# BULLETIN OF THE ALLYN MUSEUM

3621 Bayshore Rd. Sarasota, Florida 34234

Published By The Florida State Museum University of Florida Gainesville, Florida 32611

Number 114

30 December 1987

## NEOTROPICAL NYMPHALIDAE VI. REVISION OF ASTEROPE (=CALLITHEA AUCT.)

Dale W. Jenkins

## NEOTROPICAL NYMPHALIDAE VI. REVISION OF ASTEROPE (=CALLITHEA AUCT.)

Dale W. Jenkins

3028 Tanglewood Drive, Sarasota, FL 34239 and Research Associate, Allyn Museum of Entomology

## A. INTRODUCTION

Asterope are well known by the name *Callithea* (auct.) and are considered to be among the most beautiful butterflies in the world. They were very highly prized and quite rare in older collections. It was considered to be an honor to name species of this genus as patronyms after early naturalists including *batesii*, *hewitsoni*, *salvini*, *staudingeri*, and *wallacei*.

Asterope are brightly colored medium-sized, neotropical nymphalid butterflies. The upper wing surface is bright blue or dark purple, and some have orange or reddish-orange markings. Many of the species have a greenish metallic band bordering the wings. On the ventral surface of the hind wing (VHW) there are usually four rows of dark maculae or one row with three lines. Some of the species have antennae with a round, knobbed flat tip; others have an elongated pointed tip.

The genus is in the family Nymphalidae and subfamily Eurytelinae. They are most closely related to the genus *Pyrrhogyra* which is similar morphologically but quite different in external appearance and habits.

Asterope occur primarily in undisturbed tropical forest in the Amazon Valley extending from the mouth of the Amazon, into the Guyanas, Venezuela and Colombia and south on the eastern slopes of the Andes to Bolivia and into central Brazil. The genus does not extend into Central America or the West Indies (except one doubtful record in Panamá).

While there are relatively few specimens in most museum and private collections, the adults of several species are not uncommon in certain remaining undisturbed tropical forests in the Amazon basin and surrounding areas. However, they are usually difficult to collect since most species occur in the forest canopy, and some appear to have a relatively short emergence period.

Asterope are involved in a rather extensive mimicry ring including *Callicore* and *Agrias*. This makes the taxonomy much more difficult and compounds identification problems. In addition, there is great variability in the coloration and patterns of some species. *Asterope optima* may have the basal half of the VHW reddish-orange, or there may be wide variation in pattern, to only a small basal coloration. This and other variations have resulted in difficulties in identification and are also the cause for a number of synonyms.

Eight species and ten subspecies are recognized here, of which two subspecies are newly described. Of the 38 taxa previously described, 16 are newly synonymized and the status of twelve taxa is revised.

In Röber, in Seitz (1916), many figures of Asterope are synonyms or require change in status. Plate 99, row c, the figure of sapphira  $\Im$  is unrecognizable; the figure labelled sapphira  $\Diamond$  U is  $\Im$  U; hewitsoni is  $\Im$  markii hewitsoni; row d, depuiseti is  $\Im$  leprieuri depuiseti; fassli is  $\Im$  optima optima; row e eminens is  $\Im$  optima philotima; freyia (=freyja) is  $\Im$  optima philotima; adamsi U is degandii adamsi U; srnkai is whitelyi srnkai; buckeeyi is buckleyi and row f batesii is a  $\Diamond$  batesii.

In Lewis (1973) plate 34, 3. Callithea adamsi is A. degandii adamsi; 6. Callithea markii is A. markii hewitsoni; and 9. Callithea sonkei is A. whitelyi srnkai.

In Smart (1975) p. 201, f. 50 Callithea philotima is A. optima optima; f. 51 Callithea adamsi is A. degandii adamsi; f. 54 Callithea davisi [sic.] is A. markii hewitsoni; f. 55 Callithea davisi [sic.] ssp. tirapatensis is A. markii davisii; f. 56 Callithea adamsi is A. markii allyni; f. 59 Callithea buckleyi f. staudingeri is A. buckleyi.

*Callithea* Feisthamel (1835) is a junior subjective synonym of *Asterope* Hübner [1819] and was synonymized by Hemming (1967). The genus has needed critical revision to permit accurate identifications.

## **B. MATERIALS AND METHODS**

Asterope were collected and studied by the author in the field in several neotropical countries. Specimens in twenty nine museums and private collections were examined and the *Asterope* were identified. Type specimens were studied in the British Museum of Natural History, London, the Madame Aimée Fournier Collection in the Museum of Paris, and the Zoologishes Museum, Berlin.

The characters used for identification of species and subspecies include wing patterns, wing coloration, wing venation, sexual dimorphism, male genitalia, male hypandria, and female genitalia. Series of adult specimens were collected in the field to study the range of variation in single localities especially in intergrade areas. Keys are presented for identification of species based on antennae, wing coloration and pattern of both males and females, and for male genitalia, and hypandria. Keys were made for differentiating subspecies using wing pattern and coloration.

Data have been compiled for each specimen examined including sex, date, geographic locality, altitude and museum in which it is located. Full data are presented only for rare or new species or subspecies. The exact localities are presented but other data on sex, dates, and altitude are summarized for more common taxa. These details are available from the author.

The nomenclature of wing veins follows Miller (1970). The venation and nomenclature of Asterope are shown in Figs. 1 and 2. The terminology for the male and female genitalia follows Klots (1970) and the hypandrium or subgenital plate follows Tuxen (1970).

Male genitalia and hypandria were studied in 39 male specimens, and the genitalia in 12 female specimens. Dissected genitalia were preserved in small glycerine vials that were numbered and deposited with their corresponding specimens. Mr. Philip Ackery kindly loaned 15 slides of male genitalia and hypandria of *Asterope* which he had prepared. These were of great value in this revision.

The distribution maps (Figs. 83-90) are based on specimens determined by the author. Combined circles, triangles or squares indicate intergrades between subspecies at intergrade or tension zones. An "X" following a locality name indicates intergrades.

Some species of *Asterope* are locally common in restricted localities but most are relatively uncommon or rare. A total of 2,733 specimens were identified in museums or private collections or were collected in the field. There were 2,089 males and 644 females studied and identified. Twenty four different types were studied and compared with other specimens. Color photographs were made of the types and other critical specimens and the negatives and prints are deposited in the Allyn Museum.

The holotypes of two new subspecies described will be deposited in the Allyn Museum.

#### COLLECTIONS EXAMINED

- AA Allyn Museum of Entomology, Florida State Museum, Sarasota, FL. (L. D. Miller)
- AM American Museum of Natural History, New York City, NY. (F. H. Rindge)
- BM British Museum (Natural History), London, England (R. I. Vane-Wright, P. Ackery)
- BO Booth Museum, Brighton, England (G. Legg)
- CA California Academy of Science, San Francisco, CA (P. H. Arnaud)
- CM Carnegie Museum of Natural History, Pittsburgh, PA (C. Young)
- FL Division of Plant Industry, Florida Dept. Agriculture, Gainesville, FL
- GS Gordon B. Small Collection, Balboa, Panamá (now in SI)
- HD Henri Descimon Collection, Marseille, France
- JC Dale and Joanne Jenkins Collection, Sarasota, FL
- KB Keith S. Brown Collection, Campinas, Brazil
- LA Los Angeles Co. Museum Natural History, Los Angeles, CA (J. P. Donahue)
- MM Milwaukee Public Museum, Milwaukee, WI (A. M. Young and S. S. Borkin)
- MN Museu Nacional, Rio de Janeiro, Brazil (J. Cândido de Mello Carvalho)
- MP Museum d'Histoire Naturelle de Paris. Paris, France (G. Bernardi). (Includes the Madame Aimée Fournier Collection.)



Figure 1. Wing venation of Asterope markii davisii.



Figure 2. Wing venation of Asterope optima optima.

- MZ Museum of Comparative Zoology, Harvard University, Boston, MA (M. D. Bowers)
- NC James Neidhofer Collection, Milwaukee, WI (in MM)
- OS Department of Entomology, Ohio State University, Columbus, OH
- PA Philadelphia Academy of Sciences (in CM)
- RO Romero Collection, Maracay, Venezuela
- SI National Museum of Natural History, Smithsonian Institution, Washington, D. C. (J. F. Gates Clarke and R. Robbins)
- SN Stanley Nicolay Collection, Virginia Beach, VA (now in SI)
- ST Herman Strecker Collection (at Allyn Museum of Entomology), Sarasota, FL (now in Field Museum of Natural History, Chicago, IL)
- TE Thomas Emmel Collection, Gainesville, FL
- UC Universidad Facultad de Agronomía Central, Maracay, Venezuela (F. Fernández and L. Otero)
- UN Universidad Nacional Mayor de San Marcos, Museo de Historia Natural, Lima, Perú (G. Lamas)
- UP Universidade Federal do Paraná, Curitiba, Brazil (O. Mielke)
- VK Harold L. King Collection, Sarasota, FL (now in FL)
- ZM Museum fur Naturkunde de Humboldt, Universität zu Berlin, Zooligisches Museum (types photographed by Dr. Gerardo Lamas)

#### C. BIOLOGY

Asterope occur mainly in undisturbed, virgin, tall evergreen and semi-deciduous tropical forest, and have been collected more commonly in river valleys. They are also found in slightly disturbed forest, especially in forest openings where a tree has fallen or has been cut, or along forest roads or trails and the edges of forests surrounding streams. They occasionally fly into open areas if there are attractive food sources, and to stream margins and sand bars in dry weather. A. sapphira and A. leprieuri also fly in low campo vegetation in the Santarém area according to Fassl (1920). Bates (1864) states that when an emergence occurs, A. sapphira may also be found on native houses.

Adults inhabit the tree canopy area usually above 10-20 m. They are seen flying relatively slowly with a slow wing beat. They have rather broad and somewhat rounder wings, the forewing usually less pointed than *Anaea* and *Eunica* which may be flying with them. They are easier to distinguish from *Heliconius* which have more elongate wings and a different fluttering wing beat, and from *Agrias* which are heavier bodied, usually larger, and fly much more rapidly.

The flight period is from about 1000 to 1400 hrs. with most activity about noon in Ecuador and Perú. They fly only when there is sun, especially hot bright sun, and are rarely seen when it is cloudy and cool.

The adults are attracted to decaying foul substances which include well rotted (one week old) fish, pig feces, and human feces fermented several days. Well fermented banana and other fruit baits are somewhat attractive. Fassl (1920) also found the adults feeding on fermenting fallen cashew fruit under the trees.

An interesting teleological account of the behavior of *Asterope* is presented in Röber, in Seitz (1916).

"Paul Hahnel reports about the intellectual powers of the *Callitheae* that a *markii* (*hewitsoni*) after having been several times chased up, at last took refuge on a small trunk where it, however, hardly rested and in the very same moment changed its mind and immediately went some inches higher up in order to hide itself on the under surface of a leaf hanging down above it—it probably imagined to be quite safe there; the observer was really astonished at this clear thinking power of the animal so hardly pressed upon by its persistent pursuer. The *Callitheae* (like many butterflies with an intensive blue) have, according to the same observer, a scent very similar to that of vanilla."

The known food plants of the larvae are vines of the genus *Paullinia* in the family Sapindaceae (Table 1). They are known to possess narcotic poisonous properties due to a poisonous alkaloid, timboine. The poison is known as "barbasco" and is used for

stupefying fish and for poisoning arrows. It is possible that the reported caustic or venomous properties of the larval spines are related to this poison.

Asterope batesii (or markii) larvae have five yellow-orange bands on a black background and black spines. Five larvae were found at Tefé, Brazil in August 1935 by A. Miles Moss (BM) and painted in color. The larvae were feeding on *Paullinia sp.* of the family Sapindaceae.

*Paullinia* is a robust, semiscandent, tendril-bearing vine, with alternate, persistent, pinnate leaves with 5-7 lanceolate, slightly coriaceous leaves. The inflorescence is an axilar raceme of small, whitish, 4-petaled flowers. The fruits are about the size of a coffee bean, reddish-orange when mature and containing three shiny-black seeds.

Fassl (1920) states that larvae of both Asterope sapphira and A. leprieuri dürcki fed on young leaves of a vine which he described in some detail but did not identify. The description of the leaves and fruit fits *Paullinia* quite accurately. He states that in the Santarém, Brazil region, the plants grow on dry sandy soil in the shade of not tall "campovegetation" where the adults fly. This surprised him since he expected to find the adults in the canopy of tall tropical forest. He also found a specimen of A. sapphira on a native hut.

Asterope sapphira		
Paullinia sp.	Sapindaceae	Obidos, Brazil Moss (BM)
"	n	Santarém, Brazil Moss (BM)
"	"	Santarém, Brazil Fountaine (BM)
"	"	Faro, Pará, Brazil K. Brown (pers. comm.)
Asterope leprieuri		
Paullinia sp.	Sapindaceae	Santarém, Brazil Moss (BM)
"	n	Obidos, Brazil Fountaine (BM)
"	n	Santarém, Brazil Fassl (1920)
Asterope batesii		
Paullinia sp.	Sapindaceae	Tefé, Brazil Moss (BM)

Table 1. Host plants of Asterope

## D. MIMICRY

Asterope adults show great similarity to Agrias and Callicore and appear to be heavily involved in mimicry relationships. This makes the taxonomy more complex.

At present, it is not known whether *Agrias* and *Asterope* are palatable, distasteful, or poisonous to predators. This would be difficult to determine since they are relatively rare or uncommon and are in the tropical forest canopy. Based on field observations and feeding experiments, De Vries (1987) states that *Callicore* appear to be distasteful to certain species of birds. Since *Asterope* and *Callicore* larvae feed on poisonous Sapindaccae, this might provide the basis for their serving as models with *Agrias* as mimics, or in a mimicry complex. Descimon (1977) proposed a Batesian mimicry system with *Agrias* as mimics of *Asterope* and *Callicore*. Swynnerton (1926) found that large-bodied *Charaxes* served as models for smaller mimic species. If this also applies to *Agrias, Asterope* and *Callicore* might conceivably be mimics.

In Asterope there appear to be Müllerian mimicry pairs. A. batesii and A. markii markii are very similar on the dorsal surfaces. Asterope d. degandii and A. d. bartletti are very similar to A. whitelyi srnkai ventrally and similar in pattern dorsally. This has resulted in misidentifications. A. w. whitelyi may be a mimic pair with both A. optima philotima and A. leprieuri depuiseti. All of these pairs share similar geographic ranges. In each case one of the pair is rare or relatively rare. The rare members of the pairs are A. m. markii, A. whitelyi srnkai and A. w. whitelyi.

All species and most subspecies of *Asterope* are involved in mimicry with *Agrias* on either dorsal, ventral or both wing surfaces. A very interesting observation is that there



Figure 3. Distribution of species of Asterope.

Asterope batesii. Range: Amazon basin from Santarém to Iquitos, south on Rio Madeira to Rondônia, Brazil.

Agrias pericles ahasverus. Range: Rio Madeira, Brazil.

Agrias phalcidon anaxagoras. Range: Rio Madeira, Brazil.

Agrias phalcidon hewitsonius. Range: Tefé, Brazil.

Asterope markii (Mullerian complex). Range: Upper Amazon from Manacapuru to Rio Madeira, Brazil, and Iquitos, Perú.

Asterope degandii degandii. Range: S. Colombia and Ecuador.

Agrias beatifica pherenice. Range:

Brazil, from São Paulo de Olivença, Ecuador and Perú (beatifica).

Asterope whitelyi srnkai (=salvini). Range:

S. Colombia, Ecuador, Perú and W. Brazil.

Asterope degandii adamsi. Range: Colombia and central Perú.

Agrias beatifica pherenice. Range: As above.

Agrias beatifica staudingeri. Range: Perú, Rio Huallaga.

Asterope markii markii. Range: Upper Amazon valley, Manaus and Rondônia, Brazil to Iquitos, Perú.

Same mimicry as Asterope batesii.

Asterope markii davisii. Range: central Perú from San Martín to Puno, and Bolivia? Agrias amydon boliviensis. Range: Bolivia (yellow)

Agrias amydon tryphon. Range: Same as davisii and Iquitos to Tefé, Brazil.

Agrias amydon zenodorus. Range: Ecuador and N. Perú.

Agrias amydon flava. Range: Perú, Juanjui.

Callicore denina (yellow).

Callicore cadomannus (orange).

Callicore aegina.

Asterope markii hewitsoni. Range: Ecuador, N. Perú, W. Brazil, Colombia and Venezuela. Agrias amydon amydon. Range: Colombia, Venezuela.

Agrias amydon tryphon. Range: N. Perú, W. Brazil.

Agrias aedon. Range: Colombia, N. Ecuador.

Agrias claudina lugens. Range: Venezuela, Colombia, Ecuador to Bolivia.

Callicore cyllene. Range: Same?

Callicore incarnata. Range: Same?

Asterope markii boyi. Range: Brazil, S. of Amazon, Rio Madeira, Rio Tapajós.

Agrias pericles pericles. Range: Same ( $\circ \circ \circ$  yellow)

Agrias narcissus tapajonus morph icterica. Range: Same. phalcidon, itaituba morph horrackii.

- Asterope markii ackeryi. Range: Brazil, N. of Amazon, Obidos. Agrias pericles aurantiaca morph trajanus. Range: Manaus, N. of Amazon, Brazil. Callicore excelsior arirambae. Range: Manaus, Campos do Ariramba, Brazil.
- Asterope buckleyi. Range: S. Colombia, Ecuador, N. & central Perú, W. Brazil to São Paulo de Olivença.

Agrias beatifica stuarti. Range: Ecuador, Rio Napo. (VHW orange, but if model absent is red).

Agrias beatifica olivencius. Range: Perú, Loreto.

Asterope whitelyi srnkai. Range: Ecuador, N. and central Perú, S. Colombia, W. Brazil.

Agrias beatifica pherenice. Range: Brazil from São Paulo de Olivenca, Ecuador, and Perú. Asterope degandii bartletti (mullerian).

