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A REVISION OF THE *PICTA* GROUP OF *POLYTHORE,* WITH A DESCRIPTION OF A NEW SPECIES, *P. LAMERCEDA* SPEC. NOV., FROM PERU (ZYGOPTERA: POLYTHORIDAE)

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The *picta* group of the genus *Polythore,* to which is assigned *gigantea* (Sel.), *procera* (Sel.), *picta* (Ramb.), *derivata* (McL.), *terminata* Fr. (new status), and *lamerceda* sp. n. (holotype ♂, allotype ♀, Mus. Zool., Univ. Michigan, Ann Arbor, MI, USA; LaMerced, Junin Dept, Peru, 13-VI-1931), is analyzed, and these spp. are redescribed and figured. Body color pattern, male abdominal appendages, and female mesostigmal lamina are too similar to be of taxonomic value. Males are differentiated on length and shape of penis horns and on wing color pattern, females only on the latter. Analysis of these characteristics showed much interdemic variation, but it was either insufficient to meet the 90% joint non overlap criterion or too discordant for the erection of new subspecies. F.C. FRASER's (1946, *Trans. R. ent. Soc. Lond.* 96: 11-46) "races", *adjuncta, ambigua,* and *originata* are invalid, but his "race" *terminata* is given full specific status. The *picta* group occurs almost entirely in Colombia, Ecuador, and Peru.

INTRODUCTION

MONTGOMERY (1967) stated that he had assembled hundreds of specimens of Polythoridae and had a monograph of the family in progress. His death in January, 1983 (WESTFALL, 1983a, 1983b) prevented completion of the project. Fulfilling Montgomery's wish, Westfall brought to Gainesville, FL, the extensive Polythoridae collection, the photographs, and the notes which Montgomery had assembled. The essentially unsorted and undetermined collection, consisting entirely of adults, was turned over to us for study. The specimens are almost entirely from Colombia, Ecuador, and Peru, primarily from the eastern foothills

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of the Andes. Most were taken by commercial collectors and distributed to museums from which they were borrowed by Montgomery. BROWN (1941) and WOYTKOWSKI (1954) gave much information on these collectors and localities in Ecuador and Peru respectively. Some specimens were in poor condition most likely because of adverse collecting conditions and much transporting. Many were broken, often in many places, and some lacked their terminal abdominal appendages. Labelling, often minimal and badly faded, was sometimes entirely absent. WOYTKOWSKI (1954), who collected many of the specimens, described the difficulties of collecting, preserving, and shipping specimens in these remote tropical areas.

Additional to the specimens assembled by Montgomery, we studied those in Florida State Collection of Arthropods, University Michigan Museum of Zoology, U.S. National Museum, and material sent to us by C. Cook, S.W. Dunkle, R.W. Garrison. D.R. Paulson checked his collections with our descriptions and sent his records and field notes.

From these sources, 15 of the nominal 18 species (MONTGOMERY, 1967) were examined. We became particularly interested in the 1,198 specimens which we designate as the *picta* group and in which we place: *gigantea* (Selys), *procera* (Selys), *lamerceda* sp. n. (described herein), *picta* (Rambur), *derivata* (MacLachlan), and *terminata* Fraser (new status). Comparisons of the original descriptions of these taxa with later literature (RIS, 1918; FRASER, 1946; MONTGOMERY, 1967) and with Montgomery's notes and photographs of types showed disagreement. Moreover, it became apparent that various workers did not agree on determinations of what is obviously the same species. There has been no monograph of the genus; the most recent work is by FRASER (1946) and MONTGOMERY (1967). A taxonomic revision of the genus *Polythore* is needed, but because this will require much more time and because most confusion in the genus involves the *picta* group, these six species are treated here so that some progress may be recorded pending broader generic coverage.

METHODS

The locality given on the original collection envelope is recorded under material examined, but spellings and assignments to provinces or departments sometimes were updated by checking with: *Official standard names, Peru, Ecuador* (Anonymous, 1955, 1957) and with modern maps. Countries are given in caps, departments (Colombia, Peru) and provinces (Ecuador) in *italics*, followed by the specific locality, all listed alphabetically. Elevations were sometimes given on the original envelopes but, if not, were determined from BROWN (1941) and WOYTKOWSKI (1954).

Because the penis was usually concealed by the chitinized vesicle, it was relaxed and extended in order to study the taxonomically important terminal segment with its terminal lobes which we prefer to call horns. The length of a horn was measured at 80X with a micrometer ocular (1 unit = 0.025 mm).

Because the abdomens were often broken, sometimes in several places, wing length was used to indicate size. Since the hind wings were more amenable to measurement, the length of one (HWL),

usually the left, was measured by inserting a paper, ruled in 2 mm squares, between the wings so as to isolate one hind one. With the paper in place, the wing length and the distance from wing apex to the proximal limit of the black at its mid width was measured and the latter converted to percent of wing length. This was done for both males and females even though in heteromorphic females there is a larger hyaline area at the wing apex. Thus, in males and andromorphic females, the wing black is the percent of wing length covered by black, whereas in heteromorphic females it is the proximal beginning of black as a percent of wing length.

The specimens came from many localities, some very close together. To conserve space and to avoid a statistical analysis of very small populations, some combining was essential. Localities within a radius of 120 km² were combined, and some with few specimens were omitted when large numbers from other nearby localities were available. Although data for specimens from nearby localities were combined when measurements varied only slightly, the interdemic variation was sometimes sufficient to warrant separate presentations of measurements.

To assist in determining possible subspecific status for these varying populations, the joint non overlap criterion, suggested by MAYR (1969) was used.

All specimens gathered by Montgomery are now in the authors' care. Except for some duplicates which will be placed in the Florida State Collection of Arthropods, specimens borrowed by Montgomery and by us will be returned to the various institutions and individuals from which they came.

The following abbreviations are used:

AL	A. Langley, et al.	LC	A. Langley & J. Cohen
AM	A. Maller	LP	D.L. Pearson
AMNH	American Museum Natural History	MCZ	Museum Comparative Zoology, Harvard Univ.
AP	A.F. Porter	MHN	Museo de Historia Natural Javier Prado, Lima, Peru
BP	B. Pohl	MP	M.L. Paulson
CC	C. Cook	MS	M. Strones
CF	C.J. Farrell	MW	M.J. Westfall, Jr.
CM	Carnegie Museum	OF	O.S. Flint, Jr.
CP	C.R. Patrick	PE	L.E. Pena G.
CU	Cornell Univ.	PM	Museum National d'Histoire naturelle, Paris
DL	D.B. Laddey	PP	P. Paprzycki
DP	D.R. Paulson	PS	P.J. Spangler, et al.
DV	D.L. Vincent	RD	R.E. Dietz
FB	F.M. Brown	RG	R.W. Garrison
FO	F. Ovale	RH	R. Haensch
FSCA	Florida State Collection of Arthropods	RL	R. de Lafebre
FW	F. Woytkowski	SD	S.W. Dunkle
GK	G.G. Klug	SR	E.I. Schlinger & E.P. Ross
GL	G. Lamas	TE	T.C. Emmel
HA	H.A. Allard	TR	T.E. Rogers
HB	H. Bassler	UMMZ	Univ. Michigan Museum Zoology
HR	H.G. Real	USNM	U.S. National Museum
IF	I. Finkelstein	WB	W.W. Benson
JP	J.C. Pallister	WC	W.J. Coxey
JR	J. de D. Rivas S.	WM	W.C.-Macintyre
JW	J.H. Williamson		
LA	L.G. Alonzo		

CHARACTERISTICS OF THE *PICTA* GROUP

Specimens may be assigned to Polythoridae and to the genus *Polythore* by characteristics given in FRASER (1946, 1957) and MONTGOMERY (1967). Members of the *picta* group are similar to other species of the genus in:

(1) the overall black body color with pale markings in both sexes;
(2) the absence of inferior abdominal appendages in males;
(3) males with uniformly black superior appendages each with a conspicuous process extending ventro-medially at mid length (Fig. 14);
(4) males with lateral flagella and terminal horns on the terminal segment of the penis (Figs 15-21);
(5) females with dark, elongated, triangular mesostigmal lamina, pointed ventrally and rimmed on all sides by a low elevation.

The following characteristics taken collectively distinguish mature males of the *picta* group from other members of the genus:

(1) fore and hind wings similar in color pattern;
(2) wings with iridescent black extending proximally for varying distances from the apex (Figs 1-6);
(3) the black, never interrupted by hyaline or milky white areas, may or may not be preceded by milky white;
(4) orange or yellow never present.

There are two basic wing patterns in females, andromorphs (A) and heteromorphs (H). Andromorphs, like males, have completely black wing apices. Heteromorphs, unlike males, have a hyaline area of variable size at or near the wing tip. Heteromorphs are of two types, one (Ha, Figs 7-8, 10-13) has a wide black band with a distal clear area which suggested a window to some describers. A white band or area, proximal to the black, may or may not be present. The other heteromorph (Hb, Fig. 9) has a narrow white band immediately distal to the nodus followed by a black band of variable width.

Of course, andromorphic females of the *picta* group can be separated from other *Polythore* species by the same criteria listed for males. Like males, mature heteromorphic females of the *picta* group always lack orange or yellow wing color, have fore and hind wings similar in color pattern, and have the black of the wings uninterrupted by milky white. Also, the proximal beginning of black as percent of wing length in Ha females is similar to that in males of the same species. However, we cannot differentiate Hb *procera* females from females of *P. pozuzina* (Foerster) as will be discussed later.

DIFFERENTIATION OF SPECIES

The following characteristics of the hind wing were studied in 10 males of each of the six species (Tab. I): width/length ratio, position of the first visibly

Table I

A comparison of 10 males of each of the six species of the *P. picta* group with regard to six characteristics which are obviously not useful in separating the species

Characters	*derivata*		*terminata*		*picta*		*lamerceda*		*procera*		*gigantea*	
	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean
Length of superior appendages mm	1.5-1.7	1.6	1.4-1.9	1.6	1.5-1.6	1.6	1.5-1.7	1.6	1.5-1.8	1.6	1.5-1.9	1.7
Hind wing width/length ratio	25-28	26.5	28-32	30.1	26-31	28.2	29-33	30.8	29-32	30.0	26-31	28.7
Location of first thickened antenodal	10-15	12.3	10-15	12.8	10-15	11.7	11-13	11.9	9-12	11.1	9-12	10.0
No. veins in basal space	12-15	13.7	11-15	13.1	11-16	13.5	11-15	12.6	9-13	11.5	10-12	11.2
No. veins in quadrilateral	6-7	6.5	6-10	7.9	7-10	8.4	8-9	8.6	6-10	7.5	6-9	7.4
Postnodal origin of R3	2-6	4.8	3-7	4.6	3-5	3.7	3-5	4.1	2-4	3.3	3-5	3.9

thickened antenodal, number of cross veins in the basal space, number of cross veins in the quadrilateral, postnodal origin of vein R3. Because the six species were so similar in these details, wing venation could not be used to differentiate species of the *picta* group. Also, as in most Calopterygoidea (DUMONT, 1972; SCHNEIDER, 1984), many morphological characters conventionally used in taxonomy, such as male appendages, female pronotum, mesostigmal lamina, and ovipositor, were almost identical in all species of the *picta* group.

