A reappraisal of two endemic hawkmoths (Lepidoptera: Sphingidae) from the Solomons Archipelago

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Abstract: The morphology and distributions of *Ambulyx meeki* (ROTHSCHILD & JORDAN, 1903) and *Macroglossum albigutta* ROTHSCHILD & JORDAN (1903), two hawkmoths endemic to the Solomons Archipelago, are reviewed in the light of recently collected material. Features previously considered diagnostic are critically reappraised and taxa are redescribed using constant external features and characters of the male genitalia. Ranges of variation in colour and pattern of both sexes are illustrated. A new subspecies of *Ambulyx meeki* is described from the island of San Cristobal: *A. meeki* ***makirae*** **ssp. nov.** (HT in BMNH).

Eine Neubewertung zweier endemischer Schwärmerarten (Lepidoptera: Sphingidae) von den Solomonen

Zusammenfassung: Durch kürzlich gefangenes Material wurde eine Neubearbeitung von Morphologie, Verbreitung und Systematik von *Ambulyx meeki* (ROTHSCHILD & JORDAN, 1903) und *Macroglossum albigutta* ROTHSCHILD & JORDAN (1903), zwei endemischen Schwärmerarten der Solomonen, ermöglicht. Vorher als wichtig erachtete Merkmale werden kritisch neubewertet; die vorhandenen Taxa werden erneut beschrieben auf der Basis konstanter Habitusmerkmale und von Merkmalen des männlichen Genitalapparats; für beide Arten werden mehrere Unterarten auf den Solomonen angenommen. Die Variationsbreite von Färbung und Zeichnung beider Geschlechter wird abgebildet. Eine neue Unterart von *Ambulyx meeki* wird von der Insel San Cristobal beschrieben: *A. meeki* ***makirae*** **ssp. nov.** (HT in BMNH).

Introduction

The Solomon Islands form a double chain of more than 900 islands, extending for over 1600 km southeast from the Bismarck Archipelago in the southwest Pacific. The large island of Bougainville, politically part of Papua New Guinea, is geographically and faunistically part of the Solomons Archipelago. Some islands are little more than coral atolls; others are rugged, mountainous and heavily forested. The archipelago covers 1.5 million km^2 in total, of which the land area is 28000 km^2. Despite a colonial history, the fauna of the Solomon Islands is not well represented in museum collections, and the Lepidoptera have never been systematically surveyed.

The aim of this paper is to clarify the taxonomy of two species for a forthcoming checklist of Sphingidae of the Solomons Archipelago (TENNENT, in prep. a), a study based primarily on material collected by the first author during the Imperial College Solomon Islands Expedition 1996 (ICSIE). ICSIE visited the Solomon Islands between July and October 1996 and, as part of a project to investigate the biodiversity and distribution of Sphingidae, hawkmoths were collected on several islands of the New Georgia Group, Guadalcanal and San Cristobal.

Ambulyx meeki (ROTHSCHILD & JORDAN, 1903)

The genus *Ambulyx* WESTWOOD, 1847, comprises 44 species of large hawkmoths (KITCHING & CADIOU, in prep.). Many are morphologically similar and some may only be identified with certainty after examining the structure of the male genitalia. Species of *Ambulyx* are found throughout the Indo-Australian region, from the Indian subcontinent, east and north through China to the Korean peninsula and Japan, and south and east, through the Philippines and islands of the Malay Archipelago, to northern Queensland and the Solomon Islands. The easternmost representative of the genus is *Ambulyx meeki* (ROTHSCHILD & JORDAN, 1903), which is confined to the Solomons Archipelago.

A. meeki was originally described from a pair captured on the island of Santa Isabel by Albert S. MEEK in 1901. (In the original description, ROTHSCHILD & JORDAN attributed capture of these moths to "A. S. MEEK & EICHHORN", but specimen labels make no mention of the latter collector.) Both are in the collection of The Natural History Museum, London (BMNH) (Plate I, figs. 1, 2), and have been examined. Prior to ICSIE, these appear to be the only known individuals of the nominotypical subspecies. ROTHSCHILD & JORDAN (1903) considered *meeki* to be allied to *Ambulyx wildei* MISKIN, 1891, from Tanimbar, New Guinea and Queensland, but concluded the description of *meeki* with the comment that it was "easily distinguished from all the other species [of the genus] by the conspicuous olive antemedian and discal bands of the forewing".

Two decades later, JORDAN (1923) described a second subspecies, *Ambulyx meeki pyrrhina*, based on a female from the island of Choiseul captured by MEEK in 1904 (Plate III, fig. 9). As no male was available, JORDAN compared this specimen with the female paratype of *m. meeki* (Plate I, fig. 2), noting that in *m. pyrrhina* the area between the two antemedian lines on the forewing upperside was not darkened; the distal half of the forewing upperside anterior of M_3 was distinctly lighter than the area posterior to that vein; the forewing subbasal spots were smaller; and the three transverse bands on the hindwing upperside were narrower, with the outer one only faintly indicated. Thus, the two specimens appear superficially dissimilar. In addition, the forewing underside of *m. pyrrhina* lacked a dark median line and the discal area had only traces of dark markings, whereas in *m. meeki*, a light median area was sharply bordered by dark antemedian and postmedian lines.

A previous lack of material of *meeki* has hampered study. However, collection by ICSIE of 28 specimens from the islands of Kolombangara, New Georgia, Guadalcanal and San Cristobal has allowed us to investigate more fully the variation of *meeki* within the Solomons.

The external appearance of males varies considerably, in both ground colour and intensity of the various pattern elements. Some specimens (e.g. Plate I, fig. 3; Plate IV, fig. 12) present a very uniform appearance. The ground colour of the forewing upperside is a soft, pale brown, with poorly defined transverse bands and lines, and relatively small basal spots. The marginal area is well-delimited by a dark inner line, but externally is a similar intensity to the postmedian band. The hindwing has a distinct orange cast and the transverse lines are pale brown, not especially contrasting. The undersides of both wings are pale orange-brown and the transverse lines are barely discernible. Other specimens present an altogether more contrasting appearance (e.g. Plate I, fig. 4; Plate IV, fig. 15), in which the ground colour of both surfaces of both wings is decidedly yellow. The uppersides have strong, dark brown transverse lines and bands, between which are numerous small dots of the same colour. The basal spot is quite large and, in most specimens, the marginal area is distinctly darker than any other area of the wing (the specimen in Plate IV, fig. 13 is an exception). The undersides of both wings are a uniform deep yellow, with numerous dark brown spots and contrasting, though indistinctly formed, transverse bands.

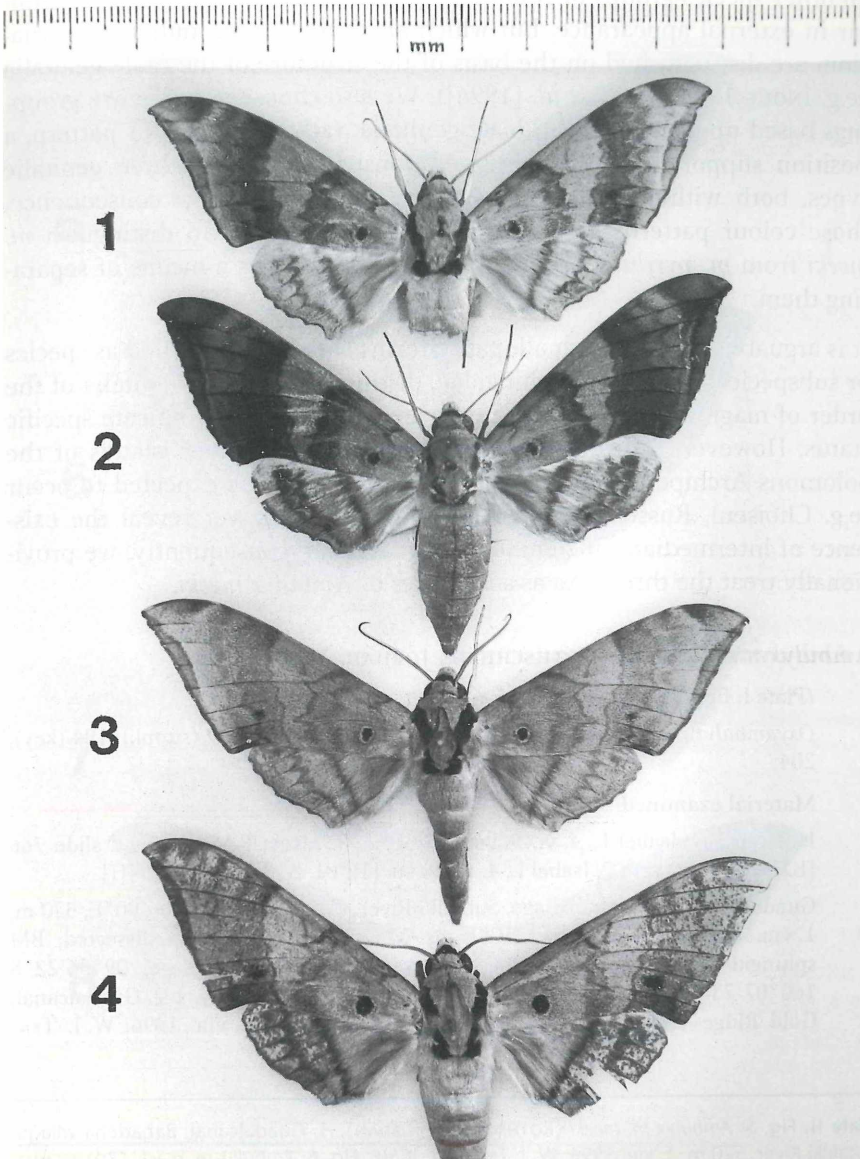
Both "pale" and "yellow" forms fly together on the islands of Kolombangara, New Georgia and Guadalcanal. So far, only single "yellow" specimens are known from Santa Isabel and San Cristobal, but further collecting may show that the "pale" form exists on these islands also. A number of moths of intermediate appearance have been captured; for example, the specimen in Plate IV, fig. 13, has well-developed antemedian and postmedian transverse bands on the forewings, but otherwise corresponds in facies with the "pale" form. In contrast, some specimens of the "yellow" form have reduced banding and one has almost no trace of such a pattern. Variation in females is less extensive. However, there are forms that can be associated with the "pale" and "yellow" male forms (Plate II, fig. 6 and Plate III, fig. 11 respectively).

Initially, we thought that the "pale" and "yellow" forms might represent two species, occurring sympatrically throughout most, if not all of the Solomons Archipelago. In order to investigate this possibility further, we dissected and examined the male genitalia of specimens from all islands and of both forms, where available.

Current studies of the biodiversity and biogeography of Solomons butterflies (TENNENT, in prep. b) suggest that some islands or island groups in the archipelago have more endemic taxa than others. Notably, the New Georgia Group (New Georgia, Kolombangara, Rendova, Vella Lavella) and the large eastern island of San Cristobal each have significant numbers of endemic taxa, while Guadalcanal and the large islands of the 'northern' chain (Choiseul, Santa Isabel and, to a lesser extent, Malaita) seem to have greater faunistic affinity.

It was interesting to find that genitalia of males from the New Georgia Group were essentially constant in structure, and that those of Santa Isabel and Guadalcanal were similarly constant, whereas between these areas there were marked differences. As might be expected, the solitary male available from San Cristobal was dissimilar to both the New Georgia Group and Santa Isabel/Guadalcanal material. In contrast, the genitalia of the respective "pale" and "yellow" males from Kolombangara, New Georgia and Guadalcanal were similar in all respects.

Plate I. Fig. 1: *Ambulyx meeki meeki* (ROTHSCHILD & JORDAN), holotype ♂, [Santa] Isabel, 4. VI.–9. VII. [19]01, A. S. MEEK (coll. BMNH). **Fig. 2:** *Ambulyx m. meeki* (ROTHSCHILD & JORDAN), paratype ♀, same data as holotype (coll. BMNH). **Fig. 3:** *Ambulyx m. meeki* (ROTHSCHILD & JORDAN), ♂, Guadalcanal, Babadeha village, Sutakiki River, 520 m, 1. VIII. 1996, W. J. TENNENT, ICSIE (coll. BMNH). **Fig. 4:** *Ambulyx m. meeki* (ROTHSCHILD & JORDAN), ♂, same data as Fig. 3 (coll. BMNH).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In other species-groups of *Ambulyx*, species and subspecies that are similar in external appearance, but which also show strong individual variation, are distinguished on the basis of the structure of the male genitalia (e.g. INOUE 1991, INOUE *et al.* [1996]). We also choose to recognize groupings based upon variation in male genitalia, rather than colour pattern, a position supported by the observed consistency of the three genitalic types, both within and between the island groups. As a consequence, those colour pattern features used by JORDAN (1923) to distinguish *m. meeki* from *m. pyrrhina* are now wholly unreliable as a means of separating them.

It is arguable whether such allopatric forms should be regarded as species or subspecies, and within Sphingidae, distinctions in male genitalia of the order of magnitude observed here are generally taken to indicate specific status. However, future examination of *meeki* from other islands of the Solomons Archipelago, where it is known or might be expected to occur (e.g. Choiseul, Russell Group, Florida Group), may yet reveal the existence of intermediates in genitalic structure and, consequently, we provisionally treat the three taxa as subspecies of *Ambulyx meeki.*

Ambulyx meeki meeki (ROTHSCHILD & JORDAN, 1903)

(Plate I, figs. 1-4; Plate II, figs. 5-6)

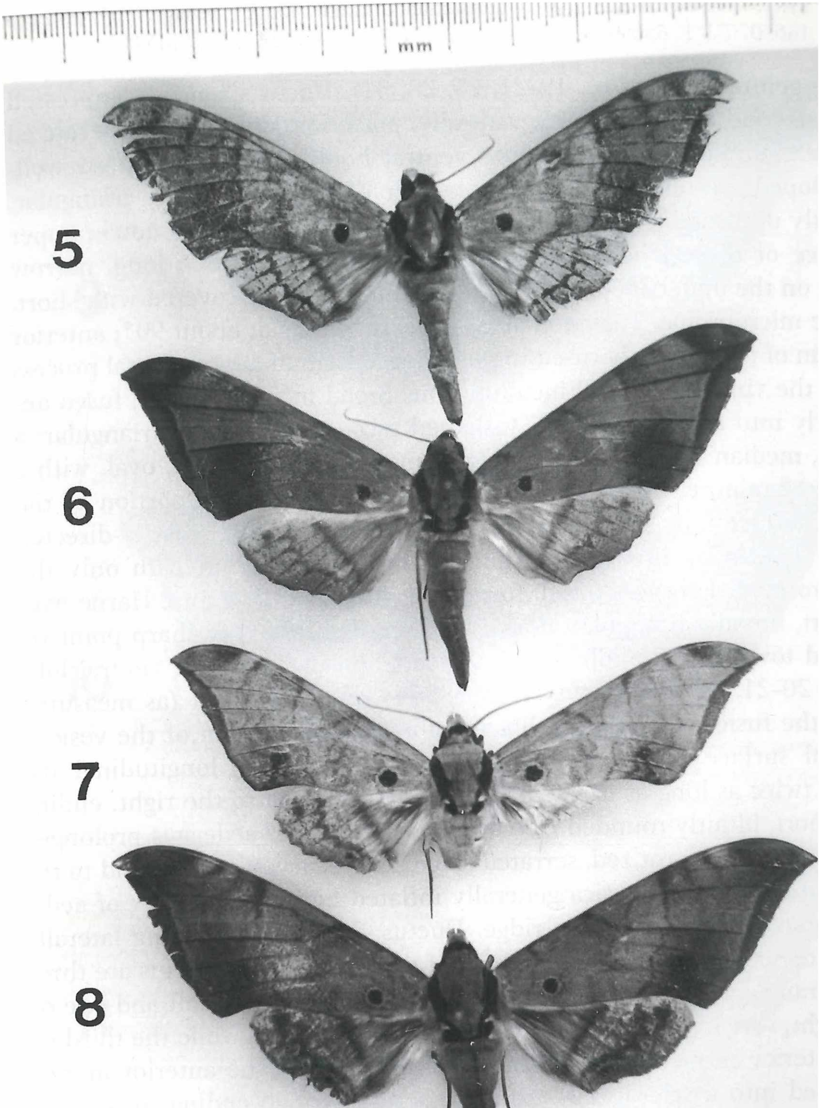
Oxyambulyx meeki ROTHSCHILD & JORDAN, 1903, Novit. zool. 9 (suppl.): 194 (key), 204.

Material examined:

Holotype: ♂, Isabel I., 4. VI.-9. VII. [19]01, A. S. MEEK, B.M. sphingid slide 766 [BMNH]. Paratype: ♀, Isabel I., 4. VI.-9. VII. [19]01, A. S. MEEK [BMNH].

Guadalcanal, Babadeha village, Sutakiki River, 09°40'41"S 160°06'90"E, 520 m, 1. VIII. 1996, W. J. TENNENT, ICSIE, 9 ♂♂, 3 ♀♀ (2 ♂ genitalia dissected; BM sphingid slides 771 & 774). Guadalcanal, Gold Ridge Village, 09°36'22"S 160°07'73"E, 580 m, 20. VII. 1996, W. J. TENNENT, ICSIE, 1 ♂, 1 ♀. Guadalcanal, Gold Ridge Village, 09°36'22"S 160°07'73"E, 580 m, 3. VIII. 1996, W. J. TEN-

Plate II. Fig. 5: *Ambulyx m. meeki* (ROTHSCHILD & JORDAN), ♂, Guadalcanal, Babadeha village, Sutakiki River, 520 m, 1. VIII. 1996, W. J. TENNENT, ICSIE. Fig. 6: *Ambulyx m. meeki* (ROTHSCHILD & JORDAN), ♀, Guadalcanal, Gold Ridge Village, 580 m, 4. VIII. 1996, W. J. TENNENT, ICSIE (coll. BMNH). Fig. 7: *Ambulyx meeki makirae* n. ssp., holotype ♂, San Cristobal, Arahani, east of Kira-Kira, 12. VIII. 1996, W. J. TENNENT, ICSIE (coll. BMNH). Fig. 8: *Ambulyx meeki makirae* n. ssp., paratype ♀, San Cristobal, Hunari village, Rawo river, east of Kira-Kira, 20 m, 13. VIII. 1996, W. J. TENNENT, ICSIE (coll. BMNH).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NENT, ICSIE, 1 ♂, 1 ♀. Guadalcanal, Gold Ridge Village, 09°36'22"S 160°07'73"E, 580 m, 4. VIII. 1996, W. J. TENNENT, ICSIE, 1 ♀. [BMNH.]

Male genitalia (Figs. 16, 19-21, 25, 28, 31). Uncus strongly compressed laterally and expanded dorso-ventrally; posterior edge heavily sclerotized apically, straight, with a minute ventral hook (Fig. 16). Gnathos well-developed, posterior margin with a pair of median, bluntly triangular, slightly upturned lobes, between which is a blunt, V-shaped notch; upper surface of these lobes rugose. Subscaphium present as a long, narrow band on the underside of the anal tube; inner surface covered with short, dense microtrichia. Tegumen arms wide, diverging at about 90°; anterior margin of each broadly fused to posterior margin of a large dorsal process from the vinculum arm. Vinculum arms broad in ventral view; fused anteriorly into a large, pointed, V-shaped saccus. Juxta small, triangular; a small, median notch on the posterior margin. Valve, broad, oval, with a patch of minute, dense stridulatory scales on the dorsal portion of the outer surface (Fig. 19); inner surface covered with long, basally-directed hairs. Transtillae broad, quadrilateral, medially adjacent with only the postero-medial corners fused, forming a hinge-like structure. Harpe with a short, broadly triangular, dorsal hook ending in a very sharp point recurved towards the midline and a broad, apically rounded, ventral lobe (Figs. 20-21, 25). Aedeagus (Figs. 28, 31) relatively short (as measured from the fusion with the anellar membrane to the origin of the vesica); ventral surface with a strongly invaginated, narrow, longitudinal bar about twice as long as the aedeagus, apically curved to the right, ending in a short, bluntly-rounded free process. Left side of aedeagus prolonged into a narrow, sclerotized, serrated ridge that recurves dorsally and to the right in a broad arc; vesica generally inflated between the apex of aedeagus and end of the serrate ridge. Ductus ejaculatorius arising laterally and directed to the right. At the base of the ductus ejaculatorius are three membranous diverticula; two face posteriorly, one on the left and one on the right, which are very short and difficult to discern; while the third on the anterior surface of the vesica is longer and has the anterior margin modified into a sclerotized, minutely serrated ridge ending in a short,

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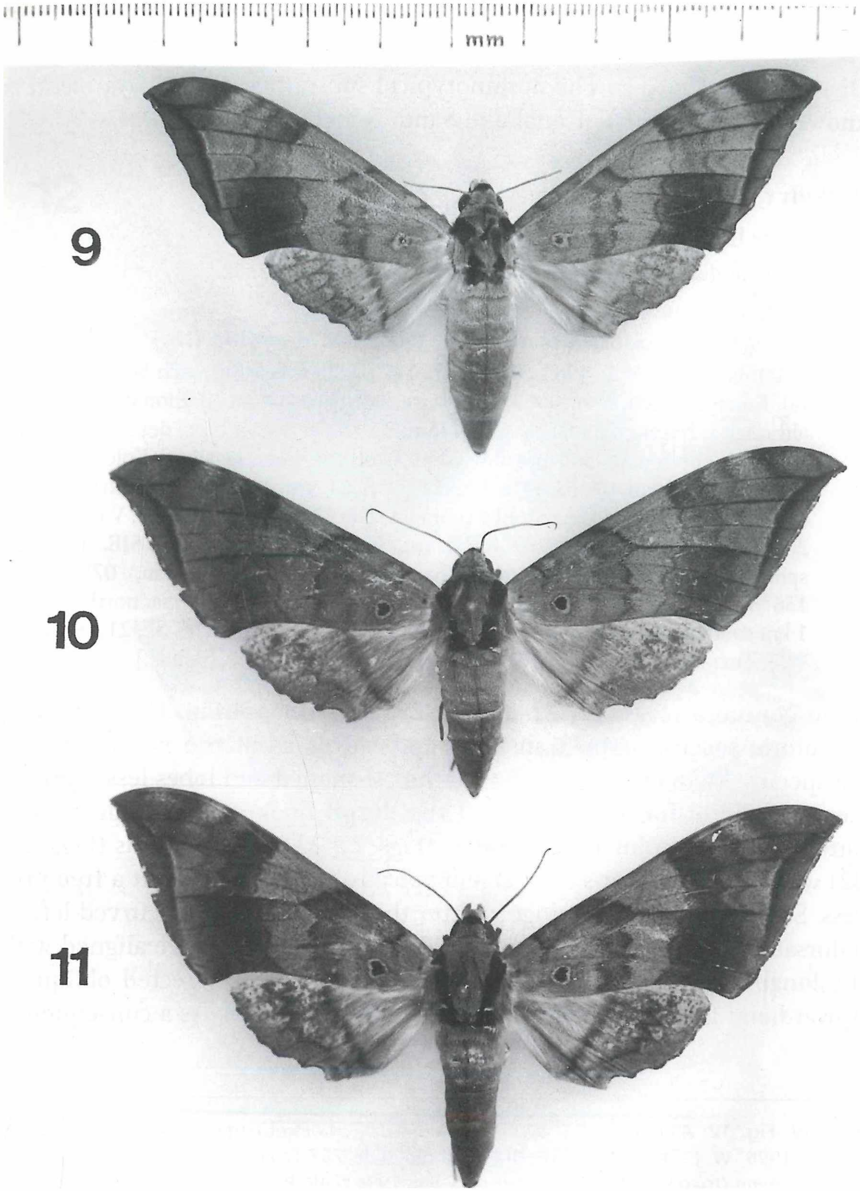
Plate III. Fig. 9: *Ambulyx meeki pyrrhina* (JORDAN), holotype ♀, Choiseul, south side, I. 1904, A. S. MEEK (coll. BMNH). **Fig. 10:** *Ambulyx meeki pyrrhina* (JORDAN), ♀, Kolombangara, Vanga Point, 20 m, 22. VIII. 1996, W. J. TENNENT, ICSIE (coll. BMNH). **Fig. 11:** *Ambulyx meeki pyrrhina* (JORDAN), ♀, same data as Fig. 10 (coll. BMNH).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pointed, antero-laterally directed cornutus. Both Guadalcanal specimens dissected agreed fully in genitalic structure with the holotype of *m. meeki* from Santa Isabel.

Distribution (Fig. 34). The nominotypical subspecies of *Ambulyx meeki* is known only from Guadalcanal and Santa Isabel.

Ambulyx meeki pyrrhina (JORDAN, 1923)

(Plate III, figs. 9-11; Plate IV, figs. 12-15)

Oxyambulyx meeki pyrrhina JORDAN, 1923, Ent. Mitt. **12**: 52.

Material examined:

Holotype: ♀, Choiseul I., south side, I. 1904, A. S. MEEK [BMNH].

Kolombangara, 25. IV. 1983, M. BIGGER, 1 ♂ [Dodo Creek Research Station, Honiara]. Kolombangara, 1. VII. 1983, M. BIGGER, 1 ♀. [There is an additional male, which although it has no data label, agrees in other respects (pin type, determination label) with the female and possibly came from the same locality.] Kolombangara, Vanga Point, 20 m, 07°53'84"S 156°57'59"E, 21. VIII. 1996, W. J. TENNENT, ICSIE, 3 ♂♂ (1 ♂ genitalia dissected; BM sphingid slide 772). Kolombangara, Vanga Point, 20 m, 07°53'84"S 156°57'59"E, 22. VIII. 1996, W. J. TENNENT, ICSIE, 1 ♂ (BM sphingid slide 767) 2 ♀♀. Kolombangara, Vanga Point, 20 m, 07°53'84"S 156°57'59"E, 25. VIII.1996, W. J. TENNENT, ICSIE, 1 ♂. New Georgia, north coast, c. 1 km south of Menakasapa (Paradise), 08°02'34"S 157°22'44"E, SL, 21. VIII. 1996, W. J. TENNENT, ICSIE, 2 ♂♂ (BM sphingid slides 770 & 773). [BMNH.]

Male genitalia (Figs. 17, 22-23, 26, 29, 32). Uncus (Fig. 17), tegumen, vinculum, saccus, juxta, transtillae and valves as in the nominotypical subspecies. Median notch in the gnathos U-shaped and lobes less pointed. Ventral lobe of harpe and base of the dorsal hook narrower, giving the latter a more prominent appearance (Figs. 22-23, 26). Aedeagus (Figs. 29, 32) with ventral bar less curved and apically rounded, without a free process. Sclerotized serrated ridge shorter than ventral bar, not curved left in a dorsal arc, and thus the vesica and ductus ejaculatorius are aligned with the longitudinal axis of the aedeagus, with the vesica directed obliquely upward and the ductus ejaculatorius vertically upward. As a consequence

