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Description of the male of the north-eastern Australian species *Scotocyma rutilimixta* Schmidt

(Insecta, Lepidoptera, Geometridae, Larentiinae, Xanthorhoini)

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Schmidt, O. (2007): Description of the male of the north-eastern Australian species *Scotocyma rutilimixta* Schmidt (Insecta, Lepidoptera, Geometridae, Larentiinae, Xanthorhoini). – Spixiana **30/1:** 93-97

The study of specimens deposited in the geometrid moth accessions of the Australian National Insect Collection (CSIRO Entomology, Canberra) resulted in the discovery of the male of the north-eastern Australian larentiine species *Scotocyma rutilimixta* Schmidt. The male can be distinguished from congeners by the following characters: uncus distally with a medial dorsal keel and a small ventral hook; tegumen narrow, at base with short, weakly sclerotised, serrated lateral arms with moderately developed teeth; valva relatively short. The male is described and illustrations of adult, wing venation, abdominal characters, and genitalia are provided. Additional illustrations of the female are given. A phylogenetic analysis, including the data for the newly described male, revealed close relationship of *S. rutilimixta* to eastern Papuan species of *Scotocyma* and confirmed the more distant relationship to *S. albinotata*, the second known Australian species.

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Introduction

The Australasian genus *Scotocyma* Turner (1904) currently comprises the following species: *S. albinotata* (Walker, 1866), *S. legalis* (Warren, 1896), *S. mimula* (Warren, 1905), *S. miscix* Prout, 1934, *S. manusensis* Prout, 1940, *S. scotopepla* Prout, 1940, *S. asiatica* Holloway, 1997, *S. samoensis* Schmidt, 2005, *S. rutilimixta* Schmidt, 2005, *S. sumatrensis* Schmidt, 2005, and *S. longiuncus* Schmidt, 2005. In recent years some taxonomic (Holloway 1979, 1997), phylogenetic and biogeographic studies of the genus (Schmidt 2005, 2006) have been done. However, females of *S. asiatica*, *S. longiuncus*, and *S. scotopepla* as well as males of *S. mimula* and *S. rutilimixta* were unknown so far.

During a short-term visit at the Australian National Insect Collection in Canberra in October 2005 the study of the accessions of the geometrid moths collection resulted in the discovery of several males and females of *S. rutilimixta* that were collected in northern Queensland (Australia) from 1957 to 1998 by several collectors. *Scotocyma rutilimixta* previously was known only from a single female from Cairns district (northern Queensland). The holotype is deposited in the Museum Victoria, Melbourne, Australia (Schmidt 2005). The aim of this paper is to describe the male of *S. rutilimixta*, to provide illustrations, and to discuss phylogenetic relationships using characters of male adult and genitalia.

Material and methods

Seven males and four females deposited in the Australian National Insect Collection (ANIC) were examined.

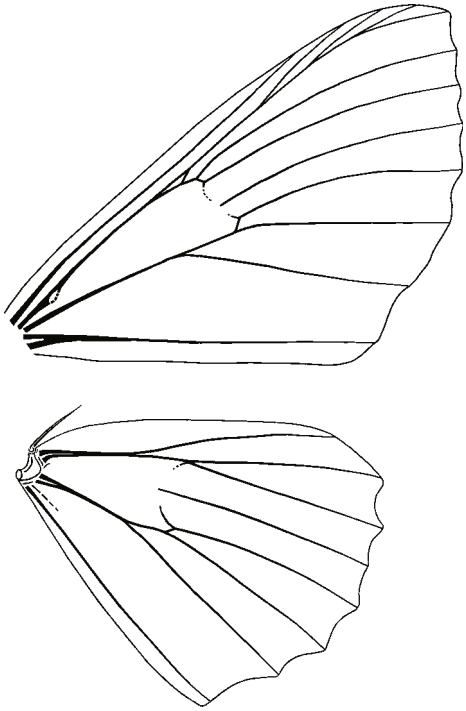


Fig. 1. *Scotocyma rutilimixta* Schmidt, male, wing venation.