The important criteria for species identification are: wing color pattern and length and shape of the penis horns. An accurate description of the wing color pattern required measuring the proximal limit of the terminal black, and if present, the extent of wing white. These measurements yielded considerable intra- and interdemic variation (Figs 22-23). The variation in the extent of black could not be correlated with altitude, but there was some evidence in *procera* that wing white varied ontogenetically. The interdemic variation in length of penis horns (Fig. 24), in proximal extent of wing black, and sometimes in width of wing white caused us concern over questions of specific and subspecific status.

Long ago MacLACHLAN (1881) was similarly concerned as was FRASER (1946) 65 years later. Because more than a century after MacLachlan the same difficulties faced us, it is appropriate to quote his 1881 statement:

> "With regard to some of the *Calopterygina* a well-known, and ever-increasing, difficulty asserts itself, viz., that of deciding what should constitute a species, and what a "race" or variety. The insects of this subfamily prove themselves especially plastic, so far as local modifications are concerned, and it is highly probable that each elevated valley of the mountainous regions of tropical America may possess its own peculiar form of one rootspecies, if I may be allowed the term, ... The beautiful genus *Thore* [=*Polythore*] is strongly illustrative of this tendency to run into local forms, and in it (as in many other *Calopterygina*) the radical test of different structure in the anal parts can hardly be applied, so we are left with colour and markings as the chief guides".

In males, the terminal black of the wings varies interspecifically from a narrow

Table II
A comparison of males of the six species of the *picta* group relative to penis horns, wing black, and wing white

Species	Penis horns (mm)	Distance from wing apex to proximal limit of black as % of wing length	Wing white
gigantea			
N	29	38	None
Range	0.037-0.087	58-73	
Mean	0.057	64	
	Short & stout	Limit is proximad of nodus	
procera			
N	64	161	Extensive, sometimes reaches quadrilateral
Range	0.037-0.125	37-58	
Mean	0.085	50	
	Usually short & stout	Limit is distad of but near nodus	
lamerceda			
N	15	15	None
Range	0.100-0.175	48-55	
Mean	0.136	52	
	Neither short & stout nor elongate & slender	Limit is distad of but near nodus	
picta			
N	107	225	Usually absent, sometimes with a broad cloudiness or a diffuse narrow band
Range	0.100-0.187	16-35	
Mean	0.138	26	
	Neither short & stout nor elongate & slender	Limit is well distad of nodus	
derivata			
N	47	78	A sharply defined band
Range	0.150-0.275	11-28	
Mean	0.220	19	
	Usually elongate & slender	Limit is well distad of nodus	
terminata			
N	31	44	None
Range	0.200-0.300	16-29	
Mean	0.256	24	
	Elongate & slender	Limit is well distad of nodus	

apical band to an extensive area occupying almost the entire wing (Figs 1-6, 22). This black area may be preceded proximally by a conspicuous milky white band or by an extensive milky white area which may reach to the quadrilateral, or by an entirely hyaline area. The extent of wing black can also be applied to the identification of Ha females (Figs 7, 8, 10-13, 23) even though the black in heteromorphs does not reach the wing tip. Except for Heteromorph b females

Table III
A comparison of females of the six species of the *picta* group relative to wing black and wing white

Species	Distance from wing apex to proximal limit of black as % of wing length		Wing white
gigantea Ha			
N	10	Limit is proximad of nodus	Absent
Range	58-68		
Mean	62		
procera Ha			
N	35	Limit is distal to but near	Extensive, sometimes reach-
Range	40-56	nodus	ing quadrilateral
Mean	49		
procera Hb			
N	19	A narrow band near nodus	A narrow band at nodus
Range	38-45		
Mean	42		
lamerceda Ha			
N	5	Limit is distal to but near	Absent or a narrow band
Range	44-47	nodus	distal to nodus
Mean	46		
picta Ha			
N	75	Limit is well distad of	Usually absent, sometimes with
Range	25-36	nodus	broad cloudiness or a narrow
Mean	31		band distal to nodus
derivata Ha			
N	16	Limit is well distad of	A sharply defined band distal
Range	13-21	nodus	to nodus
Mean	17		
terminata Ha			
N	24	Limit is well distad of	Absent
Range	21-31	nodus	
Mean	27		

(Fig. 9), the wing black begins proximally at a distance from the apex similar to that of males of the same species.

In his unpublished and often overlooked thesis, KENNEDY (1919) figured, without discussion, the penes of nine species of *Polythore* wherein a difference between *gigantea* and *procera* on the one hand and *picta* on the other can be seen. FRASER (1946), apparently aware of only KENNEDY's published (1920) drawing of *gigantea,* stated that the penes of all members of his *picta* group are alike and that all agree with Kennedy's drawing of *gigantea.* On the contrary, the

penes are not alike in all species, and the length and shape of their terminal horns, although varying, is an important characteristic in species determination. Based on the length of the horns, the *picta* group may be divided into three subgroups (Figs 16-21, 24): those in which most populations have elongate horns (*derivata, terminata*), those in which most populations have short ones (*gigantea, procera*), and those with horns of intermediate length (*picta, lamerceda* sp. n.). These three penis groups may suggest that the *picta* group should include three, rather than six, species. This would disregard the pattern of wing color, the primary criterion for species identification in the entire family. Because the colorful wings of the *picta* group must be an important species isolating mechanism, they cannot be ignored as a taxonomic character. It seems to be biologically unsound to unite *procera,* which has extensive wing white, with *gigantea* which lacks this white, even though the penes of the two are similar.

The six species which we place in the *picta* group may be differentiated by characteristics summarized in Tables II (males) and III (females). It is emphasized that the tables are based on mature individuals, that identification of males requires measurements of length of penis horns as well as percent of hind wing occupied by black that interdemic variation should be considered, and that determination of some females requires association with males and/or precise locality data.

BIOLOGY

We saw only single specimens from southern Venezuela (*terminata*), western Brazil (*picta*), and from Guyana (*picta*). Apart from these rare isolates, the main range of the *picta* group, based on material examined, is Colombia, Ecuador, and Peru, between latitudes of about 7N and 13 S. Only *gigantea* and possibly a Colombian population of *procera,* for which the specific locality is unknown, were collected west of the Andes in the Pacific drainage; all other species were from east of the Andes in the Amazon drainage. Although collections were at elevations of 330-2819 m, the group is best represented at intermediate elevations (800-1300 m) in the eastern foothills of the Andes.

In the material studied, there were no instances of sympatry among three or more species and few where only two species of the group were abundant at the same locality: (1) *procera* and *derivata* at Abitagua, Ecuador, (2) *procera* and *terminata* in the Macas area, Ecuador, (3) *picta* and *lamerceda* sp. n. in the Satipo-LaMerced area, Peru. Recently odonatologists spent considerable time collecting at Limoncocha, Ecuador, where, in the *picta* group, only *derivata* was taken.

There seems to be no direct correlation between elevation and extent of hind wing black. In males, the extent in *procera* ($\bar{X} = 51\%$, $N = 83$) and *derivata* ($\bar{X} = 16\%$, $N = 15$) differed greatly at Abitagua where both were present at 1000-1200

m. In the Macas area, the same is true for *procera* ($\bar{X}$ = 49%, N = 13) and *terminata* ($\bar{X}$ = 26%, N = 34), and in the Satipo area for *picta* ($\bar{X}$ = 28%, N = 155) and *lamerceda* sp. n. ($\bar{X}$ = 52%, N = 15).

Regrettably, no species of *Polythore* has been described in the larval stage. We never encountered the genus in the field, and found no information on its biology in the literature. DE MARMELS (1982) stated that little is known of the ecology and behavior of the entire family. Information recorded with the specimens and that supplied by recent collectors indicate that the *picta* group is typically associated with forest streams. No obvious trends in seasonal abundance were detected; adults were collected throughout the year, but were scarce in January.

POLYTHORE GIGANTEA (SELYS)

Figures 1, 7, 16, 22-24

Thore gigantea SELYS, 1853: 69 (type ♂, Bogota, Colombia; Belg. Mus.); 1854: 254; 1869: 26; 1873a: 35; — HAGEN, 1861: 307; 1875: 30; — MacLACHLAN, 1878: 88; — KIRBY, 1890: 116; — NEEDHAM, 1903: 746; — RIS, 1918: 31, 38; — KENNEDY, 1920: 29, figs 16-17.

Polythore gigantea: KENNEDY, 1919: pl. I, figs 1-2; — MUNZ (not SELYS, 1853), 1919: pl. I, fig. 2; — FRASER, 1946: 15; — SOUKUP, 1954: 14; — RACENIS, 1959: 488; — MONTGOMERY, 1967; 127, 151.