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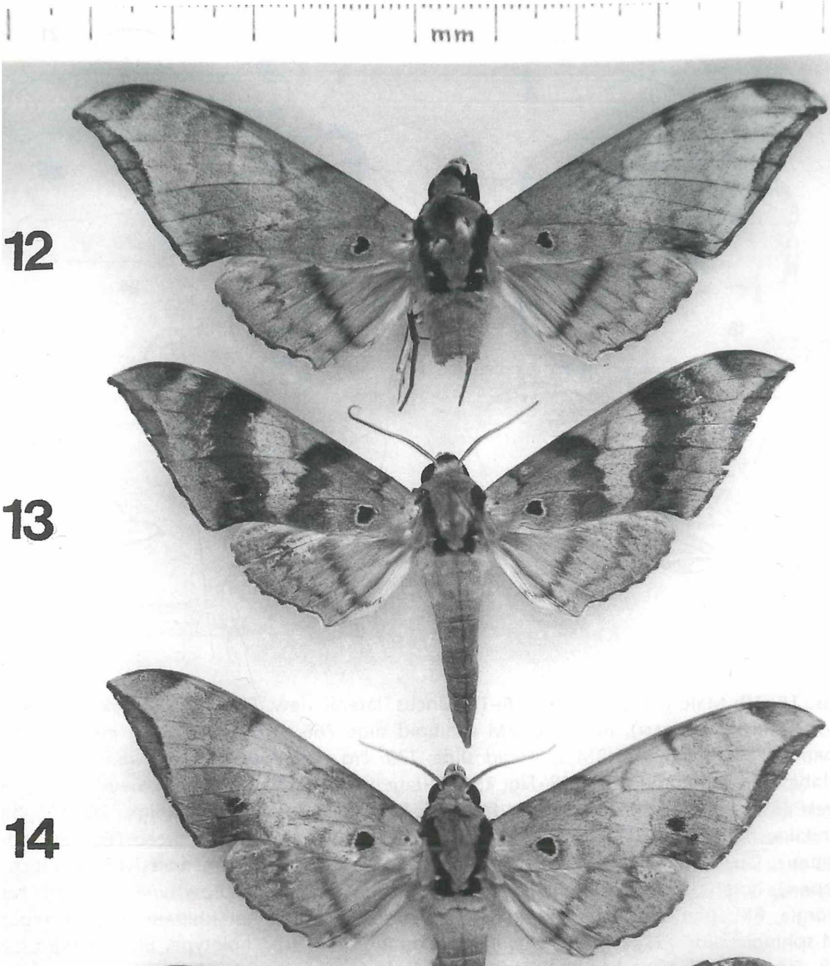
Plate IV. Fig. 12: *Ambulyx meeki pyrrhina* (JORDAN), ♂, Kolombangara, Vanga Point, 20 m, 22. VIII. 1996, W. J. TENNENT, ICSIE, BM sphingid slide 767 (coll. BMNH). **Fig. 13:** *Ambulyx meeki pyrrhina* (JORDAN), ♂, same locality, 25. VIII. 1996 (coll. BMNH). **Fig. 14:** *Ambulyx meeki pyrrhina* (JORDAN) ♂, New Georgia, north coast, about 1 km south of Menakasapa (Paradise), 2. IX. 1996, W. J. TENNENT, ICSIE, BM sphingid slide 770 (coll. BMNH). **Fig. 15:** *Ambulyx meeki pyrrhina* (JORDAN) ♂, same data as Fig. 14, BM sphingid slide 773 (coll. BMNH).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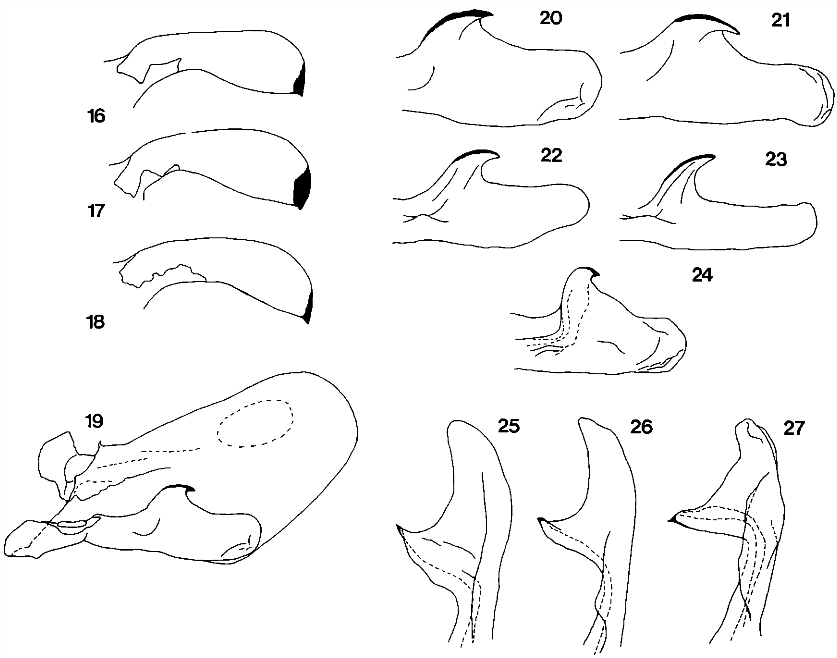
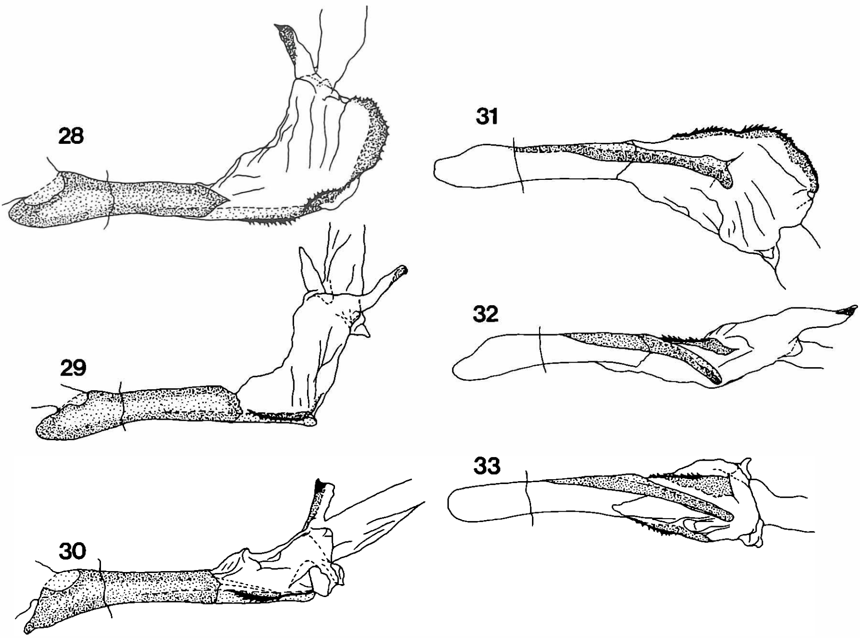


Figs. 16–19: Male genitalia. **Figs. 16–18**: Uncus, lateral view. **Fig. 16**: *Ambulyx meeki meeki* (ROTHSCHILD & JORDAN), holotype, BM sphingid slide 766. **Fig. 17**: *Ambulyx meeki pyrrhina* (JORDAN), New Georgia, BM sphingid slide 770. **Fig. 18**: *Ambulyx meeki makirae* n. ssp., holotype, BM sphingid slide 768. **Fig. 19**: Male genitalia, right valve, inner view, *Ambulyx m. meeki* (ROTHSCHILD & JORDAN), Guadalcanal, BM sphingid slide 771. **Figs. 20–27**: Male genitalia, right harpe. **Figs. 20–24**: Inner view. **Fig. 20**: *Ambulyx m. meeki* (ROTHSCHILD & JORDAN), Guadalcanal, BM sphingid slide 771. **Fig. 21**: *Ambulyx m. meeki* (ROTHSCHILD & JORDAN), holotype, BM sphingid slide 766. **Fig. 22**: *Ambulyx meeki pyrrhina* (JORDAN), New Georgia, BM sphingid slide 770. **Fig. 23**: *Ambulyx meeki pyrrhina* (JORDAN), Kolombangara, BM sphingid slide 772. **Fig. 24**: *Ambulyx meeki makirae* n. ssp., holotype, BM sphingid slide 768. **Figs. 25–27**: Ventro-lateral view. **Fig. 25**: *Ambulyx m. meeki* (ROTHSCHILD & JORDAN), Guadalcanal, BM sphingid slide 771. **Fig. 26**: *Ambulyx meeki pyrrhina* (JORDAN), New Georgia, BM sphingid slide 770. **Fig. 27**: *Ambulyx meeki makirae* n. ssp., holotype, BM sphingid slide 768.