Asterope sapphira. Range: Brazil. Lower Amazon below Manaus (also Perú?).

Agrias narcissus tapajonus morph icterica. Range: Same. Resembles  $\Diamond$  light blue VHW with black spots; orange DFW. Range where no sapphira, Agrias  $\Diamond$  is red.

Agrias phalcidon phalcidon morph paulus. Range: Same. Resembles 3.

Asterope leprieuri leprieuri Range: Lower Amazon, Rio Madeira, Brazil, and N. and central Perú.

Agrias phalcidon phalcidon. Range: Brazil, Pará, Rio Tapajós.

Agrias phalcidon xinguensis. Range: Brazil, Pará, Belém.

Agrias phalcidon rubrobasalis. Range: Brazil, Pará, Belém.

Asterope leprieuri depuiseti. Range: S. Perú and Bolivia. Agrias beatifica beata. Range. S. Perú.

Asterope optima optima. Range: S. Colombia to central Perú, W. Brazil.

Agrias beatifica beatifica. Range: Rio Napo, Perú and Ecuador.

Asterope optima philotima. Range: Central Perú to Bolivia.

Agrias beatifica staudingeri. Range: Perú, Rio Huallaga.

may be mimicry between the *Asterope* dorsal surface and *Callicore* ventral surface. A summary of available data on mimicry involving *Asterope* is presented in Table 2, using the names and distributions in the present revision. This is based partly on Descimon (1977) and partly on further study of examples in various collections, especially his private collection.

### F. TAXONOMY

- ASTEROPE Hübner, [1819], Verz. Bekannt. Schmett. (5): 66. Type species by selection by Scudder (1875), Proc. Amer. Acad. Arts Sci., Boston, 10:122): Oreas sapphira Hübner, [1816], Samml. Exot. Schmett. 1: pl. [96] f. 1-4. (Hemming, 1967).
- =CALLITHEA Feisthamel, 1835, Mag. Zool. Cl. IX Ins. 5: pl. 122 et explic. Type-species by monotypy: Callithea leprieuri Feisthamel, 1835, ibid. 5: pl. 122 et explic. (Hemming 1967).
- =CALLITHEA Boisduval, [1836], (Roret's Suite à Buffon), Hist. Nat. Ins., Consid. Gén. Lépid. 1: explic. pl. 10 [=pl. 6B]. Type-species by monotypy: Oreas sapphira Hübner, [1816] Samml. Exot. Schmett. 1: pl. [96]. The name Callithea Boisduval is invalid under the Law of Homonymy, as it is a junior homonym of Callithea Feisthamel, 1835. This generic name is also a junior objective synonym of Asterope Hübner, [1819] (Hemming, 1967.)
- =CYANE Felder, (C.), 1861, Nova Acta Leop. Carol. 28(3): 22. Type-species by monotypy. Callithea leprieuri Feisthamel, 1835, Mag. Zool. Cl, IX Ins. 5: pl. 122 et explic. The name Cyane Felder is invalid, as it is a junior objective synonym of Callithea Feisthamel, 1835.

The genus Asterope is in the subfamily Eurytelinae and in the tribe which I designate Epiphilini.

Description: Adult Male: The eyes are smooth. The palpi are elongate, porrect and directed dorsally; the terminal segment is small and narrow, and the palpi are black or white ventrally. The proboscis is usually yellowish. The antennal club in *batesii* and *degandii* is elongate and pointed, in *buckleyi* swollen and pointed, and in all other species is knoblike, rounded and large, compressed and spoon-shaped. The body is robust and heavily scaled with black, deep purple, or blue. The forewing is roughly triangular but is rounded and smooth, not falcate. The dorsal forewing (DFW) is usually blue or bluish-purple with a metallic greenish marginal band, with three species having orange or red areas. The  $R_2$  may arise basal to, at the same distance from, or distal to the end of the discal cell r<sub>s</sub>-m<sub>s</sub>. There is some basal swelling of the Sc and M veins. The discal cell is closed and  $m_2 m_3$  joins  $M_3$  distal to the fork of  $M_3$  and  $Cu_1$ . The dorsal hindwing (DHW) has the humeral vein with one branch and sometimes a small indistinct second branch. The wing is usually blue (or purplish-black) with a greenish marginal band (except batesii, markii and sapphira). There is a black and roconial area in the discal cell in *leprieuri* and optima. The ventral forewing (VFW) is gray to pale blue, usually with basal orange or red and postmedian black maculae. The VHW has four rows of black maculae some of which may be compressed. In A. buckleyi there is a row of black circular maculae and three lines. There may be varying amounts of orange or red present in the basal half.

The forelegs are small and narrow with white, bluish, or black scales; the terminal segment is small and without claws. The middle and hind legs have the femora and tibiae without spines, and the tarsi with several rows of short spines on the underside. The claws are very curved and sickle-shaped.

The male genitalia may have a short to very long saccus; the aedeagus may be short to very long (10 mm.) and straight or very bent. The valva may or may not have a chitinous lip at the crista and may have from 14 to 52 spines. It may be pointed or rounded. The gnathos arms are connected ventrally. The male hypandrium (subgenital plate) is more elongate, not squarish, and may be somewhat narrow. There are usually postero-lateral clumps of spines which may be long (in *markii*).

Female: The wings are more rounded and the dorsal surfaces of the wings are usually black with wider greenish, metallic marginal bands in most species. There is yellowish or orange in the basal part of the DFW in *batesii* and *markii*. In *sapphira* the DFW has basal bright blue and a broad postmedian orange diagonal band. There is much orange on the VFW. In most species the ventral surfaces are similar to the males. The female genitalia have little chitinization of the antrum and a simple outward flaring which forms the ostium. The corpus bursae has two signa that are usually elongate and deeply concave.

*Immature Stages:* The larvae are banded by five bands of yellow, orange, or red on a metallic blue, violet, or black background (Figs. 4 & 5). The head has long head horns which are black with whorls of black spines. The larvae have heavily branched spines. The spinal pattern for the dorsal and subdorsal rows of spines are shown in Table 3. The sharp spines are said to be caustic or venomous. The recorded descriptions of larvae for the known species are presented below.

Asterope sapphira. In Röber, in Seitz, (1916), Otto Michael states, "The male larvae are of a beautiful blue coloring, while the female larvae are more greenish or orange coloured; they have sharp spines containing a caustic or venomous substance and live as single specimens on a bean-like creeper. At Santarém." Bates (1859) states "On 12 Jan. larvae of Asterope sapphira appear in great numbers feeding upon the leaves of various species. The larva is very beautifully banded with metallic violet color and orange red; and bristled with long, branching spines of the metallic color, two of which arising from



Figure 4-5. Larva of Asterope sapphira (4). Larva of Asterope leprieuri leprieuri (5).

		Head Horn Spines		$T_2$	$T_3$	A1	$\mathbf{D}_{\mathbf{A}_2}$	orsa A <sub>3</sub>	llia A₄	Ant A₅	erio A <sub>6</sub>	ra A <sub>7</sub>	A <sub>8</sub>	P A <sub>7</sub>	Dorsa Poster A <sub>8</sub>	alia iora A <sub>9</sub>
4 - 4	Dorsal	2,4,4,5												3	5	11-1-1-1
Asterope batesii	Subdorsal		1	2,3	6	2	2,3	3	3	3	3	3	4			5
Antonona	Dorsal	2,4,4,5												4	5	
sapphira	Subdorsal		1	4	6	3	3	3	3	3	3	3	3			5
	Dorsal	2,4,4,5												-	5	
Asterope leprieuri	Subdorsal		-	÷	-	-	3	3	3	3	3	3	-			5

Table 3. Spines on Larvae of Asterope

Number = number of branches of spine.

the head, are 3 X the length of those on the body. 1 Feb. they change into pupae and 15 Feb. emerge." Bates (1864) states: "The caterpillar is armed with branched spines like *Epicalia*, two much longer than the rest, arising from the head. The under surface is pale yellow, the upper black with five broad bands of vermillion. The pupa has the dorsal face of its thorax deeply emarginate, and is of a pale red color."

Asterope leprieuri. The larva is spinose similar to sapphira. However, it is colored differently, being banded with bluish-black and greyish pallid green. The pupa has a few black spines not present in sapphira (Bates, 1859). The larval dorsal surface is black, with five broad bands of light greenish-blue tint. (Bates, 1864).

Asterope leprieuri dűrcki Fassl (1921) states: "Larvae feed on the same plant as C. sapphira. It is rather larger, about the same as larvae of Vanessa io, with similar dark blue spines and incisions but above of bright green color, not ochre brown. The pupa is also rather large but quite different from sapphira pupae with a dark thoracic median line and two rows of 2 mm long black dorsal spines, two pairs on each segment. The larva of typical leprieuri is of more grey-green color."

The pupa has the dorsal surface of the thorax deeply emarginate. The pupae of A. sapphira do not have black spines but have small black warts, while A. *leprieuri* have two rows of 2 mm long black dorsal spines with two pairs on each segment. There are cast pupal skins of both species in the BM collected by A. Miles Moss.

Asterope is not an homogeneous genus and the eight species can be divided into a number of subgroups. Cladistic analysis indicates that it is divisible into two species groups.

#### Batesii Species Group

This species group contains six species which are distinct and rather disparate and could be separated into various species groups. However, some of the more striking characters appear to be related to mimicry and show reversals and parallelisms.

This species group is characterized by the FW having the  $R_2$  branch basal to or slightly distal to  $r_{3-5}$ - $m_1$ . The FW has  $m_1$ - $m_3$  straight or only slightly curved and not skewed with  $m_2$ - $m_3$  (except in *sapphira*). The aedeagus is shorter ( <6.0 mm) in length and mostly curved. The male hypandrium is more elongate, not broader, with chitinous rods. The saccus is shorter ( <5.0 mm) in length. The VHW does not have red at the base, but may be reddishorange. The forewing is more elongate apically, not reduced in length in the costal area, and broader at the tornus. There is no black hairy androconial patch in the discal area of the DHW. The palpi are white or grey ventrally. This species group includes the species *A. batesii*, *A. degandii*, *A. markii*, *A. buckleyi*, *A. whitelyi*, and *A. sapphira*.

#### Leprieuri Species Group

This species group is characterized by the FW having the  $R_2$  branched distal to  $r_{3-6}$ -m<sub>1</sub> (at least <sup>1</sup>/<sub>4</sub> the distance to the fork of  $R_3$  and  $R_4$ ). The antennal club is rounded and knobbed. The DFW has the  $m_1$ - $m_2$  curved and heavily skewed with the  $m_2$ - $m_3$  branched distally on the  $M_2$ . The aedeagus is straight and very long (7.5-10.0 mm). The hypandrium is relatively broad with chitinous elongate rods. The valva has a chitinous lip at the crista. The saccus is very long (7.0-8.0 mm). The VHW has reddish-ochre or red color especially at the base of the wing. The male has reduced wing length in the costal area, and is broader at the tornus. The DHW has a black androconial patch of black hairs in the discal cell. The palpi are black ventrally. The proboscis is yellow. This group includes the species A. leprieuri and A. optima.

## KEY TO MALE ASTEROPE

-----

. . .

1a.	in basal <sup>1</sup> / <sub>2</sub> to <sup>2</sup> / <sub>2</sub> , with a single postmedian row of large rounded black maculae
	in block of the second standing of the second
1h	inside an indescent green area surrounded by black line bolders
10.	Not as above, vitw without a single postnetian row of large rounded black
0	maculae with a black line bordering a rounded yellow-orange basal area2
za.	No yellow or orange markings on any wings; VHW with greenish iridescence
	and red or rust-red markings at least basally; DHW with shaggy black hair in
	discal cell; DFW usually wider posteriorly
2b.	Yellow or orange markings present on wings dorsally or ventrally; VHW with
	four rows of black maculae without red or rust-red markings (reddish-orange
	in <i>whitelyi</i> ); DHW without shaggy black hairs in discal cell; DFW not wider
	posteriorly
3a.	Upper surface of wings bright sapphire blue with large median black patches,
	narrow black distal borders, and no greenish marginal bands; VHW with small
1.000	basal orange area anterior from R <sub>s</sub> sapphira
3b.	Upper surface of wings not bright sapphire blue with large median black patches
	and narrow black distal borders4
4a.	DFW with yellow, orange or reddish-orange markings present
4b.	DFW without such markings present
5a.	Antennal club elongated tapering to a point; DFW & DHW without bright blue
	area; VHW with basal ¼ orange; VFW with two large and two or three smaller
	subapical black maculaebatesii
5b.	Antennal club rounded and blunt, not elongated or pointed; DHW with bright
	blue in distal $\frac{1}{2}$ to $\frac{2}{3}$ ; VHW with orange only in costal and anal areas; VFW
	with only two or three black maculaemarkii
6a.	Antennal club rounded and blunt, not elongated or pointed; DHW marginal band
	of metallic green narrow $<3.0$ mm, with entire inner $\frac{3}{4}$ or more bright
	bluewhitelyi
6b.	Antennal club elongated tapering to a point; DHW marginal band of metallic
	green broader > 3.0 mm, with undulating inner margin with darker color
	extending outward along veinsdegandii
7a.	DHW with submarginal greenish metallic band strongly dissected by black veins
	and with a black margin; VFW with three or four black spots in metallic blue
	or green area which may indent into black area; VHW and VFW with red or
	red-ochre only adjacent to body and in 2Aleprieuri
7b.	DHW with light green metallic marginal band with a very thin edge of black
	if present at all; no black veins dissect the band; DFW with one to five black
	spots in metallic green area which does not indent into black area; VHW and
	VFW with variable amount of red or red-ochre extending on to the wings; DFW
	with much brighter metallic blue

-----

. . .

## KEY TO FEMALE ASTEROPE

1a.	DFW with a broad orange median diagonal cross band and basal area bright
	blue; VHW light blue with four rows of black maculae, orange in basal area;
	VFW mostly orange
1b.	DFW without broad orange median cross band
2a.	DFW with yellow, orange or red in basal area or extending to tornus; a
	subapical diagonal band present
2b.	DFW without any vellow, orange or red color: a broad postmedian or
	submarginal iridescent band present.
3a	Antennal club elongated and tapering to a point: VHW with over ½ of
ou.	discal cell orange disculture reporting to a point, virth with over vir or
3h	Antennal club rounded and blunt not tangering to a point: VHW with almost
55.	no orange in discal coll
10	No of ange in discarce in head 1/ or 2/ with a single postmotion now
4a.	of laws rounded block meaning inside on inidescent succe surrounded by
	of large rounded black maculae inside an indescent green area surrounded by
	lines or bands
4b.	VHW not with above combination of markings
5a.	Antennal club rounded and blunt, not elongated or pointed; VFW and VHW
	with red or red-ochre at base
5b.	Antennal club elongated tapering to a point; VHW with orange at base
	of wingdegandii
6a.	DHW with submarginal band with a distinct black margin, with little or no white
	fringe; VFW with three to four black spots in metallic greenish area which often
	indents into black area; VHW and VFW with red adjacent to body and in
	anal cell to 2Aleprieuri
6b.	DHW with very broad metallic marginal band without black margin or very
	thin black margin; with much white fringe; DFW with one to five black spots
	in metallic area which do not indent into black area. VHW and VFW with variable
	amount of red extending on to the wings
	anoune or rea encodang on vo the mingo

## KEY TO MALE GENITALIA AND HYPANDRIA OF ASTEROPE

1a.	Hypandrium broad and bifid posteriorly, with lateral elongate chitinized rods
	extending anteriorly from posterior spiny areas, aedeagus 7.5-10.0 mm;
	saccus 7.0-8.0 mm; valva with chitinous lip at crista
1b.	Hypandrium elongate narrower or constricted, not bifid posteriorly, without
	chitinized rods; aedeagus < 6.0 mm, saccus < 5.0 mm
2a.	Hypandrium posterior lobes not rounded, but with angular lateral projection
	on each sideleprieuri
2b.	Hypandrium with rounded postero-lateral lobes, may have small angular
	projectionoptima
3a.	Hypandrium narrow elongate with postero-lateral expanded area with clusters
	of long heavy spines (0.6 mm); valva with 41-52 spinesmarkii
3b.	Hypandrium with postero-lateral area with short spines (0.3 mm or less);
	valva with 20-37 spines
4a.	Saccus short (2.0-3.2 mm); aedeagus short (2.8-4.5 mm)
4b.	Saccus longer (>4.6 mm); aedeagus longer (>5.6 mm)7
5a.	Hypandrium only slightly constricted, lateral margins nearly straight; postero-
	lateral areas with cluster of very small spines; valva with chitinous lip at
	cristawhitelyi
5b.	Hypandrium constricted and narrower, valva without chitinous lip at
	crista
6a.	Hypandrium greatly constricted posteriorly, postero-laterally extended; valva
	with about 19-20 spinesbatesii

## Asterope batesii (Hewitson), 1850

## Figs. 6, 7, 8, 9, 68, 76, 83

- Callithea batesii Hewitson, 1851. Trans. Ent. Soc. 1: pl. 11, f. 2 (♂); and 1857. Exot. Butt. 3: Callithea, f. 1 & 4 and explanation (2976). (♀). TL: Brazil [Amazonas] "river Amazon" [Tefé]. Syntypes: ♂ ♀ BM (ex. coll. Saunders) (Figs. 6-9) (Examined). =Callithea batesii munduruca Fassl, 1922. Ent. Zeit. 36(10): 4-5. TL: Brazil, [Pará] Rio
- Tapajós, Itaituba. Syntypes: ∂ & ♀ Location unknown. (Examined Fassl specimens in BM and MP) [Syn. nov.].
- =Callithea batesii aimeeana Fassl, 1922. Ent. Zeit. 36(10: 5-6. TL: Brazil, [Pará], Rio Madeira, Manicoré. Syntypes: ♂ & ♀ Location unknown. (Examined Fassl specimens in BM & MP) [Syn. nov.]

Description: Male. Antennal club is elongate narrow and pointed. DFW has the  $R_1$  and  $R_2$  branched basal to the  $r_{3-5}$ - $m_1$  at the end of the discal cell. The DFW has an orange rounded area in the basal  $\frac{1}{4}$ , with a wide postmedian dark purple to blackish band, and the outer  $\frac{1}{4}$ th metallic green. The DHW usually has basal orange in the costal and discal areas; the rest of the wing is dark purple to blackish with a submarginal green metallic line. The VFW has the basal  $\frac{1}{4}$  orange, the outer  $\frac{3}{4}$  with pale metallic blue with some median black shading, and two large and two small postmedial maculae. The VHW has the basal  $\frac{1}{4}$  orange and the outer  $\frac{3}{4}$  pale metallic blue with four rows of black maculae. The male hypandrium is greatly constricted posteriorly; the saccus is short (2.0-3.0 mm), and the aedeagus is also short (2.8-4.5 mm). The valva is without a chitinized lip at the crista, and there are 19-20 spines.

Female. The DFW is the same as in the male but with no deep purple, only blackish; the wings are rounded. The DHW has orange basally in the costal and discal areas; most of the wing is black with a submarginal green metallic line. The VFW and the VHW are as in the male. Antennae are the same as in the male. The female genitalia have the atrium chitinized with a collar, also a chitinized collar at the junction of the ductus bursae and corpus bursae. There are two concave elongate signa, length about 2.5 times width.

Average wing length is  $\delta$  (23-31)27 mm,  $\circ$  (24-30)27 mm.

Distribution: A. batesii occurs in the Amazon basin from Santarém in the Tapajós, Madeira, Purus and Amazon rivers in Brazil to near Iquitos in Perú and in Letícia, Colombia.

Taxonomy and Variation: This species is quite variable in size and color which has resulted in the description by Fassl of two forms. Male and female syntypes of A. batesii were examined in the BM and they are typical of most specimens over the range. The adults vary greatly in size. Male specimens measured from 23 to 31 mm forewing length. There does not appear to be any difference in size related to latitude and probably not to season. There is wide variation from the same locality. I have examined series of A. batesii munduruca Fassl, including Fassl specimens in the BM and MP. There is great variability in all the characters listed to separate this form, even from the same localities scattered throughout the range of batesii. The DFW has reddish-purple coloring, the verdigris margins are variable in width and coloring, and the orange on the DHW and on the VHW is variable in size and in shade. A. batesii aimeeana is variable in size, in the amount of coloring of the "green marginal bands", and in the intensity of blackness of the marginal and submarginal ocelli. On the basis of study of a rather large series of specimens of this relatively uncommon species, I have synonymized both munduruca and aimeeana. These forms exhibit the extremes of variation found in this species, but they occur throughout the range and are not geographically segregated. The location of these Fassl types is unknown, but I have examined series of Fassl specimens of munduruca and aimeeana in the collection of Madame Aimée Fournier in the Museum of Paris, which very probably contains unlabelled types, especially specimens from the type localities.

Biology: A. batesii occurs in evergreen and deciduous tropical forest especially in undisturbed areas. It is more common in river valleys. The adults fly above in the forest canopy and sometimes come to lower levels of the forest. According to Fassl (1922): "both sexes do react upon any bait." They are usually found singly and are considered to be relatively uncommon; however, 175  $\Im$  and 46  $\heartsuit$  have been studied in collections and determined.

The adults have been collected only from June to December with a few specimens reported from January through May. It appears that there may be a brood in June and July and another in September to December. They occur at lower altitudes from about 100 m to 250 m mostly in river valleys.

Immature Stages: There is a specimen of a dried larva in the BM, Rh 1544, identified as A. batesii by Moss. The larval setal pattern was determined and is presented in Table 3. A larva of C. batesii (or C. markii) was painted at Tefé, Amazonas, Brazil in August 1935. It is yellowish-orange with black bands. It looks very similar to the larval painting of A. sapphira (from Santarém) except that the base color is lighter yellow-orange and the black bands are narrower.

The host plant is reported to be Paullinia sp. of the family Sapindaceae (Moss, unpub.).

Specimens Examined: 175 & 46 Q

COLOMBIA: Amazonas, Letícia; PERU: Loreto, Pebas; Rio Mazán; Rio Nanay; Rio Napo; BRAZIL: Amazonas, Tefé; Humaitá; Ipixuna; Hyutanahã; Manicoré; Belém; Guajará; Rio Madeira; Borba; Tonantins; Florêncio; Lauara; Arima; Nova Olinda; Manacapuru; Rondónia, Pôrto Velho; Cachoeira do Samuel; Jaru; Pará, Rio Tapajós; Moju; Monte Cristo; Conceicão; Itaituba; Santarém; Aveiro; Miritituba.

Asterope degandii (Hewitson), 1857

A. degandii is limited mainly to the eastern slopes of the Andes and the upper Amazon valley. It is divided into the nominate form and three subspecies. Morphologically it is closely related to A. batesii having an antennal club that is elongate, narrow, and pointed. A. d. degandii is sometimes fairly common in Ecuador where I have collected many from bait traps in the canopy of the tropical forests. A. degandii and its subspecies are actively involved in mimicry relationships and mimicry rings (Table 2). The subspecies are relatively easy to identify from the key to subspecies. A. d. adamsi is somewhat variable and there appears to be an isolated undescribed subspecies in Colombia that is closely related.

Description: Male. The antennal club is elongate, narrow and pointed. The DFW has the  $R_1$  and the  $R_2$  branched basal to the  $r_{3-5}$ - $m_1$  at the end of the discal cell. The upper wing surface is deep purple, usually with some iridescent blue, with a metallic green band distally; the apical tip may be darker. The DHW is the same coloration as the DFW. The VFW has some basal orange. The amount of orange and blackish shading varies according to the subspecies; the wings are mostly pale metallic bluish or greenish with two large and two small black postmedian maculae. The VHW has only basal orange, or up to  $\frac{1}{2}$ 

of the wing orange, with four rows of black maculae on a light bluish metallic background. The male hypandrium is narrow with the posterior end little expanded. The valva is without a chitinous lip at the crista and there are 25-35 spines. The saccus is short, about 2.0-3.0 mm; the aedeagus is short, about 2.8-4.5 mm.

Female. The DFW is black with a wide (½th of wing) metallic greenish outer band, the wings are rounded, and the DHW same as the DFW. The ventral surface is similar to the male. The female genitalia has an atrium with a pair of chitinous extensions forming the ostium; the ductus bursae joins the corpus bursae without a chitinous collar. The corpus bursae has a pair of very elongate concave signa which have a length about three times the width.

### Key to Subspecies of Asterope degandii

Males.

1a.	VFW with basal orange-ochre extending $\frac{1}{2}$ - $\frac{3}{4}$ or more length of discal cell; VHW with orange-ochre covering basal half of wing, extending to or beyond cross
	vein of discal cell
1b.	VFW with basal orange-ochre only in basal $\frac{1}{4}$ to $\frac{1}{3}$ of the discal cell; VHW with
	to cross usin of discal cell
2a.	DHW with metallic green marginal band wide (3.0-5.0 mm); dorsal surfaces of both wings with some bright blue diffused with deep purple; VFW with basal
	orange-ochre in basal $\frac{1}{2}$ to $\frac{2}{3}$ and usually without black suffusion in distal $\frac{1}{3}$ of discal cell; VHW with basal orange-ochre rounded, not extending posteriorly
	in a point in anal cell, contained proximal to median row of black maculae
oh	DUW with motallia manning hand a surgery (2.5 to 4.0 mm), development of
20.	both wings blackish and deep purple result with some diffused dark blue in
	hasal areas: VFW with basal orange-ochre usually extending <sup>3</sup> / <sub>4</sub> of discal cell
	usually with black suffusion in distal <sup>1</sup> / <sub>4</sub> or more of cell: VHW with basal orange-
	ochre extending distally to a point in anal cell to second row of black
	maculae
3a.	DHW with a wide greenish metallic band extending to white fringed margin;
	VFW discal cell metallic green without any dark suffusion or with less than
	1/2 lightly shaded with bluish-black suffusion; VHW with orange-ochre extending
	about $\frac{2}{3}$ distance to cross vein of discal cell, not bordered by black diffused
	border
3b.	DHW with wide greenish border interrupted with dark blue cross veins and
	margin is narrow dark blue proximal to white fringe. VFW discal cell orange-
	ot and of diggal calls WHW with dark arange ashre extending distant of cross vein
	to cross usin of discal call; bordered by a black diffuse border: margin of orange-
	ochre is very irregular
Fem	ales.

1a.	DFW & DHW with deep azure blue (as bright as in males) diffused with some
	purple; very wide greenish metallic bands interrupted by narrow dark blue
	veins

1b. DFW & DHW deep blackish-purple, without deep blue; very wide greenish metallic bands not interrupted by narrow dark blue veins .....bartletti (females of adamsi & allyni unknown)

## Asterope degandii degandii (Hewitson), 1857 [Stat. rev.]

## Figs. 10, 11, 12, 13, 69, 77, 84

Callithea degandii Hewitson, 1857. Exot. Butt. pl. [2] Catogramma IX & Callithea, f. 7-8, and explanation. TL: "Amazon norte" on syntype label (author states "Upper Amazon" [Perú, Loreto, Nauta]. Syntypes: BM 1 & Rh. 9473, 1 ♀ Rh. 9474 (Examined) (Figs. 6 & 7).

Description: As in A. degandii except for differences listed for A. d. degandii in the key to subspecies. Average wing length 3 (27-34)30 mm, 9 (29-34)31 mm.

Distribution: A. d. degandii occurs from southern Colombia through eastern Ecuador with a very doubtful records in Panamá and Guayaquil, Ecuador. The distribution in northern Perú is not certain and it appears that intergrades and perhaps both A. d. degandii and A. d. bartletti occur in Iquitos, if these records can be considered valid.

Taxonomy and Variation: A. degandii degandii is quite similar to A. whitelyi srnkai; however, degandii has elongated pointed antennae and srnkai has round knobbed antennae. Two  $\delta$  syntypes of C. degandii were examined in the BM. They have deep blackish-blue coloration of the wings with relatively wide greenish margins. This is typical of the majority of specimens studied.

Careful examination of 300 specimens of both subspecies A. d. degandii and A. d. bartletti and analyses of the ranges of distribution substantiate the status of the two separate taxa. I collected a series of fresh specimens in Ecuador which provided valuable data on the range of variation. C. bartletti was described by Godman & Salvin (1878) who stated "Allied to C. degandii, the chief difference consisting in the deep purple colour of the upper surface, which in C. degandii is rich blue. On the under surface they are nearly alike." I have found that the best and most reliable characters for separation are the much wider greenish metallic marginal bands of A. d. degandii. On the VHW, the darker orangeochre basal area extends into the second row of black maculae on the inner anal margin. There is some variation in the purple and blue colorations of the upper wings, so that this is not always a reliable character.

Biology: A. d. degandii occurs in undisturbed tall evergreen tropical forest and in tall semi-deciduous tropical forest. The adults fly in the sun above the canopy or in the upper canopy. They are rarely seen at lower elevations in the forest. However, they occasionally fly down to baits on the forest floor in openings caused by the falling of a tree. I have observed them resting early in the morning at about 5-8 m, and when the sun is warmer they fly to the canopy. They readily enter traps baited with fermented pig or human feces or rotten fish and are somewhat attracted to well-fermented banana and other fruit. I have not observed them to fly outside of the forest in cut over areas as *A. optima* sometimes do. The flight period is from about 0900 to 1300 hours when the sun is shining. If it is cloudy and rains until about 1130 hours, adults may not fly the rest of the day even with bright sun. *A. d. degandii* is not uncommon and was collected in most undisturbed tall forest areas where baiting was undertaken in the canopy.

Adults fly throughout the year and there appear to be several broods. I have found them more common in November in Ecuador. They occur at elevations from about 100 m to 1,100 m.

*Immature Stages*: There are no known reports on the immature stages or food plants.

Specimens Examined: 95 3 51 Q

PANAMA: Chiriquí (doubtful record). COLOMBIA: Putumayo, Rio Putumayo; Ticunas; Mocoa; Florida; ECUADOR: Napo, Sachas; Puerto Misahualli; Tena; Aguarico; Sarzayacu; Rio Pano; Rio Napo; Rio Anzu; Pastaza, Canelos 800 m; Rio Pastaza; Sarayacu; Tungurahua, Puyo; PERU: Loreto, Iquitos X; Nauta.

Asterope degandii bartletti (Godman & Salvin), 1878 [Stat. rev.]

Figs. 14, 15, 16, 17, 69, 77, 84

Callithea bartletti Godman & Salvin, 1878. Ann. Mag. Nat. Hist. 1(5): 264. TL: Perú, [Loreto], Lower [Rio] Ucayali; Rio Napo. Syntypes: BM, 1 & Rh. 9471, 1 & Rh. 9472, 1 & Rh. 9470 (Examined). (Figs. 14, 15).

=Callithea adamsi frigga Röber, in Seitz. [1916]. Macrolep. World 5: 491. TL:Perú, Cuzco. Syntypes: Location unknown, not found in Mus. Berlin [Syn. nov.].

Description: As in A. degandii except for differences listed for A. d. bartletti in the key to subspecies.

Average wing length ♂ (28-33)30 mm, ♀ (28-33)31 mm.

*Distribution*: This subspecies occurs from São Paulo de Olivença in Amazonas, and western Acre, Brazil to central Perú and also in the Cuzco area.

Taxonomy and Variation: A. d. bartletti is similar to A. d. degandii and was formerly considered to be a synonym since there is some confusion in the types. The syntype  $\hat{\sigma}$  of A. d. bartletti from the Rio Napo, Ecuador in the BM, Rh. 9472, is more typical of the distinct Peruvian population. At an earlier time Ecuador included the mouth of the Rio Napo near Iquitos, Perú.

C. adamsi frigga Röber, in Seitz, [1916] was described as follows: "frigga subsp. nov. from Perú (Cuzco) is above hardly differing from adamsi, but shows beneath the yellow basal area on the hindwings extended as in degandii, on the forewings, however, more extended, the black markings are also much more developed." Röber's type or types have not been found. According to the description, if the orange is more extended on the VFW and the VHW as in degandii, it would appear to be typical bartletti with more developed orange and black markings on the VFW. I have studied specimens from Cuzco province and other areas which were typical bartletti, but with some extension of orange in the VFW. The amount of orange and black markings on the VFW is variable from a single locality. Therefore, frigga is synonymized.

*Biology*: This subspecies occurs mostly in undisturbed evergreen and deciduous tropical forest the same as *A. d. degandii*. The adults fly in the sun above the forest canopy and in the canopy. They are attracted to baits and have nearly the same habits as *degandii*. They also fly to baits on the forest floor especially in openings of the forest. Adults have been collected throughout the year with more found in May to September. They occur at altitudes from about 100 m to 1,600 m.

Immature Stages: There are no known reports on the immature stages or food plants.

Specimens Examined: 128  $\circ$  40  $\circ$ 

PERU: Loreto, Iquitos; Santa María de Nanay; Mishana; Boquerón del Padre-Abad; Cahuapanas; Pebas; Rio Cachiyacu; Yurimaguas; Chambirayacu; Contamana; Nauta; Pucallpa; San Martín; Rio Seco; Tocache; Tarapoto; Huánuco, Bosque Nacional de Iparía; Aguaytía; Tingo María; Cuzco, Illapani Viejo; Junín, La Merced; Chanchamayo; Rio Satipo 800 m; Rio Perené; Pasco, Pozuzo 800 m; Palcazu; Rio Pichis; BRAZIL: Amazonas, Tabatinga; São Paulo de Olivença; Rio Purus; Benjamin Constant; Rio Javarí; Rio Itacuaí; Acre, Pórto Walter; Alto Rio Juruá.

## Asterope degandii adamsi (Lathy), 1903 [Stat. rev.]

#### Figs. 18, 19, 69, 84

Callithea adamsi Lathy, 1903. Entomol. 36: 105, pl. 2, f. 1 & 2. TL: Perú [Junín] Rio Perené 4000'. Syntypes: BM 15  $\Im$  coll. H. J. Adams. HT  $\Im$  and 14  $\Im$  paratypes (Examined) (Figs. 18, 19)

Description: As in A. degandii except for differences listed for A. d. adamsi in the key to subspecies.

Average wing length & (27-32)30 mm.

Distribution: The known range of A. degandii adamsi is in Huánuco, Pasco and Junín provinces in central Perú. However, there are two specimens from Iquitos, Perú (UN) and two from Mocoa, Colombia (MP) where they occur with A. d. degandii. There is also a specimen from Medellín, Colombia in the SI. These are difficult to explain, and they may be disjunct populations if the records are valid.

Taxonomy and Variation: A. d. adamsi was described by Lathy (1903) based on 15  $\hat{\sigma}$  types in the BM which were examined. I have studied 55  $\hat{\sigma}$  and there is some variation in the amount of orange on the ventral surfaces of the wings. An extreme from Mocoa, Colombia has the crossvein  $m_2 \cdot m_3$  closing the discal cell on the VHW, bright orange. There is some variation in the black maculae on the VHW where there may be four or five rows of maculae, and there is much variation in the size and shape of the maculae adjacent to the reduced orange area. There may be one to four postmedian black maculae on the VHW. There are no valid differences from A. d. degandii observed in the coloration of the dorsal surfaces. No females have been reported to my knowledge.

*Biology*: This subspecies occurs in the tropical forest canopy layer. The adults are attracted to baits but are uncommon. Adults have been collected from May to October and in December. There are insufficient records to determine whether there are any peak emergence periods. They have been found from elevations of about 200 m to 1,300 m.

Immature Stages: There are no known data on the immature stages or host plants.

Specimens Examined: 55  $\circ$  0  $\circ$ 

COLOMBIA: Antioquia, Medellín; Sep. 1 ♂ SI; Mocoa 2 ♂ MP; PERU: Loreto, Iquitos 2 ♂ UN; Pasco, Pozuzo 2 ♂ AA; No specific locality Dec. 1 ♂ JC; Huánuco, Puerto Inca 2 ♂ UN; Junín, Perené 1,300 m, Oct. 15 ♂ incl. HT coll. M. J. Adams, BM; 1 ♂ (coll. by Watkins same data as type) AA; 1 ♂ MP; Satipo 4 ♂ Oct. Jul. AA; Jan. 3 ♂ AM; 1 ♂ HD; 3 ♂ (UC); Rio Ipoki, Ipokiari May, 5 ♂ UN; Shanki; Rio Satipo 800 m Aug. 1 ♂ UN; Chanchamayo 3 ♂ AM; 1 ♂ BM; 1 ♂ MP; La Merced 2 ♂ BM; Rio Colorado 1 ♂ BM; 1 ♂ MP; No specific locality Jun. 2 ♂ MM; 1 ♂ SI; Cuzco, Rio Tono, 400 m, MP.

Asterope degandii allyni [Subsp. nov.]

## Figs. 20, 21, 69, 84

=Callithea adamsi Smart, 1975. The International Butterfly Book, p. 201, f. 56 (nec Lathy, 1903). Ventral view of A. d. allyni.

*Description*: Male. Antennae have a narrow elongate and pointed club. The DFW is a beautiful dark purplish with iridescent blue, with more blue basally in the costal and postmedian areas. There is a broad metallic green marginal band with a blue apical area. The DHW is dark purplish with iridescent blue especially in the basal and postmedian

area adjacent to the broad metallic green marginal band. There is a thin marginal border of blue. The DFW is metallic slate blue with diffuse blue-black in the discal cell and posterior part of wing. The basal part of the wing has orange-ochre extending slightly distally on the main veins. There are two large and two small postmedian black maculae. The VHW has the basal ¼ to ¼ orange-ochre with a very irregular margin which is bordered by a black diffuse band. The base color of the wing is a golden metallic slate blue color, with four rows of black maculae. The first row has elongate stretched and diffuse maculae, and the outer submarginal row has narrow elongate black maculae forming a broken line.

The male hypandrium and genitalia are illustrated in Fig. 69, similar to A. d. degandii. Female. Unknown.

Wing length ♂ (30-31)30.3 mm.

HOLOTYPE: PERU: Huánuco, Tingo María, 800 m. Collected October 1981 by D. W. Jenkins. 1 ♂ genitalia preparation no. 6159. PARATYPES: 8 ♂. Deposition of type material: Holotype ♂ and 1 ♂ paratype in Allyn Museum; 3 ♂ paratypes in Universidad Nacional Mayor de San Marcos, Museo de Historia Natural, Lima, Perú; 1 ♂ paratype in Smithsonian Institution, 3 ♂ paratypes in Henri Descimon Coll., Marseille, France, 1 ♂ paratype in coll. Danny Burk.

Distribution: It is presently known from central Perú from Huánuco and Junín provinces.

Taxonomy and Variation: The dorsal surface has much iridescent blue similar to A. d. degandii from southern Colombia and Ecuador. It is very different from the dark purple with little dark blue of the closely related A. d. adamsi from nearby central Perú. The marginal metallic greenish band of A. d. allyni is narrower and has blue veins interrupting the band. There is a purplish blue narrow margin which also distinguishes it from A. d. adamsi. The very reduced orange-ochre on both the VFW and the VHW and the surrounding diffuse black border of the basal orange-ochre on A. d. allyni also separate it from adamsi. There is slight variation in the amount of black marking and dark suffusion around the orange-ochre on the VHW. A. d. allyni is sympatric with A. d. markii over part of its range and may be a separate species instead of a subspecies.

*Biology*: The adults have been collected in semi-deciduous tropical forest in the Huallaga valley at an elevation of about 800 m and in the Shanki region of the Rio Satipo at about 400 m. They have been collected in March, August, October, November and December.

*Immature Stages*: Nothing is known about the immature stages or food plants.

Specimens Examined: 10  $\delta$ 

PERU: Huánuco, Tingo María, Oct. 1  $\circ$  D. W. Jenkins, Holotype AA; Mar. 1  $\circ$  J. Y. Miller, Paratype AA; Oct. Dec. 2  $\circ$  M. Rojas, Paratypes UN; Jul. 1  $\circ$  Coll. Danny Burk; Tingo María; Mantensión, Nov. Dec. 3  $\circ$  H. Descimon, Paratypes, HD; Junín, Shanki, Rio Satipo, Aug. 1  $\circ$  UN; No specific locality June 1  $\circ$  SI.

This beautiful new subspecies is named to honor the memory of the late Dr. Arthur C. Allyn, who provided enthusiastic help, an excellent lepidoptera collection, and facilities which contributed significantly to this study. He is missed greatly by his many friends.

#### Asterope markii (Hewitson), 1857

A. markii is the most widespread and variable species of the genus. The species extends from Colombia to southern Perú and throughout much of the Amazon basin. There are four subspecies in addition to the nominate form. Two subspecies, A. m. davisii and A. m. hewitsoni, are common and are geographically separate; however, there is extensive intergradation from southeastern Ecuador to southern Perú. This has resulted in some forms which have been described and are here synonymized.

In the lower Amazon extending into the Tapajós, Madeira and Purus rivers, A. m. boyi

occurs rarely. This subspecies has shorter orange and brighter blue markings on the DFW and more orange on the VHW. It is closely related to *A. m. markii*. The hypandria and male and female genitalia are very similar in the different subspecies; however, the wing markings are distinct. A new subspecies *A. markii ackeryi* is described from near Obidos, Brazil. It is part of a mimicry ring with species and forms of *Callicore* and *Agrias*. It is most closely related to the nominate *A. m. markii*.

Key to Subspecies of Asterope markii

## Males.

1a.	DFW with orange-red or yellow extending from the base and nearly to the tornus
	(1-2 mm from edge) covering $\frac{1}{2}$ or more of the wing
1b.	DFW with orange-red or yellow extending from the base to about 1/2-3/4 distance
	or less to tornus (to 4 mm or more from edge) covering $\frac{1}{3}$ to less than $\frac{1}{2}$
	of wing
2a.	DFW with vellowish-orange extending from basal costal area and forming a
24.	very broad submedian hand: the basal 1/4 or 1/4 of discal cell dark blue extending
	postoriorly more distally in Cu-24. (The dark blue is reduced in
	intergrades)
9h	DEW with orange red from base nearly to the termus: the discal cell and Cu. 2A
20.	with out doop blue (except in intergrades in which the deep blue modified is
	without deep blue (except in intergrades in which the deep blue marking is
0	variable)
3a.	DFW with yellow or deep reddish-orange extending to about 34 distance to
	tornus, and extending posterior to $Cu_2$ ; with a subapical light blue band; VFW
	with over <sup>1</sup> / <sub>2</sub> orange, without subapical band; VHW usually with basal orange
	extending into anal foldboyi
3b.	DFW with red or orange basal area extending $\frac{1}{3}$ to $\frac{1}{2}$ length of wing4
4a.	DFW with basal <sup>1</sup> / <sub>3</sub> rounded orange, outer <sup>2</sup> / <sub>3</sub> with dark bluish purple, with a
	wide subapical green band forming an arc to the tornus. The distal area is black.
	DHW with dark bluish-purple; orange may or may not be present in costal area.
	VFW basal $\frac{1}{2}$ to $\frac{1}{2}$ orange, distal $\frac{1}{2}$ grey to black with three subapical black
	maculae. VHW with orange in costal and anal areasmarkii
4b.	DFW with red basal area in basal $\frac{1}{3}$ to $\frac{1}{2}$ extending slightly past end of discal
	cell, and basal ¼ of Cu,-Cu,; area posterior to Cu, blackish-blue; subapical area
	with a very prominent white diagonal band; DHW black with dark blue
	iridescence, with four greenish submarginal elongate maculae; VFW similar to
	DFW but with slate blue distal to subapical white bands: VHW grey-blue with
	basal area reddish
Fen	nales
1 011	
la	DFW with basal orange to dark orange extending $\frac{1}{2}$ to $\frac{2}{3}$ distance to tornus
Ia.	subanical area with wider (2 mm) and longer light hlue hand
lh	DEW with basel vellow erenge or dark erenge extending from base to near
10.	tornug covering over 14 of wing subarical area with a new ow (1 mm) light him
	tornus, covering over 72 of wing; subapical area with a narrow (1 mm) light blue

Description: Male. The antennae have a round knobbed and flat club. The DFW has the  $R_1$  and  $R_2$  branched basal to the  $r_{3-5}m_1$  at the end of the discal cell. The basal area has a yellowish, orange, or reddish marking which in different subspecies may be in the basal  $\frac{1}{3}$  or extend across the wing to the tornus. The area distally is black or purplish-blue with a subapical diagonal band of white to paler metallic blue. The DHW may or may not have some orange in the costal area. The wings are black with deep iridescent blue in the distal half, may be subdued in some subspecies, and may have a submarginal greenish metallic line (in *m. markii*). The VFW has the basal half orange or yellow which may extend to the tornus; the distal part is metallic pale blue or greenish with varying amounts of diffuse blackish and two large and one or two smaller postmedian black maculae. The VHW is pale blue, usually with some orange in the costal and anal fold areas, and with four rows of black maculae in the distal half. There may be some orange in the anterior distal area. The male hypandrium is narrow with expanded postero-lateral areas on each side with a cluster of long heavy spines (0.6 mm). The valva is without a chitinized lip at the crista; 41-52 spines.

Female. The DFW is similar to the male, but subdued bluish and purplish or all black; the wings are rounded. The DHW may or may not have orange in the costal area. The wings are black or subdued dark purplish with a submarginal line of narrow greenish maculae. The VFW and VHW are similar to the male.

#### Asterope markii markii (Hewitson), 1857 [Stat. rev.]

#### Figs. 22, 23, 24, 25, 25A, 25B, 70, 78, 85

- Callithea markii Hewitson, 1857. Exot. Butt. [63] Callithea (partim), pl. [32], figs. 2, 3, 6, nec 5 and explanation. TL: Brazil, Amazons, Ega [=Tefé], "New Granada" [Colombia, probably refers to fig. 5] Syntypes: ∂, ♀ BM (Examined) [Figs. 22, 23].
- =Callithea wallacei Staudinger, 1886. Exot. Tagf. 1: 123. Unnecessary Nomen novum for C. markii Hewitson, 1857. Partim, figs. 2, 3, 6 nec 5.
- =Callithea refulgens Kaye, 1919. Ann. Mag. Nat. Hist. (9)4: 86. TL: "Brazil, Jary, Parana" [=Amazonas, Paraná do Jary]. Holotype: BM Type Kaye ♂ Figs. 25A, 25B (Examined) [Syn. nov.]

Description: As in A. markii except for differences listed for A. m. markii in the key to subspecies.

Average wing length ♂ (27-30)29 mm, ♀ (30-31)30.5 mm.

Distribution: A. m. markii occurs in the upper Amazon valley from near Manaus to Rondônia and Acre in Brazil and west to near Iquitos, Perú.

Taxonomy and Variation: This beautiful subspecies has bright orange on the basal <sup>1</sup>/<sub>3</sub> of the DFW, with some bright blue and a subapical metallic green band. The orange pattern is similar to *A. batesii*. However, the DHW and the lower wing patterns, the round knobbed antennae, the long spines on the hypandrium and the heavily curved aedeagus are very different. The wing patterns and coloration are quite variable, especially the amount of orange in the costal region of the DHW and in the costal area and the anal fold of the VHW. I have examined the male and female syntypes of *C. markii* from Tefé, Brazil in the BM and they are typical of the most common wing pattern over the range of the species.

C. refulgens is one of the extremes of wing pattern and color variation. It was described as differing from A. markii by the absence of orange in the costal area of the DHW and by the presence of ochraceous-orange in the distal area of the VHW. In a fairly large series from Tefé, both of these characters may or may not be present in the same population. The holotype  $\delta$  of A. refulgens (Figs. 25A and 25B) was studied in the BM. The specimen is mounted with the basal part of the hindwing (which has some orange) under the forewing. The amount of orange is variable on the DHW. A. refulgens is synonymized, but these variations are noted to exist throughout the geographic range of A. m. markii. The type locality of refulgens was stated to be "Brazil, Parana(?). This locality is more than questionable." The holotype  $\hat{\mathcal{S}}$  has a label "Jary-Parana, Brazil". This is Paraná do Jary in Amazonas, Brazil, not distant (about 300 km) from Tefé, the type locality of *markii*. A specimen of *A. markii boyi* was misidentified as *refulgens* from Paraná do Jary, Brazil in the Museum of Paris collection.

*Biology: A. m. markii* is relatively uncommon; only 59 specimens have been identified. According to Bates (1864) it may be locally common. "It is more abundant that *batesii* at Tefé, and sometimes escapes from the forest to join the crowds of butterflies of other genera at the damp margins of water in sunny places."

Adults have been collected from June to February with most found from July to October. None have been reported from March to May. They occur mostly in river valleys from about 100 to 300 m.

*Immature Stages*: Nothing is known to have been reported on the immature stages or on the host plants.

Specimens Examined: 52 3 12 9

COLOMBIA: Amazonas, Letícia 1  $\circ$  Sept. JC; New Granada. Types  $\circ$   $\circ$  Hewitson 1857 ((?) is for davisii Error?). BRAZIL: Amazonas, São Paulo de Olivença 1  $\circ$  MN; Tefé, Jul.-Oct. 10  $\circ$  1  $\circ$  MP; Aug. Sep. Nov. 8  $\circ$  1  $\circ$  MN; Sep. 1  $\circ$  AM; 1  $\circ$  (genitalia 6634) AA; Oct. 12  $\circ$  4  $\circ$  BM; 1  $\circ$  AA; Sep. 1  $\circ$  AA; Rio Japu Jul 1  $\circ$  MN; Manicoré Aug. 3  $\circ$  MN; Paraná do Jary 1  $\circ$  BM; Lower Rio Madeira Sep. 1  $\circ$  BM; Rio Madeira 1  $\circ$  MN; Humaitá Jul. 1  $\circ$  BM; Manacapuru 1  $\circ$  MP; Juruá 2  $\circ$  BM; Rio Purus Dec. 1  $\circ$  BM; Rio Javarí 1  $\circ$  1  $\circ$  MN; "Amazon Sup." 1  $\circ$  MP; Rondônia, Cachoeira do Samuel Jun. 1  $\circ$  MN; Rio Javarí 1  $\circ$  1  $\circ$  MN; Põrto Velho, Rio Madeira 1  $\circ$  MN; Rondônia Oct. 1  $\circ$  MM; Acre, Alto Juruá 2  $\circ$  MN; PERU: Loreto, Rio Nanay, Feb. 1  $\circ$  MN.

Asterope markii boyi (Röber, in Seitz), [1924] [Stat. rev.]

Figs. 26, 27, 28, 29, 70, 78, 85

Callithea boyi Röber, in Seitz [1924]. Macrolep. World. 5: 1031, pl. 102c, row d, f. 4. TL: Brazil, "Mujo" = [Pará, Tapajós, Mujo]. Type: 1 ♀ Holotype, location unknown.

Description: As in A. markii except for differences listed for A. m. boyi in the key to subspecies.

Average wing length  $\circ$  (27-29) 28 mm,  $\circ$  30 mm.

Distribution: This subspecies occurs from the lower Rio Tapajós in Pará to Rondônia and Acre, Brazil.

Taxonomy and Variation: A. markii boyi was described by Röber, in Seitz [1924] in a supplement and a figure of the  $\varphi$  holotype was illustrated in a plate separate from other *Callithea*. It was described from a single  $\varphi$ .

"Callithea boyi (102 C d). This new species was discovered by Mr. Carlos Boy in September 1922 Mujo (Lower Amazon); before me was a Q which has been figured. It is allied to *batesii* (99f); the differences above are to be seen from the figures, the under surface of the hindwing, however, is not verdigris as in *markii*, but of a delicate grey which is lighter in the larger distal half; yellow colouring is only noticeable in a spot at the base of the wing and in a stripe not coherent with the basal spot, at the proximal margin, the four rows of black spots consist of almost equally large spots, the proximal three rows being composed of smaller spots than in *batesii* whereas the submarginal spots are larger and distinctly crescentiform. The under surface of the forewing resembles more that of *markii* (99f) but the basal yellow colouring occupies a larger space, the distal half is brightened up in the centre, and there are only 3 black

spots, the anterior one of which is very small, whilst the posterior one is only indicated by some scales."

A. markii boyi is apparently quite rare since it is known from only 8  $\circ$  and 2  $\circ$ . The specimens from the lower Amazon including the type are a deep orange, while those at the western edge of the known range are yellow. An orange  $\circ$  labeled "Amazon Superior", from the Staudinger Coll., Holland Coll., CM, fits the description of the holotype  $\circ$  exactly and could be the holotype. It is illustrated in Figs. 28, 29.

There is a slight variation in the length of the orange or yellow basal marking on the DFW, in the presence or absence of orange in the costal area of the DHW, and in the amount of costal, anal and distal orange or yellow markings. There is almost as much orange on the VHW as in *A. markii*.

There may be two valid subspecies, one with yellow and one with orange markings on both the dorsal and ventral surfaces. Additional specimens and more study are needed.

*Biology*: Nothing is known of the biology of this subspecies. It has been collected in September and is known to occur in river valleys from about 100 m to 300 m.

Immature Stages: Nothing is known of the immature stages or food plants.

Specimens Examined: 8  $\circ$  2  $\circ$ 

BRAZIL: *Pará*, Mujo, Tapajós, Sept. 1  $\bigcirc$  Holotype (orange) (Röber in Seitz, [1924] pl. 102C, d, f. 4); *Amazonas*, Paraná do Jary 1  $\Diamond$  (orange) MP; *Mato Grosso*, Rio Verde 1  $\Diamond$  (yellow) MN; No specific locality 1  $\Diamond$  (yellow) MN; *Rondônia*, Guapore, Cachoeira do Samuel, Rio Jamari 2  $\Diamond$  (yellow) MN; Calama, Rio Madeira 1  $\Diamond$  (orange) BM; *Acre*, Alto Juruá 1  $\Diamond$  (yellow) MN; Xapuri 1  $\Diamond$  (yellow) MN; "Amazon superior" No specific locality 1  $\Diamond$  (yellow) (Staudinger Coll; Holland Coll.). CM.

#### Asterope markii ackeryi [Ssp. nov.]

## Figs. 30, 31, 78, 85

Description: Male. The antennae have the club round, knobbed, and flat. The DFW is red in the basal  $\frac{1}{3}$  to  $\frac{1}{2}$  extending slightly distal to the end of the discal cell, and in the basal  $\frac{1}{2}$  of Cu<sub>1</sub>-Cu<sub>2</sub>; the area posterior to the Cu<sub>2</sub> is blackish-blue; the postmedian area is bluish-purple; the subapical area has a prominent white diagonal band; and the apical area is black. The DHW is black with some dark blue iridescence and three or four elongate blue distal to the subapical white diagonal band, with two postmedian black maculae immediately proximal to the white subapical band. The VHW is slate blue with a small amount of red at the base of the wings; the anal cell is slate blue; the hind wing has four rows of black maculae, and the outer row is flattened and comma-shaped. The hypandrium at the posterior end is divided into two expanded lateral projections, each with medium length spines absent in the central concave margin.

Female. Unknown.

Wing length 3 28 mm.

HOLOTYPE: BRAZIL: *Pará*, Obidos. Collected August 25, 1983. 1  $\delta$  is in the private collection of Mr. Philip May, to be deposited in the Allyn Museum.

*Distribution*: It is known only from the holotype male with a label which states Obidos, *Pará*, Brazil. It is presumed to come from north of Obidos or from the Rio Ariramba, Amapá, Brazil, localities where its model or mimic *Callicore excelsior arirambae* Durke occurs.

Taxonomy and Variation: While only the holotype male is described, another specimen has been reported but it has not been located. This subspecies makes an almost perfect mimic pair with *Callicore excelsior arirambae* and also with *Agrias aurantiaca* morph *trajanus*. I have examined and photographed the holotype kindly loaned by Mr. Philip May. I drew the protruding posterior end of the hypandrium since it was not permitted to dissect this specimen. The DFW is more similar to *A. m. markii* but the VHW resembles *A. m. davisii*.

*Biology*: Nothing is known of the biology of this subspecies except the date and place of capture of the specimen. It was presumably collected August 28, 1982 near Obidos, Brazil, which is under 200 m elevation, but the exact locality is unknown.

Immature Stages: Immature stages and host plants are unknown.

This new subspecies is named for Mr. Phillip R. Ackery, Department of Entomology, British Museum (Natural History) who made an earlier study of *Asterope*. He very kindly helped me at the British Museum and loaned specimens and 15 slides of  $\Im$  genitalia he had prepared.

Asterope markii hewitsoni (Staudinger), 1886 [Stat. rev.]

## Figs. 32, 33, 34, 35, 70, 78, 85

- Callithea hewitsoni Staudinger, 1886. Exot. Tagf. Vol. 1: 123. TL: "New Grenada" [Colombia]. Syntypes: & BM. Nomen novum for C. markii Hewitson, 1857. Exot. Butt. Callithea [63], pl. 32, fig. 5 (Examined). (Figs. 32, 33).
- =Callithea markii Hewitson, 1857. Exot. Butt. [63] (partim) pl. [32] fig. 5 (nec figs. 2, 3, 6). TL: "New Grenada". Syntypes:  $(\Im)$  BM.

Description: As in A. markii except for differences listed for A. m. hewitsonii in the key to subspecies.

Average wing length ♂ (28-31)30 mm. ♀ (30-30.5)30.25 mm.

*Distribution*: This subspecies occurs from north central Colombia and southern Venezuela to Ecuador, Iquitos and the Rio Ucayali and Madre de Dios area in Perú. It extends eastward to Rondônia, Acre, and western Amazonas in Brazil.

Taxonomy and Variation: A. m. hewitsoni was originally described by Hewitson as A. markii (1857). C. hewitsoni was described by Staudinger (1886), based on Hewitson (1857) from Colombia. There is much intergradation with A. m. davisii, which includes coloration on the DFW from red or reddish-orange to orange. There is also variation in the amount of dark blue in the basal to the medial area in the  $Cu_2$  posteriorly and rarely in the discal cell. Furthermore, there is variation not apparently related to intergradation in the amount of orange on the VHW in the basal, costal, and anal fold area and also distally in the costal area. In some specimens with red on the DFW there is also orange on the DHW in the basel, on the DFW there is also have narrow greenish submarginal maculae on the DHW.

*Biology*: The adults are found in the same tropical evergreen and semideciduous forests as *A. m. davisii*. They are more often found in river valleys. They are more widespread but are less common than *A. m. davisii*.

Adults have been collected from about 200 to 800 m. They have been found throughout the year with more collected in August and November.

Immature Stages: No reports are known on the immature stages and host plants.

Specimens Examined: 93 & 2 Q

VENEZUELA: Amazonas, Alto Orinoco; Confluence of Orinoco & Rio Ugueto; COLOMBIA: Santander, Rio Opón; Caquetá, San Vicente del Caguán; Rio Peneya 1,000 m; Boyacá, Rio Upia; Muzo; Cundinamarca, Bogotá; Meta, Villavicencio; Rio Guatiguiá; Baldios; Putumayo, Umbria; ECUADOR: Napo, Sachas; Coca; Tena; Puerto Misahualli; Curaray; Pastaza, Sarayacu; Canelos; Tungurahua, Baños; Rio Pastaza 1300 m; Latas; Hacienda la Merced; Morona-Santiago, Macas X; PERU: Loreto, Iquitos; Pebas; Rio Cachiyacu; Achinamiza; Aguaytía; Mazán; Explorama; Upper Marañón; Contamana X; Yarina-Cocha; Pucallpa; Balsapuerto X; Yahuas Territory; San Martín, Rio Chambirayacu; Moyobamba; Cuzco, San Antonio X; Puno, Tirapata X; Yahuarmayo X; Cahuapanas; Pasco, Chuchurras X; Palcazu; Madre de Dios, Boca Rio La Torre X; Inambari X; Puerto Maldonado; Rio Tambopata; Iberia; BRAZIL: Amazonas, Rio Caiary (=Rio Uaupés); Benjamin Constant; São Paulo de Olivença; Rio Javarí; Juruá; Tabatinga; Yauareté; Acre, Rio Purus; Pôrto Walter; Alto Juruá; Xapuri; Rondônia, Vilhena; Pimenta Bueno; Calama; BOLIVIA: No specific locality.

#### Asterope markii davisii (Butler), 1877 [Stat. rev.]

#### Figs. 36, 37, 38, 39, 70, 78, 85

- Callithea davisii Butler, 1877. Ann. Mag. Nat. Hist. (4) 20: 124. TL: PERU, [Loreto] [Rio] Ucayali, Syntypes: 5 ♂ BM. (Examined) (Figs. 36, 37).
- =Callithea davisii croceus Kaye, 1919. Ann. Mag. Nat. Hist. (9)4: 88. TL: ECUADOR, Pastaza, Sarayacu [Error?], BRAZIL, Acre, [Rio] Juruá. Syntypes: ♂ BM Joicey Coll. (Kaye, 1919: 86 states croceus is from "N. Perú, Contamana, Rio Ucayali".) (Examined) [Syn. nov.]
- =Callithea davisi [sic] tirapatensis Kaye, 1919. Ann. Mag. Nat. Hist. (9)4: 86. TL: PERU, [Puno], Tirapata, Yahuarmayo. Syntypes: BM Joicey Coll. (Examined) [Syn. nov.]
- =Callithea davisii forma praedives Stichel, 1936. Mitt. D. Ent. Ges. Jahrg. 6: 63-64. TL: PERU, [San Martín], Rio Seco, Jepelacio. Type: HT  $\hat{\sigma}$  in ZM (photographed by G. Lamas) [Syn. nov.]

Description: As in A. markii except for differences listed for A. m. davisii in the key to subspecies. Average wing length  $\hat{\sigma}$  (27-30)28 mm,  $\circ$  30 mm.

Distribution: A. m. davisii occurs in central Perú from south of the Rio Marañón and west of the Rio Ucayali, south to the Puno area and perhaps in Bolivia. Intergrades are extensive on the border of the population with A. m. hewitsoni.

Taxonomy and Variation: A. m. davisii is highly variable probably because it is involved in mimicry and mimicry rings. A. m. davisii was described by Butler (1877) from five  $\Im$ specimens now in the BM. A syntype labeled by P. Ackery is shown in Figs. 36 & 37. I have carefully examined these syntypes. I have examined the syntypes of A. davisii croceus Kaye (1919), which appears to be an exact duplicate and it is synonymized. C. davisii forma praedivas Stichel (1936), according to translation of the original description, is the same as C. m. davisii  $\circ$  with blue submarginal markings on the anal angle of the DHW. These blue markings are found in about 25% of specimens in large series from the same locality so it is synonymized. A. m. davisii was described from the Rio Ucavali area of Perú. This is in the intergrade area between davisii and A. m. hewitsoni. The type of davisii is a yellow-orange intergrade with only a small amount of dark bluish-purple extending from the hind margin of the DFW into Cu<sub>2</sub>-A and into the base of the discal cell. The typical davisii population extends from southern Ecuador to west of the Rio Ucayali in Perú. A. davisii tirapatensis Kaye (1919) is a typical example of this population and is synonymized after careful study of the syntypes. Intergrades with A. m. hewitsoni are darker orange with some pinkish, and they have various amounts of bluish-purple marking toward the discal cell of the DFW.

Biology: A. m. davisii occurs relatively commonly in evergreen and semideciduous tropical forest. It has been collected more often in river valleys. It flies to the river banks where

it has been collected more easily especially in the dry season. It is attracted to fermenting feces and rotten fruit.

Adults have been collected at elevations from about 300 to 1,100 m. They have been found every month of the year. There appears to be greater emergence from June to November according to available records.

Immature Stages: No reports are known on the immature stages and food plants.

Specimens Examined: 287 ♂ 3 ♀

ECUADOR: Morona-Santiago, Macas x; PERU: San Martín, Rioja; Jepelacio; Yumbatos; Tarapoto; Rio Mixiolla; Rio Seco; Loreto, Contamana X; Huánuco, Tingo María; Rio Huallaga; Santa Teresa; Cuchacas; Pasco, Chuchurras; Rio Pachitea; Cuzco, Illapani Viejo; Junín, Chanchamayo; Rio Perené; Satipo; Puno, Tirapata; Chaquimayo; Yahuarmayo X; Madre de Dios, Rio Tambopata X; Inambari X.

#### Asterope buckleyi (Hewitson) 1869

## Figs. 40, 41, 42, 43, 71, 79, 86

Callithea buckleyi Hewitson, 1869. Equat. Lep.: 29, n. 52. TL: "Ecuador" [Pastaza], Rio Rutuno. Syntype: 1 ♂ BM Type Rh. 1968 (Examined) (Figs. 40-41).

Callithea buckleyi staudingeri Röber, in Seitz, [1916]. Macrolep. World 5: 491. TL: Brazil, [Amazonas] São Paulo do Olivença; Perú, [Loreto] Yurimaguas. Syntypes; &, location unknown, not found in Berlin Museum [Syn. nov.]

=Callithea buckleyi dilata Lathy, 1929. Ann. Mag. Nat. Hist. Ser. (10)3: 194. TL: Colombia [Putumayo] Mocoa. Syntypes: 6 ♂ MP. (Examined) [Syn. nov.]

Description: Male. The antennal club is somewhat expanded but flat and pointed. The DFW has the  $R_1$  and  $R_2$  branched basally to  $r_{3-6}$ - $m_1$  at the end of the discal cell. The wings are a beautiful dark azure blue with a marginal band of metallic greenish; the DHW is the same as the DFW. The VFW has the basal <sup>1</sup>/<sub>4</sub> orange-ochre with much diffuse blackish in the posterior half, with the remainder of the wing pale metallic blue with one to four postmedian small black spots. The VHW is orange-ochre in the basal <sup>1</sup>/<sub>2</sub> to <sup>3</sup>/<sub>3</sub>, bordered by a black line of varying thickness; the outer <sup>1</sup>/<sub>3</sub> is pale metallic blue with a postmedian row of large circular black maculae followed by two black narrow bands or lines. The male hypandrium is elongate and relatively narrow with the posterior margin covered with spines not in separate lateral clumps. The saccus is longer (4.6 mm), and the aedeagus is also longer (5.6 mm). The valva is without a chitinous lip at the crista, with about 30-33 spines.

Female. The DFW is dark black with the distal  $\frac{1}{3}$  a broad diffuse metallic greenish band; the wing margin is slightly rounded. The DHW is similar to the DFW. The VFW and the VHW are similar to the male.

Average wing length ♂ (30-35)33 mm, ♀ (34-35)34.5 mm.

*Distribution*: This subspecies occurs in the Upper Amazon valley from southern Colombia, eastern Ecuador, Perú and bordering areas in Brazil.

Taxonomy and Distribution: A buckleyi was described by Hewitson (1869) from Ecuador. I have examined a syntype in the BM which is typical of the general population of *buckleyi* with a relatively narrow postmedian black line bordering the orange-ochre area on the VHW. The thickness of this black line is quite variable from wide to almost absent. Staudinger (1886) noted some minor differences in *buckleyi* from São Paulo de Olivença, Brazil and Yurimaguas, Perú. However, Röber, in Seitz, [1916] described these specimens as a subspecies *staudingeri*, based on their somewhat larger size, with narrower green margins on the upper surface of the wings, and with a wider postmedian black line on

the VHW. I have not been able to locate the types of Röber, but have examined specimens from these localities and they are not of any taxonomic significance. C. buckleyi dilata was described by Lathy (1929) based on "having the black border of basal yellow area of hind wing below more than twice as wide, the row of postdiscal black spots larger." I have examined the syntypes of Lathy in the MP, from Mocoa, Colombia, and they have a wide black postmedian line on the VHW as do specimens from "Upper Putumayo" and Iquitos, Perú. However, the thickness is variable in the large series from Iquitos. I have studied the thickness of this line and the size of the postmedian black circular maculae in each of the over 100 specimens examined. These are highly variable over the entire range with the thinnest line in northeastern Ecuador (Sachas) and the widest about 150 km north at Mocoa, Colombia. Over most of the range of the species these characters vary widely even in series from the same locality. The described subspecies staudingeri and *dilata* are synonymized, with *dilata* representing the dark extreme and *buckleyi* representing the other extreme of a highly variable species with regard to these characters. The number of postmedian black spots on the VFW vary from zero to four. The upper surface of the wings is quite constant with slight variation in the width of the metallic green margins.

*Biology*: This species occurs in undisturbed evergreen and deciduous tropical forests, especially in river valleys or close to rivers. It has also been found in forests with selective tree cutting. It flies in the open sun above the canopy and in the forest canopy. It is attracted to excrement and rotting fruit.

The adults have been collected nearly throughout the year with most specimens found in October to January with a small population peak in June. The species occurs more commonly at lower altitudes (200 to 400 m) in river valleys.

*Immature Stages*: Nothing has been reported on the immature stages or host plants.

#### Specimens Examined: 104 ♂ 3 ♀

COLOMBIA: Putumayo, Mocoa 6 ඊ (Syntype of dilata) MP; Putumayo 1 ඊ AM; 2 ඊ MP; 1 & BM; ECUADOR, Napo, La Joya de los Sachas Oct. 2 & JC; Morona-Santiago, Rio Mangosisa 1  $\stackrel{\circ}{\circ}$  HD; *Imbabura*, Yana-urcu 3  $\stackrel{\circ}{\circ}$  BM; No specific locality 1  $\stackrel{\circ}{\circ}$  AM; (type buckleyi) 1 & BM; 1 & MP; PERU: Loreto, Iquitos 6 & 1 Q AM; 1 & Feb. MM; Cahuapanas 1 & HD; Aug. 2 & LA; 1 & MP; 1 & ST; 1 & SI; Rio Putumayo 2 & UN; Aguaytia 400 m Jun. 4 & AA; Aug. 1 & HD; Oct. 1 & UN; Feb. 1 & UN; Yurimaguas 1 & (syntype staudingeri) Röber [1916]; Middle Rio Ucayali Jan. 1 & AM; Achinamiza Jan. 1 & AM; Balsapuerto 2 & 1 9 MP; Pebas 1 & BM; Rio Cachiyacu 1 & BM; Pucallpa Sep. Oct. 2 & HD; Rio Mishuayacu 1 & HD; San Martín, Chambirayacu 1 & BM; 1 & MP; Rio Seco Jun. 2 & AA; Huánuco, Iparía Bosque Nacional 320 m; Tournavista 1 & AA; Junin, Chanchamayo 5 & AM; 2 & SI; 5 & MP; Rio Tambo 1 & MN; Pasco, Pozuzo 1 & BM; Chuchurras 2 & UN; 1 & AM; 1 & BM; Huancabamba 1 & BM; Pichis Jan. 1 Å BM; 3 Å HD; 10 Å MP; Palcazu 236 m, 1 Å BM; 2 Å HD; Rio Pachitea 1 Å HD; 2 ♂ MP; BRAZIL: Amazonas, São Paulo de Olivença 1 ♂ MP; "Amazon Superior" 1 9 BM; Benjamin Constant Nov. 1 & MM; No specific locality 1 & SI; Rio Itacuaí Oct. Nov. 3 & MN; Rio Javarí May 1 & MN; Acre, Alto Juruá 1 & MN.

#### Asterope whitelyi (Salvin), 1869

Asterope whitelyi has never been associated with A. srnkai, but careful examination of the dorsal wing color and pattern and especially of the male genitalia and hypandria shows them to be closely related subspecies despite the very different colors and pattern on the VHW. However, these distinctive patterns and colors are probably related to mimicry: whitelyi with A. o. philotima and A. l. depuiseti, and A. w. srnkai with A. d. bartletti and A. d. degandii. Both whitelyi and srnkai appear to be the rarer members of the mimicry rings, which also include Agrias beatifica pherenice for srnkai and all of the Agrias listed in Section D related to A. optima and A. leprieuri depuiseti. The mimicry relationships of Asterope require more detailed study, field observations, and experiments.

Description: Male. The antennal club is round, knobbed and flat. The DFW has the  $R_1$  and the  $R_2$  branched basally to the  $r_{3-5}$ - $m_1$  at the end of the discal cell. The upper surfaces of the wings are beautiful dark azure blue with a greenish metallic band, which is marginal in the posterior part, and subapical in the anterior part with a darker apical area. The DHW is dark azure blue with a greenish metallic marginal band. The VFW has some orange-reddish or orange-ochre basally with the remainder of the wing pale metallic blue with diffuse blackish posterior to the  $Cu_1$ . There are two large and two small black postmedian maculae. The VHW has varying amounts of mostly basal reddish-orange or the basal half is orange-ochre. The distal half or more is metallic pale blue or greenish base color with four rows of black maculae, the outer one narrow forming a broken band. The male hypandrium is elongate and straight with expanded postero-lateral areas, each with a cluster of small spines. The valva has a chitinous lip, and about 13-18 spines. The saccus is short (< 3.0 mm).

Female. Unknown.

Key to Subspecies of Asterope whitelyi

## Males.

- 1a. VFW with red-ochre at base of wing; VHW with basal red-ochre in a very irregular shape varying from only in basal area adjacent to body and in anal cell to irregular shape with a rounded extension <sup>3</sup>/<sub>4</sub> of distance to median row of black maculae; separate reddish maculae may occur to discal cell cross vein; DFW has a broad greenish metallic diagonal postmedian band 7-8 mm at M<sub>1</sub> with black apically
- 1b. VFW with orange-ochre at base of wing extending over ½ of discal cell; VHW with orange-ochre in basal half extending to median row of black maculae and extending posteriorly to beyond second row of black maculae (this is an exact mimic of A. d. bartletti, but has round knobbed antennae and brilliant azure blue dorsal surface with very narrow marginal greenish band) ......srnkai

Female.

The females are unknown.

Asterope whitelyi whitelyi (Salvin), 1869 [Stat. rev.]

## Figs. 44, 45, 72, 87

Callithea whitelyi Salvin, 1869. Ann. Mag. Nat. Hist. 4: 179, n. 28. TL: Perú, [Cuzco], Valley of Cosñipata. Syntypes: BM 3 ♂ (Examined) (Figs. 44, 45).

=Callithea lugens Druce, 1903. Ann. Mag. Nat. Hist. 1(12): 220-222. TL: Perú, Cuzco. Syntypes: BM 3 ♂ (Examined) [Syn. nov.]

Description: As in A. whitely i except for differences listed for A. w. whitely in the key to subspecies.

Average wing length  $\circ$  (30-31)30.5 mm.

*Distribution*: This subspecies occurs in southeastern Perú in Puno and Cuzco provinces, in Eirunepé and Calama, Brazil and in the "Yungas" of Bolivia. It is also reported from Iquitos, Perú, which was a collecting and shipping point, but the validity and exact locality of this specimen is uncertain. Taxonomy and Distribution: A. whitelyi was described by Salvin (1869) from the Cuzco area where several specimens of this rare subspecies have been collected. It has been somewhat of a mystery because it combines characters of degandii with leprieuri, which are in different species groups of Asterope. However, whitelyi has rounded knobbed antennae, very distinct  $\Diamond$  hypandria and lacks an androconial patch on the DHW as in degandii. On the ventral surfaces of the wings there is a basal area of reddish-orange usually surrounded by a black margin.

A. lugens which was described by Druce (1903) is also from the Cuzco area. He compared it with A. optima and A. whitelyi. An important difference is the presence on the VHW of "a large round red spot at the end of the cell." I have examined three syntypes of A. w. whitelyi and three syntypes of A. lugens in the BM, with a total of 28  $\Im$  specimens of this rare subspecies. The amount of waxy reddish-orange at the base of the VFW and the VHW varies from a small amount of basal coloring to over  $\frac{1}{3}$  of the VHW, extending beyond the cross vein m<sub>2</sub>·m<sub>3</sub> at the end of the discal cell. The amount of reddish-orange varies exactly the same as in optima even in the same locality. The  $\Im$  genitalia and hypandria, wing colors and patterns and the type locality of lugens are the same as whitelyi so that lugens is hereby synonymized.

*Biology*: Nothing has been reported on the biology of this subspecies except that it has been collected in May, and August-November at elevations of 400 and 410 m. No females are known to have been collected.

Immature Stages: The immature stages and host plants are unknown.

Specimens Examined: 28  $\circ$  0  $\circ$ 

PERU: No specific locality 1 ♂ MN; 3 ♂ BM; Loreto, Iquitos Aug. 1 ♂ LA; Puno, Inambari 2 ♂ (Fournier Coll.) MP; Yahuarmayo 410 m, May 2 ♂ MP; Cuzco, Rio Tono 400 m, 9 ♂ MP; Cuzco 1 ♂ (Type of lugens) MP; Hacienda Cajón Nov. (Garlepp) 2 ♂ BM; 1 ♂ MP; Illapani Viejo (Ex. Stgr.) 1 ♂ BM; Valle de Cosñipata (type of whitelyi) 1 ♂ BM; BOLIVIA: No specific locality, 1 ♂ MP; La Paz Yungas 1 ♂ (27/211) MN; BRAZIL: Amazonas, Eirunepé 1 ♂ MN; Rondônia, Calama, Rio Madeira 1 ♂ BM.

Asterope whitelyi srnkai (Honrath), 1884 [Stat. rev.]

Figs. 46, 47, 72, 87

- Callithea srnkai Honrath, 1884. Berl. Ent. Zeit. 28 (1): 208-209, pl. 7, f. 6-6a. TL: Perú, [Loreto], Iquitos, Pebas. Syntypes: BM 1 ♂ with no type label, with label "H"/Adams Bequest/ (Examined). I have designated this as lectotype. (Figs. 46, 47).
- =Callithea salvini Staudinger, 1886. Exot. Tagf. 1: 124. TL: Perú, [Loreto], Iquitos. Syntypes: BM 1 ♂ labeled "TYPE, Godman & Salvin, Ex. Staudinger". Probably a syntype (Examined). Also a syntype in ZM. [Syn. nov.]

Description: As in A. whitely i except for differences listed for A. w. srnkai in the key to subspecies.

Average wing length & (29-32)31 mm.

Distribution: A. whitelyi srnkai occurs on the Amazon slopes of the Andes from Bogotá?, Putumayo area of Colombia, eastern Ecuador, Perú to Inambari, and in western Amazonas and Acre in Brazil.

Taxonomy and Variation: Callithea srnkai was described by Honrath (1884) and the description and figures show that it is very similar to *degandii* except that the VHW dark maculae surrounding the basal orange-ochre area are thin. However, the figure shows that the antennae are knobbed the same as A. salvini and not elongate and pointed as



Figures 6-13. Asterope batesii (Hewitson).  $\hat{\mathcal{O}}$  (Row 1) dorsal (6) ventral (7) surfaces. BRAZIL, [Amazonas] "river Amazon." Syntype Callithea batesii Hewitson (BM).  $\mathcal{Q}$  (Row 2) dorsal (8) ventral (9) surfaces. BRAZIL [Amazonas], Ega [=Tefé]. Syntype Callithea batesii Hewitson (BM). Asterope degandii degandii (Hewitson).  $\hat{\mathcal{O}}$  (Row 3) dorsal (10) ventral (11) surfaces. "Upper Amazon" "Amazon norte". Syntype Callithea degandii Hewitson (BM).  $\mathcal{Q}$  (Row 4) dorsal (12) ventral (13) surfaces. ECUADOR, Tungurahua, Puyo (JC).



32



Figures 14-21. Asterope degandii bartletti (Godman & Salvin). 👌 (Row 1) dorsal (14) ventral (15) surfaces. "Ecuador, Rio Napo". Syntype Callithea bartletti Godman & Salvin (BM). Q (Row 2) dorsal (16) ventral (17) surfaces. PERU, Loreto, Iquitos (AM). Asterope degandii adamsi (Lathy). 3 (Row 3) dorsal (18) ventral (19) surfaces. PERU [Junin, Rio] Perené. Syntype Callithea adamsi Lathy (BM). Asterope degandii allyni Jenkins. & (Row 4) dorsal (20) ventral (21) surfaces. PERU, Huánuco, Tingo María. Holotype Asterope degandii allyni Jenkins (AA).



Figures 22-27. Asterope markii markii (Hewitson).  $\circ$  (Row 1) dorsal (22) ventral (23) surfaces. BRAZIL, [Amazonas] Ega [=Tefé]. Syntype Callithea markii Hewitson (BM).  $\circ$  (Row 2) dorsal (24) ventral (25) surfaces. BRAZIL [Amazonas], Tefé (MP).  $\circ$  (Row 3) dorsal (25A) ventral (25B) surfaces. BRAZIL, Jary-Paraná. Holotype Callithea refulgens Kaye. Asterope markii boyi (Röber).  $\circ$  (Row 4) dorsal (26) ventral (27) surfaces. BRAZIL, Amazonas, Paraná do Jary (MP).



Figures 28-35. Asterope markii boyi (Röber).  $\bigcirc$  (Row 1) dorsal (28) ventral (29) surfaces. "Amazon superior" (Staudinger Coll.) (CM). Asterope markii ackeryi Jenkins.  $\Im$  (Row 2) dorsal (30) ventral (31) surfaces. BRAZIL, Pará, Obidos. Holotype Asterope markii ackeryi Jenkins (Coll. Philip May, to AA). Asterope markii hewitsoni (Staudinger)  $\Im$  (Row 3) dorsal (32) ventral (33) surfaces. COLOMBIA "New Grenada". Syntype Callithea hewitson Staudinger (BM).  $\heartsuit$  (Row 4) dorsal (34) ventral (35) surfaces. PERU, Loreto, Iquitos, Rio Itaya (MP).



Figures 36-43. Asterope markii davisii (Butler).  $\hat{\bigcirc}$  (Row 1) dorsal (36) ventral (37) surfaces. PERU, [Loreto] Rio Ucayali. Syntype Callithea davisii Butler (BM).  $\heartsuit$  (Row 2) dorsal (38) ventral (39) surfaces. No locality data (MP). Asterope buckleyi (Hewitson)  $\hat{\bigcirc}$  (Row 3) dorsal (40) ventral (41) surfaces. ECUADOR, [Pastaza], Rio Rutuno. Syntype Callithea buckleyi Hewitson (BM).  $\hat{\bigcirc}$  (Row 4) dorsal (42) ventral (43) surfaces. PERU, [Loreto], Iquitos (AM).



Figures 44-51. Asterope whitelyi whitelyi (Salvin)  $\circ$  (Row 1) dorsal (44) ventral (45) surfaces. PERU, [*Cuzco*], Valley of Cosñipata, Syntype Callithea whitelyi Salvin (BM). Asterope whitelyi srnkai (Honrath).  $\circ$  (Row 2) dorsal (46) ventral (47) surfaces. PERU, [*Loreto*] Iquitos, Pebas. Lectotype Callithea srnkai Honrath (BM). Asterope sapphira (Hübner).  $\circ$  (Row 3) dorsal (48) ventral (49) surfaces. BRAZIL. [*Pará*] Santarém (BM).  $\circ$  (Row 4) dorsal (50) ventral (51) surfaces. BRAZIL [*Pará*] Santarém. (JC).



Figures 52-59. Asterope leprieuri leprieuri (Feisthamel).  $\hat{\mathcal{O}}$  (Row 1) dorsal (52) ventral (53) surfaces. BRAZIL, Pará (JC).  $\Diamond$  (Row 2) dorsal (54) ventral (55) surfaces. BRAZIL, Pará (JC). Asterope leprieuri depuiseti (Felder).  $\hat{\mathcal{O}}$  (Row 3) dorsal (56) ventral (57) surfaces. "ECUADOR" [Probably error]. Syntype Cyane depuiseti Felder (BM).  $\Diamond$  (Row 4) dorsal (58) ventral (59) surfaces. PERU, Madre de Dios, upper Rio Madre de Dios (AM).



Figures 60-67. Asterope optima optima (Butler)  $\hat{\odot}$  (Row 1) dorsal (60) ventral (61) surfaces. PERU "Santa Cruz, Hauthaga [=Huallaga] Peruvian Amazons" Syntype Callithea optima Butler (BM).  $\heartsuit$  (Row 2) dorsal (62) ventral (63) surfaces. PERU, Loreto, Iquitos (CM). Asterope optima philotima (Rebel).  $\Diamond$  (Row 3) dorsal (64) ventral (65) surfaces. PERU, Junín, Satipo (JC).  $\heartsuit$  (Row 4) dorsal (66) ventral (67) surfaces. BRAZIL, no specific locality (AA). in *degandii*. I had already found that *salvini* had male genitalia and hypandria similar to whitely i srnkai, but there was no trace of where the type by Honrath might be located. Detailed study of the black and white drawing of the type of Honrath (1884) Pl. VII, figs. 6 & 6a showed a diagonal scratch on the left VFW submarginal area, and on the right apical VFW (and left DFW) there appeared to be a fold or repair. Careful examination of the srnkai specimens in the BM resulted in finding a  $\delta$  specimen (Figs. 46 & 47) with the same diagonal scratch on the left VFW, and a repair of the apical area of the right VFW. The marks and specimen were identical with the figures. The specimen was from Iquitos, the type locality of srnkai, and had a label with a large capital "H", which probably stands for Honrath. It was not labelled as a type, only a label, "Adams Bequest B.M. 1912-399." I have designated this specimen as lectotype of A. whiteleyi srnkai with a pencil label. A specimen labelled "TYPE/Godman & Salvin Coll. 1916-4,/ 3/ex. Staudinger/C. Salvini, Staudinger," is nearly identical with srnkai. The type locality of salvini is also Iquitos. The only difference between the two "types" is that the green metallic marginal band of the DHW in salvini is somewhat more narrow than srnkai. However, in examining series from the same locality this is quite variable. The  $\hat{\sigma}$  genitalia and hypandria of *salvini* and *srnkai* are the same. I have therefore regretfully synonymized the patronym salvini as a synonym of srnkai.

There is some variation in the width of the metallic green in the subapical area of the DFW. There may be four or five postmedian black maculae on the VFW and the last macula may be in a circle of metallic green surrounded by black. There is much variation in the size of the black maculae surrounding the dark orange-ochre area on the VHW. There was no observed seasonal or geographic relationships to small or large black maculae around the orange-ochre.

*Biology*: There are no known reports on the habitat, biology, or flight habits of this subspecies.

Adults have been collected from October to January and in May and August. They have been found at elevations from about 300 to 1,500 m.

*Immature Stages*: Nothing is known to have been reported on the immature stages and food plants.

Specimens Examined: 98  $\delta$ , 0  $\varphi$ 

COLUMBIA: Putumayo, Umbría; Upper Rio Putumayo; Mocoa; Rio Mulato; Cundinamarca, Bogotá; ECUADOR: Napo, Rio Napo; PERU: Loreto, Iquitos; Pebas; Rio Cachiyacu; Balsapuerto; San Martín, Yumbatos; Jepelacio; Saposoa; Huánuco, Rio Huallaga; Pasco, Pozuzo; Chuchurras; Pichis Rd. 1200 m; Rio Pachitea; Junín, Rio Perené; Chanchamayo; Puno, Inambari; BRAZIL: Amazonas, Tabatinga; Benjamin Constant; Eirunepé; Rio Javarí; Itacoaí; Acre, Alto Juruá.

#### Asterope sapphira (Hübner), [1816]

#### Figs. 4, 48, 49, 50, 51, 73, 80, 88

Oreas corusca sapphira (Hübner) [1816]. Samml. Exot. Schmett. 78.1: pl. [96] figs. 1-4. TL: "Brazil," [Pará] Santarém. Syntypes: ♂ ♀ Vienna?

- = Vanessa callithea Godart, 1819. Enc. Meth. 9:234. TL: de l' intérieur de l'Amérique méridionale. Syntypes: Museum Paris (not found). (Guérin, [1832]) Figured in pl. 78, f.1, 1a.
- =Asterope sapphyra Hübner, 1821: [6], Nomen novum for Oreas sapphira Hübner [1816] 78: fig. 1-1a.
- =Callithea godard Feisthamel, 1835. Ann. Soc. Ent. Fr. 3(4): 67.

=Callithea godarti (Boisduval) 1836 Ann. Soc. Ent. Fr. 4: 31.

Description: Male. The antennal club is rounded, knobbed and flat. The DFW has the  $R_2$  branched slightly distal to the  $r_{3-5}$ -m<sub>1</sub> at the end of the discal cell. The wings are a beautiful azure blue except in a broad median black patch in the posterior part of the wing and in a narrow black marginal band. The DHW is azure blue basally and in the distal  $\frac{1}{3}$  there is a broad median black patch, and a narrow black distal margin. The VFW is pale metallic blue with a diffuse dark area posterior to the Cu<sub>1</sub>; there are usually three black postmedian maculae. The vein posterior to the discal cell may be orange. The VHW has a small basal orange-ochre area anterior to the discal cell; the wing is pale metallic blue with four rows of black maculae. The male hypandrium is very constricted with postero-lateral projections each with a compact clump of small spines. The aedeagus is bent and longer (> 5.6 mm), and the saccus is longer (> 4.6 mm). The valva has a chitinous lip at the crista. There are about 22 spines.

Female. On the DFW the basal  $\frac{1}{3}$  is azure blue, with a large broad orange-ochre postmedian diagonal band with the apical area black and metallic green. There is a blackish median area posterior to the end of the discal cell. The DHW has the basal  $\frac{1}{3}$  blue; there is a broad black diffuse median area, and the distal  $\frac{1}{3}$  is a diffuse greenish metallic band. The VFW is mostly orange-ochre with a broad diffuse blackish median area posterior to the Cu<sub>1</sub>; the distal  $\frac{1}{4}$  is pale metallic blue, usually with three postmedian black maculae. The VHW has the basal area orange-ochre; the wing is pale metallic blue with four rows of black maculae. The female genitalia has an antrum without a chitinized collar, simply opening into an ostium, without a chitinized collar at the junction of the ductus bursae and the corpus bursae; the two signa are concave, with the length about twice the width.

Average wing length ♂ (27-33)30 mm, ♀ (28.5-35)32 mm.

*Distribution: A. sapphira* occurs in the lower Amazon basin, especially between Santarém and Manaus on the Amazon river, and also in the lower Tapajós river in western Pará and eastern Amazonas in Brazil. I have examined specimens from disjunct segregated localities at Tabatinga in Amazonas, Brazil and Iquitos and Tingo María, Perú. These are generally sites of commercial collectors, and the records should be corroborated.

*Taxonomy and Variation*: This species was described about 160 years ago and is so distinct that it has rarely been confused with other taxa. The location of the types is unknown. No new synonymy is presented. There is little variation; however, the deep azure blue of the males may be purplish in some specimens, and there is variation in the amount of black on the outer margin of the DFW and the amount of golden iridescence on the VHW.

A study was made of the specimens from the isolated upper Amazon localities at Tabatinga 1  $\circ$  UP; Iquitos 1  $\circ$  UN; Tingo María 3  $\circ$  UN; and "Perú" 2  $\circ$  and 3  $\circ$  AA. The only distinctive characteristic found was smaller size 27-29 mm  $\circ$ , 28-30 mm  $\circ$ , but the specimens from the lower Amazon area are also variable in size, 27-32 mm  $\circ$ , 28-35 mm  $\circ$ . The apparently isolated populations from the upper Amazon do not appear to be a distinct subspecies. If these are valid disjunct populations, they could have resulted from the flooding of the upper Amazon basin producing isolated and probably rare relict populations. These records are questionable and should be confirmed if possible.

*Biology: A. sapphira* occurs mostly in forests in river valleys where the adults may be locally abundant in season. Bates (1859) states:

"At the end of the dry season (end of December) this butterfly became very scarce on the wing, and the specimens were worn and faded... At the beginning of February [larvae] generally changed into the pupa state, and about the middle of the month the perfect butterfly appeared, in beautiful dress and in great profusion, but only for a few days, for, with the continuation of the heavy rains in February and March, it disappeared again.

The flight of *C. sapphira* is slow in comparison with all other *Nymphalidae*. It settles frequently, and seeks the foliage of trees at a height of from ten to twenty feet from the ground. The female settles lower, but is very wary, and apt to escape into the thicket

on being disturbed. The male is quicker in flight, and very rarely descends within reach of a moderate-sized net."

Bates (1864) adds the following:

"This most richly coloured butterfly appears to be confined in its range to the dry woods near *Santarem*, on the eastern side of the mouth of the Tapajós. Further westward I never saw a specimen; and to the south its area appears to be equally limited, as I did not find it further than twenty miles from the mouth of the river. It may, however, extend over the country to the east, that part of this region not having yet been explored. The species appears to have two broods in the course of the year, the first in October, and the second in February and March; but the first fails if the season be a dry one. In March it abounds, at least in some years, the woods positively swarming with the superbly adorned creatures, the two sexes being in about equal number, and the glowing sapphire and orange liveries imparting wonderful liveliness to the sylvan scenes. When very abundant, especially in gleamy showery weather, they issue from the woods, and are seen in the streets of the town, attracting the notice of the inhabitants."

This species occurs in the lower Amazon basin at elevations usually under 200 m. If the Tingo María records are valid it would also occur at up to 800 m. Adults have been collected from September to April with most records being in December to February and one record in July. Peruvian records are in April and October.

*Immature Stages*: The larva of *A. sapphira* is illustrated in Fig. 4. It has been observed feeding on *Paullinia* sp. (*Sapindaceae*).

## Specimens Examined: 225 & 215 Q

PERU: Loreto, Iquitos(?); Huánuco, Tingo María 800 m (?); No specific locality (?); BRAZIL: Amazonas, Tabatinga (?); Manaus; "Amazon Superior"; "Rio Negro"; Pará, Parantins; Itaituba; Santarém; Obidos; Taperinha; Rio Trombetas; Porteira; Juruti; Aveiro; "Rio Tapajós"; Belterra; Cuiabá to Santarém, km. 1666.

#### Asterope leprieuri (Feisthamel), 1835

It is difficult to ascertain the taxonomic status of the species A. leprieuri and A. optima. They can be considered as two closely related species, each with a subspecies, or as a superspecies complex, or possibly as a species with three subspecies. A. l. leprieuri can be distinguished readily from A. optima by the black DHW with no blue, and by a wide black margin and heavily dissected subapical metallic band in leprieuri. In A. l. depuiseti an apparent intergradation of these characters with A. optima philotima occurs. In A. leprieuri there is a tendency for the hypandrium to be somewhat narrower and sharply angled at the postero-lateral lobes, and while in A. optima it is rounded, this is not always consistent. No good characters were found in the male genitalia to distinguish them.

A. l. leprieuri is found in the Amazon River and major tributaries to north and central Perú. A. l. depuiseti (if it is a valid subspecies) is distributed in western Bolivia and southeastern Perú. A. o. optima occurs from southern Colombia to central Perú, and A. o. philotima occurs in central and southeastern Perú, and western Bolivia, the same as A. l. depuiseti. The geographic distribution is one of the main reasons for considering A. l. depuiseti as a subspecies of A. leprieuri. Further study is required to elucidate this problem.

Description: Male. The antennal club is round, knobbed and flat. The DFW has the  $R_2$  branched quite distal to the  $r_{3-5}$ - $m_1$  at the end of the discal cell. The wings are blackishblue with the submarginal metallic green band with a black border. The wings are broader at the tornus than anteriorly. The DHW is black (with some dark blue in *A. l. depuiseti*) with a black hairy androconium in the discal cell; a metallic green submarginal band is broken by black veins, and the marginal area is black. The VFW has a small basal red marking; it is diffuse black with the costal and distal  $\frac{1}{4}$  pale metallic blue with three

or four postmedian black maculae. The VHW has basal red markings adjacent to the body, extending into the anal cell. The wing is pale bluish with a metallic greenish border with a median black band circling around a postmedian row of elliptic black maculae, then forming a broken black submarginal band, with a thin submarginal black line and a thin black margin. The male hypandrium is broad with chitinous rods extending anteriorly from the postero-lateral lobes which have angular extensions each with a cluster of spines. The saccus is very long (7.0-8.0 mm), and the aedeagus is very long (7.5-10.0 mm). The valva has a chitinous lip at the crista. There are about 30-37 spines.

Female. The DFW is similar to the male but is black without any blue; the outer margins are more rounded; and the DHW is all black except a broader metallic green submarginal band. The outer margin is black. The VFW and the VHW are similar to the male. The female genitalia have the atrium without a chitinized collar, but with a chitinized crescentic structure posterior to the ostium. There are two concave signa, with the length about two times the width.

Key to Subspecies of A. leprieuri

#### Male.

## Females.

Asterope leprieuri leprieuri (Feisthamel), 1835 [Stat. rev.]

Figs. 5, 52, 53, 54, 55, 74, 81, 89

- Callithea leprieuri Feisthamel, 1835. Rev. Zool. 5: pl. 122. TL: "Guyane centrale, Jary Supérieure" [=Brazil, Pará, upper Rio Jari]. Syntype: BM Coll. Felder?
- =Callithea leprieuri dürcki Fassl, 1920. Ent. Zeit. 34(25): 98-99. TL: Brazil [Pará], Rio Tapajóz; Montechristo, Taperinha and Santarém. Syntypes: (♂ ♀) Location unknown. [Syn. nov.]

Description: As in A. leprieuri except for differences listed for A. l. leprieuri in the key to subspecies.

Average wing length ♂ (24-34)32 mm. ♀ (28-35)32 mm.

Distribution: A. l. leprieuri occurs in the Guyanas and the mouth of the Amazon river to northern Perú to Tingo María in central Perú. It is also distributed along the major tributaries, the Tapajós, Negro, and Madeira rivers. It appears to be nearly limited to river valleys.

Taxonomy and Variation: This is a distinctive species described by Feisthamel in 1835

from "Guyane central, upper Jary Superior" which is the upper Rio Jari in Pará, Brazil. The syntype(s) is supposed to be in the Felder collection in the BM, but I was unable to find it. The illustration by Feisthamel is quite accurate.

Fassl (1920) described *Callithea l. dürcki* in detail including the larva. It is a smaller form in the Rio Tapajós area. He states (abbreviated translation) that the "dürcki" 3 wing is 24 mm and the  $\varphi$  is 29 mm while *leprieuri*  $\delta$  is 28 mm and the  $\varphi$  is 32 mm. The adults have smaller wings that are more rounded at the apex. The  $\delta$  has the blue gloss more violaceous, and the marginal bands of both wings are more silvery and more compact. On the hindwings the bands are much narrower and proximally excised at the veins. In the Q the silvery band is broader and on the HW it has straightened edges. On the VFW of both sexes there is an apical green band which has its proximal edge less angled below the fourth black spot. Basal red markings of the VHW are stronger and more extended. Fassl also describes the larva as a bright green color while *leprieuri* is more grey-green. I have found that A. leprieuri shows much variation in size, wing shape, and color markings. After examination of nearly 500 specimens, including specimens collected by Fassl (especially in the MP collection which probably contains the syntypes), these variations can be found in many parts of the range and can be found in the same locality, so that "dürcki" is considered to be a synonym. However, it is recognized that there is a tendency for this smaller form to be more common in the Rio Tapajos region, and may be an incipient race or local variation, perhaps correlated with dry sandy areas with more scrubby campo vegetation as described by Fassl (1920).

*Biology*: This subspecies occurs in tropical forest and scrub forest areas particularly in river valleys and near rivers. The adults fly in scrub forest openings and at forest edges and river banks, and may be found in more open areas when there is a seasonally abundant emergence. They are attracted to decaying fruit and animal feces. The adults fly in open sun above and in the forest canopy.

The adults fly throughout the year with more collection records in October and November. Bates (1864) states that in these months they were abundant at Obidos and Vila Nova, Brazil. The species occurs mostly at lower elevations below 200 m in the Amazon valley, but also occurs less commonly at higher altitudes, up to 600 m in Perú.

*Immature Stages*: The larvae (Fig. 5) are banded with bluish-black with five bands of greyish-pallid green to bright green. The pupa has a dark thoracic line and two rows of 2 mm long black dorsal spines, two pairs on each segment (Fassl, 1920). The larvae feed on vines of *Paullinia sp.* of the Sapindaceae according to Fountaine (BM larval collection).

Specimens Examined: 279 & 183 Q

GUYANE: "Central Guyane"; GUYANA: No specific locality; SURINAM: No specific locality; COLOMBIA: Amazonas, Letícia; BRAZIL: Amazonas, Benjamin Constant; Tefé; Manaus; Manacapuru; Manicoré; Itacoatiara; Nova Olinda; Piquiá; Parinari; Jubuti; Humaitá; Pará, Cucari; Monte Alegre; Altamira; Erere; Serra da Lua; Santarém; Itaituba; Obidos; Conceição; Tapajós; "upper Rio Jari" (Feisthamel, 1835); Almeirim; Taperinha; Monte Cristo; Parintins; Cuminá; Aveiro; Rondônia, Aliança; Rio Madeira; Calama; Cachoeira do Samuel; Pôrto Velho; PERU: Loreto, Iquitos; Pebas; San Martín, Yumbatos; Junín, Rio Perené; La Merced.

Asterope leprieuri depuiseti (Felder), 1861 [Stat. rev.]

## Figs. 56, 57, 58, 59, 74, 81, 89

Cyane depuiseti C. & R. Felder, 1861. Wien. Ent. Monat. 4: 107, no. 94. TL: "Ecuador" [Probably error]. Syntypes: 1 ♂ BM Coll. Felder (Examined) (Figs. 56, 57).

=Callithea depuiseti forma eudia Röber, in Seitz, [1916]. Macrolep. World. 5: 492. TL: "Bolivia" Syntypes: Mus. Berlin? [Syn. nov.] Description: As in A. leprieuri except for differences listed for A. l. depuiseti in the key to subspecies.

Average wing length ♂ (20-33.5)32 mm, ♀ (29-33.5)32 mm.

*Distribution: A. l. depuiseti* occurs from south central Perú from Pozuzo and Chanchamayo to southeastern Perú and eastern Bolivia. Records from Mocoa, Columbia (MZ) and Ecuador are doubtful.

Taxonomy and Variation: This subspecies was accurately illustrated by Felder, and I have examined and photographed the Felder types in the BM. The type locality of Ecuador is probably an error since no *depuiseti* are known to occur in Ecuador. This subspecies appears to be distinctive, but may be a defined intergrade population between A. leprieuri and A. optima. It has about the same distribution as A. o. philotima. A. l. depuiseti is similar to A. l. leprieuri but has lighter iridescent blue including on the DHW (absent in leprieuri) but has a thin black margin on the DHW with black veins extending into the submarginal greyish-green band. The form eudia Röber, in Seitz, [1916] from the description, appears to be a confusion of depuiseti with A. o. philotima which is similar and occurs in the same region. The "golden gloss" confined to the median band is found not only in Bolivian specimens but occurs throughout its range in Perú. The form eudia has no validity and is synonymized under depuiseti and probably in part under A. o. philotima.

*Biology*: This subspecies is not common, only 36 specimens having been examined. It is also possible that *depuiseti* is a seasonal form of A. *o. philotima*, but the only dated specimens were collected in March, April, August, and October to December. It has been collected from about 400 to 1,500 m elevation.

Immature Stages: There are no known reports on the immature stages and food plants.

Specimens Examined: 30 8 6 9

PERU: Pasco, Pozuzo 1  $\circ$  BM; Junín, Satipo Oct. 1  $\circ$  AA; ' 3  $\circ$  AM; 2  $\circ$  CM; La Merced 1000 m, Nov. 2  $\circ$  AA; 1  $\circ$  UP; Shanki, Rio Satipo 750-1000 m Aug. 1  $\circ$  UP; San Ramón 1  $\circ$  MN; Chanchamayo 3  $\circ$ ; Cuzco, Cosñipata Valley 1  $\circ$  BM; 1  $\circ$  AA; 1  $\circ$  ST; Cuzco Nov. 1  $\circ$  1  $\circ$  BM; 1  $\circ$  SI; Rio Tono 1  $\circ$  BM; 400 m 1  $\circ$  AA; Buenos Aires, Rio Cosñipata 1,200-1,500 m Dec. 1  $\circ$  UP; Madre de Dios, Upper Madre de Dios 500 m 1  $\circ$  AA; Madre de Dios 1  $\circ$  BM; Puno, Inambari; 1  $\circ$  BM; Chaquimayo 1  $\circ$  1  $\circ$  BM; San Gaban 700 m Mar. Apr. 2  $\circ$  BM; Yahuarmayo 1  $\circ$  BM; La Unión, Rio Huacamayo 700 m 1  $\circ$  BM; BOLIVIA:La Paz, La Paz 1  $\circ$  1  $\circ$  BM; Yungas de La Paz 1  $\circ$  BM; 1  $\circ$  AA; 1,000 m 1  $\circ$  1  $\circ$  MN.

#### Asterope optima (Butler), 1869

The relationship of A. leprieuri and A. optima required detailed study since these are very closely related species. The geographic range of A. l. leprieuri is completely separate from A. o. optima and A. o. philotima; however, the range of A. l. depuiseti is about the same as A. o. philotima. In addition depuiseti appears to be an intermediate (or mimic) approaching philotima. However, no intergrades between depuiseti and philotima were found based on wing color and pattern. Larger series of fresh specimens should be studied in localities where both of these taxa occur together. No significant differences were found in male genitalia and there was a minor difference in hypandria.

Description: Male. The antennal club is round, knobbed and flat. The DFW has the  $R_2$  branched quite distal to the  $r_{3-5}$ - $m_1$  at the end of the discal cell. The upper surface of the wing is deep blue with the outer  $\frac{1}{2}$  a greenish metallic band with a black margin. The wings are broader at the tornus than anteriorly. The DHW is deep blue in the postmedian area; the discal cell has long black androconial hairs; and there is a green metallic marginal

band with white fringe at the margin. The VFW has a red or reddish-ochre basal marking; it is diffuse blackish with the costal and distal <sup>1</sup>/<sub>4</sub> pale metallic green or pale blue with three or four postmedian black maculae. The VHW has the basal area reddish-ochre which may extend onto the basal half of the wing in various patterns with the most extreme covering nearly all of the basal half and looking like a lateral view of a "chick" with a small dark elliptic "eye spot". The remainder of the wing is metallic green or pale blue, a median black line or band circling around a postmedian row of elliptic black maculae, then forming a broken black submarginal band, with a thin submarginal black line and a white fringe along the margin. The male hypandrium is broad with chitinous rods extending anteriorly from the postero-laterally rounded lobes, each with a cluster of spines. The saccus is very long (7.0-8.0 mm), and the aedeagus is very long (7.5-10.0 mm). The valva has a chitinous lip, and there are about 30-35 spines.

Female. The DFW is black with a very broad metallic greenish marginal band; the wing margin is rounded with a white marginal fringe. The VFW and VHW are similar to the male. The female genitalia has an atrium without a chitinized collar; the ductus bursae flares open at the end forming the ostium.

#### Key to Subspecies of Asterope optima

#### Males.

## Females.

- 1a. DHW with relatively narrow metallic blue or green marginal band (5-6 mm); VHW with basal ¼ orange-red, or with prominent extensions of orange-red markings optima

Asterope optima optima (Butler), 1869 [Stat. rev.]

#### Figs. 60, 61, 62, 63, 75, 82, 90

- Callithea optima Butler, 1869. Exot. Butt. 12, pl. 5, f.1 & 2. TL: "Santa Cruz, Hauthaga [=Huallaga] Peruvian Amazons." Syntypes: BM 1 ♂ Rh. 9966 labeled "Call. optima Butler type." (Examined) (Figs. 60, 61).
- =Callithea fassli Röber, in Seitz, [1916]. Macrolep. World. 5: 493, pl. 99d. TL: Colombia-Ecuador border, Colonia Florencia on Rio Putumayo. Syntypes: Location unknown. [Syn. nov.]

Description: As in A. optima except for differences listed for A. o. optima in the key to subspecies.

Average wing length ♂ (28-33)31 mm, ♀ (32-37)34 mm.

Distribution: A. optima optima occurs from Colombia through Ecuador into the Upper Amazon in Amazonas, Brazil and into Central Perú where it intergrades with A. o. philotima. There are specimens labeled Itaituba, Obidos, and Manaus, Brazil, but the isolated locality records are questionable and need to be confirmed.

Taxonomy and Variation: This subspecies was described from the Rio Santa Cruz in Huánuco near Tingo María, Perú. The Huallaga river was mispelled [Huathaga] in the original description by Butler (1869). I have examined a  $\Im$  syntype in the BM and it is nearly typical of the *optima* population, the VHW having an orange-red "chick-like" pattern slightly reduced from those further north. The type locality area is in the intergrade area with *philotoma*. I designate this specimen BM-Rh 9966 as lectotype of *optima*.

There is extensive variation in *optima*. The VHW may have a large orange-red pattern which fills the basal third, often shaped like the side view of a "chick" often with a dark eye spot. This pattern is found throughout the range of the subspecies. The orange-red pattern may vary from this marking through a wide range of orange-red extensions and spots to only basal orange-red more typical of *philotima*. Any of these variations may occur in a single locality but there is a tendency for a single type to occur in one locality. (The "chick-like" pattern does not occur in *philotima*). There is similar variation in the amount of golden iridescence on the VHW and in the number of postmedian black spots on the VFW which can vary from two to four. Examination of large series of specimens shows almost every possible variation in the amount of orange-red markings.

Callithea fassli was described by Röber, in Seitz, [1916] from one or more  $\delta$  specimens from Colonia Florencia on the Rio Putumayo (frontier between Colombia and Ecuador). Röber based his description on one of the common variations which occurs throughout the range of the subspecies. The dorsal surface of fassli shown in Röber, in Seitz, [1916] fig. 99d is exactly the same as optima. The description (p. 493) is sufficiently detailed that it is possible to accurately define this taxon. Specimens from this type locality were studied and show these characters to be similar to those over the range of optima. While the type specimen or specimens have not been located, there is no doubt that fassli is just one example of the normal range of variation of optima, and it is, therefore, synonymized. (For the synonymy of A. optima form eminens (Röber), see A. o. philotima).

Biology: A. o. optima usually occurs in undisturbed tall tropical evergreen forest and in semi-deciduous tropical forest. The adults fly rather fast in open sun in the top of the forest canopy. They usually fly from about 1000 to 1400 hours when the sun is shining. They are readily attracted to baits of fermented human and pig feces and somewhat to fermented fruit and will enter bait traps higher in the forest. They will also fly down to baits on the forest floor in openings where a tree has fallen or has been felled and at the forest edges and stream openings in the forest. They have been found less commonly in openings in the forest caused by indian homes. I have also collected specimens on dog feces on an open road several hundred meters from the forest in Ecuador. The adults fly rapidly and are difficult to catch except when they are feeding on fermented feces or fruit.

The adults fly every month of the year but are most common from September to November with the fewest in December to June. They have been collected at altitudes of 100 to about 2,400 m and reported at 3,300 m. They are usually more common at relatively lower altitudes.

Immature Stages: There are no known reports on the immature stages and food plants.

#### Specimens Examined: 267 3 37 9

COLOMBIA: Amazonas, Letícia; Putumayo, Mocoa; Puerto Umbría; Florida; Condagua, Rio Caquetá; La Caravina; Canungucho; Huila, Gigante; Caquetá, Rio Bodoquero 1,300 m; Rio Pererya 1000 m; Sucre 3,300 m [?]; Colonia Florencia 2,400 m; ECUADOR: Napo, Sachas; Latas; Puerto Misahualli; Pano; Tena; Chauluyacu; Rio Anzu; Coca; Pastaza, El Partidero 1300 m; Canelos; Rio Pastaza; Sarayacu; Azuay, Cuenca; Imbabura, Paramba; Bolívar, Balzapamba; Morona-Santiago, Rio Mangosisa; Chimborazo, Riobamba; Tungurahua, Rio Verde; Puyo 1,200 m; PERU: Loreto, Rio Putumayo; Iquitos; Pebas; Achinamiza; Middle Rio Ucayali; Aguaytía; Pucallpa; Yurimaguas; Mishuayacu; Papa yacu; Balsapuerto; San Roque; San Martín, Jepelacio; Rio Seco; Rio Pachitea; Yumbatos; Rio Chambirayacu; Huánuco, Tingo María X; Rio Huallaga; Santa Teresa; Pasco, Palcazu X; Pichis; Puerto Inca; Pozuzo; BRAZIL: Amazonas, Benjamin Constant; Rio Javari; Rio Calary, Uaupés; Rio Itacoaí; Jauareté; Tabatinga.

Asterope optima philotima (Rebel), 1912 [Stat. rev.]

Figs. 64, 65, 66, 67, 75, 82, 90

Callithea philotima Rebel, 1912. Verh. Zool. Bot. Geo. Wien. 62: 218)f. 1 TL: Perú [Junín], Chanchamayo. Holotype: 1 ♂ Vienna?

- *Callithea optima eminens* Röber, in Seitz, [1916]. Macrolep. World 5: 492, pl. 99e, f.
  I. TL: Perú [Cuzco], Upper [Rio] Madre do Dios, 500-1200 m. Syntypes: ô Mus. Berlin?
  [Syn. nov.]
- =Callithea freyja Röber, in Seitz, [1916]. Macrolep. World 5: 493, pl. 99e, f. 3 (as freyia). TL: Perú [Junín] Chanchamayo. Syntypes: ♂ Mus. Berlin? [Syn. nov.]

Description: As in A. optima except for differences listed for A. o. philotima in the key to subspecies.

Average wing length ♂ (25-34) 32 mm, ♀ (33.5-36) 34 mm.

Distribution: Asterope optima philotima occurs from Central Perú south to Bolivia. Intergrades with optima occur in central Perú.

Taxonomy and Variation: A. o. philotima was described by Rebel (1912) from a male specimen from the intergrade area with optima at Chanchamayo, Perú. This subspecies is characterized by the broader metallic blue or green margins on the upper surface of the wings. Examination of fairly large series from various localities shows that the redorange coloration on the VHW is highly variable from a small amount basally to much more extensive with streaks extending to the median black line. I have never seen a *philotima* with a full red-orange area with a "chick-like" pattern as in optima. The holotype  $\delta$  is said to be in Vienna. I have examined topotypical specimens and the original description is quite adequate to accurately identify *philotima*.

Callithea optima eminens is fairly well described and the VHW of a specimen from the Madre de Dios area of Perú is shown in fig. 99e in Röber, in Seitz, [1916]. The specimen illustrated is a common form of the extensive variation of *philotima*. The very broad metallic border of the dorsal surface of the wings is typical of *philotima* and *optima eminens* is synonymized.

*Callithea freyja* Röber, in Seitz, [1916] also from Chanchamayo, Perú, is one of the common variations seen in a series from the type locality or other localities. It has a smaller amount of red-orange on the VHW and less black markings. It is also made a synonym of *philotima*.

Biology: This subspecies occurs in tropical evergreen and semideciduous tropical forest, usually in undisturbed or uncut forest. The adults fly in the canopy the same as A. o. optima and have the same habits. They also come to the same baits and fly at about the same times.

Adults have been collected every month of the year with the peak of abundance in August to October. More study is required especially for *A. l. depuiseti* to determine if it is a seasonal form occurring in October to December and in March and April as the preliminary data suggest. Most of the records indicate elevations of 600-1,300 m, which is about the altitudinal range of *A. l. depuiseti*.

Immature Stages: There are no known reports on the immature stages or food plants.

Specimens Examined: 173 & 50 Q

PERU: Huánuco, Tingo María X; San Martín, Rio Seco X; Cuzco, Rio Tono; Buenos Aires, Rio Cosñipata; Illapani Viejo; Junín, Rio Colorado; La Merced; Chanchamayo; Shanki; Rio Satipo; Rio Sanibeni; Rio Perené; Utcuyacu; San Ramón; Pasco: Palcazu X; Madre de Dios, Madre de Dios; Inambari; Puno, Chaquimayo; Yahuarmayo; BOLIVIA: La Paz, Yungas de la Paz; San Ernesto.

## **E. PHYLOGENY**

The phylogenetic relationships of Asterope have been a matter of conjecture. Röber, in Seitz, [1916] assigned the genus (*Callithea*) to the tribe Catagrammini, next to *Catagramma* (now *Callicore* and *Perisama*).

I have defined and made a cladistic study of the subfamily Eurytelinae which includes six tribes and 39 genera (Jenkins, in prep.) Eurytelinae is characterized as follows: 1. Presence of a male hypandrium or subgenital plate (unique except in four species of *Acraea*). 2. Forewing vein(s) swollen (also occurs in some Satyrinae and Apaturinae). 3. Larvae usually with head horns, one row of dorsal setae or spines, and branched dorso-lateral spines. 4. Host plants Euphorbiaceae or Sapindaceae.

Asterope is included in the tribe Epiphilini which includes the genera Asterope, Pyrrhogyra, Peria, Nica, Temenis, Libythina, Bolboneura, and Epiphile. I characterize the tribe by the following: 1. Male hypandrium elongate and relatively narrow (unique except Catagrammini). 2. Forewing crossvein  $r_s m_2$  joins at or distal to junction of veins  $M_3$  and  $Cu_1$  (unique except three genera of Epicalini). 3. Host plants Sapindaceae (unique in Eurytelinae except Catagrammini). 4. In the male forewing,  $R_1$  branches proximal to  $r_s m_2$  and  $R_2$  branches at  $r_s m_2$  (five of eight genera).

The genus Asterope is characterized by the following: 1. The VHW has four rows of black maculae, some maculae flattened into lines (four rows unique). 2. The dorsal surfaces of the wings are blue with metallic green borders (yellow or orange in 2 spp.). 3. Antennae have the club round and knob-like (five of eight spp., unique except Antigonis). 4. The aedeagus is relatively long and thin. 5. The forewing is rounded, not falcate (in three of eight genera in Epiphilini).

The most closely related genera, according to my cladistic study of the subfamily Eurytelinae, appear to be *Pyrrhogyra* and *Peria*. They are allied on the basis of morphological characters; however, they are quite different in appearance, habits, and ecology. *Pyrrhogyra* was selected as the sister group, but it also appears to be more advanced than *Asterope* for some characters. *Panacea* in the tribe Epicalini was also used as a related outgroup.

A detailed analysis of *Asterope* was made and all characters were evaluated and compared with *Panacea* and *Pyrrhogyra*. Emphasis was placed on morphological characters of the wings, antennae, palpi, male genitalia, hypandria, and female genitalia. Some wing color and pattern elements were also used. Critical study of the characters showed eight multistate series and 18 binary characters which made a total of 26 characters. Character states were listed in a hypothetical order of polarity to be tested in cladistic analysis. These characters are listed in Table 4. The character states are shown as decimals from 0 to 3 and missing data as 9. A character matrix is presented in Table 5.

Cladistic analysis was carried out both manually and by computer analysis using the PAUP package (Version 2.4.1, Swofford, 1985). The computer analysis was run with multistate characters "unordered" which, according to Swofford (1985), gives results comparable to Transformation Series Analysis by Mickevich (1982). Various analysis options were used and compared. The most parsimonious tree had a length of 52 steps and a consistency index of 0.756. The most parsimonious manually produced tree (Text Fig. 1) had a length of 52 steps. The computer-produced tree differed from it by having *A. markii* branching before *A. degandii* based on a single wing color character (21), and *A. whitelyi* branching before *A. buckleyi* based on several homoplasious characters. There are five autapomorphic and 13 homoplasious characters of which six are shared between *Asterope* and the outgroup genera. The cladogram in Text Fig. 1 portrays a plausible evolutionary representation.

#### Table 4. Character states for Asterope

- 1.0 FW with  $R_2$  branched basal to  $r_{3-5}$ -m<sub>1</sub>.
- 1.1 FW with  $R_2$  branched at or slightly distal to  $r_{3-5}$ -m<sub>1</sub>.
- 1.2 FW with  $R_2$  branched distal to  $r_{3-5}$ -m<sub>1</sub> (at least  $\frac{1}{4}$  to junction of  $R_3$  and  $R_4$ ).
- 2.0 Antennal club elongate and pointed.
- 2.1 Antennal club knobbed and pointed.
- 2.2 Antennal club knobbed and rounded.
- 3.0 Larval food plant Euphorbiaceae
- 3.1 Larval food plant Sapindaceae
- 4.0 Aedeagus short (2.8-4.0 mm).
- 4.1 Aedeagus intermediate length (4.6-5.6 mm).
- 4.2 Aedeagus long (7.5-10.0 mm).
- 5.0 Aedeagus bent or curved.
- 5.1 Aedeagus relatively straight.
- 6.0 Hypandrium broad and nearly square.
- 6.1 Hypandrium with bulbous base, constricted posteriorly.
- 6.2 Hypandrium elongate but little constricted.
- 6.3 Hypandrium relatively broad in middle with chitinous rods.
- 7.0 Hypandrium posteriad with short spines dispersed and on lateral extensions.
- 7.1 Hypandrium posteriad with long spines in a lateral bundle.
- 7.2 Hypandrium posteriad with many short spines in a lateral bundle.
- 8.0 Valva without chitinized lip at crista.
- 8.1 Valva with chitinized lip at crista.
- 9.0 Valva with 13-37 spines.
- 9.1 Valva with 41-52 spines.
- 10.0 Saccus short (2.0-3.2 mm).
- 10.1 Saccus intermediate length (4.0-5.0 mm).
- 10.2 Saccus long (7.0-8.0 mm).
- 11.0. Q ductus bursae without chitinous collar at sterigma.
- 11.1  $\circ$  ductus bursae with chitinous collar at sterigma.
- 12.0  $\bigcirc$  ductus bursae without chitinous collar at corpus bursae.
- 12.1  $\bigcirc$  ductus bursae with chitinous collar at corpus bursae.
- 13.0  $\circ$  papilla anale with apophysis posterior enlarged and rounded at tip.
- 13.1  $\bigcirc$  papilla anale with apophysis posterior narrow, not rounded at tip.
- 14.0  $\bigcirc$  ductus bursae short in length ( <2.4 mm).
- 14.1 9 ductus bursae intermediate in length (3.0-5.0 mm).
- 14.2  $\bigcirc$  ductus bursae long (> 5.7 mm).
- 15.0 VHW with yellow or orange coloration.
- 15.1 VHW without yellow or orange coloration.
- 16.0 VHW without four rows of squarish maculae.
- 16.1 VHW with four rows of squarish maculae or some flat maculae.
- 16.2 VHW with three rows of squarish or rounded maculae (outer row narrow).
- 16.3 VHW with first row a black line, second row of larger rounded black maculae.
- 17.0  $\circ$  DFW and DHW without metallic margins.
- 17.1  $\circ$  DFW and DHW with metallic margins.
- 18.0  $\circ$  DFW without a narrow subapical whitish or greenish band.
- 18.1 Å DFW with a narrow subapical whitish or greenish band.
- 19.0 Q DFW without postmedian orange cross band.
- 19.1  $\bigcirc$  DFW with postmedian orange cross band.
- 20.0 FW with  $r_3$ - $m_3$  joining basal to junction of  $M_3$  and  $Cu_2$ .
- 20.1 FW with r<sub>3</sub>-m<sub>3</sub> joining at or distal to junction of M<sub>3</sub> and Cu<sub>2</sub>.
- 21.0  $\circ$  DFW with orange, yellow-orange or red.
- 21.1 Å DFW without orange, yellow-orange or red.
- 22.0  $\circ$  DFW without strongly contrasting black center area.
- 22.1 Å DFW with strongly contrasting black center area.

- 23.1  $\circ$  FW with reduced length in costal area, broader at tornus.
- 24.0 Å DHW without black androconial patch.
- 24.1 Å DHW with black androconial patch.
- 25.0 Palpi white or grey ventrally.
- 25.1 Palpi black ventrally.
- 26.0 Å DFW without extensive bright blue.
- 26.1 & DFW with extensive bright blue.

## Table 5. Character States for Asterope

#### Characters

Taxon	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Panacea	Ô	õ	0	0	1	0	0	õ	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0
Pyrrhogyra	õ	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0
A hatesi	Ő	0	1	0	0	1	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
A degandii	õ	0	9	0	0	1	0	0	0	0	0	0	0	0	0	2	1	0	0	1	1	0	0	0	0	0
A markii	0	2	9	0	0	1	1	0	1	0	0	0	0	0	0	2	0	1	0	1	0	0	0	0	0	0
A hucklevi	0	1	9	1	1	2	0	0	0	1	0	0	1	1	1	3	1	0	0	1	1	0	0	0	0	1
A whitelyi	0	2	9	0	1	2	2	1	0	0	9	9	9	9	0	2	1	0	0	1	1	0	0	0	0	1
A sapphira	1	2	1	1	0	1	2	1	0	1	0	0	1	1	0	1	1	0	1	1	1	1	1	1	1	1
A. leprieuri	2	2	1	2	1	3	2	1	0	2	0	0	1	2	1	3	1	0	0	1	1	0	1	1	1	1
A. optima	2	2	9	2	1	3	2	1	0	2	0	0	1	2	1	3	1	0	0	1	1	0	1	1	1	1



Text Figure 1. Cladogram of Asterope.

If the larvae and pupae of all species were known and studied, the phylogeny would be strengthened. The larval setal pattern was found to differ in the few species known. Additional studies would also help to resolve some of the homoplasies.

## ACKNOWLEDGMENTS

I would like to acknowledge the kind assistance of persons who have helped with this revision of *Asterope*. