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THE GENUS *POLYTHORE* EXCLUSIVE OF THE *PICTA* GROUP (ZYGOPTERA: POLYTHORIDAE)

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G.H. BICK & J.C. BICK (1985, *Odonatologica* 14: 1-28) studied 6 spp. of *Polythore* in the *picta* group. An additional 859 specimens are now assigned to 10 spp. in 5 other groups. These groups are characterized, keys to males and females are presented, synonyms are given, and species are redescribed with a drawing of the terminal segment of the penis of each and a color photograph of the wings of each sex. The groups and their included spp. are: *vittata* group: *vittata* (Sel.); — *victoria: victoria* (McL.); — *boliviana: boliviana* (McL.), *ornata* (Sel.), *williamsoni* (Foer.); — *batesi: batesi* (Sel.), *beata* (McL.), *aurora* (Sel.), *mutata* (McL.); — *concinna: concinna* (McL.). The genus occurs primarily in western South America north of Chile. The 6 spp. in the *picta* group and 6 (*boliviana, concinna, mutata, ornata, victoria, williamsoni*), in the present study are essentially Andean, primarily above 300 m; 4 spp. (*aurora, batesi, beata, vittata*) are Amazonian, from lowlands primarily below 300 m.

INTRODUCTION

In 1985 we reported on six species of *Polythore* in the *picta* group: *gigantea* (Selys), *procera* (Selys), *picta* (Rambur), *derivata* (McLachlan), *terminata* Fraser, and *lamerceda* Bick & Bick. The present paper completes our study of the genus by considering 859 additional adult specimens assigned to 5 groups and 10 species: *vittata* (Selys), *victoria* (McLachlan), *boliviana* (McLachlan), *ornata* (Selys), *williamsoni* (Foerster), *batesi* (Selys), *beata* (McLachlan), *aurora* (Selys), *mutata* (McLachlan), *concinna* (McLachlan). Thus 16 species are assigned to the genus rather than 18 (MONTGOMERY, 1967; DAVIES & TOBIN, 1984). No *Polythore* species has been described in the larval stage. All names applied to species treated herein and locations of types are summarized in Table I.

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Table I
Name, original reference, type locality, location of type, and present placement of *Polythore* species exclusive of those in the *picta* group

Name	Original reference	Type locality	Location of type		Present placement
acostai	NAVAS, 1924	Yepisca, Peru		[lost?]	*vittata*
aequatorialis (♀ only)	SELYS, 1873a	Ecuador	BMNH	holotype ♀	*procera*, Hb form
albovittata	SELYS, 1873b	Ega = Tefe, Brazil	BE	lectotypes ♂, ♀	*vittata*
aurora	SELYS, 1879	Rio Napo, Ecuador	BE	lectotypes ♂, ♀	*aurora*
batesi	SELYS, 1869	Sao Paulo de Olivenca, Brazil	BE	lectotype ♂	*batesi*
beata	McLACHLAN, 1869	Pebas, Peru	BMNH	lectotype ♂	*beata*
boliviana	McLACHLAN, 1878	Chairo, Bolivia	BMNH	holotype ♂	*boliviana*
concinna	McLACHLAN, 1881	Rio Bobonaza, Ecuador	BMNH	lectotype ♂	*concinna*
inaequalis (♀ only)	SELYS, 1869	Fonte Boa, Brazil	BE	lectotype ♀	*beata*
montana (♀ only)	FOERSTER, 1914	Pozuzo, Peru	UMMZ	holotype ♀	*ornata*
mutata	McLACHLAN, 1881	Rio Bobonaza, Ecuador	BMNH	lectotype ♂	*mutata*
ornata	SELYS, 1879	Peru	BE	lectotype ♂	*ornata*
pozuzina	FOERSTER, 1914	Pozuzo, Peru	UMMZ	lectotype ♂	*ornata*
pulchella	KIRBY, 1889	Colombia	BMNH	lectotype ♂	*concinna*
tincta	NAVAS, 1924	Yepisca, Peru		[lost?]	*vittata*
victoria	McLACHLAN, 1869	Bolivia	BMNH	holotype ♂	*victoria*
vittata	SELYS, 1869	Ega = Tefe, Brazil		[lost?]	*vittata*
williamsoni	FOERSTER, 1903	Vilcanota, Peru	UMMZ	lectotypes ♂, ♀	*williamsoni*

Fortunately we were able to examine most of these types in the British Museum (Natural History), the Brussels Museum, the University of Michigan Museum of Zoology, and to study important specimens in the Museum of Paris, the Museum of Comparative Zoology, Harvard University, and the U.S. National Museum.

Procedures are essentially as in our 1985 study of the *picta* group, except that intraspecific variation is not treated statistically. Because most literature in the present paper was referenced in our earlier one, only additions are listed here. Also, McLachlan is here spelled as LIEFTINCK et al. (1984) suggested.

The following abbreviations are used:

AMNH	American Museum Natural History	MCZ	Museum Comparative Zoology Harvard Univ.
AP	A.F. Porter	MP	P. Martin
BD	B.A. Drummond	MW	M.J. Westfall, Jr.
BE	Institut Royal des Sciences Naturelles de Belgique (Brussels Museum)	MM	M. Madera
		OG	O. Garlepp
BP	P. Pohl	OS	O. Staudinger
BMNH	British Museum (Natural History)	PE	L.E. Pena G.
CC	C. Cook	PN	P. Nagel
CM	Carnegie Museum	PM	Museum National d'Histoire naturelle, Paris
CU	Cornell University		
DL	D.B. Laddey	PP	P. Paprzycki
FF	F. Foerster	RC	R.B. Cumming
FSCA	Florida State collection of Arthropods	RG	R.W. Garrison
		RH	R. Haensch
FW	F. Woytkowski	RM	R. Martin
GK	G. Klug	RO	I. Rolle
HB	H. Bassler	RS	R. Steinbach
HR	H.G. Real	TB	T. Barbour
HWL	Hind wing length	TR	T.E. Rogers
JH	J.B. Heppner	UMMZ	Univ. Michigan Museum Zoology
JR	J.D. Rivas	USNM	U.S. National Museum
JS	J. Steinbach	WF	W.T.M. Forbes
KM	K.J. Morton	WM	W.C.-MacIntyre
LA	L.G. Alonzo	WU	F. Wucherpfennig

DISTRIBUTION

The 16 species of *Polythore* occur primarily in western South America: Colombia, Ecuador, Peru, northwestern Brazil, and northern Bolivia, but there is 1 specimen each from Venezuela and Guyana (Tab. II). No species of *Polythore* is recorded in more than 3 countries.

The genus is best represented in Peru (Tab. II) in the eastern foothills of the Andes. We hypothesize a center of origin in the central part of that country where 4 species occur almost exclusively: *picta, lamerceda, ornata,* and *victoria.* From there, radiations in all directions occurred. The northward one resulted in *procera, derivata, mutata, terminata, concinna,* and *gigantea.* The record of *gigantea* from Mesopotamia, Antioquia Dept., Colombia, and of *terminata* from Tachira, Venezuela (BICK & BICK, 1985) are the northernmost (8.09 N) for the genus. The southward radiation yielded only *williamsoni* and *boliviana,* the latter reaching the southernmost locality for the genus at Santa Cruz (17.45 S), Bolivia. The radiation west of the Andes gave rise to *procera* and *gigantea;* the former now found as far west as Balzapamba, Ecuador, the later as far as Santo Domingo de los Colorados, Ecuador, both at about 79 W, the westernmost localities for the genus. The above 12 species are essentially Andean, each

Table II

The number of *Polythore* specimens examined, exclusive of types, from each of seven South American countries, and the range of elevation for each species

Species	Elevation (m)	Colombia	Ecuador	Peru	Bolivia	Brazil	Venezuela	Guyana
ANDEAN								
Northern								
procera	518-2819	110	233					
gigantea	374-1524	35	44	5				
derivata	120-2819	8	153	21				
terminata	200-1400		78	16			1	
mutata	120-1000	6	64	1				
concinna	400-2819		156	3				
Central								
picta	200-1400			407		1		1
lamerceda	700-1067			22				
ornata	350-1900			149				
victoria	803?			12				
Southern								
williamsoni	?			9	1			
boliviana	400-1800			4	62			
AMAZONIAN								
Northeastern								
beata	100-200	5		9		1		
aurora	120		3	152		5		
batesi	100			2		68		
vittata	100		2	3		88		
Species in each country		*5*	*8*	*15*	*2*	*5*	*1*	*1*

reaching a maximum elevation above 1000 m. The northeastward radiation gave rise to *aurora, batesi, beata,* and *vittata,* all essentially Amazonian, occurring entirely below 300 m. *P. batesi* from Obidos Brazil, at 55.30 W is the easternmost record for the genus.

The highest elevation recorded for any *Polythore* species is 5300 m for *williamsoni* (FOERSTER, 1903) in the Vilcanota Mts of Peru. Because, among other reasons, no other record approaches such a high elevation, we doubt that the Foerster specimens were indeed collected alive at such heights. The highest elevation from which we have seen specimens is 2819 m for *concinna, derivata,* and *procera* at Quito, Ecuador. Quite differently, some Amazonian species are common at 100 m or less, so that the genus is represented from almost sea level to 2819 m. Most Andean species of *Polythore* have a wide altitudinal range (Tab. II), but Amazonian ones are more sharply restricted to less than 200 m.

SPECIES GROUPS

Based on mature males, the genus *Polythore* can be separated into 6 groups. Wings of the first 3 are black and white or black and hyaline; wings of the second 3 are entirely amber or have transverse bands or large areas of white, yellow, orange, or orange-brown.

(1) *PICTA* GROUP (cf. BICK & BICK, 1985)
- (a) Medium to large (HWL, 31-46 mm).
- (b) Fore and hind wing color pattern similar.
- (c) Apical wing black extends to tip without interruption by a white band.
- (d) Cells under stigma 9.0-16.5.
- (e) Penis horns short (*gigantea, procera*), medium (*picta, lamerceda*), long (*derivata, terminata*); flagella usually 2-segmented.
- (f) Includes the above 6 species.

(2) *VITTATA* GROUP
- (a) Medium (HWL, 32-40 mm).
- (b) Fore and hind wing color pattern similar.
- (c) Wing black is interrupted by a white band and does not quite reach the wing tip.
- (d) Cells under stigma 9.5-13.0.
- (e) Penis horns very short, flagella 1-segmented.
- (f) Includes only *vittata*.

(3) *VICTORIA* GROUP
- (a) Large (HWL, 46-47 mm).
- (b) Fore and hind wing differ in color pattern.
- (c) Apical black conspicuously concave proximally; hind wing with a curving dark-brown stripe proximad of and paralleling the apical black.
- (d) Cells under stigma 14.0-16.5.
- (e) Penis horns of medium length, flagella 2-segmented.
- (f) Includes only *victoria*.

(4) *BOLIVIANA* GROUP
- (a) Medium — large (HWL, 31-45 mm).
- (b) Fore and hind wing color patterns differ (*boliviana, ornata*), or not (*williamsoni*).
- (c) Fore wing with a large expanse of white, orange, or orange-brown, usually interrupted by a paler lunule.
- (d) Cells under stigma 8.5-17.0.
- (e) Penis horns of medium length, flagella 2-segmented.
- (f) Includes the above 3 species.

(5) *BATESI* GROUP
- (a) Small (HWL, 26-37 mm).
- (b) Fore and hind wing color patterns dissimilar (*beata*) or similar (*aurora, batesi, mutata*).
- (c) A pale transverse band in hind wing.
- (d) Cells under stigma 3.5-8.5.
- (e) Penis flagella 1-segmented; horns long (*aurora*) or medium (*beata, batesi, mutata*).
- (f) Includes the above 4 species.

(6) *CONCINNA* GROUP
- (a) Medium (HWL, 32-36 mm).
- (b) Fore and hind wing similar.
- (c) Wings entirely amber, without transverse bands.

(d) Cells under stigma 10.5-16.0.
(e) Penis horns long and divergent, flagella 1-segmented.
(f) Includes only *concinna*.

We agree with McLACHLAN (1881) who stated that *batesi, aurora, mutata,* and *beata* form a compact group because of their small size and few cells under the stigma. On these criteria the grouping is reasonable, although *beata* diverges strongly from the others in its completely hyaline fore wing, as does *aurora* in its longer penis horns.

FRASER (1946) formed a *concinna* group by adding that species to the above 4, a decision based on wing color of females. However, the divergent penis horns and the uniformly amber wings of the male, separate *concinna* from all other species.

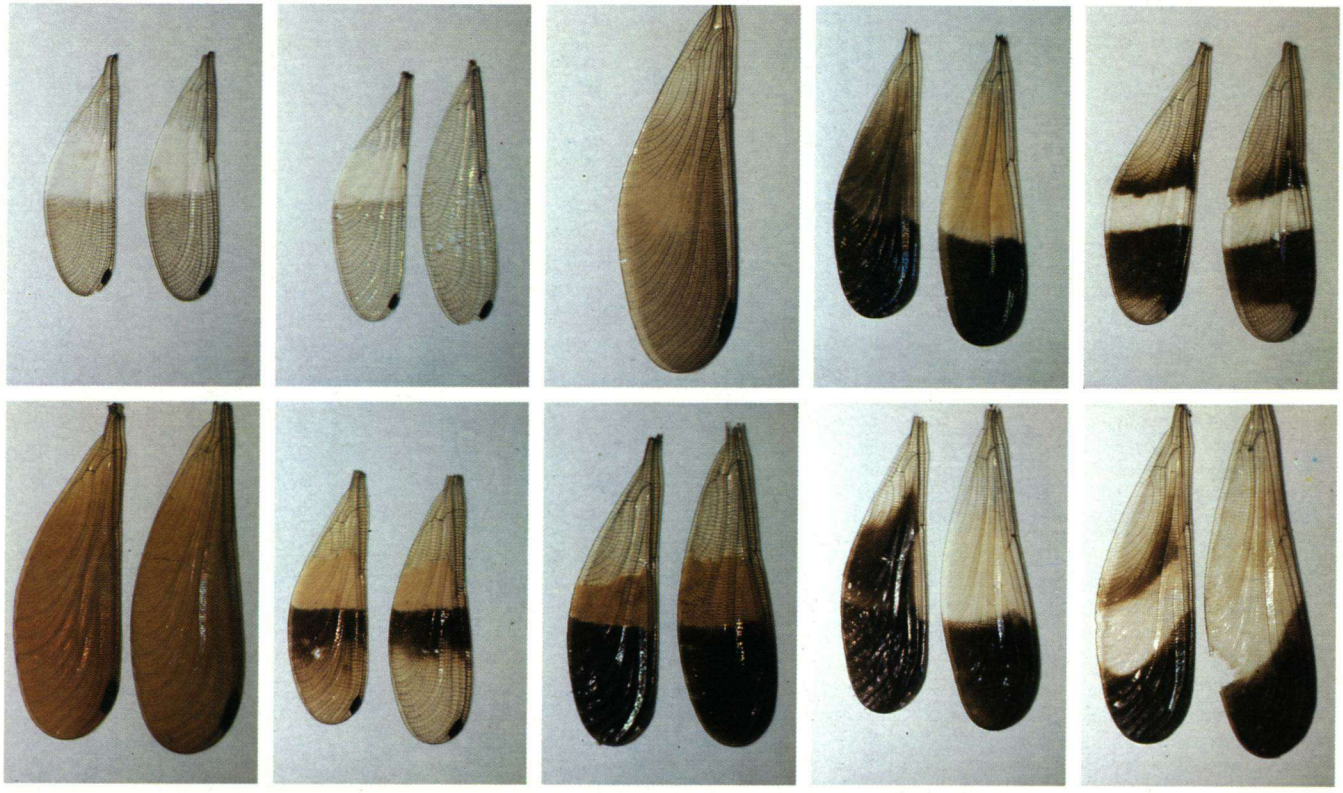
Additional to his *concinna* group, Fraser listed 2 others: *picta* (including *picta, gigantea, victoria*) and *derivata* (including *derivata* with 4 subspecies and *vittata*). We do not recognize a *derivata* group but place this species in the *picta* group as previously (BICK & BICK, 1985) discussed. Also *victoria* and *vittata* are each here assigned to a monotypic group. Wings of *victoria* males are black, white, and hyaline as in *vittata* and *picta* groups, but the contrasting fore and hind wing patterns, the slanted and curved apical wing bands, and other details set *victoria* apart. The black and white *vittata* wing pattern along with the very short penis horns, similar to those of *gigantea* and most *procera,* suggest the *picta* group. However, the straight white band interrupting the wing black is unique for *vittata* males, a feature which justifies placement in a separate group.

FOERSTER (1914) grouped *pozuzina, boliviana, ornata,* and *williamsoni. P. pozuzina* will be shown to be a synonym of *ornata.* The 3 remaining species do seem to be logically grouped because all are similar in size, penis horns and flagella, and in the presence of an obscure, cuneate color band in one or both wings.

DIFFERENTIATION OF SPECIES

Differentiation of species presents difficulties primarily because of the scarcity of species specific morphological characteristics. As in the *picta* group (BICK & BICK, 1985), species determination could not be based on male abdominal appendages, female mesostigmal laminae, wing venation, or color pattern of head, thorax, or abdomen. Instead, determinations depend primarily on wing color pattern.

Figs 1-10. Left front and hind wings of males: (1) *Polythore vittata;* (2) *P. victoria;* (3) *P. boliviana;* (4) *P. ornata;* (5) *P. williamsoni* (hind wing); (6) *P. batesi;* (7) *P. beata;* (8) *P. aurora;* (9) *P. mutata;* — (10) *P. concinna.*


(9) *mutata*
(7) *beata*
(5) *williamsoni*
(3) *boliviana*
(1) *vittata*
(10) *concinna*
(8) *aurora*
(6) *batesi*
(4) *ornata*
(2) *victoria*

Additional difficulties arise because males and females of all species treated herein, except *vittata* and *beata,* differ in wing color pattern. Thus, the following keys consider males and females separately. Identification of a male is at times aided by the length and shape of the penis horns. However, identification of a female, unassociated with a male, is more difficult because determination rests mainly on wing color, sometimes assisted by geographic distribution. For example, the *picta* group is excluded from the key to females because we could not differentiate the various wing patterns of Hb *procera* (in the *picta* group) females from those of *ornata.* But distribution separates them; the former is limited to Ecuador, the latter to the southern half of Peru.

Species differentiation is difficult also because both sexes of many species undergo great color change during maturation. For example, in *batesi* males the transverse, nodal band is white in immatures, yellow in intermediates, and deep orange or orange-brown in matures. Similar maturation color changes occur in *aurora, boliviana,* and *ornata* males, and in *aurora, batesi, boliviana, concinna, mutata* females. Scarcity of material does not permit a statement on color change in ♂ and ♀ *victoria* and in ♀ *beata* and *williamsoni.* Although the following keys can be used for immatures as well as matures, there are no colored illustrations of immature specimens in the present paper. Whenever a specimen is immature, or even doubtfully so, one should consider the descriptions of ontogenetic changes in the species discussions.