of this alignment of the vesica, the relative positions of the three diverticula in *m. pyrrhina* are markedly different from those in *m. meeki*. The posterior-facing diverticulum on the right side in *m. meeki* is dorsal in *m. pyrrhina* and is longer, being subequal in length to the diverticulum bearing the cornutus, now placed laterally on the left side and directed posteriorly. The third diverticulum, which is about half the length of the



Figs.28–30: Male genitalia, aedeagus, lateral view from left side, dorsal surface uppermost. **Fig. 28**: *Ambulyx m. meeki* (ROTHSCHILD & JORDAN), Guadalcanal, BM sphingid slide 774. **Fig. 29**: *Ambulyx meeki pyrrhina* (JORDAN), New Georgia, BM sphingid slide 773. **Fig. 30**: *Ambulyx meeki makirae* n. ssp., holotype, BM sphingid slide 768. **Figs. 31–33**: Male genitalia, aedeagus, ventral view. **Fig. 31**: *Ambulyx m. meeki* (ROTHSCHILD & JORDAN), Guadalcanal, BM sphingid slide 774. **Fig. 32**: *Ambulyx meeki pyrrhina* (JORDAN), New Georgia, BM sphingid slide 773. **Fig. 33**: *Ambulyx meeki makirae* n. ssp., holotype, BM sphingid slide 768.

other two, is placed laterally on the right side and directed postero-ventrally. All four specimens of *m. pyrrhina* dissected, two from Kolombangara and two from New Georgia, are consistent in these genitalic structures.

Distribution (Fig. 34). It remains uncertain whether the populations of *meeki* from Kolombangara and New Georgia, which we have provisionally assigned to *m. pyrrhina*, actually belong to that subspecies. Certainly, the differences in the male genitalia described above demonstrate that the moths on these islands constitute a different subspecies from *m. meeki* on

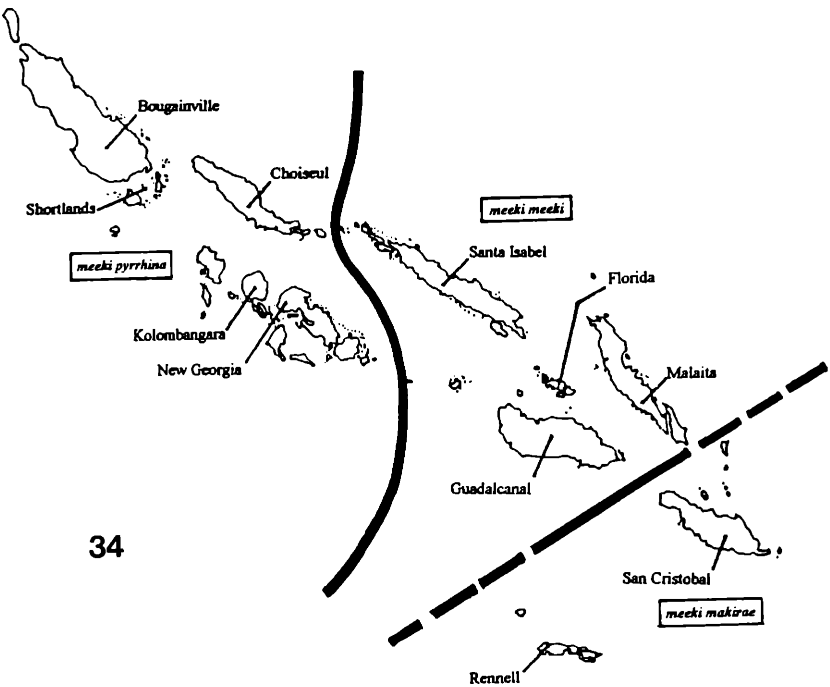


Fig. 34: Distribution of *Ambulyx meeki* (ROTHSCHILD & JORDAN) in the Solomon Islands.

Guadalcanal and Santa Isabel and *m. makirae* **ssp. nov.** on San Cristobal (see below). However, the female holotype of *m. pyrrhina* is still the only specimen known from the type locality and only genitalic examination of males from Choiseul will confirm our placement of the New Georgia Group populations. If this agrees with the New Georgia Group specimens, *m. pyrrhina* will stand as the valid name for the subspecies of *meeki* on these islands. However, if the Choiseul population agrees with nominotypical *meeki* from Guadalcanal and Santa Isabel, then *pyrrhina* will sink as a junior synonym of *meeki* and the New Georgia Group subspecies will require a new name. In an attempt to resolve this dilemma, WJT visited Choiseul in 1997, hoping to obtain further material of *meeki* from this island. Unfortunately, the visit coincided with a period of cyclonic weather conditions that made collecting impossible.

***Ambulyx meeki makirae* ssp. nov.**

(Plate II, figs. 7-8)

Holotype: ♂, Makira (San Cristobal), Arahani, east of Kira-Kira, 10°29'20"S 161°57'26"E, SL, 12. VIII. 1996, W. J. TENNENT, ICSIE, BM sphingid slide 768. [BMNH.]

Paratype: ♀, Makira (San Cristobal), Hunari village, Rawo River, east of Kira-Kira, 10°31'96"S 161°57'42"E, 20 m, 13. VIII. 1996, W. J. TENNENT, ICSIE. [BMNH.]

Male genitalia (Figs. 18, 24, 27, 30, 33). Apex of uncus less dorso-ventrally expanded than in *m. meeki* and *m. pyrrhina*, posterior margin curved rather than straight (Fig. 18). Median lobes of gnathos longer and more well-developed. Harpe (Figs. 24, 27) with anterior margin of dorsal hook vertical (rather than oblique), with a strong ridge, basal of which is a deep concavity; posterior margin of dorsal hook strongly oblique; ventral lobe of harpe quite short and broad. Aedeagus and vesica intermediate in overall appearance between *m. pyrrhina* and *m. meeki*, but distinctively different from both. Ventral bar of aedeagus (Figs. 30, 33) with a rounded free apical process (not curved to the left as in the nominotypical subspecies). Serrate ridge on the left side slightly longer than the ventral bar, somewhat broadened apically and then narrowed and reflexed upwards. A second serrate ridge present on the right side is shorter than the ventral bar. This ridge is absent in most of the other specimens of *meeki* that we have examined (it is very faintly indicated in one of the two specimens of *m. meeki*) but occurs in many other species of *Ambulyx*. Vesica much shorter and less inflated and ductus ejaculatorius directed more obliquely posteriorly than in the other two subspecies. Orientation of the three diverticula as in *m. meeki*, in that the diverticulum bearing the cornutus is dorsal and the other two subventral, one on each side. It would appear that the elongated serrate ridge in *m. meeki* and *m. makirae* has the effect of rotating the vesica through about 120° anti-clockwise (viewed from the anterior end), relative to the orientation observed in *m. pyrrhina*.

