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Taxonomic notes on the genus *Visiana* Swinhoe, with description of a new species from northern India

(Lepidoptera, Geometridae, Larentiinae)

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The present taxonomic study deals with the Indo-Australian geometrid moth genus *Visiana* Swinhoe, currently comprising nine species and one subspecies. The status of a specimen deposited in the Natural History Museum (London, UK) from India (Khasis) that was recognised by Prout as infrasubspecific variation *Xanthorhoe sordidata* ab. *fuscata* has been reconsidered. The new species *V. fuscata* spec. nov. is described and illustrated. It is closely related to *V. sordidata* (Moore), and characters are given to separate it from other species of the genus *Visiana*. In the course of recent study of Lepidoptera collection of the Royal Belgian Institute of Natural Sciences (Brussels) a unique female of *V. inimica* (Prout) from Java (Indonesia) has been discovered and is described and illustrated for the first time. Comparison of female genitalia supports the sister-relationships of *V. inimica* and *V. tamborica* (Prout) from Lesser Sunda Islands (Indonesia).

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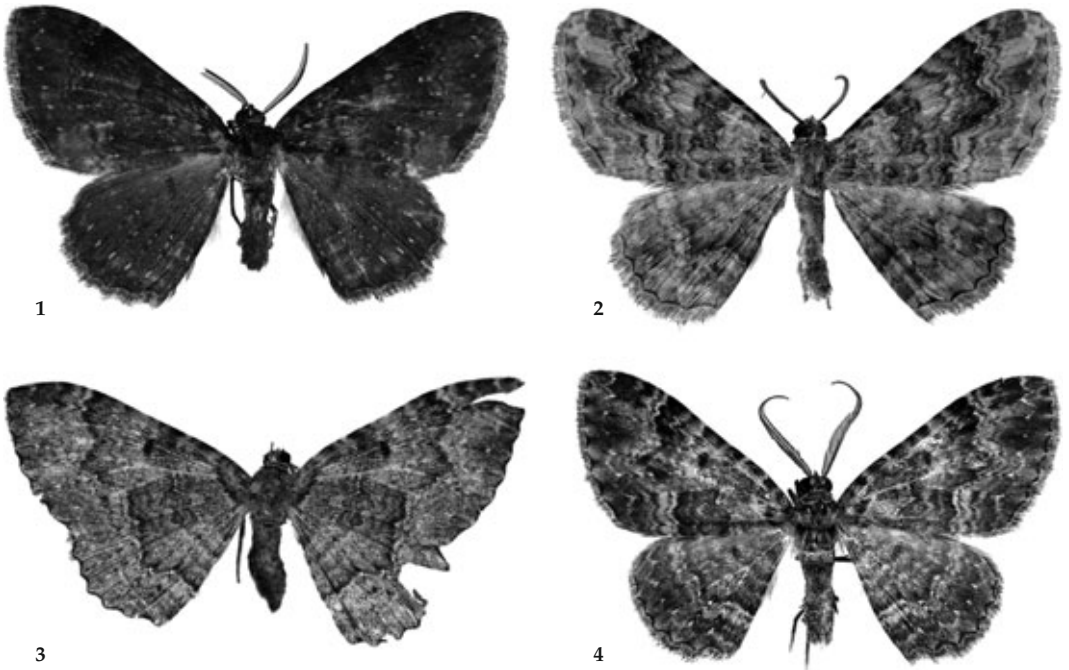
Introduction

Species of the Indo-Australian geometrid moth genus *Visiana* Swinhoe (1900) are medium- to rather large-sized, brownish-coloured and difficult to distinguish based on external morphological characters alone even if specimens are well preserved. Although there are *Visiana* specimens deposited in several insect collections around the world, they are sometimes in poor condition and often misidentified or not identified. Generally, the species diversity of the genus is underestimated. A decade ago five species and four subspecies have been recorded for the genus (Scoble 1999). Nine species and one subspecies are currently known (Schmidt 2006a). Due to further investigations of the geometrid moth fauna, especially from the Papuan region and Australia, this number might double in future once the genus has been studied more thoroughly.

Species of the genus *Visiana* have been cited, dis-

cussed or reviewed by the following authors: Guenée (1858), Walker (1862, 1866), Moore (1888), Meyrick (1890), Swinhoe (1900), Warren (1907), Turner (1904, 1922, 1926), Prout (1937, 1939), Holloway (1986, 1997), McQuillan and Edwards (1996), McQuillan et al. (1998), Scoble (1999), McQuillan (2004), and Schmidt (2005, 2006a). The type species, *V. sordidata* (Moore), has been studied in detail, all supraspecific taxa formerly included in it are now regarded as good species, including *V. inimica* (Prout), *V. robinsoni* (Prout), and *V. tamborica* (Prout). A new species, *V. hollowayi*, has been described recently (Schmidt 2006a,b).

Royal Belgian Institute of Natural Sciences (Brussels) holds a relatively small geometrid collection, containing mainly old material collected in Europe as well as in other parts of the world by Dufrane, Le Moults, Delderenne, Derenne, van Delden, and Kiriakoff. The collection has been largely ignored by geometrid taxonomists, but provided material that was used in the current study.



Figs 1-4. *Visiana* spp., adults, wings above. 1. *V. fuscata*, male, India, Khasis. 2. *V. sordidata*, male, India, Darjeeling. 3. *V. inimica*, female, Indonesia, Java, Poedjon. 4. *V. inimica*, male, Indonesia, Bali, Mondoktoempang.

Material and methods

The geometrid moth collections of the Natural History Museum, London (BMNH) and the Royal Belgian Institute of Natural Sciences, Brussels (RBINS) have been searched for *Visiana* specimens. Additionally, material borrowed from the Museum für Naturkunde der Humboldt-Universität zu Berlin (MNHU) and Zoölogisch Museum Amsterdam (ZMAN) has been studied.

Wing expanse was measured as twice the distance from midthorax to the forewing apex. The abdomen and the genitalia were mounted on permanent slides in Euparal. Terminology for adult morphology and genitalia follows Pierce (1914), Forbes (1948), Klots (1970), and Nichols (1989).

Microphotographs of abdominal structures and the genitalia were taken with a digital camera (ProgRes C10plus, Jenoptic Laser.Optik.Systeme GmbH) attached to a microscope and processed using the AutoMontage system, version 5.03 (Syncroscopy, Synoptics Ltd). Photographs of adults were taken with a Canon Power Shot G5. The digital images were enhanced and the plates compiled with Adobe Photoshop™.

Visiana Swinhoe

Visiana Swinhoe, 1900: 335. Type species: *Scotosia sordidata* Moore, 1888 (by monotypy).

A diagnosis of the genus has been given by Schmidt (2006a), and only the most important characters are given here. Moths are brownish coloured, usually with forewings above with median band forming tooth-like medial projection outwards, underneath brown, often with thin darker lines, with the wing expanse 28-44 mm. Diagnostic characters of the male genitalia are as follows: uncus sclerotised, broadly based, often shortened, tegumen shorter than vinculum, with sclerotised lateral arms, vinculum with distinct, often protruded saccus, calcar missing. In the female genitalia apophyses posteriores thin, less than twice as long as apophyses anteriores, antrum medium-sized, without folds of sclerotisation, corpus bursae usually large, membranous, with a small diverticulum.

Visiana fuscata, spec. nov.

(Figs 1, 5, 8, 11-12)

Type. Holotype male, India (north), Khasis, iii.1894, Nat. Coll., no other data (BMNH).

Description. Labial palpi brown to dark brown. Wing expanse 40 mm. Forewings above dark brown, speckled with some dark reddish scales, with median band rather indistinct, blackish-brown, edged

with thin, wavy, dark brown line outwards, with whitish dots on the veins in the postmedial area, underneath dark brown, with veins rather distinct, with light brown dots on the veins in the postmedial area, likewise the wings above. Hind wings above dark brown, with whitish dots in the postmedial area, underneath coloured and patterned as forewings (Figs 1, 5).

Male genitalia (Figs 8, 11, 12). Uncus very small, rather thin, tapering apically, fused with the tegumen; tegumen hemispherical, slightly narrower than in *V. sordidata*, with almost straight, slightly thickened lateral arms protruded to the base of juxta; valvae short, with basal projection rather long, inwardly directed, with costa broad, sclerotised, slightly twisted, with distinct projecting apical process, valval lobe broader than in *V. sordidata* (Fig. 7), protruded below the apical process of costa valvae; saccus massive, protruded; juxta with small lateral papillae; aedeagus curved, longer and thinner than in *V. sordidata*, with anellus covered with very fine spines, without sclerotisation apically, without cornuti or distinct scobination in vesica.

Female genitalia. Unknown.

Distribution. India (Khasis).

Remarks. The specimen was briefly described by Prout (1939) and regarded as an aberration of *Xanthorhoe sordidata* (Moore). According to article 45.6.2. of the International Code of Zoological Nomenclature (ICZN 1999), the name is infrasubspecific. The combination *Xanthorhoe sordidata* ab. *fuscata* suggested by Prout (1939) has not been adopted for a species or subspecies by subsequent authors, therefore the name not available and allows the taxon to be described as new species.

***Visiana inimica* (Prout)**

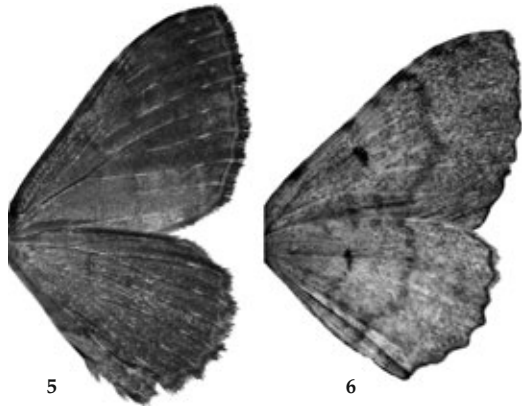
Figs 3-4, 6, 13

Xanthorhoe sordidata inimica Prout, 1937: 181. Holotype ♂, Bali (west), Mondoktoempang, 750 m, J.P.A. Kalis, ix.1934 (BMNH, examined).

Visiana sordidata inimica: Holloway 1997: 192 (as ssp.). Change of combination.

Visiana inimica: Schmidt 2006a: 83-84. Change of status.

Diagnosis. Female similar to male but slightly larger. Wing expanse 39 mm. Forewings above brown, with some ochreous scales, with median band brown to dark brown, less distinct than in males, with a medial projecting tooth, slightly narrower and sharper than in *V. sordidata*, edged with thin, dark brown and ochreous-brown wavy lines, less distinct than in males, with whitish scales, un-



Figs 5-6. *Visiana* spp., adults, wings underneath. 5. *V. fuscata*, male, India, Khasis. 6. *V. inimica*, female, Indonesia, Java, Poedjon.

derneath brown, with some ochreous scales, with a median brown line, forming a medial projecting tooth outwards. Hind wings above coloured as forewings, with median line forming a double medial projecting tooth, underneath coloured and patterned as forewings (Figs 3-4, 6).

Description (female)

Genitalia (Fig. 13). Antrum very broad, rather short, weakly sclerotised; ductus bursae broad, very short, sclerotised, with distinct lateral stripes of heavier sclerotisation, corpus bursae medium-sized, broader and more complex than in *V. tamborica* (Prout) (Fig. 14), asymmetric, with two wrinkled extensions in its distal part, with a patch of weak sclerotisation ventrally, semi-spherical and membranous proximally, with an elongate ellipsoid diverticulum of the same size as in *V. tamborica*, connected to the corpus by a short, rather thin tube, with ductus seminalis arising from the distal extension of corpus bursae; signum absent.

Distribution. Indonesia (Bali, Java).

Material examined. 1 ♀, Indonesia, Java (east), Poedjon, 1212 m, collector missing, 24.xii.1932 (RBINS). The adult male of the species has been re-described and the genitalia characters have been described and illustrated by Schmidt (2006a).

Discussion

Examination of morphological characters suggests that *V. fuscata* is closely related to the northern Indian species *V. sordidata* (Figs 2, 7). The external morphological differences between *V. fuscata* and *V. sordidata*



Figs 7-12. *Visiana* spp., male genitalia. 7. *V. sordidata*, apex valvae. 8. *V. fuscata*, apex valvae. 9. *V. robinsoni*, apex valvae. 10. *V. hollowayi*, apex valvae. 11. *V. fuscata*, armature. 12. *V. fuscata*, aedeagus.

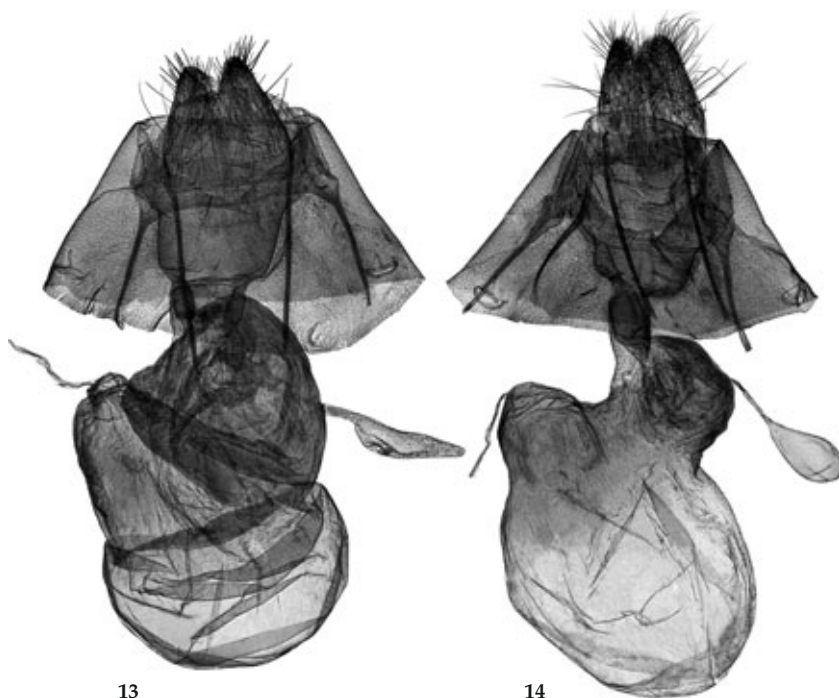
are evident. The newly described species is much darker coloured, with the median band rather indistinct. *Visiana fuscata* can also be distinguished from *V. sordidata* by the following characters in the male genitalia: uncus thinner, tegumen slightly narrower, valval lobe broader, protruded below the apical process of costa valvae, aedeagus longer and thinner (Fig. 12). The apices of the valvae of the related species *V. robinsoni* (Prout) and *V. hollowayi* Schmidt, are shown in Figs 9-10 for comparison.

The tentative sister-relationships of the two Indonesian species *V. inimica* from Bali and Java, and *V. tamborica* from the Lesser Sunda Islands (Schmidt 2006a,b) are supported by characters of the female genitalia. Despite noticeable differences between the two species, they have the following characters in common: similar structure and shape of the antrum, ductus bursae, and of the proximal part of corpus

bursae, the position of the ductus seminalis on the distal extension of corpus bursae, and the absence of a signum.

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Figs 13-14. *Visiana* spp., female genitalia. 13. *V. inimica*. 14. *V. tamborica*.

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