Abbreviations

Coll.	collection
DEMV	Museum Victoria, Melbourne, Australia
distr.	district
Mt	Mount
NP	National Park
SF	State Forest

Wing expanse was measured as twice the distance from midthorax to the forewing apex. Following the known dissecting techniques, the wings were soaked in a solution of house bleach and alcohol, stained with eosin and dehydrated in a solution of 2-Propanol, scales were removed with fine brushes, and the wings finally mounted in Euparal. Abdomen and dissected genitalia were stained with Chlorazol Black in a 30 % solution of ethanol and mounted on slides in Euparal. Nomenclature for adult morphology and terminology for genitalia used in this paper follow Pierce (1914), Forbes (1948), Klots (1970) and Nichols (1989).

A digital camera (ProgRes™ C10^{Plus}, Jenoptic Laser Systems GmbH) attached to a microscope (Leitz Diaplan) was used for taking photomicrographs of the abdomen and the male genitalia. Pencil sketches of the fore and hind wing venation was prepared using a drawing tube attached to a microscope and the image scanned for subsequent digital processing. Digital images of the abdomen and the genitalia were processed with the AutoMontage system (version 4.03 Synoptics Ltd). Photographs of adults were taken with a Canon PowerShot G5. All digital images were enhanced and the plates compiled with Adobe Photoshop™.

Scotocyma rutilimixta Schmidt

Figs 1-8

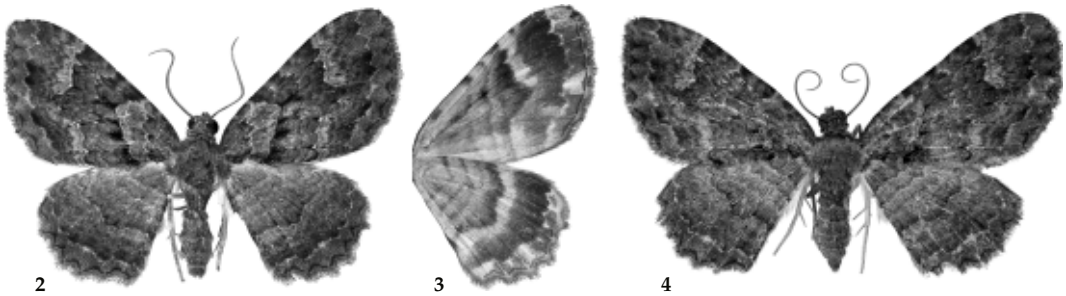
Holotype: ♀, Australia. Queensland, Cairns distr., F. P. Dodd, date missing, coll. Lyell (DEMV).

Other material examined: Australia. Queensland: 1♀, 15°53'S, 145°14'E, Summit Mt Misery, 13 km NW Bloomfield, 860 m, B. Hacobian, 8.i.1988; 1♀, 16°35'S, 145°17'E, Mt Lewis SF, J. C. Keast, L. S. Willan, 2.viii.1992; 1♂, 17°17'S, 145°38'E, Lake Eacham NP, 760 m, E. D. Edwards, H. Sutrisno, 23.xi.1998; 6♂♂, 1♀, 19°00'S, 146° 12'E, Paluma, 900 m, D. W. Frith, 22.-24.ii.1979 or 9.ix. 1979, J. Bugeja, 25.i.1995; 1♀, Kuranda, E. J. Harris, 5.v. 1957. The specimens, wing and genitalia slides are deposited in ANIC.