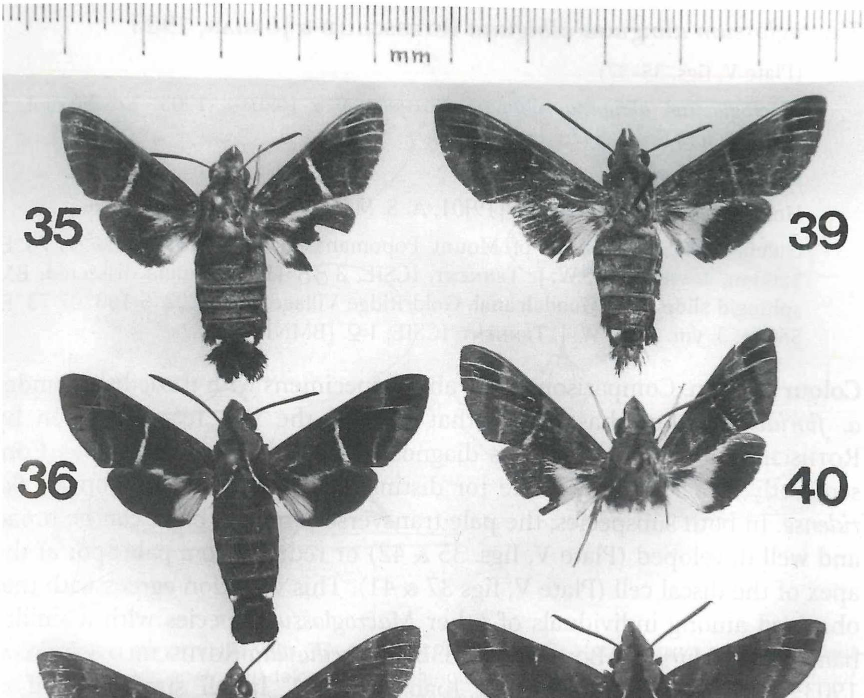
Distribution (Fig. 34). *Ambulyx meeki makirae* is known only from San Cristobal.

Macroglossum albigutta ROTHSCHILD & JORDAN, 1903

Each of the two subspecies of *Macroglossum albigutta* described by ROTHSCHILD & JORDAN (1903) was based on a single female collected by MEEK in 1901. The holotype of *a. albigutta* was captured on Guadalcanal and that of *a. floridense* on Florida Island. The nominotypical subspecies was characterized by the following features: narrow, white, transverse, median band across the forewing upperside very prominent; yellow, median band on the hindwing upperside broadly interrupted; undersides of the wings "deep mummy-brown" in colour; abdominal segment 3 with a lateral, yellow patch and only a few yellow scales present on segments 2 and 4; and abdominal sternite 7 with a white median dot. In contrast, the median forewing band of *a. floridense* was less distinct; the yellow hindwing band was uninterrupted; undersides of the wings were "Mars-brown"; the yellow side patch on abdominal segment 4 was as large as that on segment 3, and abdominal sternite 7 had a white median line with "more or less distinct" white dots on the other sternites.

Later, ROTHSCHILD & JORDAN received a series of *a. floridense* collected by MEEK on Bougainville, quite distant from the type locality of *a. floridense*. The nominotypical subspecies continued to be known only from the holotype until ICSIE collected four more, also from Guadalcanal. We found three additional specimens of *a. floridense*, one from Bougainville and two from Malaita, in the B.P. Bishop Museum (BPBM), Honolulu, misidentified as *Macroglossum rectans* ROTHSCHILD & JORDAN, 1903. A further specimen from Bougainville in the Australian National Insect Collection (ANIC), CSIRO, Canberra, was also examined. Comparison of these specimens with those in the BMNH has enabled us to clarify the status of the two subspecies of *albigutta*.

Plate V. Fig. 35: *Macroglossum a. albigutta* ROTHSCHILD & JORDAN, holotype ♀, Guadalcanal, III. [19]01, A. S. MEEK (coll. BMNH). **Fig. 36:** *Macroglossum a. albigutta* ROTHSCHILD & JORDAN, ♂, Guadalcanal, ridge north of Mount Popomanaseu, 1200 m, 2. VIII. 1996, W. J. TENNENT, ICSIE (coll. BMNH). **Fig. 37:** *Macroglossum a. albigutta* ROTHSCHILD & JORDAN, ♀, Guadalcanal, Gold Ridge Village, 580 m, 3. VIII. 1996, W. J. TENNENT, ICSIE (coll. BMNH). **Fig. 38:** *Macroglossum albigutta floridense* ROTHSCHILD & JORDAN, ♀, Bougainville, IV. 1904, A. S. MEEK (coll. BMNH). **Fig. 39:** *Macroglossum albigutta floridense* ROTHSCHILD & JORDAN, holotype ♀, Florida, I. [19]01, A. S. MEEK (coll. BMNH). **Fig. 40:** *Macroglossum albigutta floridense* ROTHSCHILD & JORDAN, ♂ Bougainville, IV. 1904, A. S. MEEK, BM sphingid slide 781 (coll. BMNH). **Fig. 41:** *Macroglossum albigutta floridense* ROTHSCHILD & JORDAN, ♂, Bougainville, Guava, 4000 ft [1220 m], 1953, W. W. BRANDT & E. HALLSTROM (coll. ANIC). **Fig. 42:** *Macroglossum albigutta floridense* ROTHSCHILD & JORDAN, ♂, Bougainville, V. 1904, A. S. MEEK (coll. BMNH).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Macroglossum albigutta albigutta ROTHSCHILD & JORDAN, 1903

(Plate V, figs. 35-37)

Macroglossum albigutta albigutta ROTHSCHILD & JORDAN, 1903, Novit. zool. 9 (suppl.): 620 (key), 647.

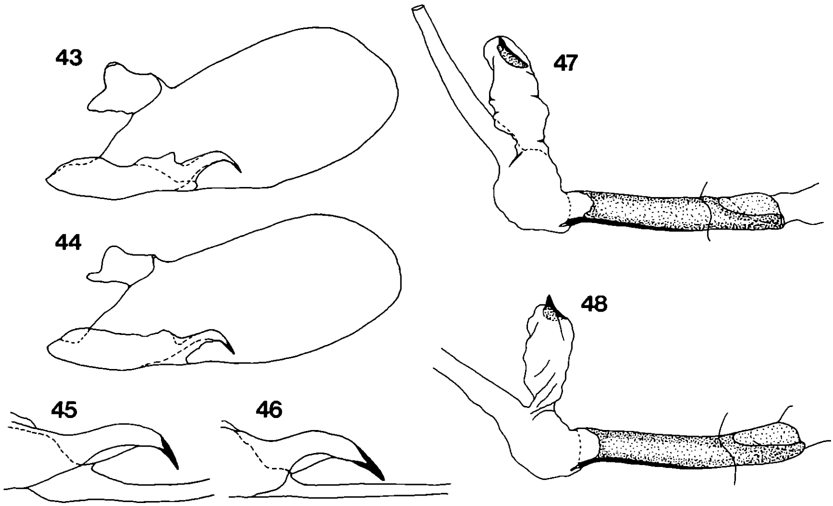
Material examined:

Holotype: ♀, Guadalcanal, III. [19]01, A. S. MEEK. [BMNH]

Guadalcanal, ridge north of Mount Popomanaseu, 09°38'70"S 160°06'76"E, 1200 m, 2. VIII. 1996, W. J. TENNENT, ICSIE, 3 ♂♂ (1 ♂ genitalia dissected; BM sphingid slide 780). Guadalcanal, Gold Ridge Village, 09°36'22"S 160°07'73"E, 580 m, 3. VIII. 1996, W. J. TENNENT, ICSIE, 1 ♀. [BMNH.]

Colour pattern. Comparison of the above specimens with those listed under *a. floridense* below, has shown that four of the five features given by ROTHSCHILD & JORDAN (1903) as diagnostic are individually variable. Consequently, none has any value for distinguishing *a. albigutta* from *a. floridense*. In both subspecies, the pale transverse forewing band can be broad and well developed (Plate V, figs. 35 & 42) or reduced to a pale spot at the apex of the discal cell (Plate V, figs 37 & 41). This variation agrees with that observed among individuals of other *Macroglossum* species with a similar band (e.g. *M. hirundo* BOISDUVAL, 1832; *M. mediovitta* ROTHSCHILD & JORDAN, 1903; *M. rectans* ROTHSCHILD & JORDAN, 1903). In all specimens of *a. albigutta* examined, the lateral yellow patches on abdominal segments 3 and 4 are poorly developed and dark-yellow. However, similarly reduced patches are also observed in some specimens of *a. floridense*, while others have well-developed and bright yellow patches on these segments. The undersides of the wings of *a. albigutta* are generally darker brown than in *a. floridense*. However, the darkest specimens of *a. floridense* are a deeper brown than the holotype of *a. albigutta* and there is thus no unambiguous difference between the two subspecies. Finally, on the underside of the abdomen, there may be just a single dot on sternite 7 (as in the holotype of *a. albigutta*); a short white line on sternite 7 with dots on the more anterior segments (as in the holotype of *a. floridense*), or a continuous white line along the entire length of the abdomen. It is the last of these conditions that is most frequently observed in both *a. albigutta* and *a. floridense* and the holotypes appear to be atypical in this regard.

Only the yellow, median band on the hindwing upperside is constantly different between the two subspecies, with that of *a. albigutta* being broadly interrupted with black scaling, while that of *a. floridense* is not.



Figs. 43–46: Male genitalia. **Figs. 43–44**: Right valve. **Fig. 43**: *Macroglossum albigutta albigutta* ROTHSCHILD & JORDAN, Guadalcanal, BM sphingid slide 780. **Fig. 44**: *Macroglossum albigutta floridense* ROTHSCHILD & JORDAN, Bougainville, BM sphingid slide 781. **Figs. 45–46**: Right harpe, ventral view. **Fig. 45**: *Macroglossum albigutta albigutta* ROTHSCHILD & JORDAN, Guadalcanal, BM sphingid slide 780. **Fig. 46**: *Macroglossum albigutta floridense* ROTHSCHILD & JORDAN, Bougainville, BM sphingid slide 781. **Figs. 47–48**: Male genitalia, aedeagus, lateral view from right side, dorsal surface uppermost. **Fig. 47**: *Macroglossum albigutta albigutta* ROTHSCHILD & JORDAN, Guadalcanal, BM sphingid slide 780. **Fig. 48**: *Macroglossum albigutta floridense* ROTHSCHILD & JORDAN, Bougainville, BM sphingid slide 781.

Male genitalia (Figs. 43, 45, 47). Uncus and gnathos well-developed and undivided; forming a pincer-like structure typical of most Macroglossinae. Saccus broadly rounded, somewhat truncate apically. Juxta a small, rounded-triangular sclerite ventral to the aedeagus. Valve (Fig. 43) ovate; ribbed and apically truncate stridulatory scales present. Transtillae forming two narrow bars from bases of valve costae, fused medially above the aedeagus. Harpe strongly hooked (Fig. 45), apex directed ventrally and towards the internal surface of the valve. Aedeagus (Fig. 47) cylindrical and unadorned, other than with a short, ventral, posteriorly-directed and apically pointed process; transverse apical, toothed bar found in most Macroglossinae is absent. Vesica membranous; basal part inflated forming an ovoid sac; ductus ejaculatorius arising posteriorly and directed dorsally; also arising from the basal sac, dorso-laterally and from the right side, is a large diverticulum, directed dorsally, with a narrowed basal "neck" and bearing a short, posteriorly-directed, apical cornutus.

Distribution. *Macroglossum albigutta albigutta* is currently known only from Guadalcanal.

Macroglossum albigutta floridense Rothschild & Jordan, 1903

(Plate V, figs. 38–42)

Macroglossum albigutta floridense Rothschild & Jordan, 1903, Novit. zool. 9 (suppl.): 647.

Material examined:

Holotype: ♂, Florida I., I. [19]01, A. S. Meek [BMNH].

Bougainville, IV. 1904, A. S. Meek, 3 ♂♂ 1 ♀. Bougainville, V. 1904, A. S. Meek, 5 ♂♂ (1 ♂ genitalia dissected; BM sphingid slide 781). Bougainville, Arawa, XII. 1907, A. S. Meek, 1 ♀. Bougainville, A. S. Meek, 1 ♂. [BMNH.] Bougainville, Guava, 4000 ft [1220 m], 1953, W. W. Brandt & E. Hallstrom, 1 ♂ [ANIC]. Bougainville: Buin, 1. VI. 1956, E. J. Ford, Jr coll., BPBMent 54735 1 ♂. [BPBM] Malaita: Auki, 20 m, 1.–2. VI. 1964, at M.V. light, J. & M. Sedlacek colls, BPBMent 54736 (genitalia dissected) 1 ♂. Malaita: Auki, 20 m, 1.–2. VI. 1964, at M.V. light, J. & M. Sedlacek colls, BPBMent 54737 1 ♂. [BPBM]

Colour pattern. The differences in colour and pattern between *a. floridense* and *a. albigutta* are discussed above under the latter taxon.

Male genitalia (Figs. 44, 46, 48). Structure of uncus, gnathos, tegumen, vinculum, saccus, juxta and valve as in the nominotypical subspecies. Apical hook of harpe (Figs. 44, 46) somewhat straighter in ventral view, being directed less towards the interior surface of the valve than in *a. albigutta*. Aedeagus (Fig. 48) also essentially as in the nominotypical subspecies, but with the lateral diverticulum of the vesica slightly shorter and the apical cornutus slightly longer. None of these differences is very marked.

Distribution. *Macroglossum albigutta floridense* is known so far from Bougainville, Florida and Malaita.

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