

TWO NEW SPECIES AND ONE SUBSPECIES OF RIODINID FROM SOUTHWEST BRAZIL (LEPIDOPTERA: RIODINIDAE)

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ABSTRACT.—Two new species and one subspecies in the riodinid genera *Xenandra* C. & R. Felder, 1865, *Argyrogrammana* Strand, 1932, and *Pachythone* Bates, 1868, are described from Mato Grosso and Rondônia states in south-west Brazil. The symmachiine species *caeruleata* Godman & Salvin, 1878, is transferred to the genus *Esthemopsis* C. & R. Felder, 1865, from *Xenandra* (stat. rev.).

KEY WORDS: Amazon, androconia, *Argyrogrammana*, *Argyrogrammana talboti naranjilla* n. ssp., Bolivia, Dioprinae, Ecuador, *Esthemopsis*, Guianas, Leguminosae, Mato Grosso, *Mesene*, *Mesenopsis*, Neotropical, *Pachythone*, *Pachythone analuciae* n. sp., Peru, Proteaceae, Rondônia, Sapindaceae, *Stichelia*, Symmachiini, taxonomy, *Xenandra*, *Xenandra mielkei* n. sp.

The purpose of this paper is to describe three new riodinid taxa in the genera *Xenandra* C. & R. Felder, 1865, *Argyrogrammana* Strand, 1932, and *Pachythone* Bates, 1868, to facilitate the compilation of butterfly checklists for the Alto Rio Arinos area of Diamantino in Mato Grosso state, Brazil (EF), and Ecuador (JPWH). P. J. DeVries, as the co-discoverer of the new *Pachythone* species, is included as an author on that taxon. All of the unstarred collections listed in Hall (1999) have been examined for relevant types and additional material of the taxa described here. The following collection acronyms are used throughout the text:

AMNH American Museum of Natural History, New York, USA
BMNH (British) Natural History Museum, London, England
EF Eurides Furtado collection, Diamantino, Mato Grosso, Brazil
PJD Philip J. DeVries collection, Eugene, Oregon, USA
UFPC Universidade Federal do Paraná, Departamento de Zoologia, Curitiba, Paraná, Brazil
USNM United States National Museum, Smithsonian Institution, Washington, USA

Xenandra mielkei Hall & Furtado, n. sp.

Fig. 1a-d; 4a-c

Description.—MALE: forewing length 15.5mm. Forewing costal margin shallowly convex towards base, distal margin strongly convex; hindwing angular, tornus pointed. **Dorsal surface:** forewing ground color dark brown; dark orange-red at very base of anal margin and along vein at lower edge of discal cell, becoming slightly broader in postdiscal region and extending to base of veins Cu_1 and M_3 and along discal cell end; fringe brown. Hindwing ground color dark brown, pale brown at very base of wing; large patch of dark orange-red extends from costal margin to a point in middle of cell 2A two-fifths distance from base to wing margin, and then as a semicircle to apex, small area of dark orange-red scaling in lower middle portion of cell 2A; long orange-brown, erectile, androconial setae along medial region of cell 2A extend towards anal margin; fringe brown. **Ventral surface:** ground color of both wings dark brown, paler brown at anal margin of forewing; orange-red dorsal pattern very faintly visible. **Head:** first and third segments of labial palpi brown, dorsal surface of second segment brown, ventral surface orange; third segment very short. Eyes brown and bare, margins with orange scaling. Frons orange. Antennal segments and tubular clubs entirely black. **Body:** both surfaces of thorax black, patagia orange. Dorsal surface of abdomen black, sides and ventral surface of distal half orange, except for narrow medial black line. A broad band of concealed androconial scales with

a small gap dorsally on upper half of abdominal tergites 4 and 5 (Fig. 4c) (see Harvey, 1987, and Hall & Willmott, 1996a, for SEM illustrations of this scale type). All legs brown. **Genitalia** (Fig. 4a,b): uncus rounded at lower posterior corner, produced into point at dorsal tip; tegumen triangular with large rectangular lightly sclerotised region anteriorly; falci of medium size and width; vinculum a narrow ribbon, produced into broad, short saccus ventrally; valvae consist of well sclerotised lower portion produced into a single rounded point, and a more lightly sclerotised upper portion encircling aedeagus and produced into a rounded lobe; aedeagus of even width and slightly downwardly pointed, anterior opening directed ventrally, posterior opening directed ventrally and to right with tip curled inwards; a single large cluster of hair-like cornuti; pedicel large and well sclerotised, produced into a pronouncedly rounded posterior curve.