KEY TO MALES

1 Both fore and hind wings amber throughout; penis horns divergent ..... ***concinna***
1′ Wings and penis not as above 2

2 Both fore and hind wings smoky gold throughout ..... ***williamsoni***
2′ Wings not as above 3

3 Color pattern of fore and hind wings clearly unlike 4
3′ Color pattern of fore and hind wings essentially alike 7

4 Fore wing completely hyaline ..... ***beata***
4′ Fore wing not completely hyaline 5

5 Hind wing with a curving brown stripe separated proximally from, and paralleling, the curving apical black ..... ***victoria***
5′ Hind wing not as above 6

6 Apical dark area of hind wing contrasts sharply with the less-pigmented basal 2 3 ***boliviana***
6′ Apical dark area of hind wing does not contrast with the basal 2 3 ..... ***ornata***

7 Both wings with white bands or areas 8
7′ Both wings with yellow or orange nodal bands 12

8 Wings with prominent black areas 9
8' Wings without prominent black areas 10

9 Wing black extends to tip and is not interrupted by white ..... *picta* group
9' Wing black does not quite reach the tip and is interrupted by a white band ..... *vittata*

10 White wing band entirely distad of nodus ..... *batesi* (immature)
10' White wing band extends both proximad and distad of nodus 11

11 Penis horns elongate, 0.200-0.250 mm (Fig. 29) ..... *aurora* (immature)
11' Penis horns shorter, 0.100-0.150 mm (Fig. 28) ..... *mutata*

12 Pale wing bands entirely distad of the nodus ..... *batesi*
12' Pale wing bands extend both proximad and distad of the nodus ..... *aurora*

KEY TO FEMALES EXCLUSIVE OF THE *PICTA* GROUP

1 Both fore and hind wings hyaline throughout ..... *ornata* (in part, *montana* form)
1' Both fore and hind wings not hyaline throughout 2

2 Fore wing entirely hyaline 3
2' Fore wing not entirely hyaline 5

3 Hind wing with a wide (4 mm, N = 1), white rectangular, nodal band ..... *beata*
3' Hind wing nodal bands narrow (less than 2.6 mm) 4

4 Hind wing pale band slants postero-distally forming an angle greater than 90° with the proximal costal border ..... *victoria*
4' Hind wing pale band forms an angle of only about 90° with the proximal costal border ..... *ornata* (in part)

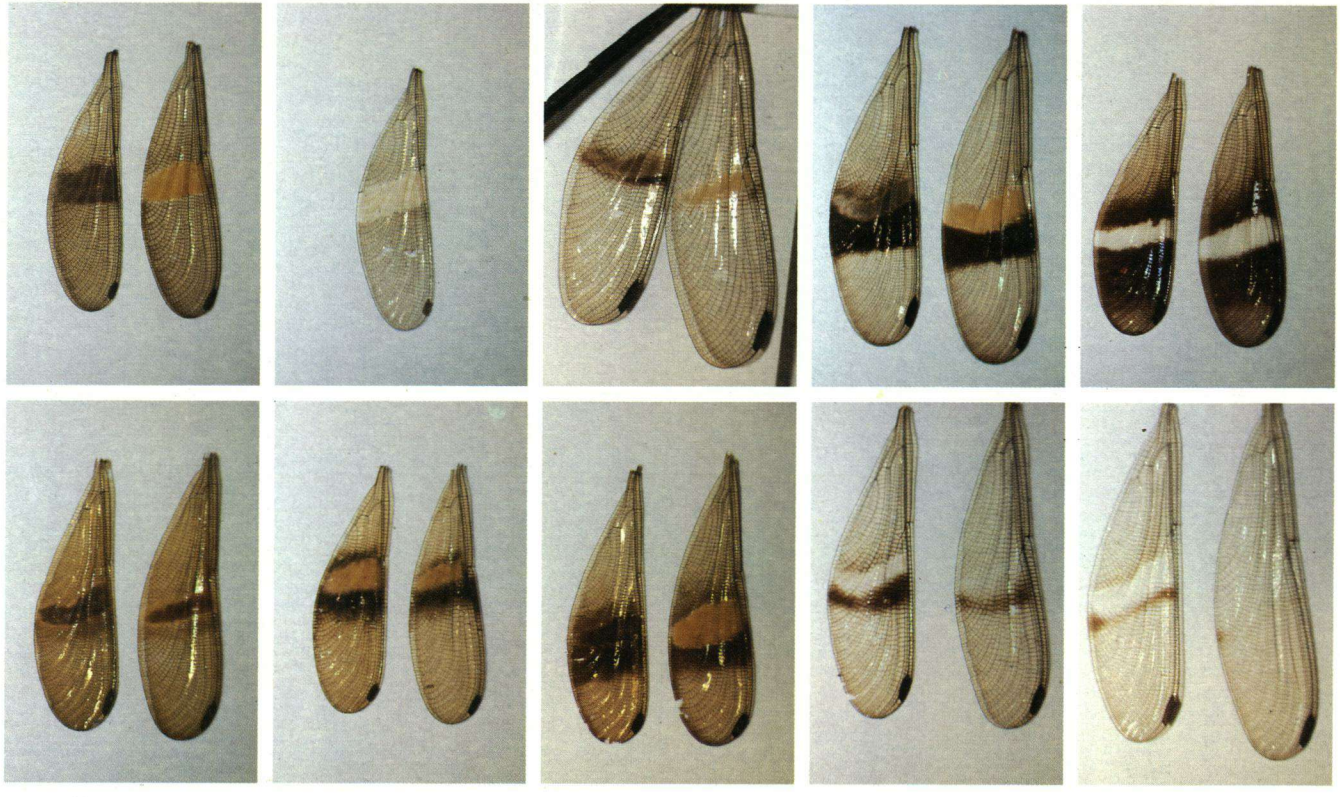
5 Each wing with a large dark-brown or black area interrupted by a uniformly wide, white band ..... *vittata*
5' Wing pattern not as above 6

6 Hind wing with a narrow ($\bar{X}$ = 1.9 mm, N = 9), white, nodal band bordered distally by a narrow ($\bar{X}$ = 1.2 mm, N = 9) brown band ..... *ornata* (in part)
6' Hind wing nodal bands not as above 7

7 HWL = 32-40 mm 8
7' HWL = 28-33 mm 9

8 Fore wing with a wide, brown or black band distad of the pale nodal band ..... *boliviana*
8' Fore wing without a brown or black band distad of the nodus ..... *williamsoni*

Figs 11-20. Left front and hind wings of females: (11) *Polythore vittata;* — (12) *P. victoria;* (13) *P. boliviana;* (14) *P. ornata* (maximum color); — (15) *P. williamsoni;* (16) *P. batesi;* (17) *P. beata* (hind wing); - (18) *P. aurora;* (19) *P. mutata;* (20) *P. concinna.*



(19) *mutata* (17) *beata* (15) *williamsoni* (13) *boliviana* (11) *vittata*

(20) *concinna* (18) *aurora* (16) *batesi* (14) *ornata* (12) *victoria*

9 Fore wing pale band very narrow ($\bar{X}$ = 2.2 mm, N = 10); hind wing pale band concave proximally ..... ***concinna***

9′ Fore and hind wing pale bands not as above 10

10 Fore wing pale band begins well distad of nodus ($\bar{X}$ = 8.4 cells, N = 13) ..... ***batesi***

10′ Fore wing pale band begins proximad of, or slightly distad of nodus 11

11 Fore wing pale band begins proximad of nodus ($\bar{X}$ = 3.2 cells, N = 9) or rarely at nodus ..... ***aurora***

11′ Fore wing pale band begins distad of nodus ($\bar{X}$ = 1.6 cells, N = 5) ..... ***mutata***

POLYTHORE VITTATA (SELYS)

Figures 1, 11, 21

Thore picta Race? *vittata* SELYS, 1869: 29 (1 ♂, Ega = Tefe, Brazil).

Thore picta: SELYS (not Rambur), 1869: 28.

Thore albovittata SELYS, 1873b: 65, 66 (no descr., new name for *picta* SELYS, Race? *vittata* SELYS, and Race? *aequatorialis* SELYS); — KIRBY, 1890: 117; — SCHMIDT, 1942: 247 (key); — FRASER, 1946: 21 (syn.); — MONTGOMERY, 1967: 128, 149 (syn., types).

Thore vittata: KIRBY, 1890: 117; — RIS, 1918: 31, 37 (key, descr., Pozuzo, Peru); — SCHMIDT, 1942: 250.

Thore acostai NAVAS, 1924: 320 (1 ♂, Yepisca, Peru); — SCHMIDT, 1942: 250 (syn.); — RACENIS, 1959: 489 (syn.); — MONTGOMERY, 1967: 140, 149 (type).

Thore tincta NAVAS, 1924: 319 (1 ♂, Yepisca, Peru); — SCHMIDT, 1942: 250 (syn.); — RACENIS, 1959: 489 (syn.); — MONTGOMERY, 1967: 140, 153 (type).

Polythore vittata: FRASER, 1946: 21, 1, figs 2, 3 (wings, as *albovittata*); — RACENIS, 1959: 489; — MONTGOMERY, 1967: 153 (type).

Type data — Neither we nor MONTGOMERY (1967) could find the *vittata* holotype in BE which seems to be lost. However, in BMNH, we examined 3 ♂, 2 ♀ from Ega labelled paratypes. *P. aequatorialis*, described from 1 ♀ from Ecuador, was long considered a synonym of *vittata;* we examined the ♀ holotype in BMNH (KIMMINS, 1970). The ♂ and ♀ of *albovittata* in BE, which MONTGOMERY (1967) designated lectotypes, were examined. Along with Montgomery, we could not find the types of *acostai* and *tincta* which are almost certainly lost.

Other material examined: 64 ♂, 29 ♀ (andromorphs). BRAZIL, *Amazonas*, Borba, 0-100 m, WU, VI-1932, 3 ♀, UMMZ; — Fonte Boa, WU, X-1937, 6 ♂, 3 ♀, XI-1937, 11 ♂, 3 ♀, XII-1937, 2 ♂, BMNH; — Manicore, WU, IX-1937, 1 ♂, 1 ♀, BMNH; — Sao Paulo de Olivenca, 0-100 m, IV-1923, 1 ♂, CM; WU, XI-1931, 1 ♂, XII-1931, 7 ♂, 4 ♀, I-1932, 7 ♂, II-1932, 2 ♂, III-1932, 1 ♂, 1 ♀, IV-1932, 7 ♂, 3 ♀, V-1932, 7 ♂, 4 ♀, VI-1932, 1 ♀, UMMZ; collector?, 7 ♂, 1 ♀, BE; RM, 1 ♂, PM; — Tefe, BP, X-1929, 2 ♂, 1 ♀, UMMZ. — ECUADOR, *Chimborazo* or *Morona-Santiago*, "Macas via Riobamba", MM, IX-1924, 1 ♀, UMMZ; — *Pastaza*, Rio Bobonaza, 1 ♀, BE. — PERU, *Loreto*, Pebas, 2 ♂, 1 ♀, BE.

Male (HWL, $\bar{X}$ = 33.8 mm, N = 13; penis horns, $\bar{X}$ = 0.043 mm, N = 13).

SELYS (1869) stated that his *Thore picta* from Ega is remarkable for the straight white band in each wing of both sexes and for a supplementary yellow

thoracic stripe in the male. He also mentioned dark areas proximad and distad of the white band in the adult male wing. In the same paper, Selys described *Thore picta* race *vittata* based on 1 ♂ also from Ega which differed from the above only in the absence of the extra mesepisternal pale stripe. After examining Rambur's type of *picta*, SELYS (1873b) realized that his *picta* differed from Rambur's and assigned the new but unnecessary name (MONTGOMERY, 1967), *albovittata* to *picta* Selys and to *picta* race *vittata* Selys.