Description

Male (Figs 1-3)**.** Wing expanse 30-36 mm (n=7). Forewings above coloured and patterned similar to the female (see Schmidt, 2005, Fig. 4), but with basal band coloured lighter and median band usually more distinct, slightly darker, with distinct blackish scales along inner margin. Hind wings above are like in the female, but sometimes slightly darker basally (Fig. 2). Wings underneath are like in the female (Fig. 3). Abdominal coremata consist of eversible hair tufts in a long, broad pocket bearing a small, lateral finger-shaped appendix (Schmidt 2006a) which is characteristic for the genus *Scotocyma*, a weakly sclerotised ring between the seventh and the eighth segments with a small medial sclerite is present (Fig. 5).

Male genitalia (Figs 6, 7). Uncus relatively short, similar to *S. scotopepla* but somewhat heavier sclerotised at base, broader medially, tapering, distally with a medial dorsal keel and a small but distinct ventral hook; tegumen more narrow than in *S. scotopepla*, at base with short, weakly sclerotised, serrated lateral arms with moderately developed teeth; valva shorter than in *S. scotopepla*, narrowed medially, with costa weakly sclerotised, twisted at base, with an apically projecting point; vinculum U-shaped, distally more narrow than in *S. scotopepla*; calcar rather short, with medium-sized apical hook turned down, with thick hairs in its distal part; hood-shaped membrane with medium-sized, rounded lateral



Figs 2-4. *Scotocyma rutilimixta* Schmidt, adults. **2.** Male (Australia, Queensland, Paluma), wings above. **3.** Male (same locality), wings underneath. **4.** Female (Australia, Queensland, Mt Lewis SF), wings above.

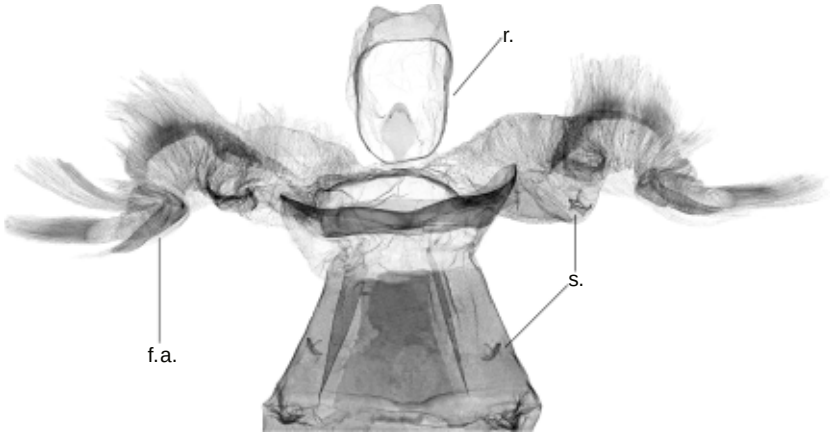
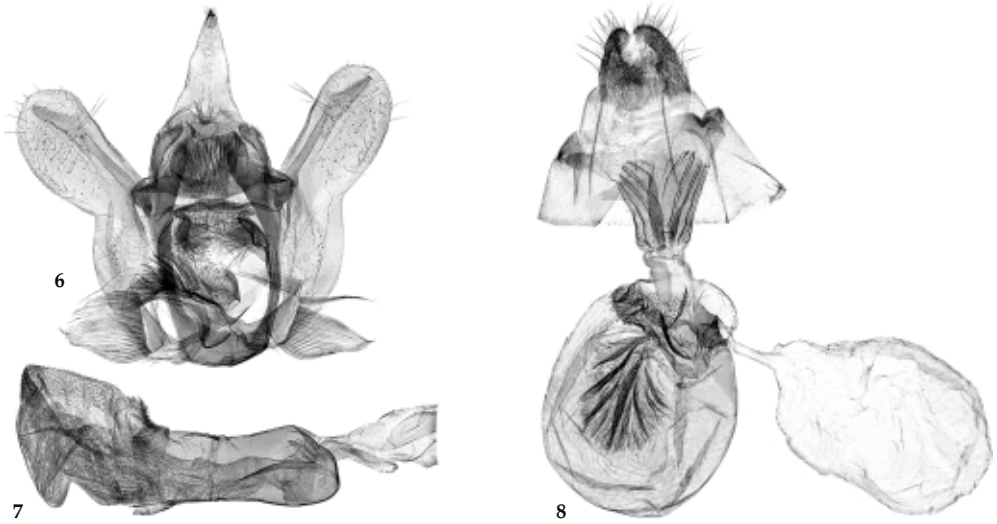


Fig. 5. *Scotocyma rutilimixta* Schmidt, male, abdominal coremata and the sclerotised ring. Abbreviations: **f. a.** finger-shaped appendix; **r.** ring; **s.** spiracle.



Figs 6-8. *Scotocyma rutilimixta* Schmidt, male and female genitalia. **6.** Male, armature. **7.** Male, aedeagus. **8.** Female. Fig. 8 is not in scale.

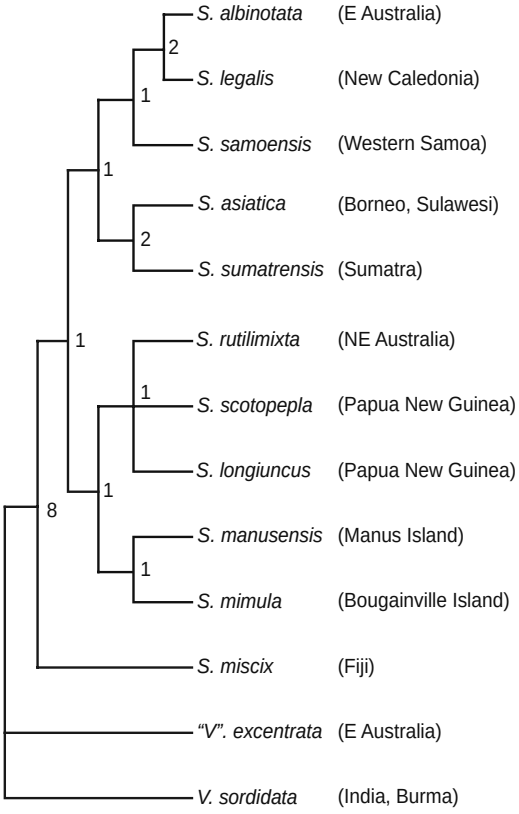


Fig. 9. Strict consensus tree for *Scotocyma* spp. Branch support for the nodes is presented.

patches of hairs; aedeagus with a medial patch of weak scobination in vesica.

Female genitalia (Fig. 8)**.** Description given in Schmidt (2005).

Distribution and habitat. *Scotocyma rutilimixta* occurs in northern Queensland, at the edge of tropical rainforest, at altitudes of 760-1100 m.

Very little is known about the biology of *S. rutilimixta*. Considering that the second Australian species, *S. albinotata*, is known to feed on *Coprosma repens* (Rubiaceae) (Schmidt 2003, 2005) it seems possible that *S. rutilimixta* feeds also on *Coprosma*. However, a search for the potential host plant in the vicinities of Kuranda (northern Queensland) in November 2005 was not successful. During a six years long survey in the middle of a tropical rainforest patch near Kuranda at an elevation of 335 m, the species was never collected at light (David C. F. Rentz, personal comm. 2005). *Scotocyma rutilimixta* is presumably nocturnal as all specimens deposited in insect collections were attracted to light at night. The peak of the seasonal activity of the species could not be determined since the specimens were collected all year round: two females in January, five males in February, one female in May, one female in August, one male in September, and one male in November.

Remarks. Wing expanse in females 34-37 mm (n = 5). An illustration of the female from a non-type locality is given in Fig. 8.

The holotype was collected by F. P. Dodd. The type locality written on the label is "Cairns distr.". It is known that F. P. Dodd has been mainly collecting in the mountain forest in the Evelyn district, which is about 15 km SSE of Herberton, at an altitude of 1100 m (G. Monteith 1991 and personal comm. 2005).

Discussion

Phylogenetic analysis. The analysis of the data matrix used in an earlier revision (Schmidt 2005) including the data for the newly described male of *S. rutilimixta* produced two most parsimonious trees of length 102 steps, consistency index (CI) = 0.92, retention index (RI) = 0.85.

Bremer support was calculated for the clades. In this analysis the basal node for the genus *Scotocyma* shows a high support value of 8 which supports the monophyly of the genus. The strict consensus tree with Bremer support for clades is shown in Fig. 9. The new consensus tree differs from the previous one (Schmidt 2005) by the position of *S. rutilimixta*. Previously, it came out as closely related to the Malaysian-Indonesian group *S. asiatica* + *S. sumatrensis*. The enlarged data matrix allowed more precise estimation of the relationships, and the north-eastern Australian species *S. rutilimixta* appears to be most closely related to the clade containing the eastern Papuan species *S. scotopepla* and *S. longiuncus*. This is mainly based on the shape of the brownish median band in a forewing underneath and moderately developed teeth on the lateral arms at base of the tegumen. The node is not resolved because females of the eastern Papuan species are still unknown.The clade *S. manusensis* + *S. mimula* is shown to be the sister-group to (*S. scotopepla* + *S. longiuncus* + *S. rutilimixta*). Close relationships of endemic north-eastern Australian and Papuan species are understandable when considering the geology of this region (Jaques & Robinson 1977, Holloway 1984, Pigram & Davies 1987, Boer 1995, Schmidt 2005), and many examples of such relationships are known, e.g. the larentiine genus *Crasilogia* Warren and the

ennomine genus *Polyacme* Warren (Holloway 1984), or the cicada genus *Gymnotympana* Stål (Boer 1995). Presumably, the common ancestor of the group (*S. scotopepla* + *S. longiuncus* + *S. rutilimixta*) reached Australia during one of the most recent glacial related Pliocene-Pleistocene sea level falls, as it happened in the case of *Gymnotympana* (Boer 1995).

The distant relationship of *S. rutilimixta* and the second known eastern Australian species, *S. albinotata*, which occurs in Queensland and New South Wales, could be confirmed in the present phylogenetic analysis which assumes a different distribution pattern for *S. albinotata*.

The present and the recent studies (Schmidt 2005, 2006) support the view that the Australasian genus *Scotocyma* has its origin outside of Australia.

Acknowledgements

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Buchbesprechungen

10. Jadwiszczak, A. S. & P. Wegrzynowicz: World Catalogue of Coccinellidae. Part 1 Epilachninae. – Mantis, Olsztyn, 2003. 264 S. ISBN 83-91812-53-7

Zahlreiche Neubeschreibungen und Änderungen in Nomenklatur und Systematik seit Erscheinen des Coleopterorum Catalogus von Junk über Coccinelliden, 1931 – 1932 machten eine Neubearbeitung dringend nötig. Diese liegt nun im 1. Teil über Epilachninae vor. Sie ist mit vorbildlicher Genauigkeit zusammengestellt. Insgesamt sind 4 Bände geplant: Teil 2: Sticholotidinae, Chilocorinae und Coccidulinae, Teil 3: Scymninae und Teil 4: Coccinellinae. Tribus, Gattungen und Arten sind jeweils alphabetisch innerhalb ihrer höheren taxonomischen Kategorien aufgelistet, was die Übersichtlichkeit sehr erleichtert. Im Unterschied zum Junk- Katalog zitieren die Autoren nicht die gesamte Literatur über jedes Taxon. Dafür findet man hinter dem gültigen Namen den der Erstpublikation mit den dazu gehörigen Daten, dazu den Fundort der Typen, evtl. Typenfestlegung, eine vollständige Liste der Synonyme und den Hinterlegungsort des Typus, dazu Angaben über die Verbreitung. Um die Übersichtlichkeit zu erhöhen, sind alle Literaturzitate, nach Autoren geordnet, am Schluß zusammengefaßt. Gerade die Angaben über Typen, auch bei Synonymen ist ein unschätzbarer Vorteil gegenüber dem Junk- Katalog. Auf die Einleitung folgt ein Liste der Acronyme der Sammlungen, die allerdings nicht immer mit den allgemein üblichen übereinstimmen. So liest man z.B. statt ZSM – ZSMC oder für MNHUB – ZMUB. Dann folgt eine Zusammenstellung der nomenklatorischen Änderungen dieses Katalogs, wie neue Synonyme, neue Namen, neue Kombinationen. und Emendationen. An den Katalog gültiger Taxa schließt sich eine Liste der nomina nuda, der Taxa mit unsicherer Zuordnung und der Taxa an, die als Epilachninae beschrieben worden sind, jetzt aber anderen Gruppen zugeordnet werden. Literatur- und Inhaltsverzeichnis schließen den Band ab.

So ist dieses Buch eine unentbehrliches Nachschlagewerk moderner Coccinellidensystematik, unverzichtbar für Bibliotheken, Museen und vor allem für Coccinellidenkenner. Das Preis-Leistungs-Verhältnis ist korrekt.

H. Fürsch

11. Peck, S. B.: The Beetles of the Galápagos Islands, Rcuador: Evolution, Ecology, and Diversity (Insecta: Coleoptera). – NRC Research Press, Ottawa, 2006. 313 pp. Few colour fotos. ISBN 0-660-19421-X

Since Charles Darwin's legendary visit at the Galápagos Islands during the circumnavigation of the globe of H.M.S. Beagle this group of volcanic islands off the coast of South America has fascinated biologists, especially those with an evolutionary view, because, as Darwin has demonstrated, these islands of different size and age are somewhat like a laboratory that demonstrates how evolution works and how straddling immigrants from a distant landmass can adapt to new and difficult environments and which species diversity and new life style types evolution under such ecological pressures can cause. Hence, since Darwin's time these islands have been visited and investigated again and again by many scientists, including several entomologists.

Apparently the time is now ripe for a first inventory of species, and in the present volume this has been done for the beetles which have been studied by a number of specialists, including and at the first place by S. B. Peck who has visited the islands several times and for quite extended periods. Although the main objective is a species inventory of the presently known beetle fauna of the islands, the volume gives not only an introduction into the abiotic and biotic features of the island group, but likewise it represents an extensive investigation of the history of the beetle fauna, beginning with the origin and arrival of the beetle colonists, the evolution of the beetle fauna, their ecology and distribution, and the beetle assemblages in the different habitat types. This part reads as a well documented explanation of evolution and ecology, though certainly the beetle fauna still merits further investigation. This is clearly perceptible when checking the species inventory which includes many still unnamed species, either because these are new species that have not yet been described, either because as foreign immigrants their species identity is not yet settled.

In the meantime phylogeography of a number of beetle groups apparently is known to such a degree that migration or colonization routes of species within the island group, and subsequent evolutionary processes seem to be well understood or at least can be hypothesized with good reasons. Hence this first part of the book can be read as an introduction into island biogeography and evolution.

The bulk of the pages, however, is devoted to the species inventory which includes as well all literature records, as knowledge gained during recent investigations of the author and his scientific parties. It is not a pure checklist, but generally contains keys to all occurring genera and species, even when they are still unnamed. The species accounts include distribution and bionomics, as far as this is yet known. An extensive list of references, an index of topics and an index of generic and suprageneric names conclude the book.

This is a very useful monograph about a large part of the fauna of one of the most interesting areas on earth, in terms of evolutionary processes, that as well is satisfying the taxonomist, as well the ecologist or evolutionary biologist. The single reservation for me is: why this excellent book has not been adorned with more figures, e.g. habitus fotos of some of the endemic species?

M. Baehr