FEMALE: forewing length 15.5mm. Wing shape similar to that of male but both wings more narrow. **Dorsal surface:** forewing ground color brown; yellow longitudinal stripe extends and broadens from wing base to near distal margin, encompassing lower half of discal cell, upper basal half of cell 2A, and basal two-thirds of cells Cu_2 to M_3 (some brown scaling at upper edge of latter cell); fringe brown. Hindwing ground color brown; yellow longitudinal stripe extends and broadens from wing base to near distal margin, encompassing lower half of discal cell, upper basal half of cell 2A, basal half of cell Cu_2 , and basal three-quarters of cells Cu_1 and M_3 (some brown scaling at upper edge of latter cell); costal and distal fringes brown, anal fringe yellow. **Ventral surface:** differs from dorsal surface in following respects: yellow scaling present on forewing as a band along base of costa and as a small fleck in tornus, and on hindwing as two small yellow spots at wing base above discal cell. **Head:** labial palpi a mixture of yellow and brown scaling on all segments. Eyes brown and bare, margins with yellow scaling. Frons yellow. Antennal segments and tubular clubs entirely black. **Body:** thorax brown with yellow scaling posteriorly at sides on dorsal surface and as a spot at middle of sides on ventral surface; patagia brown. Dorsal surface of abdomen brown, remainder yellow except for narrow medial brown line at sides and on ventral surface. All legs yellow-brown.

Types.—**Holotype** ♂: BRAZIL.—Mato Grosso, Alto Rio Arinos, nr. Diamantino, 400m, 2 Nov 1989 (E. Furtado); to be deposited in the USNM.

Allotype ♀: BRAZIL.—Mato Grosso, Alto Rio Arinos, nr. Diamantino, 400m, 24 Nov 1991 (E. Furtado); to be deposited in the USNM. **Paratypes:** BRAZIL.—Mato Grosso, same locality data as HT: 1 ♂: 18 Dec 1975; 1 ♂: 6 Oct 1990; 1 ♂: 21 Oct 1990; 1 ♂: 28 Oct 1990; 1 ♀: 5 Oct 1980; 1 ♀: 20 Oct 1998 (all E. Furtado); all in the EF. 1 ♂: 2 Nov 1989; 1 ♀: 21 Jul 1992 (both E. Furtado); to be deposited in the UFPC.

Etymology.—This species is named in honor of our friend, the eminent Brazilian lepidopterist, Olaf H. H. Mielke.



Fig. 1-3. 1. *Xenandra mielkei* Hall & Furtado n. sp., holotype ♂ [USNM]: a) dorsal surface; b) ventral surface. Allotype ♀ [USNM]: c) dorsal surface; d) ventral surface. 2. *Argyrogrammana talboti talboti* Brévignon & Gallard, 1998, ♂, Alto Rio Arinos, nr. Diamantino, Brazil [USNM]: a) dorsal surface; b) ventral surface. Holotype ♀, "French Guiana" [BMNH]: c) dorsal surface; d) ventral surface. *Argyrogrammana talboti naranjilla* Hall & Furtado n. ssp., holotype ♂ [AMNH]: e) dorsal surface; f) ventral surface. Allotype ♀ [USNM]: g) dorsal surface; h) ventral surface. 3. *Pachythone analuciaae* Hall, Furtado & DeVries n. sp., holotype ♂ [USNM]: a) dorsal surface; b) ventral surface. Ecuadorian paratype ♂ [PJD]: c) dorsal surface; d) ventral surface.