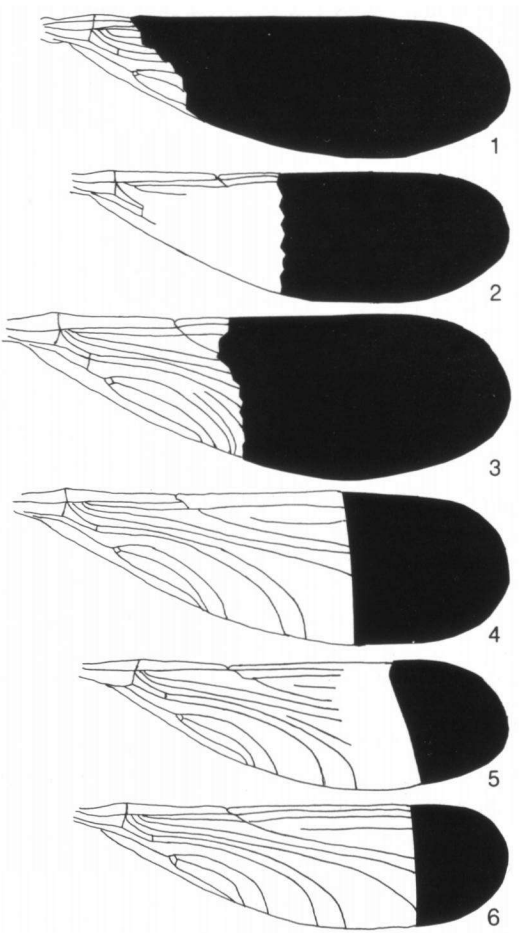
Material examined: 63 ♂, 21 ♀ (18 Ha, 3 Hb). — COLOMBIA, *Antioquia,* Mesopotamia, 1524 m, collector ?, date ?, 8 ♂, 3 ♀, (Ha), AMNH; — Locality ?, collector ?, date ?, 6 ♂, 2 ♀ (Ha), AMNH; — *Choco,* km 114, El Siete, OF, II-1983, 7 ♂, 5 ♀ (Ha), USNM ; — Dept ?, Frijoles, collector ?, date ?, 1 ♂, 1 ♀ (Ha), AMNH; — Dept ?, Locality ?, FO, date ?, 2 ♂, AMNH. — ECUADOR, *Bolivar,* Balzapamba, 630 m WM, IV-1938, 11 ♂, 1 ♀ (Ha), V-1938, 6 ♂, 2 ♀ (Ha), UMMZ; — *Cotopaxi,* Latacunga, 1450 m, LC, VII-1975, 2 ♂, 2 ♀ (Hb); — Quevedo, PS, V-1975, 1 ♂, 1 ♀ (Hb), USNM; — *Imbabura,* Guayupe, 396 m, LA, II-1946, 2 ♂, date ?, 4 ♂, 2 ♀ (Ha), UMMZ; — *Pichincha,* Alluriquin, 1000 m, HR, IX-1976, 1 ♀ (Ha), RG; DP, VII-1977, 2 ♂, DP; — Manuel Cornego Astorga, 1520 m, DP, VII-1977, 2 ♂, DP; — Santo Domingo de los Colorados, 566 m, DL, VII--1939, 2 ♂, 1 ♀ (Ha), UMMZ; — Tandapi, 1500 m, collector ?, VI-1965, 1 ♂, CC, 1 ♂, DP; — Prov. ?, Locality ?, collector ?, date ?, 1 ♂, PM. — PERU, *San Martin,* Tarapoto, 374 m, FW, III-1947, 4 ♂, UMMZ; — Dept ?, Locality ?, collector ?, date ?, 1 ♂, CU. Country ?, "Amazonas", collector ?, date ?, 1 ♂, PM.

SELYS (1853, 1854) stated "size enormous", "the largest of the Calopterygines known", and recorded the hind wing length as 44 mm. Such a length is not exceptional. Every species of the *picta* group which we examined, except *terminata,* had at least a few specimens with hind wing length 44 mm or longer. *P. gigantea* is not distinctive because of size.

Males differ from other species in the group in that the terminal black extends proximad of the nodus. SELYS (1854, 1869) stated that the posterior two thirds of the wing is dark, MacLACHLAN (1878) and RIS (1918) that the terminal dark portion extends proximad of the nodus, and FRASER (1946) that the terminal dark extends proximally to halfway between nodus and the discoidal cell. These

statements differ from those of MONTGOMERY (1967). In rubric 5 of his key, *gigantea* is reached only by deciding that the black begins at less than 2/3 the distance between the nodus and stigma, a much more distal beginning than that given in the previous literature. Confusion may have resulted from the male specimen in MCZ bearing labels *"Thore gigantea, Thore procera, Thore picta"* in Hagen's hand, which Montgomery photographed (his unpublished notes). This photograph does not agree with descriptions of *gigantea* by Selys, MacLachlan, or Fraser. It seems to be of a specimen of *procera*. We think Selys sent the specimen to Hagen at MCZ when SELYS (1869, 1873) was considering *procera* a race of *gigantea*.

Because Colombia and Ecuador specimens were from widely separated areas and because they differed slightly, they are treated separately.



Figs 1-6. Hind wings of males: (1) *Polythore gigantea;* — (2) *P. procera,* the veinless area is milky white; — (3) *P. lamerceda* sp. n; — (4) *P. picta;* — (5) *P. derivata;* — (6) *P. terminata.*

THE BALSAPAMBA POPULATIONS
(HWL, $\bar{X}$, ♂ = 37 mm, N = 24; ♀ Ha = 37, N = 4)

Specimens were from Guayupe, Imbabura Prov. (396 m), and Santo Domingo, Pichincha Prov. (566 m), as well as Balsapamba, Bolivar Prov. (630 m), all in the Pacific drainage of Ecuador. Although the short, broad penis horns ($\bar{X}$ = 0.059 mm, Figs 16, 24) are similar to those of *procera* from

Ecuador, *gigantea* can be separated readily by the more proximal extent of hind wing black and the absence of wing white. In males, the hind wing black always extends from the apex to proximad of the nodus at a mean of 61% of the wing length (Figs 1, 22), whereas in *procera* the black reaches only slightly distad of the nodus. As in males, the wing black of Ha females begins proximad of the nodus at almost the same mean distance (59%, Figs 7, 23) from the apex. In contrast, the hind wing black band in the three Hb females from Cotopaxi Prov., Ecuador, begins more distal to the nodus ($\bar{X} = 43\%$ of the wing length from the apex) than in the Ha specimens.

THE ANTIOQUIA POPULATION
(HWL, $\bar{X}$, ♂ = 42 mm, N = 14; ♀ Ha = 38, N = 4)

Specimens were from Antioquia Dept, in the mountains of northwestern Colombia, probably in the Pacific drainage, some at elevations of 1524 m. In these Colombia specimens, the extent of hind wing black in males is greater ($\bar{X} =$ 68%, Fig. 22) and the penis horns are slightly shorter ($\bar{X} = 0.047$ mm, Fig. 24) than in Ecuador ones. Likewise in Ha females, the hind wing black begins proximad of the nodus at a mean distance of 64% (Fig. 23) of the wing length from the apex, slightly greater than in Balsapamba Ha females.

The main range of *gigantea* seems to be the Pacific drainage of Colombia and Ecuador. In addition, we saw a few specimens from northern Peru, and MONTGOMERY (1967) listed it from Venezuela. J. De Marmels (pers. comm.) doubted the Venezuela record and called our attention to the following. Montgomery's record of the species from Venezuela seems to have been based on SELYS' (1873) speculation on the distribution of *gigantea* as a complex of species, and Selys also stated that all true *gigantea* which he had seen were from Ecuador.

At Cotopaxi Prov., Ecuador, a male and a female were collected (PS) from a spring seep. D.R. Paulson (pers. comm.) stated that in Pichincha Prov., Ecuador, males appeared iridescent blue on the upper surface of their wings, almost like a *Morpho* butterfly. A few of the long dead specimens still show this beautiful iridescence.

POLYTHORE PROCERA (SELYS)

Figures 2, 8, 9, 17, 22-24

Thore gigantea Race ? *procera* SELYS, 1869: 27 (type ♂, Bogota, Col.; Belg. Mus.).

Thore gigantea Race: *procera:* SELYS, 1873a: 34.

Thore procera: MacLACHLAN, 1878: 88; — KIRBY, 1890: 116; — RIS, 1918: 30, 34 (*picta* Rambur treated as a junior synonym of *procera* Selys); — SCHMIDT, 1942: 248, pl. IV.

Polythore procera: KENNEDY, 1919: pl. I, figs 15, 16; — FRASER, 1946: 15 (*procera* Selys treated as a junior synonym of *picta* Rambur; — MONTGOMERY, 1967: 128, 152.

Material examined: 219 ♂, 127 ♀ (22 A, 53 Ha,52 Hb).— COLOMBIA, *Antioquia* ?, Locality ?, collector ?, date ?, 1 ♂, USNM; — *Meta,* Rio Negro, 1200 m, WB, I-1972, 2 ♂, DP; RD, II-1969, 1 ♂, 1 ♀ (A), USNM; — Villavicencio, 920 m, SR, III-1955, 2 ♂, 1 ♀ (Ha), UMMZ; — *Sundinamarca,* Bogota, collector ?, date ?, 4 ♂, 2 ♀ (1 A, 1 Ha), CM; — Dept ?, Locality ?, FO, date ?, 53 ♂, 41 ♀ (20 A, 21 Ha), AMNH; — Dept ?, Locality ?, MS, date ?, 1 ♂, 1 ♀ (Ha), UMMZ. — ECUADOR, *Bolivar,* Balzapamba, 630 m, WM, VI-1938, 3 ♀ (Hb); collector ?, V-1938, 1 ♀ (Ha), UMMZ; — *Chimborazo,* Dos Puentes, 518 m, WC, I-1929, 1 ♀ (Ha), FSCA; — *Morona-Santiago,* Macas, 1050 m, LA, date ?, 10 ♂, 4 ♀ (2 Ha, 2 Hb), UMMZ; — Mangosisa, 850 m, LA, date ?, 4 ♂, UMMZ; — Rio Upano, LA, date ?, 3 ♂, UMMZ; — *Napo,* Cotundo, RL, VI-1975, 1 ♂, CC; — Reventador, 1500 m, PE, X-1977, 1 ♂, CC; collector ?, X-1977, 1 ♂, RG, 1 ♂, DP; — Rio Tuyano, collector ?, IX-1979, 1 ♀ (Hb), CC; — *Pastaza,* Abitagua, 1300 m, WM, IV-1936, 1 pair (Ha), 6 ♂, 6 ♀ (5 Ha, 1 Hb), VII-1936, 2 ♂, X-1936, 1 pair (Hb), 43 ♂, 18 ♀ (9 Ha, 9 Hb), XI-1936, 3 ♂, 8 ♀ (2 Ha, 6 Hb), XII-1936, 1 ♀ (Hb), 1936, 1 ♂, IV-1937, 1 ♂, VI-1937, 1 ♂, V-1939, 3 ♂, 2 ♀ (Hb), VI-1939, 2 ♂, 2 ♀ (Hb), IX-1939, 3 ♂, 3 ♀ (1 Ha, 2 Hb), X-1939, 9 ♂, 3 ♀ (Hb), XI-1939, 6 ♂, 3 ♀ (2 Ha, 1 Hb), XII-1939, 1 ♀ (Hb), IV-1940, 1 ♂, II-1941, 2 ♂, III-1941, 1 ♂, 1 ♀ (Hb), V-1941, 2 ♂, VI-1941, 3 ♂, 4 ♀ (2 Ha, 2 Hb), VII-1941, 1 ♂, 1 ♀ (Hb), XII-1948, 1 ♀ (Hb), date ?, 2 ♂, UMMZ; — Mera, 1100 m, WM, X-1936, 2 ♂, II-1939, 1 ♂, VIII-1939, 1 ♀ (Ha), UMMZ; IF, XII-1981, 1 ♂, FSCA; — Partidero, 1000 m, collector ?, X-1935, 1 ♀ (Hb), UMMZ; — *Pichincha,* Quito, 2819 m, LA, date ?, 3 ♂, 2 ♀ (Hb), UMMZ; — *Tungurahua,* Banos, 1820 m, WM, III-1946, 2 ♂, UMMZ; — La Palmera, 1300 m, WM, XII-1938, 2 ♂, 1 ♀ (Hb), UMMZ; — Rio Mapoto, 1237 m, WM, I-1939, 1 ♂, 1 ♀ (Ha), UMMZ; FB, III-1939, 1 ♀ (Hb), AMNH; collector ?, IX-1938, 1 ♀ (Hb), UMMZ; — Rio Negro, 1100 m, TR, V-1976, 1 ♂, FSCA; — Rio Topo, 1226 m, WC, IV-1931, 1 ♂, FSCA; WM, III-1936, 2 ♂, VII-1936, 1 ♂, 1 ♀ (Hb), XI-1937, 2 ♂, XII-1948, 5 ♂, 1950, 1 ♂, UMMZ; collector ?, VI-1977, 1 ♂, RG; — Rio Zuniac, 1300 m, WM, II-1949, 4 ♂, date ?, 2 ♂, UMMZ; — San Francisco, WM, X-1937, 2 ♂, 2 ♀ (Ha, Hb), UMMZ; FB, IX-1939, 1 ♀ (Hb), XII-1938, 1 ♂, AMNH; — *Zamora-Chinchipe,* Zamora, 1166 m, DL, XI-1941, 1 ♂, UMMZ; AL, VI-1976, 1 ♂, USNM; PE, X-1977, 1 ♀ (Hb), CC; collector ?, X-1977, 1 ♂, DP; — Prov. ?, Callurco, WM, IV-1949, 1 ♀ (Hb), UMMZ; — Prov. ?, Churiyacu, WM, III-1941, 1 ♀ (Hb), UMMZ. — PERU ?, Dept ?, Locality ?, AP 1926 ?, 1 ♂, UMMZ.

There has been confusion as to the correct designation for this taxon. RIS (1918) considered *picta* a junior synonym of *procera* in spite of the priority of *picta,* but FRASER (1946) regarded *procera* as a junior synonym of *picta.* After studying 346 specimens of *procera* and 472 of *picta,* we consider the two distinct species. *P. procera* males have shorter penis horns, a greater extent of terminal wing black, and an extensive milky white area proximal to the black (Figs 2, 17, 22, 24).

The morphologically similar specimens from nine Ecuador locations within 120 km² were assembled. Because these differ from those from an unknown locality (or localities) in Colombia, material from these two countries is considered separately.

THE PUYO POPULATIONS

(HWL, $\bar{X}$, ♂ = 37 mm, N = 117; ♀ Ha = 34, N = 18; ♀ Hb = 35, N = 18)

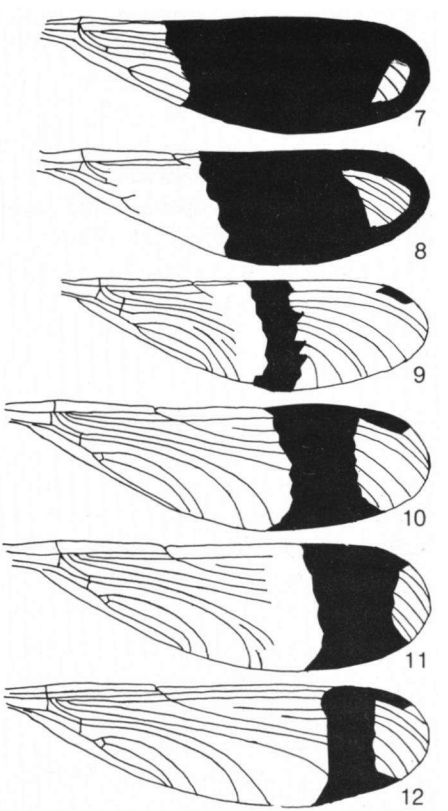
Specimens were from the Puyo area of Ecuador in the eastern foothills of the Andes, along the headwaters of the Rio Pastaza and along smaller streams

flowing into it at elevations of 850-1820 m. Specific localities are: Banos, LaPalmera, Rio Mapoto, Rio Topo and Rio Zuniac in Tungurahua Prov.; Abitagua and Mera in Pastaza Prov.; Macas and Mangosisa in Morona--Santiago Prov.

KENNEDY's (1919) drawings of the penis show both *procera* and *gigantea* with short broad horns different from the longer ones of *picta*. Likewise specimens of *procera* from Ecuador have short, broad horns ($\bar{X} = 0.065$ mm, Figs 17, 24) as have Ecuador specimens of *gigantea*. The short horns set both *procera* and *gigantea* apart from other members of the group, but *P. procera* differs from *gigantea* in the more distal beginning of the wing black and in the presence of extensive wing white.

SELYS (1873a) described the apical 2/5 of the *procera* wing as black; MacLACHLAN (1878) stated that the terminal black begins at the nodus or 12 cells distal to it; FRASER (1946) stated that the black extends right up to the level of the nodus. In Ecuador males (Figs 2, 22), the terminal black begins at a mean of 51% of the hind wing length from the apex, i.e. at, or slightly distal to the nodus.

SELYS (1873a) stated that the milky white of the wings extends from the terminal black to the quadrilateral. Our specimens are in agreement; in mature males the white extends proximally to, or almost to, the quadrilateral. However, in tenerals the white is more band--like, barely reaching the nodus.



Figs 7-12. Hind wings of females: (7) *Polythore gigantea*, heteromorph, type a, Ha; — (8) *P. procera*, Ha, the veinless area is milky white; — (9) *P. procera*, heteromorph, type b, Hb; — (10) *P. picta*, Ha; — (11) *P. derivata*, Ha; — (12) *P. terminata*, Ha.

Both Ha and Hb females occurred at the same locality. The proximal extent of black in Ha females ($\bar{X} = 53\%$, Figs 8, 23) is similar to that in males, but in Hb females ($\bar{X} = 42\%$, Figs 9, 23) is less than that of either males or Ha females.

Although males of *P. procera* and *P. pozuzina* Foerster, a species not in the *picta* group, are readily separated, we could not distinguish *procera* Hb females from those of *pozuzina*. A female of each of these species has a narrow white band at the nodus and a narrow dark one immediately distal to it (Fig. 9). There is a possibility that females which we designate as Hb *procera* may be *pozuzina* females. Geographic distribution and data from mating pairs argue against this. *P. pozuzina* is recorded only from Peru (MONTGOMERY, 1967), and all 78 male specimens examined are from that country. In contrast, *procera* has not been recorded from Peru, and we have seen neither males nor females which could confidently be assigned to that country, but we have seen 153 males from Ecuador where the Hb females were found. Because *procera* and *pozuzina* seem to be completely allopatric, there is no obvious disadvantage to the almost identical color pattern in the females. Significantly, there are two pairs from Abitagua, Ecuador, in which the copulatory contact (not merely the tandem grip) is maintained. Males of both pairs are undoubted *procera*; one female is Ha *procera*, the other, Hb *procera*.

THE COLOMBIA POPULATION
(HWL, $\bar{X}$, ♂ = 41 mm, N = 46; ♀ A = 37, N = 16; Ha = 36, N = 18)

Unfortunately, almost every specimen from Colombia lacked a specific locality. The length of the penis horns in these males ($\bar{X} = 0.107$ mm, Fig. 24) is greater than in Ecuador ones and even overlaps those of *picta*. However, the proximal extent of the hind wing black (X = 44%, Fig. 22) does not overlap that in *picta* and, of course, the two species are easily separated by the extensive white in *procera* wings. In Colombia females (Fig. 23, andromorph, X = 47%, heteromorph a, $\bar{X}$ = 44%) the black begins more distally than in Ecuador Ha females.

Both the extent of hind wing black in males and the length of the penis horns showed less than 75% joint non overlap (MAYR, 1969) between Ecuador and Colombia populations. However, the percent black in wings of Colombia and Ecuador Ha females showed a 94% joint non overlap. This discordant evidence, the absence of locality data for the Colombia specimens, and the considerable intra and interdemic variation in the genus *Polythore* suggest that Colombia and Ecuador specimens of *procera* are not subspecifically distinct.

MONTGOMERY (1967) recorded *procera* only from Colombia, but we have many specimens from Ecuador as well. All specimens from Ecuador were from the Amazon drainage as were those from Colombia for which a definite locality was recorded. However, we know nothing of the drainage area for 93 Colombia specimens without Department or locality data. Although most specimens were from lower elevations, four Ecuador ones were from 2819 m, apparently the highest elevation for the genus.

P. procera was collected in every month of the year, most abundantly during October-December. At Abitagua, Ecuador, it was collected along trails near creeks or rivers.

POLYTHORE LAMERCEDA SP. N.

Figures 3, 13-15, 18, 22-24

Material examined — **Holotype** male: PERU, *Junin,* LaMerced, Hacienda LaSalud, 1067 m, J.D. Rivas, 13-VI-1931, UMMZ. — **Allotype** female: Heteromorph a, same data as holotype, UMMZ. — **Paratypes** (15 ♂, 5 ♀): PERU, *Junin,* LaMerced, JR, 15-I-1931, 1 ♀ (Ha), 12-III-1931, 1 ♂, 15-III-1931, 2 ♂, 25-III-1931, 1 ♂, 1931, 2 ♀ (Ha), date ?, 5 ♂, 1 ♀ (Ha), UMMZ; — JR, 18--III-1937, 1 ♂, FSCA; collector ?, 9-IV-1930, 1 ♂, 23-IV-1933, 1 ♂, AMNH; — Satipo, 700 m, PP, 9--VI-1940, 1 ♂, 1 ♀ (A), date ?, 1 ♂, UMMZ; AM, VII-1945, 1 ♂, AMNH.

The extent of iridescent black in the wings of the mature male, the absence of wing white, and the length of the penis horns differentiate this species from its nearest relatives, *picta* and *procera.* The penis horns of *lamerceda* are of medium length (X = 0.136 mm, Figs 18, 24) as in *picta,* but the extent of hind wing black (52% of wing length from the apex, Figs 3, 22) is much greater than in *picta.* The hind wing black of *lamerceda* approaches the nodus as in *procera* but is not preceded by extensive wing white as in that species, and the penis horns of *lamerceda* are longer than those of *procera* (Fig. 24).

Male (holotype) — Hind wing length, 33 mm; abdomen length, 43 mm (excluding appendages); living colors unknown, but certainly mostly black, presumably with yellow markings, which because of some uncertainty will be referred to as pale.

Head — Labrum medially black, bordered on either side by a triangular pale spot; postclypeus black with a minute pale spot on either side; 3 pale spots on front of head on each side: at base of mandible, lateral to mandible base, at medial margin of compound eye; vertex with 4 pale spots rectangularly arranged. Rear of head entirely black. Labium pale at base.

Prothorax — Anterior and posterior lobes entirely black, posterior lobe evenly rounded. Middle lobe with dorsal pale stripes on either side not meeting in the mid line, and another pale stripe bordering each lateral margin.

Pterothorax — With 5 complete pale stripes on either side: the 1st, the narrowest, just laterad of the carina, has a posterior spur beneath the alar ridge and a gentle laterad curvature anteriorly; the 2nd, on the humeral suture, continues anteriorly on the mesinfraepisternum; the 3rd, on the first lateral suture, has a spur at the alar ridge; the 4th, on the 2nd lateral suture, divides along the dorsal border of the metinfraepisternum; the 5th is a Y-shaped stripe on the ventral border of the metepimeron.

Legs — Black, except for a white coxal spot and a pale stripe extending 1/3 length of the anterior surface of each meso and metathoracic femur; tibial spines

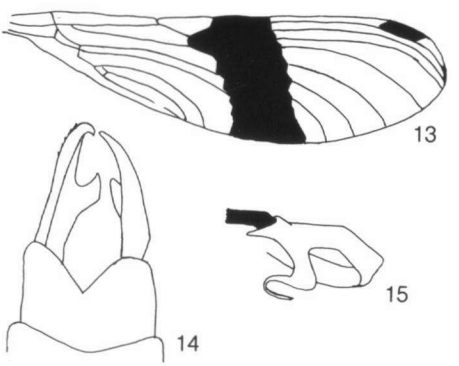
longer than intervening spaces; tooth on tarsal claw minute.

Wings — Fore and hind wing color pattern similar; hind wing width/length 31%; hyaline to 1.7 mm distad of the nodus, iridescent black beyond, the black occupying 52% (Fig. 3) of the wing length from the apex. Hind wing venation: first thickened antenodal, the 11th; 13 veins in the basal space, 9 in the quadrilateral; vein R3 originates at the 5th postnodal. Fore wing: antenodals — 46, postnodals — 62, veins under stima — 18.

Abdomen — Dorsally and ventrally black with the following lateral pale markings: segment I with a large spot; II with a full-length stripe, wider at the posterior border; III with a spot at anterior margin slightly separated from a full--length stripe; IV with a small spot followed by a thin stripe for 3/5 length of the segment.

Appendages — Inferiors absent; superiors (Fig. 14) 1.5 mm long, with a conspicuous process at mid length extending ventro-medially.

Penis — Distal segment with paired flagella and straight, rather slender terminal horns, 0.125 mm long (Figs 15, 18). The horns are longer than in *gigantea* and most populations of *procera*, shorter than in *derivata* and *terminata*, but cannot be differentiated from those of *picta*.



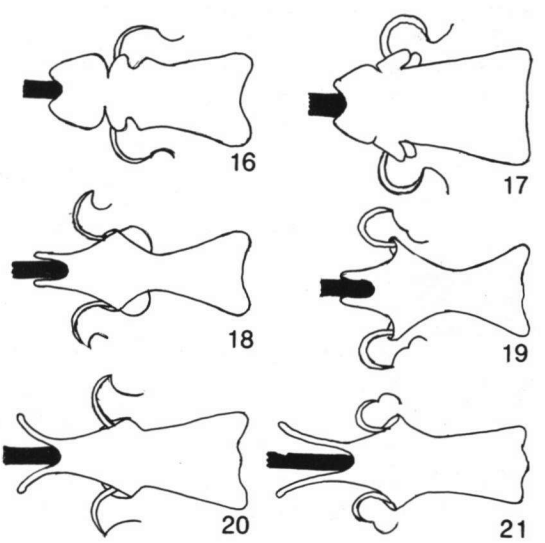
Figs 13-15. *Polythore lamerceda* sp. n.: (13) Hind wing of female, Ha; — (14) Anal appendages, dorso-medial view; — (15) Terminal segment of penis, lateral view.

Female (allotype) — hind wing length, 35 mm; abdomen length 36 mm. Body markings as in male except that pale spots are absent on postclypeus, and with these additional lateral pale markings on the abdomen: V with a small pale spot detached from a thin pale line extending 5/6 of the segment's length; VI with a small basal spot. Lateral gonapophyses extend 1 mm beyond posterior margin of X. Mesostigmal lamina, lacking distinctive features, is completely black and surrounded by a low rim. Hind wing black begins at 46% of wing length from the apex, i.e., 4 mm distad of the nodus (Fig. 13), is of almost uniform width throughout (5.5 mm) and is bordered proximally by a very narrow ill-defined white band, distally by a hyaline area reaching to the wing apex. Hind wing venation: the first thickened antenodal is the 10th; there are 10 veins in the basal space, 8 in the quadrilateral; vein R3 originates at the 5th postnodal. Fore wing: antenodals — 41, postnodals — 52, veins under stigma — 11.

Variation — Body markings among all males and females are primarily alike. Essential differences are in the wings. In males, the hind wing length is 36--46 mm, the hind wing black begins at 48-55% (Fig. 22) of the wing length from the apex, and the penis horns are 0.100-0.175 mm long (Fig. 24). In the five heteromorphic females, the beginning of the hind wing black is 44-47% (Fig. 23), and in the one andromorph it was 51% of the wing length from the apex. Body markings do not differ in the two female morphs.

The species was collected only at LaMerced and Satipo, Junin Dept., central Peru, in the Ucayali drainage at elevations of ca 1067 m.

The larval stage is unknown. Adults were collected only during March, April, June and July, a much more limited seasonal occurrence than for *picta* which was taken from one of the same localities (Satipo) during every month. This may indeed mean that *lamerceda* has a limited seasonal range, but it may mean that it occupies some distinctive habitat seldom explored by collectors. No specimen was accompanied by a habitat note. Both *picta* and *lamerceda* were taken at Satipo and LaMerced, even on the same date at Satipo. Yet there are no intermediates in extent of hind wing black even though the lengths of the penis horns are similar. Apparently the difference in wing black isolates the two species rather completely.



Figs 16-21. Terminal segment of penis, ventral view; the horns are on either side of the black mid ventral shaft: (16) *Polythore gigantea;* — (17) *P. procera;* — (18) *P. lamerceda* sp. n.; — (19) *P. picta;* — (20) *P. derivata;* — (21) *P. terminata.*

The name *"lamerceda"* refers to the type locality, LaMerced.

POLYTHORE PICTA (RAMBUR)

Figures 4, 10, 19, 22-24

Euphaea picta RAMBUR, 1842: 231 (type ♂, "Cayenne", Hope Coll., Oxford).
Thore picta: SELYS, 1853: 70; 1854: 256; HAGEN, 1861: 307; 1875: 30; KIRBY, 1890: 116.

Thore saundersii SELYS, 1853: 70; 1854: 257; — HAGEN, 1861: 307; — SELYS, 1869: 27; 1873a: 36; 1873b: 65, 66 (Syn.); — KIRBY, 1890: 117; — CAMPOS, 1922: 14; — FRASER, 1946: 14; — MONTGOMERY, 1967: 128.

Thore picturata (race of *T. saundersii*) SELYS, 1873a: 35; 1873b: 66 (syn.); — FRASER, 1946: 14; — MONTGOMERY, 1967: 128.

Polythore picta: KENNEDY, 1919: pl. I, figs 9-10; — FRASER, 1946: 14, 35, 46 (photograph of type ♂, *procera* Selys treated as a junior synonym of *picta* Rambur); — SOUKUP, 1954: 14; — MONTGOMERY, 1967: 128, 151.

Thore picta picta: SCHMIDT, 1942: 242, 248, pl. IV.

Polythore picta picta: RACENIS, 1959: 488.

Material examined: 304 ♂, 168 ♀ (all Ha). — BRAZIL, *Amazonas,* Tefe, BP, X-1929, 1 ♀, UMMZ. — GUYANA, Dept ?, Locality ?, AP, date ?, 1 ♂, UMMZ; — PERU, *Ayacucho,* Sivia, 350 m, FW, VI-1941, 1 ♂, 2 ♀, UMMZ; — *Huanuco,* Afilador, 670 m, FW, V-1937, 2 ♂, UMMZ; — Leonpampa, 800 m, FW, XI-1937, 1 ♂, XII-1937, 4 ♂, 3 ♀, UMMZ: — Shapajilla, 630 m, FW, VIII-1938, 1 ♀, UMMZ; — Tingo Maria, 671 m, FW, VII-1937, 1 ♀, UMMZ; JP, XII-1946, 2 ♂, AMNH; HA, II-1950, 1 ♀, USNM; SR, XI-1954, 2 ♂, UMMZ; LP, VIII-1972, 1 ♀, FSCA, 2 ♂, 2 ♀, DP; MP, V-1974, 2 ♂, FSCA, 1 ♂, RG, 10 ♂, 1 ♀, DP; DP, VII-1977, 3 ♂, 3 ♀, DP; collector ?, IV-1980, 1 ♂, SD, 1 ♂, RG; TE, VI-1983, 2 ♂, FSCA; — *Junin,* Campamiento, 1067 m, JW, VI-1920, 1 pair, 51 ♂, 28 ♀, UMMZ; — LaMerced, 1067 m, collector ?, III-1930, 1 ♂, 2 ♀, IV-1930, 1 ♀, VI-1930, 1 ♂, AMNH; JR III-1931, 5 ♂, 1 ♀, VI-1931, 1 ♂, 1931, 4 ♂, 2 ♀, date ?, 6 ♂, 5 ♀, UMMZ; III-1937, 1 ♀, FSCA; — Sani Beni, 840 m, FW, VIII-1935, 4 ♂, 3 ♀, IX-1935, 1 ♂, 2 ♀, X-1935, 1 ♀, UMMZ; — San Pedro de Cajas, 900 m, FW, V-1935, 2 ♂, 1 ♀, UMMZ; — Satipo, 700 m, PP, III-1940, 1 ♂, V-1940, 10 ♂, 1 ♀, VI-1940, 10 ♂, 6 ♀, VII-1940, 1 ♂, 4 ♀, X-1940, 1 ♀, XI-1940, 5 ♂, 2 ♀, XII-1940, 9 ♂, 3 ♀, VI-1941, 2 ♂, 1 ♀, XII-1941, 2 ♂, 1 ♀, 1941, 1 ♀, II-1942, 1 ♀, III-1942, 1 ♂, 2 ♀, XI-1942, 3 ♂, 4 ♀, III-1945, 3 ♂, 2 ♀, IV-1945, 18 ♂, 6 ♀, V-1945, 7 ♂, 1 ♀, VI-1945, 7 ♂, 1 ♀, IX-1945, 3 ♂, 1 ♀, IV-1948, 1 ♂, date ?, 25 ♂, 21 ♀, UMMZ; collector ?, VII-1940, 1 ♂, MHN; AM, VI-1945, 1 ♀, VII-1945, 3 ♂, 1 ♀, VIII-1945, 3 ♀, CM; PP, VII-1948, 3 ♂, 5 ♀, FSCA; CF, XII-1981, 1 ♂, 1 ♀, CC; JR, date ?, 2 ♀, UMMZ; — *Loreto,* Balsa Puerto, 200 m, GK, II-1939, 1 ♂, 1 ♀, III-1939, 3 ♂, 1 ♀, IV-1939, 2 ♂, 1 ♀, II-1940, 1 ♂, 2 ♀, III-1940, 1 ♂, 1 ♀; collector ?, date ?, 1 ♀, UMMZ; — Bouqueron del Padre Abad, 440 m, FW, VIII-1946, 1 ♂, UMMZ; — Pumayacu, collector ?, VII-1933, 1 ♀, UMMZ; — Yurimaguas, GK, V-1939, 1 ♂, 1 ♀, XI-1939, 1 ♂, 1 ♀, II-1940, 3 ♂, III-1940, 1 ♂, UMMZ; — *San Martin,* Hera, 890 m, FW, VII-1947, 1 pair, 2 ♂, 1 ♀, UMMZ; collector ?, VIII-1947, 1 ♂, MHN; — Lamas, GL, IX-1975, 1 ♂, DP; — Misquiyacu, 1400 m, FW, VIII-1947, 4 ♂, 4 ♀, UMMZ; — Moyobamba, 866 m, HB, I-1925, 1 ♀, AMNH; GK, V-1938, 3 ♂, 2 ♀, V-1939, 11 ♂, 5 ♀, VI-1939, 3 ♂, 1 ♀, IV-1940, 6 ♂, UMMZ; — Rioja, 900 m, FW, IX-1936, 6 ♂, 1 ♀, X-1936, 1 ♂, UMMZ; — Tarapoto, 374 m, collector ?, 1933, 2 ♂, AMNH; GK, IV-1940, 3 ♂, UMMZ; FW, II-1947, 2 ♂, 3 ♀, III-1947, 1 ♂, UMMZ; AP, date ?, 12 ♂, 3 ♀, UMMZ; — Dept ?, Munchin, GK, IV-1939, 1 ♂, UMMZ; — Dept ?, Locality ?, collector ?, date ?, 1 ♂, PM.

As with *procera,* the correct name for this taxon has a long and confusing history. SELYS (1873b) examined Rambur's type of *picta* and stated that the *picta* of his 1854 Monograph agreed with Rambur's *picta* but that the SELYS *saundersii* (1853, 1854, 1869, 1873a) and the SELYS *picturata* (1873a) are both junior synonyms of *picta* (Rambur). Also, as previously discussed, RIS (1918) considered *picta* (Rambur) a junior synonym of *procera* (Selys) even though the former had many years priority, and FRASER (1946) gave the reverse judgment. However, KENNEDY's (1919) penis drawings and our present analy-

sis (Tabs II, III) show that *procera* and *picta* are distinctive.

Specimens studied were from three widely separated areas in Peru: Satipo, Tingo Maria, Balsa Puerto. Because specimens from these areas showed interdemic variations, they are considered separately.

THE SATIPO POPULATIONS
(HWL, $\bar{X}$, ♂ = 40 mm, N = 142; ♀ Ha = 36, N = 49)

This area in southern Peru, in the Ucayali drainage in Junin Dept at 700 m, included populations from Campamiento, LaMerced, and Sani Beni as well as Satipo.

As in *lamerceda* sp. n. the penis horns of *picta* (X = 0.146 mm, Figs 19, 24) from the Satipo area are intermediate between the short ones of *gigantea* and *procera* and the long ones of *derivata* and *terminata.*

RAMBUR (1842) and SELYS (1853, 1854) stated that the distal third of the wing of the *picta* male is black. In 1853, SELYS stated that in *saundersii* the black covers a little more than the distal 1/4 of the wing and, in 1873a, that in *picturata* the black begins slightly proximal to the midpoint between nodus and stigma. FRASER's (1946) photograph of the type male shows that the black begins at 30% (front wing) and 32% (hind wing) of the wing length from the apex. Among the 155 measured males, the hind wing black averaged 28% (Figs 4, 22) of the wing length from the apex, a figure similar to measurements in the literature.

The literature indicates that the milky white in the wings of males varies from absent (*saundersii,* SELYS, 1873a), to a touch of dull white (*picta* RAMBUR, 1842), to rather extensive, i.e., occupying the second third of the space between nodus and stigma (*saundersii,* SELYS, 1854). In the males which we examined, the wing white was most often absent. It was never sharply defined, appearing sometimes as a broad cloudiness or as a diffuse narrow band proximal to the black.

The infrequent literature references to females mention only heteromorphs, and all females studied were heteromorph a. In the Satipo females, the black of the hind wing begins at a mean of 32% (Figs 10, 23) of the wing length from the apex, a figure similar to that of males from the area. SELYS (1854) stated that the white band of female *saundersii* occupies the second fourth of the space between nodus and stigma. Among Satipo females, indeed among *picta* females from all areas, the wing white is usually absent as in males, but sometimes appears as a broad cloudiness or a diffuse narrow band.

THE TINGO MARIA POPULATION
(HWL, $\bar{X}$, ♂ = 42 mm, N = 8; ♀ Ha = 36, 34, N = 2)

This area in central Peru, in the Huallaga drainage in Huanuco Dept, at an

elevation of ca 671 m, included a single population.

Males from this locality are similar in length of penis horns ($\bar{X} = 0.153$ mm, Fig. 24) and in extent of hind wing black ($\bar{X} = 31\%$, Fig. 22) to those from the Satipo area. Likewise, the two females from Tingo Maria are similar to those from Satipo.

THE BALSA PUERTO POPULATIONS (HWL, $\bar{X}$, ♂ = 41 mm, N = 57; ♀ Ha = 37, N = 34)

This area in northern Peru in the Huallaga drainage included populations from: Balsa Puerto and Yurimaguas in Loreto Dept; Hera, Mishquiyacu, Moyabamba, Rioja and Tarapoto in San Martin Dept at elevations of 200-1400 m.

Males have a much smaller extent of hind wing black ($\bar{X} = 20\%$, Fig. 22) than those from the Tingo Maria and Satipo areas. This smaller extent of black overlaps that in some populations of *terminata* and *derivata*. However, the penis horns in the Balsa Puerto males are of medium length ($\bar{X} = 0.131$ mm, Fig. 24) like those of *picta* populations further south, but unlike those of *terminata* and *derivata* to the north.

Although Balsa Puerto males differ greatly from those of other *picta* populations in extent of black, females are similar in this respect (black begins at a mean of 29% of the wing length from the apex, Fig. 23) to both males and females of the other populations.

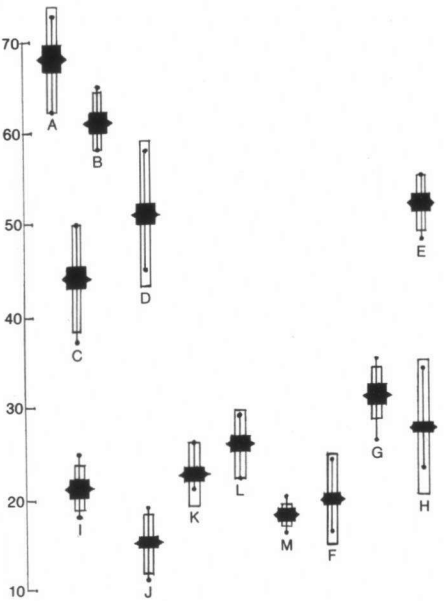


Fig. 22. Percent of hind wing length occupied by black in males from various localities arranged in a north-south sequence (left-right). Black line = sample range, black triangle = sample mean, black portion of bar = twice standard error of mean, one-half black bar plus white bar on same side of mean = standard deviation. (A) *P. gigantea*, Colombia, Antioquia (n = 14); — (B) Ecuador, Balzapamba (24); — (C) *P. procera*, Colombia (47); — (D) Ecuador, Puyo (114); — (E) *P. lamerceda* sp. n., Peru, LaMerced (15); — (F) *P. picta*, Peru, Balsa Puerto (61); — (G) Tingo Maria (9); — (H) Satipo (155); — (I) *P. derivata*, Colombia, Caqueta (7); — (J) Ecuador, Puyo (35); — (K) Limoncocha (31); — (L) *P. terminata*, Ecuador, Mangosisa (34); — (M) Zamora (8).

The more limited hind wing black in males from the Balsa Puerto area suggested the possibility of subspecific status. However, considerations of coefficients of difference produced inconsistencies. Balsa Puerto males showed a 93% joint non overlap in hind wing black with those from Tingo Maria but a less

than 75% non overlap with those from Satipo. Also, the lengths of the penis horns in males and the percent of hind wing black in females were similar for the three areas, showing extensive overlap. These data, exhibiting inconsistent variation in one character and stability in others, point to the conclusion that no subspecific status is indicated for specimens from the three Peru areas.

Literature records, none of which was verified by us, suggest a wide distribution: Guiana, Colombia, Ecuador, Peru (MONTGOMERY, 1967). Although we examined many specimens of *gigantea* and *procera* from Colombia and Ecuador, there were none of *picta* from these countries. Except for rare isolates from Guyana (1 ♂) and Tefe, western Brazil (1 ♀), all *picta* specimens examined were from Peru, in the Amazon drainage east of the Andes, mostly at elevations less than 1000 m. Records from Guyana and Brazil are far from the main range. RACENIS (1953, 1966) did not record it from Venezuela, and its occurrence there (J. De Marmels, pers. comm.) is unknown.

P. picta was collected every month of the year, but mostly from April to June. A pair was taken (FW) on July 8 from a shady boggy brook in the forest. At Tingo Maria, D.R. Paulson (pers. comm.) observed males at a forest stream with alternating rocky pools with leaf litter and waterfalls. He also found them abundant in forest clearings where the upper surface of the wings of males flashed blue in the sun.

POLYTHORE DERIVATA (MacLACHLAN)

Figures 5, 11, 20, 22-24

Thore derivata MacLACHLAN, 1881: 27 (types: ♂, ♀, Rio Bobonaza, Ecuador; Brit. Mus.); — KIRBY, 1890: 117.

Thore picta derivata: SCHMIDT, 1942: 250, pl. IV (new synonymy).

Polythore derivata: FRASER, 1946: 16, fig. 1a; — SOUKUP, 1954: 14; — MONTGOMERY, 1967: 127, 150.

Polythore derivata race *adjuncta* FRASER, 1946: 18, fig. 1c; — MONTGOMERY, 1967: 127, 150 (new synonymy).

Polythore derivata race *originata* FRASER, 1946: 18, fig. 1b; — SOUKUP, 1954: 14; — MONTGOMERY, 1967: 127, 151 (new synonymy).

Polythore derivata race *ambigua* FRASER, 1946: 19; — SOUKUP, 1954: 14; — MONTGOMERY, 1967: 127, 150 (new synonymy).

Polythore picta derivata: RACENIS, 1959: 488.

Polythore picta race *ambigua:* RACENIS, 1959: 488 (new synonymy).

Polythore picta race *originata:* RACENIS, 1959: 488 (new synonymy).

Material examined: 118 ♂, 60 ♀ (28 A, 27 Ha, 5 morph unknown). — COLOMBIA, *Caqueta*, Florencia, RD, I-1969, 1 ♂, USNM; — Morelia, 396 m, RD, I-1969, 6 ♂, 1 ♀ (Ha), USNM. — ECUADOR, *Morona-Santiago*, Macas, 1050 m, LA, date?, 1 ♂, UMMZ; — Macuma, 867 m, LP, II-1972, 1 ♂, 1 ♀, DP; — Mangosisa, 850 m, LA, date?, 1 ♂, 1 ♀ (A), UMMZ; — *Napo*, Jatunyacu, WM, I-1935, 1 ♀ (A), IV-1935, 1 ♂, III-1937, 2 ♂, 1 ♀ (A), UMMZ; — Lago Agrio, SD, VIII-1980, 1 ♂, SD; — Las Palmas, collector?, XII-1936, 3 ♂, 1 ♀ (A), UMMZ; — Limoncocha, 333 m, CP, VI-

-1965, 1 ♂, RG; LP, VII-1971, 1 ♂, VIII-1971, 2 ♀, I-1972, 1 ♂, 1 ♀, II-1972, 1 ♂, III-1972, 1 ♀, DP; LP, IX-1971, 1 ♀ (Ha), XII-1971, 1 ♂, FSCA; TE, IX-1972, 1 ♂, 2 ♀ (Ha), V-1975, 2 ♂, FSCA; PS, V-1977, 1 ♂, USNM; DV, VI-1977, 2 ♂, 1 ♀, (Ha), USNM; DP, VII-1977, 11 ♂, 1 ♀, DP; SD, VIII-1980, 5 ♂, 3 ♀ (Ha), SD, 1 ♂, RG; MW, XI-1980, 23 ♂, 9 ♀ (Ha), FSCA; — Rio Anzu, WM, VIII-1934, 2 ♂, 1 ♀ (A), XII-1936, 1 ♂, IX-1942, 2 ♂, UMMZ; — Rio Cotopino, WM, II-1950, 1 ♂, III-1950, 1 ♂, 1 ♀ (Ha), UMMZ; — Rio Napo Watershed, WM, III-1934, 1 ♀ (A), XI-1935, 1 ♀ (A), XII-1935, 2 ♀ (A), XII-1939, 1 ♂, IV-1941, 2 ♂, 2 ♀ (A), UMMZ; — *Pastaza*, Abitagua, 1300 m, WM, X-1936, 5 ♂, 3 ♀ (A), XI-1936, 1 ♂, V-1939, 1 ♂, VIII-1939, 1 ♂, XI-1939, 2 ♀ (A), 1940, 1 ♂, II-1941, 2 ♂, VI-1941, 2 ♂, VII-1941, 1 ♂, XII-1948, 1 ♂, UMMZ; — Canelos, 600 m, collector ?, XII-1938, 1 ♀ (A), UMMZ; — Partidero — Puyo trail, 1000 m, WM, VII-1935, 1 ♂, 1 ♀ (A), VIII-1935, 2 ♂, IX-1935, 1 ♂, 2 ♀ (A), X-1935, 2 ♂, 1 ♀ (A), XI-1936, 1 ♂, XI-1938, 1 ♂, IV-1950, 1 ♀ (A), UMMZ; FB, XII-1938, 1 ♂, 1 ♀ (A), FSCA; — Rio Challuayacu, WM, IX-1935, 1 ♂, UMMZ; — *Pichincha*, Quito, 2819 m, LA, date ?, 1 ♀ (Ha), UMMZ; — *Tungurahua*, La Palmera, 1300 m, WM, XII-1938, 1 ♂, UMMZ; — Rio Negro, 1100 m, TR, V-1976, 1 ♀ (A), FSCA; — Rio Topo, 1226 m, WM, VII-1936, 1 ♂, III-1950, 2 ♂, 2 ♀ (A), UMMZ; IF, XII-1981, 1 ♀ (A), FSCA; — Prov. ?, Llandia, WM, IX-1935, 1 ♀ (A), UMMZ; — Prov. ?, locality ?, collector ?, II-1936, 1 ♂, UMMZ. — PERU, *Huanuco*, Divisoria, 1700 m, FW, IX-1946, 1 ♂, UMMZ; — *Loreto*, Aguaytia, 170 m, FW, IX-1946, 1 Pair (Ha), 1 ♂, 1 ♀ (Ha), UMMZ; — Bouqueron del Padre Abad, 440 m, FW, VIII-1946, 3 ♂, 2 ♀ (Ha), UMMZ; — Iquitos, 120 m, GK, VI-1931, 1 ♀ (Ha), UMMZ; GK, IV-1936, 1 ♀ (Ha), AMNH; collector ?, date ?, 1 ♀ (Ha), UMMZ; — *San Martin*, Achinamiza, HB, XII-1925, 2 ♂, 3 ♀ (Ha), AMNH; — Tarapoto, 374 m, AP, date ?, 3 ♂, UMMZ.

In his original description of *derivata*, MacLACHLAN (1881) separated it from *picta* by the extent of hind wing black: less than 1/5 the wing length in *derivata*, more than 1/4 in *picta*. FRASER (1946) stated that the proximal border of the wing black is diffuse and vignetted into the white band in *picta*, sharply limited in *derivata*. Differently, SCHMIDT (1942) and RACENIS (1959) placed *derivata* as a subspecies of *picta*. In our material the hind wing black of *derivata* is always sharply delimited proximally, but so is the black in some *picta* specimens, and there are a few overlaps in extent of black. However, we disagree with Schmidt and Racenis; *derivata* and *picta* are specifically distinct, and males can confidently be separated if several criteria are considered collectively (Tab. II, Figs 22, 24).

In FRASER's (1946) descriptions of four "races" of *derivata*, only *ambigua* was described from "a large number of specimens". His white-banded races (*adjuncta, ambigua, originata*) show only slight differences among themselves and from the nominate subspecies in percent of hind wing black, shape of the proximal border of the black, and in the width of the white wing band. Strangely, the white bands in the Fraser illustrations do not reach the costa but stop at vein R2; in all of our specimens, the white band continues to the costa. Fraser's race *terminata* differs markedly from the other races in the absence of a white wing band.

We have seen many more specimens of *derivata* than Fraser. The intra and interdemic variation is much greater than he observed in his relatively small sample. For example, among the 30 Limoncocha males in our series, the percent

white in the hind wing averaged 18 but ranged from 12 to 27 with a standard deviation of 6.3. Recognizing such variation among the white-banded forms of *derivata* and among other species of *Polythore,* we judge that Fraser's white--banded races are not distinct subspecies.

On the other hand, Fraser's "race" *terminata* always lacks wing white and we never saw intermediates. This difference seems to be sufficient to elevate *terminata* to full specific status. Thus, we treat Fraser's *derivata* group as two full species with no infraspecific categories: *terminata* without white on the wings and *derivata* with white bands, both having several populations which differ in details of wing color pattern.

Because the present material, from four widely spaced areas, showed interesting variations, specimens from the four are considered separately.

THE PUYO POPULATIONS
(HWL, $\bar{X}$, ♂ = 39 mm, N = 33; ♀ A = 39, N = 16)

Specimens were from Puyo, Partidero, and Abitagua (near Mera) in Pastaza Prov. and Rio Anzu flowing through both Pastaza and Napo Provinces, all in central Ecuador in the eastern foothills of the Andes at 1000-1300 m.

These males have long slender penis horns ($\bar{X}$ = 0.235 mm, Figs 20, 24). The hind wing black occupies 15% of the wing length (Figs 5, 22), which agrees with MacLACHLAN's (1881) less than 1/5 of the wing length. There is a uniformly narrow ($\bar{X}$ = 9%, N = 33) but obvious, white band immediately proximal to the black.

In MacLACHLAN's (1881) original description of *derivata,* only andromorphic females were described, whereas in FRASER's (1946) description of each "race" of *derivata,* only heteromorphs were recorded. All Puyo area females are andromorphs, but heteromorphs are present in other populations. As in males from this area, hind wing black in females is small, beginning at 17% of wing length from the apex (Figs 11, 23). The width of the white band in females is remarkably similar ($\bar{X}$ = 10%, N = 22) in all *derivata* populations, andromorphs as well as heteromorphs.

THE LIMONCOCHA POPULATION
(HWL, $\bar{X}$, ♂ = 36 mm, N = 30; ♀ Ha = 34, N = 6)

These specimens were from northern Ecuador in the Napo drainage of Napo Prov., east of the Andes, at a lower elevation (333 m) than the Puyo populations.

The long penis horns of these males ($\bar{X}$ = 0.216 mm, Fig. 24) are similar to those of Puyo males, but the Limoncocha ones have a greater extent of wing black (23% of wing length, Fig. 22) and a much wider white wing band ($\bar{X}$ = 18%).

The extent of wing black in Limoncocha males overlaps that in the Balsa Puerto populations of *picta* (Fig. 22), so this character alone will not separate

males of all populations of *derivata* from those of *picta*. However, the longer penis horns (Fig. 24) in Limoncocha males distinguish them from the northern populations of *picta*.

Unlike Puyo area females, all Limoncocha ones are heteromorph a. As in Limoncocha males, the hind wing black of Limoncocha females begins more proximally ($\bar{X}$ = 24% of hind wing length, Fig. 23) than in Puyo females.

THE AGUAYTIA POPULATIONS
(HWL, $\bar{X}$, ♂ = 37 mm, N = 5; ♀ Ha = 35, N = 4)

Specimens were from Aguaytia and nearby Bouqueron along Rio Aguaytia in the Ucayali drainage of Loreto Dept, Peru, at only ca. 170 m. This small sample is far removed from other *derivata* populations.

Both males and females differ from those of the other two areas in that the wing area proximal to the white band is a dark transparent brown. The extent of hind wing black in these males ($\bar{X}$ = 23%) is similar to that of Limoncocha ones, but the narrowness of the white wing band ($\bar{X}$ = 9%) resembles that of Puyo males.

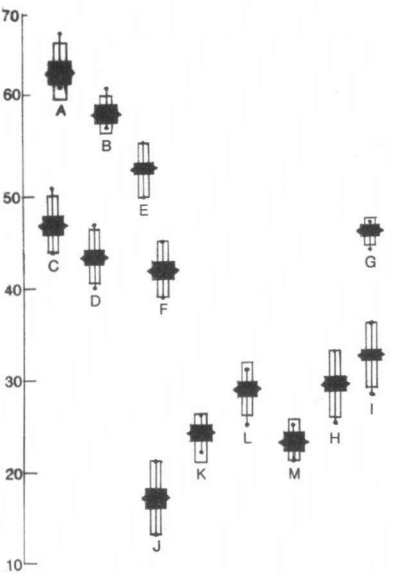


Fig. 23. Distance from wing apex to proximal limit of black as percent of hind wing length in females arranged as in Fig. 22: (A) *P. gigantea*, Colombia, Antioquia, heteromorph a (Ha, N = 5); — (B) Ecuador, Balzapamba (Ha, 5); — (C) *P. procera*, Colombia, andromorph (A, 17); — (D) (Ha, 16); — (E) Ecuador, Puyo (Ha, 19); — (F) heteromorph b (Hb, 19); — (G) *P. lamerceda* sp. n. (Ha, 5); — (H) *P. picta*, Peru, Balsa Puerto (Ha, 30); — (I) Satipo (Ha, 45); — (J) *P. derivata*, Ecuador, Puyo (A, 16); — (K) Limoncocha (Ha, 14); — (L) *P. terminata*, Ecuador, Mangosisa (Ha, 19); — (M) Zamora (Ha, 6).

THE COLOMBIA POPULATION
(HWL, $\bar{X}$, ♂ = 36 mm, N = 7; ♀ Ha = 32, N = 1)

Specimens were from Caqueta Dept, southern Colombia, in the eastern foothills of the Andes at 396 m.

The extent of hind wing black in these males (21%) is similar to that of Limoncocha ones, very different from that of Puyo ones. The extent of white (9%) is identical to that of Puyo males, very different from that of Limoncocha ones. However, the penis horn length in the Colombia males ($\bar{X}$ = 0.164 mm) is much shorter than in any other *derivata* specimens.

Differences in proximal extent of wing black (Fig. 22), in width of white wing bands, and in length of penis horns (Fig. 24) in the four populations of *derivata*

suggested subspecies. However, these differences are inconsistent. For example, Puyo males have a much smaller percent black than males of all other populations. In contrast, Limoncocha males have a greater percent of white than males of all other populations. Again, Colombia males have shorter penis horns than the other populations (Fig. 24). In spite of such differences, all of these specimens are easily recognized as *derivata,* and because the interdemic variations are discordant, these populations should not be considered subspecies.

All specimens were from east of the Andes; most were from Ecuador, but a few were from southern Colombia and from widely scattered localities in northern Peru. In addition, RIS (1918) and MONTGOMERY (1967) reported *derivata* from Bolivia. FRASER (1946) doubted Ris's determination and we are in agreement.

S.W. Dunkle and M.J. Westfall (pers. comm.) collected *derivata* at Limoncocha, Ecuador, perched on tips of low plants in seepage areas along small streams in the rain forest. At the same locality, D.R. Paulson (pers. comm.) observed the species concentrated at the upper ends of tiny forest streams. The following note (WM) accompanies a male collected April 23, 1941, "When freshly caught, the tips of hind wings had a distinct greenish bronze tinge that glittered like gold in the sun".

POLYTHORE TERMINATA FRASER, new status

Figures 6, 12, 21, 22-24

Polythore derivata race *terminata* FRASER, 1946: 20, fig. 1d (types: ♂, ♀, San Antonio, N.E. Peru; Brit. Mus.); — SOUKUP, 1954: 14; — MONTGOMERY, 1967: 151.

Polythore derivata terminata: MONTGOMERY, 1967: 127.

Polythore picta terminata: RACENIS, 1959: 488.

Material examined: 63 ♂, 32 ♀ (2 A, 30 Ha). — ECUADOR, *Morona-Santiago,* Chupientsa, FB, II-1939, 1 ♂ AMNH; — Macas, FB, I-1939, 2 ♂, 1 ♀ (Ha), AMNH; LA, date ?, 3 ♂, 5 ♀ (Ha), UMMZ; collector ?, date ?, 1 ♀ (Ha), CM; — Mangosisa, 850 m, LA, XI-1945, 6 ♂, 1 ♀ (Ha), date ?, 26 ♂, 10 ♀ (Ha), UMMZ; — Sucua, 800 m, FB, II-1939, 2 ♂, 2 ♀ (Ha), AMNH; — *Napo,* Archidona, 675 m, RH, date ?, 1 ♂, PM; HR, X-1976, 1 ♂, XII-1976, 1 ♀ (A), RG; — Jondachi, 1000 m, HR, XI-1976, 1 ♀ (A), RG; — *Zamora-Chinchipe,* Zamora, 1000 m, DL, X-1941, 4 ♂, 6 ♀ (Ha), XI-1941, 3 ♂, 1 ♀ (Ha), UMMZ. — PERU, *Amazonas,* Rio Santiago, HB, X-1923, 1 ♀ (Ha), VIII-1930, 1 ♂, AMNH; — *Loreto,* Balsa Puerto, 200 m, GK, VI-1933, 3 ♂, UMMZ; — Yurimaguas, GK, V-1939, 1 ♂, UMMZ; — *San Martin,* Hera, 890 m, collector ?, VIII-1947, 4 ♂, MHN; — Misquiyacu, 1400 m, FW, VIII-1947, 2 ♂, UMMZ; — Zepelacio, 1100 m, GK, IV-1939, 1 ♂, 1 ♀ (Ha), V-1939, 1 ♂, 1 ♀ (Ha), UMMZ. — VENEZUELA, *Tachira,* Tachira, JW, IV-1920, 1 ♂, UMMZ.

The material was from two widely separated areas in Ecuador: Mangosisa and Zamora. Because specimens from these two areas differed, they are considered separately.

THE MANGOSISA POPULATIONS
(HWL, $\bar{X}$, ♂ = 38 mm, N = 36; ♀ Ha = 36, N = 18)

These included specimens from Macas and Mangosisa in Morona-Santiago Prov., Ecuador, in the eastern foothills of the Andes at 850-1015 m, along the Rio Upano and the Rio Mangosisa.

The long penis horns ($\bar{X}$ = 0.261 mm, Figs 21, 24) are like those of *derivata*, and the proximal extent of hind wing black ($\bar{X}$ = 26%, Figs 6, 22) is similar to that in Limoncocha males of *derivata*. However, the absence of white bands in *terminata* wings easily separates the two species.

The hind wing black of females begins at 29% of the wing length from the apex (Figs 12, 23), a beginning resembling that of Mangosisa males and overlapping that of *picta* females from the Balsa Puerto area. If one did not know the location of a collection, and if males were not associated with the females, our present knowledge would not permit accurate differentiation of females of these two species.

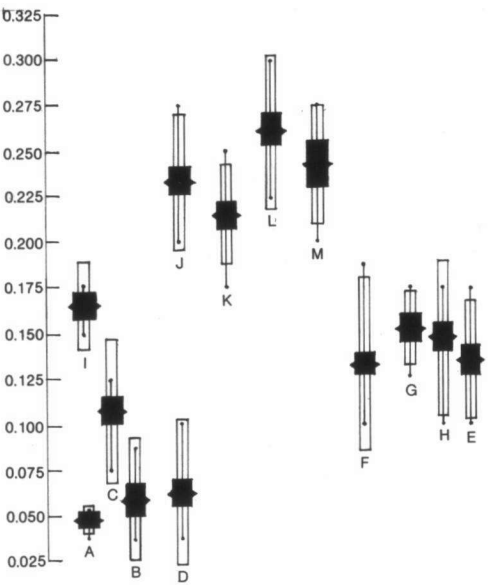


Fig. 24. Length of penis horns arranged as in Fig. 22: (A) *P. gigantea*, Colombia, Antioquia (N = 4); — (B) Ecuador, Balzapamba (25); — (C) *P. procera*, Colombia (32); — (D) Ecuador, Puyo (32); — (E) *P. lamerceda* sp. n., Peru, LaMerced (15); — (F) *P. picta*, Peru, Balsa Puerto (60); — (G) Tingo Maria (9); — (H) Satipo (38); — (I) *P. derivata*, Colombia, Caqueta (7); — (J) Ecuador, Puyo (26); — (K) Limoncocha (11); — (L) *P. terminata*, Ecuador, Mangosisa (23); — (M) Zamora (8).

THE ZAMORA POPULATION
(HWL, $\bar{X}$, ♂ = 37 mm, N = 8; ♀ Ha = 37, N = 6)

This small sample was from Zamora in southern Ecuador in Zamora–Chinchipe Prov. along Rio Zamora at 1000 m.

These males ($\bar{X}$ = 0.244 mm, Fig. 24) are similar to Mangosisa ones in length of penis horns and absence of wing white, but the proximal extent of wing black is considerably less ($\bar{X}$ = 18%, Fig. 22) in Zamora specimens. This proximal extent of black overlaps that in the Balsa Puerto population of *picta*, however the two species can be separated by the length of penis horns (Fig. 24) as has been mentioned for *picta*. In Zamora females the hind wing black begins more distad

($\overline{X} = 23\%$ of the wing length from the apex, Fig. 23) than in the Mangosisa ones.

Differences in the extent of wing black in males and females of the two populations presented the possibility of subspecific status. The coefficients of difference between the extent of apical black in males of the two groups (a joint non overlap of 94%) and in females (85% non overlap) suggested subspecific rank. However, because the Zamora sample is so small, and because we strongly suspect that a larger sample would obscure the apparent differences between the two populations, it seems inappropriate to give subspecific rank to either population.

FRASER (1946) recorded *terminata* from north-eastern Peru, but most of our specimens were from southern Ecuador, with only small isolates from northern Peru. We saw only a single specimen from Venezuela, a male from Tachira in the westernmost part of the country. This is the only known member of the genus from that country (RACENIS, 1953, 1966; J. De Marmels, pers. comm.).

In the Mangosisa area, both *terminata* and *derivata* are present, providing additional evidence for considering the two specifically distinct.

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