All specimens of *vittata* examined, including paratypes, as well as ♂, ♀ lectotypes of *albovittata*, agree with SELYS' (1869) description: (1) ♂, ♀ wings essentially alike; (2) a straight white band in each wing (3-4 mm wide in the hind wings of 10 Sao Paulo males, and 1.5-2 mm wide in the hind wings of 10 Fonte Boa males); (3) a dark area both proximad and distad of the white band (Fig. 1).

SELYS (1873b) synonymized his *picta*, which has an extra mesepisternal pale stripe, with his race *vittata* without the stripe. All of our specimens have the extra mesepisternal pale stripe, althoug it is sometimes abbreviated in immatures.

Unlike other non-*picta* species, *vittata* males have very short penis horns, similar to, but slightly shorter than, those of *gigantea* and *procera* of the *picta* group. However, the horns of *vittata* (Fig. 21) do not bulge laterally as in the above.

Our specimens agree essentially with FRASER (1946) but differ in that the fore and hind white wing bands of females are narrower, not three times as broad as those of males (hind wing band ♂, 3-4 mm, N = 8; ♀, 2-3 mm, N = 8).

Female (HWL, $\bar{X}$ = 33.2 mm, N = 16).

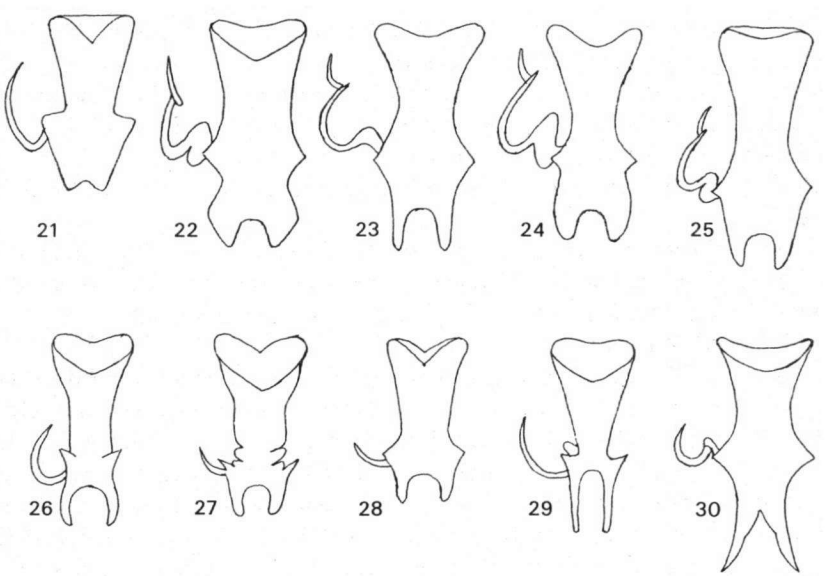
SELYS (1873a) described *aequatorialis* from 1 ♀ from an unspecified locality in Ecuador, then in 1873b made it a synonym of *albovittata* (*vittata* Selys). McLACHLAN (1878, 1881) added descriptive notes from additional Ecuador females. The male has never been described. Briefly, Selys stated that the scarcely marked, milky-white, transverse wing band beginning at the nodus is curved, concave proximally, and not at all bordered with brown. McLACHLAN (1878) noted 1 ♀ with a clearly visible pale band margined distally by a smoky, gray-brown band. FRASER's (1946) specimen and all 29 of our *vittata* females (Fig. 11) are andromorphs; none agree with the *aequatorialis* holotype or with the Selys or McLachlan descriptions. The question arises: what is the true status of *aequatorialis*? One may reason that the Selys description could apply to a heteromorphic *vittata* female, but such females have not been recorded. *P. aequatorialis* is rejected as a synonym of *vittata*.

On the other hand, we (1985) described a heteromorph b form of the female *procera*. Such a female was once found in copula with a *procera* male, and many such females were collected with *procera* males at several Ecuador localities. Wings of Hb *procera* females form a continuum from almost colorless to conspicuously banded with narrow, milky white and dark brown, these last specimens illustrated in BICK & BICK, 1985, fig. 9. The slightly colored forms of

procera agree closely with the almost hyaline wings of the *aequatorialis* holotype and with the narrowly pale-banded wings of the Selys and McLachlan descriptions of *aequatorialis* from Ecuador. Therefore the female *aequatorialis* relates best to *procera* Hb females. Because this was not realized earlier (BICK & BICK, 1985), the following new synonymy is presented:

Thore picta race ?*Aequatorialis* SELYS, 1873a: 36 (KIMMINS, 1970: 199, holotype ♀, Ecuador, BMNH) new synonym of *Thore gigantea* Race? *procera* SELYS, 1869: 27 (MONTGOMERY, 1967: 152, "type" ♂, Bogota, Colombia, BE).

Distribution and habitat — *P. vittata,* found primarily in northwestern Brazil at 100 m, occurs eastward along the Amazon to Borba in central Brazil. Specimens were collected every month except July and August. At Sao Paulo de Olivenca, *vittata* was taken concurrently with *batesi* on 6 occasions.



Figs 21-30. Terminal segment of penis, ventral view: (21) *Polythore vittata;* (22) *P. victoria;* — (23) *P. boliviana;* — (24) *P. williamsoni;* — (25) *P. ornata;* — (26) *P. batesi;* (27) *P. beata;* — (28) *P. mutata;* — (29) *P. aurora;* — (30) *P. concinna.*

POLYTHORE VICTORIA (McLACHLAN)

Figures 2, 12, 22

Thore victoria McLACHLAN, 1869: 28 (1 ♂, Bolivia); — SELYS, 1869: 25 (descr. ♂); — KIRBY, 1890: 116; RIS, 1918: 31 (descr. ♂, ♀, Pozuzo, Peru), figs 12, 13 (wings).

Thore victoria: SELYS (not McLachlan) 1873a: 33 (♀, cf. *boliviana*).

Polythore victoria: KENNEDY, 1919: 1, figs 17, 18 (penis drawings); — FRASER,

1946: 16; — SOUKUP, 1954: 14; — RACENIS, 1959: 489; — MONTGOMERY, 1967: 153 (type).

Type data — The holotype ♂ in BMNH (KIMMINS, 1970) was examined.

Other material examined: 10 ♂, 2 ♀ (heteromorphs). PERU, *Huanuco*, Pozuzo, MP, 8 ♂, BMNH; 1 ♀, PM; — PERU, labelled only "from Ris", 1 ♂, 1 ♀, UMMZ (because RIS (1910) recorded 24 ♂, 12 ♀ from Pozuzo, these 2 are probably from there); — PERU only, RM, 1920, 1 ♂, PM.

Male (HWL, $\bar{X} = 46.5$ mm, N = 2; penis horns, $\bar{X} = 0.137$ mm, N = 2).

The material examined agrees with McLACHLAN's (1869) and SELYS' (1869) descriptions except that the "brown vestige" in the fore wing (Selys) is absent. Males also agree with RIS' (1918) illustration and are easily identified in MONTGOMERY's (1967) key. HWL of McLachlan's male was 46 mm, of the 2 in UMMZ, 46, 47 mm, large relative to most *Polythore* species. Additional to large size, *victoria* males are readily distinguished (Fig. 2) by the concave, postero-distally slanting, proximal border of the apical dark brown in both wings which, in the hind, is preceded proximally by a separated, narrow, and similarly slanted lighter brown band.

Although *victoria* is distinctive in wing color pattern, its penis horn length and penis flagella (Fig. 22) are similar to those of the *boliviana* group. Both our *victoria* specimens and KENNEDY's (1919) drawing show a 2-segmented penis flagellum.

Female (HWL = 38.0 mm, one specimen).

SELYS (1873a) recorded 1 ♀ *victoria* from Bolivia, but RIS (1918) considered it to be *boliviana* and, from other specimens, gave the first description of a true *victoria* female. Wings of the 2 specimens studied (Fig. 12) agree with his description and illustration. The *victoria* ♀ differs from other members of the genus; the fore wing is completely hyaline, and the narrow, white and brown stripes near the middle of the hind wing slant postero-distally forming an angle greater than 90° with the proximal costal border.

RIS (1918) placed *aequatorialis*, known only from the female, in synonymy with *victoria*. We disagree because the faint trace of a hind wing white band in the *aequatorialis* holotype is perpendicular to the costa, whereas the stripes in the 2 ♀ *victoria* examined and in the Ris illustration are more slanted. Furthermore, *victoria* occurs primarily in central Peru, *aequatorialis* only in Ecuador. As stated previously, we consider *aequatorialis* synonymous with *procera* whose Hb form it closely resembles.

Distribution and habitat — *P. victoria* is very localized; all specimens, other than the holotype, are apparently from Pozuzo, Peru.

POLYTHORE BOLIVIANA (McLACHLAN)

Figures 3, 13, 23

Thore boliviana: McLACHLAN, 1878: 89 (1 ♂, Chairo, Bolivia); — SELYS, 1879: 53 (descr. ♂); — KIRBY, 1890: 116; — RIS, 1918: 30, 32 (key, descr. ♀, Pichis-Weg, Peru).

Thore victoria: SELYS (not McLachlan), 1873a: 33 (1 ♀ doubtfully placed in *victoria* but assigned to *boliviana* by RIS, 1918: 32).

Polythore boliviana: KENNEDY, 1919, I, figs 13, 14 (penis drawings); — MONTGOMERY, 1967: 150 (type).

Type data — In BMNH the holotype ♂ (KIMMINS, 1970) was examined.

Other material examined: 47 ♂, 19 ♀ (heteromorphs). BOLIVIA, *Cochabamba,* Cristal Mayu, 600 m, RS, 1 ♂, 3 ♀, FSCA; collector?, 2 ♂, 1 ♀, UMMZ; — Palmar, 900 m, RS, 1 ♀, FSCA; RS, XI-1950, 1 ♂, UMMZ; PE, IX-1956, 1 ♂, UMMZ; — locality?, IX-1899, 2 ♀, CU; — *LaPaz,* Caranavi, RC, IV-1960, 2 ♂, 2 ♀, FSCA; — Coroico, 1800 m, OS, 1897, 2 ♂, 1 ♀; PE, XII-1955, 10 ♂, 1 ♀, UMMZ; PE, I-1976, 1 ♀, CC; OS, 1 ♀, BMNH; — Yungas Mts, 1100 m, RS, 1 ♂, FSCA; TB, 1 ♂, MCZ; — Songo, OS, 2 ♀, BMNH; — *Santa Cruz,* Buena Vista, 400 m, RS, 22 ♂, FSCA; — Santa Cruz, JS, 1 ♂, MCZ; — dept.?, from FF, XI, 1902, 1 ♂, 1 ♀, UMMZ; — dept.?, Chairo, 1 ♀, BMNH. — PERU, *Cuzco,* Marcapata, OG, 1899, 1 ♂, 1 ♀, IV-1900, 1 ♂, date?, 1 ♀, UMMZ.

Male (HWL, $\bar{X}$ = 37.8 mm, N = 12; penis horns, $\bar{X}$ = 0.119 mm, N = 12).

The mean HWL slightly exceeds McLACHLAN's (1878) 36 mm (N = 1). He found this species remarkable in that the male fore wing is nearly entirely opaque ochreous proximal to the dark apical portion, and SELYS (1879) used the terms ochre and orange for this area. Likewise, the proximal 2/3 of the fore wing of our mature males is orange-yellow, the apical 1/3 black. In the hind wing, the shiny black apical area contrasts with the smoky-brown basal 2/3 (Fig. 3).

In immatures, the fore wing from base to apex has first a hyaline area, then a white lunule, then a light brown area, and the hind wing is similar except that the basal portion is slightly darker. With maturity, the lunule becomes progressively obscure and is absent in some specimens. The lunule of the holotype hind wing is slightly broader than that of the other specimens examined.

RIS (1918) emphasized the black wing tip of *boliviana.* Similarly, the apical 1/3 of each wing of the present specimens and of the holotype is iridescent dark brown or black in contrast with the related *williamsoni* whose wing tips are scarcely darker than the basal area. The 2 taxa are specifically distinct based on the above characteristic and on differences in the penes. The Ris description applies to *boliviana,* not to *boliviana williamsoni* to which SCHMIDT (1942) and RACENIS (1959) assigned it.

The penes of the 3 species of the *boliviana* group are similar in their 2-segmented flagella and in the length of the horns, but the horns of *boliviana* (Fig. 23) are straight, those of *ornata* (Fig. 25) and *williamsoni* (Fig. 24) slightly incurved, and the horns of *williamsoni* are broader and ventrally hollowed out.

Female (HWL, X = 35.9 mm, N = 10).

Our specimens agree essentially with the first description of the female (RIS, 1918) and with a ♀ topotype in BMNH. In immatures, the pale, transparent wing has a white band near the nodus. In matures (Fig. 13), this 3-5 mm opaque band, orange in the fore wing, light brown in the hind, is bordered distally by a wide, dark-brown band. There is an obscure, very narrow, dark-brown stripe immediately proximad of the pale band in the hind wing of some individuals.

Distribution and habitat — *P. boliviana*, the only *Polythore* common in Bolivia, occurs at 600-1800 m, in a broad expanse of west-central Bolivia, from Santa Cruz north to southern Peru.

POLYTHORE ORNATA (SELYS)

Figures 4, 14, 25

Thore ornata SELYS, 1879: 54 (2 ♂, Peru); — KIRBY, 1890: 116; — RIS, 1918: 30, 34 (key, Chanchamayo, Peru).
Thore ornata ornata: SCHMIDT, 1942: 247 (Peru: Ayna, Esperanza, Oxapampa).
Polythore ornata ornata: RACENIS, 1959: 488.
Polythore ornata: MONTGOMERY, 1967: 151 (type).
Thore pozuzina: FOERSTER, 1914: 59 (4 ♂, Pozuzo, Peru).
Thore ornata pozuzina: SCHMIDT, 1942: 248, III, fig. 6 (♂ wings).
Polythore ornata pozuzina: RACENIS, 1959: 488.
Polythore pozuzina: MONTGOMERY, 1967: 152 (type).
Thore montana: FOERSTER, 1914: 60 (1 ♀, Pozuzo, Peru); — SCHMIDT, 1942: 248 (syn. of *T. o. pozuzina*).
Polythore montana: RACENIS, 1959: 488 (syn. of *P. o. pozuzina*); — MONTGOMERY, 1967: 151 (type).

Type data — The *ornata* ♂ from Peru in BE labelled holotype by Montgomery was examined. Because there were 2 ♂ in the type series, we added the label "Lectotype, studied by G.H. Bick, 1985". In UMMZ a lectotype ♂ of *pozuzina* and the holotype ♀ of *montana*, both from Pozuzo, Peru, were examined.

Other material examined: 109 ♂, 40 ♀ (heteromorphs). PERU, *Ayacucho*, Ayna, 1900 m, FW, V-1941, 12 ♂, 3 ♀, UMMZ; — Caudalosa, FW, VI–1941, 1 ♀, UMMZ; — Sivia, 350 m, FW, VI-1941, 25 ♂, 5 ♀, UMMZ; — Yanamonte, FW, IX-1940, 6 ♂, 2 ♀, UMMZ; — *Huanuco*, Divisoria, 1700 m, FW, X-1946, 1 ♀, UMMZ; — Pozuzo, ca. 803 m, 1904, 1 ♂, UMMZ; MP, 1 ♀, BMNH; — *Junin*, Camino del Pichis, WF, VII-1920, 1 ♂, CU; — LaMerced, ca. 1067 m, JR, II-1931, 1 ♀, III-1931, 6 ♂, 2 ♀, IV-1931, 1 ♀, V-1931, 1 ♂, 1931, 1 ♂, 2 ♀, date?, 21 ♂, 8 ♀, UMMZ; MP, 14 ♂, 7 ♀, BMNH; — Pampa Hermosa, 1600 m, FW, V-1935, 15 ♂, 3 ♀, UMMZ; — San Pedro, 900 m, FW, V-1935, 2 ♀, UMMZ; San Ramon, 1 ♂, BMNH; — Satipo, 700 m, PP, VII-1940, 1 ♂, UMMZ; — *Pasco*, Oxapampa, LeMoult, 2 ♂, BE; — Dept.?, Inca Trail, Fort Union to Astillero, DeMilhau Exp. 1907, 1 ♂, MCZ.

Male (HWL, $\bar{X} = 38.2$, N = 12; penis horns, $\bar{X} = 0.102$ mm, N = 12).

The brief SELYS (1879) description of 1 ♂ *ornata* from Peru which dealt only with the hind wing, delimited in detail the hyaline (white in our specimens) costal stripe extending distad of the nodus and mentioned the lighter, curved, transverse lunule in the dark brown. FOERSTER's (1914) description of 4 ♂ *pozuzina* from Pozuzo, Peru, included the front wing also. There is an obvious similarity

between the 2 descriptions and between the *ornata* lectotype in BE and the *pozuzina* holotype in UMMZ. Like SCHMIDT (1942) and RACENIS (1959), we conclude that *pozuzina* is a synonym of *ornata.*

The 109 ♂ studied (Fig. 4) agree with the Selys *ornata* description and with the lectotype in BE. Both fore and hind wings have a dark-brown or black area beginning at about 1/2 the distance between nodus and stigma and extending to the apex. However, the fore wing is white from about midway between quadrangle and nodus to the distal black, whereas this area in the hind wing is very dark brown, scarcely contrasting with the distal dark area but sometimes separated from it by an obscure, lighter-colored lunule. In the hind wing a white costal-subcostal stripe contrasts sharply with the dark area. Foerster stated that the large light area of the fore wing may be pale yellow. However, in the type and in all of our specimens this area is white.

SCHMIDT (1942) treated *pozuzina* as a subspecies of *ornata,* the former differing only in the clarity of the wing tip. The type *pozuzina* ♂ at UMMZ, not fully mature, does show a clear area at the wing tip as do our immatures. However, the wing tips of fully mature males are very dark brown. Because this variation seems related only to stage of maturity, we judge that *ornata* is a monotypic species.

On the other hand, MONTGOMERY (1967) considered *pozuzina* and *ornata* distinct even though his unpublished photographs and notes of the *ornata* type in BE and the *pozuzina* type in UMMZ are strikingly similar. With our specimens we can reach neither *ornata* nor *pozuzina* in his key.

Female (HWL, $\bar{X} = 34.8$ mm, $N = 13$).

The *ornata* ♀ was long unknown possibly because of a reluctance to apply the name *ornata* to the colorless or sometimes only slightly banded females collected with the vividly colored males. However, FOERSTER (1914) described *montana* from 1 ♀ collected at Pozuzo, Peru, with 4 ♂ *pozuzina* (= *ornata*). We examined 10 ♀ from 5 localities where the only males collected were *ornata.* By association with males, these females very likely are *ornata.* Wing color of the 40 ♀ studied forms a continuum from completely hyaline to the merest suggestion of a white band just distad of the nodus, to a definite narrow white band bordered distally by a narrow brown one (Fig. 14). The completely hyaline females are identical with the *montana* type examined at UMMZ. Therefore, we consider *montana* to be a synonym of *ornata,* a synonym first proposed by SCHMIDT (1942).

We (BICK & BICK, 1985) could not distinguish *procera* Hb females from *pozuzina* (= *ornata*) females and still cannot differentiate them. Not clearly noted in 1985 is the fact that the wings of *procera* have the same nodal band variation in width and color intensity as just noted for *ornata.* No feature which would consistently separate the two was found. One must depend on distribution of the readily distinguished males to differentiate the associated females. Our 219 ♂ *procera,* all from Colombia and Ecuador, are readily distinguished from the 109

♂ *ornata* entirely from Peru. A North-South distance of 760 km separates the 2 species: the southernmost record for *procera* is Zamora in southern Ecuador, the northernmost for *ornata* is Pozuzo in central Peru.

Distribution and habitat — Along with *aurora* and *concinna, ornata* is one of the most abundant species (17.7% of all specimens) in the present material. *P. ornata* is recorded only from central and southern Peru, in the eastern foothills of the Andes at 350-1900 m. It has been collected February through September, most frequently in May. At LaMerced, *ornata* was collected concurrently with *lamerceda* and *picta* once, at Satipo with *picta* once. At Pampa Hermosa the collector noted, "keeps to shady spots in the forest exclusively along brooks, especially where they form pools and where [there are] small clearings" and also, "did not see one pair mating".

POLYTHORE WILLIAMSONI (FOERSTER)

Figures 5, 15, 24

"*Thore Williamsoni* n. sp. (*Th. boliviana* Rasse *Williamsoni*)" FOERSTER, 1903: 2 (numerous ♂, ♀, copulating pair, Vilcanota, Peru).
Thore boliviana Williamsoni: SCHMIDT, 1942: 247, III, figs 7, 8 (wings).
Polythore boliviana williamsoni: RACENIS, 1959: 487.
Polythore williamsoni: KENNEDY, 1919: I, figs 11, 12 (penis drawings, Bolivia); — MONTGOMERY, 1967: 153 (types).

Type data — A copulating pair from Vilcanota, Peru, collected by O. Garlepp, January 9, 1899, examined at UMMZ, is hereby designated lectotypes.

Other material examined: 8 ♂, 2 ♀ (heteromorphs). BOLIVIA, FF, 1 ♂, UMMZ. — PERU, *Cuzco,* Rio Urubamba, HB, III-1929, 1 ♂, CM; — *Puno,* Vilcanota, OS, 2 ♂, BMNH; OG, 1902, 2 ♂, 1 ♀, UMMZ; — *San Martin,* Pachitea, OS, 1 ♀, BMNH; — dept?, RM, 1920, 1 ♂, PM; — dept?, "Montana", A. Hill, 1 ♂, BMNH.

Male (HWL, $\bar{X} = 39.2$ mm, N = 6; penis horns, $\bar{X} = 0.145$ mm, N = 5).

The very distinctive wings of the specimens studied (Fig. 5) are smoky gold with a dull, very obscure lunule as in FOERSTER (1903), and their HWL (34-43 mm) is similar to that of his males (35-44 mm). Our specimens also agree with the lectotype at UMMZ and with SCHMIDT's (1942) wing illustration. In order to reach *williamsoni* in MONTGOMERY's (1967) key, one must decide at couplet 13 that the transverse wing bands are white, in contrast with Foerster's description, the type, and our specimens.

KENNEDY (1919) drew the penis horns of a specimen at UMMZ from Bolivia. Its horn length which we measured (0.150 mm) and his drawing agree closely with the 7 ♂ examined from Peru (Fig. 24).

Female (HWL, $\bar{X} = 34.5$ mm, N = 2).

The wings of the mature female (Fig. 15) are mostly transparent with a 2 mm wide, light-orange band in the fore wing just distad of the nodus, and in the hind wing an equally narrow light-brown band slightly more distad of the nodus,

bordered distally by a 1 mm dark-brown stripe. Unlike *boliviana,* there is no wide, dark-brown band distad of each pale band. Our specimens agree with FOERSTER's (1903) HWL (34-36 mm) and with SCHMIDT's (1942) wing illustration based on a photograph sent to him by L.K. Gloyd.

Distribution and habitat — Except for 1 ♂ from an unspecified locality in Bolivia, *williamsoni* is known only from Peru, and we have already indicated doubt about its reported (FOERSTER, 1903) occurrence at 5300 m.

POLYTHORE BATESI (SELYS)

Figures 6, 16, 26

Thore batesi SELYS, 1869: 29 (2 ♂, 2 ♀, Sao Paulo de Olivenca, Brazil); — KIRBY, 1890: 117; — SCHMIDT, 1942: 246 (key), 111, figs 3, 4 (wings).

Thore batesi: NAVAS (not Selys), 1924: 319 (cf. *aurora*).

Polythore batesi: KENNEDY (not Selys), 1919: 1, figs 7, 8 (penis drawings, cf. *aurora*).

Polythore batesi: FRASER, 1946: 22 (key, color change); — MONTGOMERY, 1967: 150 (type).

Type data — In BE, 4 ♂ from Sao Paulo de Olivenca were examined: 1 labelled lectotype and 3 labelled paratypes by Montgomery.

Other material examined: 55 ♂, 17 ♀ (heteromorphs). BRAZIL, *Amazonas,* Sao Paulo de Olivenca, 0-100 m, OS, 1897, 1 ♂; WU, XII-1931, 15 ♂, 5 ♀, I-1932, 5 ♂, II-1932, 5 ♂, 1 ♀, III-1932, 1 ♂, IV-1932, 5 ♂, 4 ♀, V-1932, 2 ♂, 2 ♀, UMMZ; H. Ebert, II-1976, 1 ♂, CC; collector?, 12 ♂, 2 ♀, BE; 6 ♂, 1 ♀, BMNH; — *Para,* Obidos, 1 ♀, BE. — PERU, *Loreto,* Iquitos, 1 ♀, BE; — *Pasco,* Oxapampa, LeMoult, 1 ♂, BE. — Country?, *Amazonas,* RM, 1920?, 1 ♂, 1 ♀, PM.

Male (HWL, $\bar{X} = 31.7$ mm, $N = 15$; penis horns, $\bar{X} = 0.125$ mm, $N = 15$).

Our specimens (Fig. 6) agree with the lectotype, with SCHMIDT's (1942) wing figures, and with SELYS' (1869) description: HWL, 31-33 mm, cells under stigma, 7-8, opaque wing band begins a little beyond nodus. The stigma of our specimens surmounts a mean of 7.6 cells ($N = 15$), and the pale wing band begins distad of the nodus, 1-2 mm beyond in the fore wing, 1-3 mm in the hind. These characteristics separate *batesi* from *aurora* and *mutata* where the stigma surmounts means of only 5.0 ($N = 10$) and 5.3 ($N = 17$) cells respectively, and the pale band begins proximad of the nodus.

Wing color changes with maturation are essentially as described by Selys. The 3-7 mm wide wing band, at first white, becomes yellow and finally deep orange. Also, the area distad of the band, at first pale, darkens and widens until the dark brown reaches the apex. The lectotype has white bands, and MONTGOMERY (1967) described them as white, but this feature is true only of immatures.

Penis horn length separates *aurora* (0.232 mm) with long horns from *batesi* (0.125 mm), *beata* (0.131 mm), and *mutata* (0.126 mm), all with shorter ones (Figs 26-29). For example, KENNEDY (1919) illustrated the penis horns of a "*batesi*" specimen in MCZ from Iquitos, Peru. The horns, which we measured, are 0.200 mm, much longer than those of *batesi* from Sao Paulo, Brazil, but

similar to those of *aurora* from Iquitos, Peru. Based on location of the wing band, length of penis horns, and distribution, Kennedy's specimen is *aurora*, not *batesi*.

Female (HWL, $\bar{X} = 31.1$ mm, $N = 8$).

The specimens studied agree with the SELYS (1869) description except that the HWL of his examples is slightly shorter (28-29 mm). The wing color pattern of immature *batesi* resembles that of immature *vittata*. Because both species are almost entirely from northwestern Brazil, this superficial similarity can cause confusion. However, the pale wing bands of the 2 are positioned differently: in *batesi* the band begins in the fore wing 7-10 cells distad of the nodus, in the hind wing 9-14; in *vittata*, the band begins 12-19 cells distad of the nodus in the fore wing, 15-25 cells in the hind.

With maturity (Fig. 16), the 3-4 mm white band becomes orange in the fore wing, orange or light brown in the hind. Distad of the opaque band, the transparent-brown band darkens in matures. This band is never closer than 8 mm to the apex in either wing. This agrees with the hyaline apical area described by Selys, but disagrees wih FRASER's (1946) couplet 4 stating that the dark brown extends right up to the apex of the wing.

Distribution and habitat — Sao Paulo de Olivenca on the upper Amazon, northwestern Brazil, at only 100 m elevation, is the source of most specimens examined. However, the record of 1 ♀ from Obidos in eastern Brazil at 55.30 W is the easternmost for the genus. Collections were in each month, December through May, but most frequent in December. *P. batesi* was collected concurrently with *vittata* on 6 occasions.

POLYTHORE BEATA (McLACHLAN)

Figures 7, 17, 27

Thore beata McLACHLAN, 1869: 28 (many ♂, ♀, Pebas, Peru); — SELYS, 1869: 30 (descr. ♂, ♀); — HAGEN, 1875: 31; — KIRBY, 1890: 117; — CAMPOS, 1922: 14 (Ecuador); — NAVAS, 1924: 319 (Quindio, Colombia; "Rio Ampiyan" = ? Rio Ampiyacu, Peru); — SCHMIDT, 1942: 247 (Tonantins, Brazil), III, fig. 5 (♀ wings).

Thore batesi Race? *Thore inaequalis* SELYS, 1869: 30 (1 ♀, Fonte Boa, Brazil); — HAGEN, 1875: 31; — MONTGOMERY, 1967: 127, 151 (syn., type).

Polythore beata: KENNEDY, 1919: I, figs 3, 4 (penis drawings); — FRASER, 1946: 23 (key, color change); — SOUKUP, 1954: 14 (Iquitos, Peru); — RACENIS, 1959: 487; — MONTGOMERY, 1967: 150 (type).

Type data — In BMNH, from Pebas, Peru, we examined specimens of *beata* labelled: ♂ lectotype (KIMMINS, 1970), ♀ lectotype, 2 ♂, 3 ♀ paralectotypes. In BE we examined the ♀ *inaequalis*, without locality, which MONTGOMERY (1967) designated a lectotype.

Other material examined: 11 ♂, 4 ♀ (andromorphs). BRAZIL, KM, 1 ♂, UMMZ. — COLOMBIA, *Amazonas*, LaChorrera, WF, VIII-1920, 3 ♂, 1 ♀, CU; — Leticia, VII-1972, 1 ♂, CC. — PERU, *Loreto*, Pebas, 100-200 m, 2 ♂, 2 ♀, MCZ; 2 ♂, BMNH; — Pebas District, KM, VIII-1903, 1 ♂, UMMZ; — Rio Ampiyacu, KM, VI, VII-1923, 1 ♂, 1 ♀, BMNH.

Male (HWL, X = 27.8 mm, N = 4; penis horns, X = 0.131 mm, N = 4).

McLACHLAN's (1869) brief description noted a completely hyaline fore wing and a white band in the hind. This combination, which distinguishes *beata* from all other *Polythore* species, is obvious in our specimens, but their HWL (27-28 mm) is less than that of McLachlan's (29-31 mm). SELYS (1869), adding descriptive detail, noted that the center of the transverse white band is at the nodus. However, in the present material (Fig. 7), the band extends unequally on both sides of the nodus, beginning at a mean of 1.9 mm proximad and extending 3.7 mm distad (N = 5). The white band does not change color, remaining white even in our fully mature specimens. FRASER (1946) stated that it probably remains white, and MONTGOMERY (1967) described it as white.

The mean penis horn length is slightly longer than our measurement of KENNEDY's illustrated specimen (0.125 mm).

Female (HWL, $\bar{X}$ = 28.7 mm, N = 3).

Like the male, the female has a completely hyaline fore wing and a white-banded hind one. This band (Fig. 17), narrower than in the male, begins at, and extends distad of the nodus. It is white in immatures, very slightly yellow in matures. Both Selys and Fraser discuss color change with maturity. The former described the wing band of immatures as milky white, of matures as ochreous yellow; the latter stated that the bands are chalky white in tenerals, dark ochreous in adults.

Distribution and habitat — Records from the Pacific drainage, Quindio, Colombia (NAVAS, 1924), and from an unspecified locality in Ecuador (CAMPOS, 1922) are doubted because all other literature records and all specimens examined are from a small area of the upper Amazon drainage in southeastern Colombia, northeasternmost Peru, and northwestern Brazil. *P. beata* occurs at 100-200 m, well beyond the eastern foothills of the Andes.

POLYTHORE AURORA (SELYS)

Figures 8, 18, 29

Thore aurora SELYS, 1879: 55 (2 ♂, 2 ♀, Rio Napo, Ecuador); — KIRBY, 1890: 117; — CAMPOS, 1922: 14; — SCHMIDT, 1942: 242, Fig. K (thorax), 247 (Iquitos, Peru), 111, figs 1, 2 (wings).

Polythore batesi: KENNEDY (not Selys), 1919: 1, figs 7, 8 (penis drawings).

Thore batesi: NAVAS (not Selys), 1924: 319 (Yepisca, Peru); — SCHMIDT, 1942: 247 and RACENIS, 1959: 487 (Navas' record = *aurora*?).

Polythore aurora: FRASER, 1946: 22, 23 (key, descr., Mishuyacu, Peru); — SOUKUP, 1954: 14; — RACENIS, 1959: 487; — MONTGOMERY, 1967: 150 (types).

Type data — SELYS (1879) described *aurora* from 2 ♂, 2 ♀, from Rio Napo, Ecuador. MONTGOMERY (1967) stated that 4 specimens in BE probably belong to the type series and designated the 2 more mature ones lectotypes. These 2, 1 ♂, 1 ♀, each clearly labelled lectotype, were

examined. The ♂ is actually *batesi* (cf. discussion), and the ♀, bearing the almost indecipherable label, Iquitos, which is in Peru, could not be of the type series. There is a note in BE that 1 ♂ has been removed, and we did not find the second female.

Other material examined 102 ♂, 58 ♀ (heteromorphs): BRAZIL, *Amazonas*, Tefe, 1 ♂, 3 ♀, BE; — State?, St. Catherina, BP, 1 ♂, MCZ. — ECUADOR, *Napo*, Rio Napo, 2 ♂, 1 ♀, BMNH. PERU, *Loreto*, Iquitos, 120 m, GK, VI-1931, 1 ♂, 3 ♀, VII-1931, 1 ♂, 3 ♀, V-1938, 1 ♂, VI-1939, 1 ♀, VII-1939, 2 ♂, IV-1940, 1 ♂, 1 ♀, V-1940, 1 ♂, UMMZ; IV-1936, 1 ♂, 2 ♀, AMNH; OS, 2 ♂, 1 ♀, MCZ; GK, II-1931, 1 ♂, III-1931, 1 ♂, I-1935, 2 ♂, 2 ♀, II-1935, 7 ♂, 4 ♀, III-1935, 1 ♂, V-1935, 1 ♀, I-1936, 9 ♂, 1 ♀, II-1936, 1 ♀, III-1936, 7 ♂, 6 ♀, IV-1936, 23 ♂, 16 ♀, IX-1936, 2 ♂, IV-1938, 1 ♀, V-1938, 8 ♂, 3 ♀, BMNH; IV, V-1930, 5 ♂, BMNH; JH, I-1980, 1 ♂, 1 ♀, USNM; collector?, 18 ♂, 4 ♀, BE; — Mishuyacu, 120 m, GK, VI-1931, 1 ♂, VII-1931, 1 ♂, UMMZ; PN, VII-1930, 1 ♀, BMNH; collector?, III-1930, 1 ♀, BMNH; — Rio Paranapura, GK, II-1940, 1 ♀, UMMZ; — Rio Ucayali, Bartlett, 1 ♂, MCZ.

Male (HWL, $\bar{X} = 29.0$ mm, N = 10; penis horns, $\bar{X} = 0.232$ mm, N = 10).

SELYS (1879) reported a HWL of 29 mm and described the opaque pale wing band as large, vivid orange. In our specimens, the mean HWL is also 29 mm, the pale band of matures is colored as in the Selys description (Fig. 8), and the hind wing band is slightly broader ($\bar{X} = 6.9$ mm, N = 10) than that of the fore ($\bar{X} = 5.4$ mm, N = 10) as SELYS (1879) and FRASER (1946) noted. In each wing this band proximad of the nodus extends anteriorly only to the radius. With maturity the band changes from white to vivid orange, and the area distad of it becomes dark, transparent brown, which spreads but does not reach the apex.

The proximal margin of the nodal band in the *aurora* specimens studied (6-7.5 cells proximad of the nodus) corresponds to SELYS' (1879) statement that the band in *aurora* begins halfway between the quadrilateral and the nodus. He also found that the band ends 5-6 cells beyond the nodus in the fore wing, at 1/3 the distance between nodus and stigma in the hind, adding that the band in *batesi* begins in all wings precisely where it ends in *aurora*.

The location of the proximal margin of the nodal band in the *aurora* "lectotype" (at, or 3-4 cells distad of the nodus) does not agree with that of the Selys description (proximad of the nodus). On the other hand, the proximal margin of the band in the *aurora* "lectotype" does agree with that of the *batesi* lectotype wherein the proximal margin is distad of the nodus. Furthermore, the *aurora* "lectotype" male has 7.5 and 8 cells under the stigma, unlike our *aurora* series (5.0 cells, N = 10), but like our *batesi* (7.6 cells, N = 14). For these reasons, we disagree with the determination of the ♂ *aurora* in BE labelled lectotype and have added the label, "*P. batesi*, det. G.H. Bick, 1985".

The penis horns of *aurora* are much longer than those of *batesi*. Measurements would have provided a more definite separation of the two lectotypes. Unfortunately, we considered them too fragile to warrant the manipulation required for extrusion of the penes.

Female (HWL, $\bar{X} = 29.3$ mm, N = 10).

Although not in the type series, the specimen in BE labelled lectotype by Montgomery is a true *aurora*. It, as well as specimens in our series, agrees with the

brief SELYS (1879) description: HWL = 30 mm, wing bands narrower than in the male.

When a female matures, the 3-5 mm wide white band becomes dark orange (Fig. 18), and the area distad of it forms a dark-brown band which, as in FRASER's (1946) key, ends short of the apex. A very narrow (1 mm) dark--brown stripe develops proximad of the pale one. Mature *aurora* females are readily separated from matures of *mutata* by the presence of the dark band distad of the pale one.

Distribution and habitat — Along with *ornata* and *concinna, aurora* is one of the most abundant species (18.6% of all specimens) in the present material. Most collections, subsequent to the original Rio Napo, Ecuador, one, have been from further east, near Iquitos, Peru, where the Napo empties into the Amazon. *P. aurora* was taken concurrently with *derivata* twice. Our data and FRASER's (1946) show that *aurora* is on the wing every month of the year except December.

POLYTHORE MUTATA (McLACHLAN)

Figures 9, 19, 28

Thore mutata McLACHLAN, 1881: 29 (8 ♂, 1 ♀, Rio Bobonaza, Ecuador); — KIRBY, 1890: 117; — CAMPOS, 1922: 13; — SCHMIDT, 1942: 242, fig. L (thorax), 246 (Umbria, Colombia).

Polythore mutata: FRASER, 1946: 22, 24 (key, descr., color change); — MONTGOMERY, 1967: 151 (types).

Type data — In BMNH we examined the lectotype ♂ (KIMMINS, 1970), 5 ♂ paralectotypes, 1 ♀ allotype.

Other material examined: 65 ♂, 6 ♀ (heteromorphs): COLOMBIA, *Putumayo,* Umbria, 325 m, GK, X-1930, 2 ♂, I-1931, 2 ♂, BMNH; Laidlaw, XI-1930, 1 ♂, BMNH; OS, I-1931, 1 ♀, BMNH. — ECUADOR, *Napo,* Limoncocha, 300 m, BD, XI-1973, 1 ♂, XII-1973, 1 ♂, VII-1974, 1 ♂, X-1974, 1 ♂, FSCA; TR, V-1976, 3 ♂, 1 ♀, FSCA; MW, XI-1980, 39 ♂, 4 ♀, FSCA; — Napo Watershed, 500 m, WM, VIII-1939, 1 ♂, V-1940, 2 ♂, UMMZ; — Rio Anzu, 1000 m, WM, VIII-1934, 1 ♂, XII-1936, 1 ♂, UMMZ; — Rio Tuyano, 350 m, VII-1979, 1 ♂, CC; — *Pastaza,* Rio Bobonaza, ca. 700 m, WM, I-1940, 1 ♂, UMMZ; Buckley, 5 ♂, BMNH; — province?, RH, II-1900, 1 ♂, UMMZ. — PERU, *Loreto,* Iquitos, 120 m, WF, VIII-1920, 1 ♂, CU.

Male (HWL, $\bar{X}$ = 28.4 mm, N = 17; penis horns, $\bar{X}$ = 0.126 mm, N = 17).

McLACHLAN (1881) compared *mutata* and *aurora* noting that in mature males of the former the pale wing band remains white (Fig. 9) without a conspicuous dark-brown band distal to it. From additional material, SCHMIDT (1942) and FRASER (1946) also found that the band remains white. In each ♂ examined, including the lectotype, the band is milky white without any suggestion of orange or even yellow, and there is no dark-brown, distal band, only a diffuse, transparent gray.

McLachlan, Schmidt and Fraser did not locate the white band, but MONTGOMERY (1967) stated that it is almost equally wide before and after the nodus.

In contrast, the white band averaged 2.4 mm proximad, 3.6 mm distad of the nodus in the fore wing and 1.6 mm proximad, 5.4 mm distad in the hind wing of 16 ♂. As Fraser stated, the pale band does not reach to the costa but only to the radius proximad of the nodus.

The HWL (26-30 mm) of 17 ♂ is similar to McLachlan's (28-30 mm, N = 8). He found that the stigma of *mutata* was slightly longer and narrower than that of *aurora*, a difference also very slight in the hind wings of our specimens (L/W *mutata* = 2.4x, N = 17; *aurora* = 2.1x, N = 10). McLachlan also found that the thoracic stripes are narrower and less bright in *mutata*. Among the specimens studied, the two species scarcely differ in width of the humeral stripe at mid length (*aurora*, $\bar{X}$ = 0.52 mm, N = 5; *mutata*, X = 0.49 mm, N = 5) and any slight difference in brightness seems related to maturity.

Female (HWL, $\bar{X}$ = 30.4 mm, N = 5).

McLACHLAN (1881) described the wing bands as "yellowish ochreous" in the fore wings, "brownish ochreous" in the hind, without proximal or distal dark brown. FRASER (1946) stated that the opaque band is white in immatures, but in matures is rich ochreous or "primrose yellow" in the fore wing, dusky violaceous brown or violaceous gray in the hind wing and that the band is not bordered distally by dark brown. The absence of this dark band readily separates matures of *mutata* from those of *aurora*. The band of our one immature is white, but in matures it varies from pale yellow in all wings (1 ♀) to bright orange in the fore wing (Fig. 19), brown in the hind (3 ♀). There are no literature statements locating the band, which begins 0-1 mm distad of the nodus in the fore wing, 1-2 mm distad in the hind wing of 5 ♀. The mean HWL closely approaches that of McLachlan's female (29 mm).

Distribution and habitat — Except for 6 specimens from Colombia and 1 from Peru, the present material (64) is from Ecuador at 120-1000 m. In November, 1980, at Limoncocha, Ecuador (Dunkle, Westfall, pers. comm.), *mutata* was collected with *derivata* at seepage areas near a small stream in the rain forest where, although abundant, neither species showed reproductive activity. FRASER (1946) judged that *mutata* has a short flying season, November to February, but we now have specimens from every month of the year.

POLYTHORE CONCINNA (McLACHLAN)

Figures 10, 20, 30

Thore concinna McLACHLAN, 1881: 28 (15 ♂, 4 ♀, Rio Bobonaza, Ecuador); — KIRBY, 1890: 117; — CAMPOS, 1922: 14.

Sapho pulchella KIRBY, 1889: 300 (♂, ♀, Cameroons); — KARSCH, 1891: 456 (syn., correct locality is Colombia, S.A.); — MONTGOMERY, 1967: 127, 150 (syn.).

Polythore concinna: FRASER, 1946: 22 (key, descr., Umbria, Colombia); — MONTGOMERY, 1967: 150 (types).

Type data — In BMNH the ♂ *concinna* lectotype (KIMMINS, 1970), 8 ♂, 2 ♀ paratypes, and in BE 4 ♂, 1 ♀ paratypes were examined. Also in BMNH, the *pulchella* lectotype ♂ (KIMMINS, 1970) and the allotype ♀ from Colombia were examined.

Other material examined: 121 ♂, 39 ♀ (heteromorphs): ECUADOR, *Morona-Santiago*, Mangosisa, 850 m, LA, XI-1945, 2 ♂, 1 ♀, 11 ♂, 5 ♀, UMMZ; — *Napo*, Archidona, 675 m, HR, X-1976, 1 ♂, 1 ♀, XII-1976, 1 ♂, I-1977, 1 ♂, II-1977, 1 ♂, RG; — Concepcion, 400 m, WM, XII-1939, 1 ♂, 1 ♀, UMMZ; — Cotos, 400 m, WM, II-1934, 1 ♂, V-1934, 1 ♀, UMMZ; — Jatunyacu, ca. 512 m, WM, XI-1934, 1 ♀, I-1935, 1 ♂, II-1935, 1 ♀, IV-1935, 1 ♂, III-1937, 6 ♂, UMMZ; — Las Palmas, 900 m, WM, VIII-1935, 2 ♂, UMMZ; — Napo Watershed, WM, V-1940, 1 ♂, 1 ♀, UMMZ; — Rio Anzu, 1000 m, WM, VIII-1934, 4 ♂, 4 ♀, IX-1934, 5 ♂, 4 ♀, X-1934, 1 ♀, IV-1937, 1 ♂, UMMZ; — Rio Chacayacu, WM, IV-1941, 2 ♂, VI-1941, 6 ♂, UMMZ; — Rio Cotopino, WM, II-1950, 5 ♂, III-1950, 1 ♂, UMMZ; — Rio Ila, 700 m, WM, VIII-1934, 1 ♂, IX-1934, 2 ♂, 1 ♀, XI-1934, 3 ♂, 1 ♀, XII-1936, 4 ♂, UMMZ; — Rio Misahualli, WM, III-1942, 2 ♂, V-1942, 1 ♂, UMMZ; — Tena, 512 m, OS, 4 ♂, BMNH; MW, X-1980, 1 ♂, FSCA; — Yanamanaca, WM, 1 ♀, UMMZ; — *Pastaza*, Canelos, 600 m, WM, XII-1938, 5 ♂, 2 ♀, UMMZ; — Partidero-Puyo, ca. 1000 m, WM, VII-1935, 1 ♂, X-1935, 1 ♂, XI-1935, 1 ♂, 1 ♀, II-1936, 2 ♂, XI-1936, 4 ♂, 1 ♀, UMMZ; MW, X-1980, 2 ♂, FSCA; — Pastaza Watershed, WM, XII-1935, 1 ♂, UMMZ; — Rio Arajuno, 1000 m, WM, IV-1941, 3 ♂, UMMZ; — Sarayacu on Rio Bobonaza, 700 m, WM, date?, 2 ♂, UMMZ; collector?, 2 ♂, USNM; — *Pichincha*, Papuyacu, WM, XI-1934, 2 ♂, UMMZ; — Quito, 2819 m, LA, 4 ♂, 5 ♀, UMMZ; — *Tungurahua*, Agoyan, 1700 m, WM, XI-1935, 8 ♂, 2 ♀, UMMZ; — province?, Churiyacu, 900 m, WM, III-1941, 2 ♂, 2 ♀, UMMZ; — Rio Bombainiyacu, WM, III-1941, 4 ♂, 2 ♀, IV-1941, 1 ♂, UMMZ. — PERU, *Junin*, Camino del Pichis, WF, VII-1920, 1 ♂, UMMZ; — *Pasco*, Chuchuras, MP, 1 ♂, BMNH. — Peru only RM, 1920?, 1 ♂, PM. — SOUTH AMERICA only, AP, date?, 1 ♂, UMMZ.

Male (HWL, $\bar{X} = 33.7$ mm, N = 11; penis horns, $\bar{X} = 0.203$ mm, N = 9).

The male of this very attractive species (Fig 10) with dark, transparent-amber wings, lacking other wing markings, is the most easily recognized member of the genus. The maximum HWL of our specimens (36 mm) is less than that of McLACHLAN's (1881) specimens (40 mm), yet the hind wing stigma surmounts 10.5-16.0 cells ($\bar{X} = 13.1$, N = 16), much like his count of 10-17 cells.

The shape of the penis horns (Fig. 30) also sets *concinna* apart from other members of the genus. The horns are not only long and slender, but also diverge conspicuously to form a V-shaped space between. The distinctive penis horns and the uniformly colored amber wings suggest a wide divergence from all other *Polythore* species.

Female (HWL, $\bar{X} = 30.9$ mm, N = 10).

The range of HWL (29-32 mm, N = 10) agrees with that of McLachlan's females (29-30 mm, N = 4), and the amber wings are less brilliant than in males as he pointed out. Slightly distad of the nodus is a narrow, somewhat cuneiform, opaque band, orange in the fore wing, light brown in the hind (Fig. 20). There is no definite, dark-brown band either proximad or distad of the opaque one.

McLachlan assigned a single immature female doubtfully to *concinna* because of its "pure white" wing band. We judge that this specimen is *concinna* because, among 38 ♀, 5 white-banded ones are from the same localities as the orange and brown-banded ones. Two white-banded ones are definitely immature, judged by the pale stigma, and 3 are probably so. Upon maturity, the white band becomes yellow, orange, or light-brown as in many species of the genus.

Distribution and habitat — Along with *aurora* and *ornata, concinna* is one of the most abundant (20.5% of all specimens) species in the present material. *P. concinna,* common in Ecuador at 400-2819 m, does not seem to extend into the rain forest at lower elevations, where in recent years experienced odonatologists did not find it at Limoncocha, Ecuador. It was collected concurrently at the same locality with *derivata* 7 times, with *mutata* once, and with both species once. *P. concinna* was taken every month of the year, most often October through December.

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ADDENDUM

Dr S. Dunkle has kindly brought to our attention very recently collected specimens in his personal collection taken in the Pacific drainage of the Andes: ECUADOR, *Pichincha Province,* near Santo Domingo, G.B. Edwards, May 11-17, 1986, 1♂, 3♀. The male clearly qualifies as *Polythore gigantea* because of short penis horns (0.062 mm) and uninterrupted black covering 70.3% of the hind wing. But the females differ from those of *gigantea,* previously described and figured (BICK & BICK, 1985), in that a white band interrupts the wing black to superficially suggest *P. vittata.* Nevertheless, the 3 females are *gigantea* by association with the male, by geographic distribution, and by differences from *vittata* females: their white wing bands are wider (6.0 mm) than those of *vittata* (2.6 mm), irregular rather than straight, and their apical hyaline windows are also wider (7.0 mm vs 4.7).

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