Diagnosis.—*Xenandra mielkei* n. sp. presents a remarkably interesting phenotype that appears to be an evolutionary intermediate between the genera *Xenandra* and *Mesenopsis* Godman & Salvin, [1886], and its discovery provides evidence that *Mesenopsis* may be a derived clade within *Xenandra*. Longitudinal stripes represent a very rare wing pattern in butterflies and in the moths (primarily Diopinae) which are believed to act as their mimetic models (Miller, 1996), thus it seems most likely that *Mesenopsis* species, whose sexes both have longitudinal stripes, are more derived than *Xenandra* species. In previously described species of the latter genus, the male is typically black with a variably sized red patch at the costal margin of the hindwing while the female has a transverse red forewing band. However, *X. mielkei* is unique in presenting a typical *Xenandra*-like male phenotype and a *Mesenopsis*-like female phenotype. It is most interesting to note the wing pattern variation among paratype males. The red hindwing patch varies in size and the extent to which it extends to the costal margin but, most importantly, the medial forewing red scaling varies from being completely absent (as in typical *Xenandra* males) to being very extensive and similar in shape to that of the female forewing yellow. It is not difficult to imagine how the hindwing red of the male could evolve into a longitudinal stripe by a reduction of red along the length of the costal margin. Unlike all other *Xenandra* species, *X. mielkei* lacks the apomorphic grayish-green interneural stripes on both ventral wing surfaces which perhaps also suggests that it may be close to the progenitor of the currently recognised genera *Xenandra* and *Mesenopsis*. Other external characters of *X. mielkei* that are typical of *Mesenopsis* include the orange/yellow patagia, frons and palpi.

Another character set indicating the close relationship between *Xenandra* and *Mesenopsis* is their distribution of concealed abdominal androconial scales in males. In the three *Xenandra* species examined and in all *Mesenopsis* species, there is a single band of these scales on segments 4 and 5. *X. mielkei* is typical in this respect except that there is a small gap dividing the band dorsally. It is important to note that the distribution pattern "1,1,1,1" on segments 4-7 in *Mesenopsis pulchella* Godman, 1903, reported by Harvey (1987) and subsequently cited by Hall & Willmott (1996a) is erroneous and should be "1,1" on segments 4 and 5. It is assumed that this entry was mixed by Harvey (1987) with *Mesene margareta* (White, 1843), which was recorded as having a "1,1" pattern on segments 4 and 5, but which actually has a "1,1,1,1" pattern on segments 4-7 (note that the typical pattern for *Mesene* is "1,1,1" on segments 4-6). It is also worth noting here that the abdominal androconial patch distribution, wing pattern and male genitalia of the species *caeruleata* Godman & Salvin, 1878, which is currently treated in *Xenandra* (Bridges, 1994), place it in the genus *Esthemopsis* C. & R. Felder, [1865] (stat. rev.), as first suggested by Godman & Salvin (1886) and also recently by Hall & Willmott (1996a).

The male genitalia of *X. mielkei* exhibit some characters in common with members of *Xenandra*, some with members of *Mesenopsis*, and some that are unique. The shapes of the uncus and tegumen are most similar to those of *Mesenopsis* species, but the unusual lightly sclerotised rectangle at the anterior edge of the tegumen is only seen in *Xenandra*, in a much reduced form. The valvae, which are relatively small with a single posterior point and only a lightly sclerotised dorsal portion over the aedeagus, are most similar to those of *Xenandra* species, while the pronouncedly curved pedicel appears to be somewhat intermediate between that of *Xenandra* and *Mesenopsis*. In the examined *Xenandra* species the pedicel is simple and strap-like while in all *Mesenopsis* species the pedicel is highly modified into a posteriorly projecting horn (a recurring character state in the Symmachiini: e.g. in the genera *Stichelia* Zikán, 1949, and *Mesene* Doubleday, 1847). Finally, many

characters of the aedeagus, including the ventral instead of anterior opening anteriorly, the ventral and right opening posteriorly, and the single cluster of long hair-like setae, do not occur in any of the *Xenandra* species examined and in no *Mesenopsis* species.

In conclusion, *X. mielkei* uniquely presents a blend of characters typical of the genera *Xenandra* and *Mesenopsis*, and the discussion above presents evidence that the latter genus may be phylogenetically embedded in the former or that *X. mielkei* may be closely related to the progenitor of both genera. Either way, it is highly probable that cladistic analyses of the Symmachiini will show that these genera should be combined. With this outcome in mind, this new species is placed in the first described of the aforementioned genera, *Xenandra*.

Discussion.—*X. mielkei* is currently known only from the Diamantino region of central-western Mato Grosso state in south-west Brazil, although it will certainly be found to be more widespread in the south-western Amazon basin.

Both sexes of *X. mielkei* were encountered resting under leaves less than 2m above the ground along forest edges around mid-day, and females were also observed visiting flowers of *Inga laurina* (Leguminosae) and a *Roupala* species (Proteaceae).

Argyrogrammana talboti naranjilla Hall & Furtado, n. sp.

Fig. 2e-h; 5a,b

Description.—MALE: forewing length 16.5mm. Forewing costa straight, distal margin very slightly convex; hindwing rounded. *Dorsal surface*: forewing ground color black; large orange-yellow patch extends from wing base to near submargin and as an in-curving band around end of discal cell to near costa, with uneven distal margin, that is orange below vein Cu₁ and yellow in the upper distal corner of that cell and above, thin line of yellow scaling at distal margin of orange; three small, evenly spaced triangles in discal cell of which basal two orange, distal one yellow; two small pale blue squares in middle of cells M₃ and M₂ (very faint in paratype); thin, undulating, faintly discontinuous silver-blue submarginal line extends from tornus to apex, where elements are crescent-shaped and largest; fringe black with white scaling at margin of cells 2A, Cu₁, M₂ and M₁. Hindwing ground color black; large orange patch extends from wing base to near submargin, distal margin uneven with thin line of yellow scaling, anal margin paler orange; thin, undulating, faintly discontinuous silver-blue submarginal line extends from tornus to apex; distal fringe black with white scaling at margin of cells Cu₁ and M₂, anal and costal fringes orange. *Ventral surface*: differs from dorsal surface in following respects: blue squares in forewing cells M₃ and M₂ very faint, an additional more prominent one in cell M₁; apical element of forewing submarginal silver-blue line notably larger; two tiny black spots at upper base of hindwing discal cell. *Head*: labial palpi mixture of very long brown and cream setae. Eyes brown and bare, margins with orange scaling. Frons brown with some lateral cream scaling. Antennal segments (of paratype) black with basal white scaling, tubular clubs black. *Body*: dorsal surface of thorax black with extensive orange scaling, patagia orange. Abdomen orange with slightly paler cream-orange ventrally. All legs cream. *Genitalia* (Fig. 5a,b): uncus angular, slightly indented at dorsal tip; tegumen elongate, anteriorly notched; falci somewhat large; vinculum narrow ribbon, produced into long saccus ventrally; valvae narrow and elongate, small angular point at lower margin, narrow distal portion joined at tip by small, downwardly posteriorly pointing spine; aedeagus long, narrow and pointed at tip; long continuous sclerotised cornutal band with jagged dorsal margin; pedicel long, broad at middle supporting aedeagus.

FEMALE: differs from male in following respects: forewing length 21mm. Wing shape more elongate. *Dorsal surface*: all marks in forewing discal cell larger and orange, orange extends above vein Cu₁ at base of forewing postdiscal band, blue squares in forewing subapex absent; line of yellow scaling at distal margin of orange on hindwing slightly broader. *Ventral surface*: same differences as dorsal surface except that orange does not extend above vein Cu₁ at base of forewing postdiscal band and a small area of additional black scaling present towards upper base of cell 2A.

Types.—*Holotype* ♂: BRAZIL.—"Amazonas"; in the AMNH.

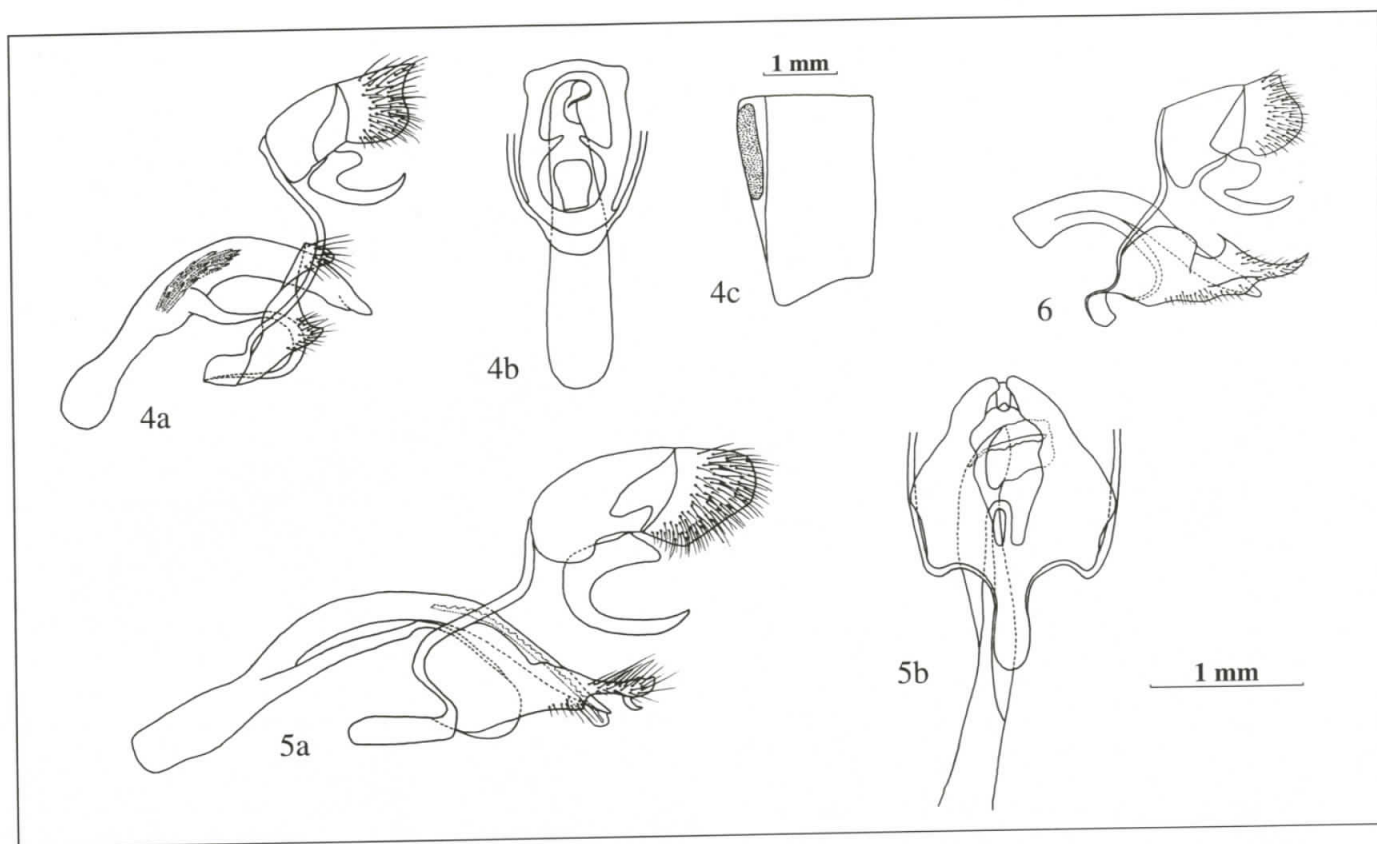


Fig. 4-6. Male genitalia and androconia. 4. *Xenandra mielkei* n. sp.: a) lateral view; b) ventral view; c) lateral view of fifth abdominal tergite illustrating concealed androconial patch at anterior margin. 5. *Argyrogrammana talboti naranjilla* n. ssp.: a) lateral view; b) ventral view. 6. *Pachythone analucia* n. sp..

Allotype ♀: BRAZIL.—Rondônia, Rio Jamari, nr. Ariquemes, 150m, 7 Aug 1978 (E. Furtado); to be deposited in the USNM. **Paratypes**: 1 ♂: same data as AT; to be deposited in the USNM. 1 ♀: same data as AT; in the EF. 1 ♀: Amazonas, Rio Puros, Lábrea, Hyutanahan (Huitana), Nov 1913 (H. W. Wickham); in the BMNH.

Etymology.—This taxon is named after the Spanish word for "orange," with reference to its bright, unmarked orange coloration, which is so atypical for the genus.

