABBREVIATIONS:

AED: Aedeagus; ANT. APO: Anterior apophyses; CO: Costa; CRP. BU: Corpus bursae; DU. BU: Ductus bursae; DU. EJ: Ductus ejaculatoris; GN: Gnathos; JX: Juxta; PAP. A: Papilla analis; PO. APO: Posterior apophyses; SA: Saccus; SL: Sacculus; SL.P: Saccular projection; TG: Tegumen; UN: Uncus; VIN: Vinculum.

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REFERENCES

- Bell T.R.D. and Scott F.B. (1937) The Fauna of British India, including Ceylon and Burma. Moths-Sphingidae 5: 1-537.
- D'Abbrera B. (1986) Sphingidae Mundi, Hawk Moths of the World, 1986: 1-235. E. W. Classey Ltd., London.
- Diehl E.W. (1982) Heterocera Sumatrana, Band 1. Sphingidae. vii.+ 97 pp., 11 pls. London.
- Fletcher D.S. and Nye I.W.B. (1982) The generic names of the moths of the world 4: 1-192. London.
- Hampson G.F. (1892) Fauna of British India including Ceylon and Burma. Moths, 1: 1-527. Taylor and Francis Ltd., London.
- Holloway J.D. (1987) The Moths of Borneo. 3: 1-199. South dene, Kuala Lumpur, Malaysia.
- Inoue H., Kennett R. D. and Kitching I. J. (1997) Moths of Thailand. Sphingidae 2: 36-39.
- Kitching I. J. and Spitzer K. 1995. An annotated checklist of the Sphingidae of Vietnam. Tinea 14: 171-195.
- Klots A.B. (1970) Lepidoptera in - Taxonomist's Glossary of Genitalia in Insects. (Ed. S.L. Tuxen). Munksgaard, Copenhagen: 115-130.
- Pittaway A.R. and Kitching, I.J. (2000) Sphingidae of Eastern Palaearctic region including China, Mongolia and the Korean Peninsula - Notes on selected species of hawkmoths (Lepidoptera: Sphingidae). Tinea 16(3): 170-211.
- Rothschild W. (1920) Preliminary descriptions of some new species and subspecies of Indo-Malayan Sphingidae. Ann. Mag. Natural History (9)5 (30): 479-482.
- Rothschild W. and Jordan K. (1903) A revision of the Lepidopterous family Sphingidae. Novit. Zoology 9 (Suppl.): 1-972, pls. 1-67.

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