Diagnosis.—The female of *Argyrogrammana talboti* Brévignon & Gallard, 1998, was erroneously associated by Talbot (1929) (and also D'Abreira, 1994) with the male of the phenotypically quite distinct *Argyrogrammana sticheli* Talbot 1929, and the true male has remained unknown until now. There has even been doubt as to whether the allotype of *A. sticheli* (= *A. talboti*) belonged in *Argyrogrammana* (Brévignon & Gallard, 1995, 1998), but examination of the genitalia of male specimens, which are illustrated here for the first time, confirms that the species does indeed belong in that genus (see below). Both sexes of nominotypical *A. talboti* are figured here along with another phenotype which we describe as a subspecies of it. Since *Argyrogrammana* is a highly speciose genus whose species often differ by only very minor wing pattern characters (Brévignon & Gallard, 1995, 1998; Hall & Willmott, 1995, 1996b, 1998), the consistent wing pattern differences exhibited by *A. talboti* and *A. naranjilla* might actually constitute specific differences, but given the small number of specimens currently available and the allopatric distribution of the two phenotypes (see Fig. 7), we conservatively prefer to treat these two taxa as subspecies. Sympatry would be the ultimate proof of their specific status.

A. talboti naranjilla n. ssp. differs most notably from the nominate by having a sharply contrasted orange/yellow forewing patch with a thin line of yellow scaling around the distal margin of the orange on

both wings. This difference is most pronounced in the females, for while the sexes of the new subspecies are monomorphic, the female of the nominate is somewhat paler than the male and a uniform yellow. Other consistent but more subtle differences include the presence in the new subspecies of two tiny black spots at the base of the discal cell on the ventral hindwing, a vertical or convex instead of markedly concave apical portion to the distal margin of the orange patch at the costa of the ventral hindwing, and the lack of orange scaling at the very distal margin of the hindwing. The male genitalia of the two taxa do not differ. The configuration of the male genitalia, particularly the shape of the uncus, pedicel and valvae, which are joined at their tip by a small posteriorly pointed hook, most closely resembles that of *A. saphirina* (Staudinger, 1887), which belongs in the ostensibly very different "trochilia group" (*sensu* Hall & Willmott, 1996b). This perhaps suggests an evolutionary sequence for the ventral wing pattern of this genus from the plesiomorphic spotted condition in members of the "stilbe" and "amalfreda groups" (*sensu* Hall & Willmott, 1995, 1996b), to the banded pattern of "trochilia group" species, to the complete lack of markings in *A. talboti*. *A. glaucopsis* (Bates, 1868), *A. praestigiosa* (Stichel, 1929) and *A. subota* (Hewitson, 1877) certainly appear to represent evolutionary intermediates between the "amalfreda" and "trochilia groups".

Discussion.—*A. talboti naranjilla* is currently known only from Rondônia and southwestern Amazonas states in Brazil but probably also occurs in Bolivia and southern Peru. H. Austin (pers. comm.) reports collecting an additional seven males of *A. t. naranjilla* in the vicinity of Cacaúlândia, near the type locality in Rondônia (Jul-Nov). The nominate subspecies has a broader known range that extends from the Guianas (2 females examined from French Guiana) to the other side of the Amazon basin in Mato Grosso state, Brazil (2 males examined from the Alto Rio Arinos, nr. Diamantino) (see Fig. 7).

Pachythone analucia Hall, Furtado & DeVries, n. sp.

Fig. 3a-d; 6

Description.— MALE: forewing length 12mm. Wing shape compact. Forewing costa straight, distal margin slightly convex; hindwing rounded. **Dorsal surface:** forewing ground color brown; faint orange discal and postdiscal scaling, distal margin darker brown; fringe brown with white scaling at distal margin of cells 2A to M₁, most prominent in cells M₂ and M₁. Hindwing ground color brown; large orange patch occupies entire area below vein M₃ except very base of wing, all of cell M₃ except small distal region, and basal half of cell M₂; fringe brown. **Ventral surface:** forewing ground color brown, yellow-brown at anal margin, darker brown at distal margin, paler brown curving postdiscal area; three dark brown spots in discal cell, one at base, one at middle and one at cell end, two dark brown spots below discal cell, at upper base of cell 2A; one dark brown marginal spot in cells Cu₂ to M₁ and two in cell 2A lined distally and proximally with dirty cream crescents become larger towards apex. Hindwing ground color brown; large orange patch as on dorsal surface; distribution of basal dark brown spots as on ventral forewing; one small dark brown marginal semicircle embedded within orange in cells 3A to Cu₂, one dark brown spot in cells M₃ to M₁ lined distally and proximally with dirty cream crescents. **Head:** first and second segments of labial palpi brown, third segment dark brown. Eyes brown and bare, margins with brown scaling. Frons dark brown in dorsal two-thirds, brown in ventral third. Antennae very short, segments black with basal white scaling; clubs black and flattened, tips orange-brown. **Body:** thorax brown on both surfaces, abdomen orange-brown on dorsal surface cream-brown on ventral surface. All legs brown. **Genitalia** (Fig. 6): ventral portion of uncus rounded, dorsal portion shallowly indented; tegumen triangular; falci of medium size and width; vinculum narrow and ribbon-like, produced into saccus that is horizontally broad and short, and ventrally somewhat elongate; valvae produced into an elongate point, basal lateral bulge prominent; aedeagus short and of even width, posterior opening directed ventrally and to right, no cornuti present; pedicel broad at base.

FEMALE: unknown.

Types.— *Holotype* ♂: BRAZIL.— Mato Grosso, Alto Rio Arinos, nr. Diamantino, 400m, 29 Aug 1993 (E. Furtado); to be deposited in the USNM.

Paratypes: 1 ♂: same locality data as HT, 12 Nov 1992 (E. Furtado); in the EF. 1 ♂: same locality data as HT, 29 Oct 1998 (E. Furtado); to be deposited in the UFPC. ECUADOR.— 1 ♂: *Sucumbíos*, Río Napo, Garzacochoa, La Selva, 200m, 25 Apr 1993 (P. J. DeVries); in the PJD.

Etymology.— This species is named in honor of Ana Lucia Mazzotti, wife of Furtado.

Diagnosis.— The short, broadly clubbed antennae, squat abdomen and configuration of the male genitalia clearly place *P. analucia* n. sp. in the genus *Pachythone*. *P. analucia* resembles only *Pachythone distigma* Bates, 1868, but has the hindwing patch orange instead of red and much larger in extent, extending beyond the discal cell and to the anal and distal margins. Orange-brown scaling is also present on the dorsal surface of the abdomen in *P. analucia*. The male genitalia of all examined *Pachythone* species are very homogeneous and provide few characters for identification; those of *P. analucia* and *P. distigma* do not differ.

Discussion.— *P. analucia* is currently known only from the disjunct localities of east Ecuador and south-west Brazil, but these suggest a broad west Amazonian distribution for the species. *P. distigma*, perhaps its closest relative, has a similarly broad, partially overlapping, Amazonian range that extends from the base of the eastern Andes (Hall and Willmott, unpubl. data) to the Atlantic (TL: Pará). *Pachythone* species are generally highly localised in time and space, and thus very rarely encountered (Bates, 1868; Brown, 1993; Brévignon and Gallard, 1998; pers. observ.). The recent discovery of *P. analucia* and the fact that the sole Ecuadorian male was found dead on the forest floor, suggests that this species is no exception. The Brazilian males were encountered in a humid area of Cerrado resting beneath leaves within 2m of the ground; one of these males was found imbibing fluids from an extrafloral nectary on the young shoots of a *Magonia pubescens* plant (Sapindaceae).



Fig. 7. A map of South America illustrating the distribution of both subspecies of *Argyrogrammana talboti*.

Many *Pachythone* species, most notably *P. conspersa* Stichel, 1926, *P. xanthe* Bates, 1868, and *P. lateritia* Bates, 1868, are highly phenotypically variable both between and within populations. The Ecuadorian paratype (Fig. 3c,d) is a darker specimen with a black ground color and no faint orange scaling on the dorsal forewing. A thin black line or small spots are variably present at the distal margin of the orange on the dorsal hindwing.

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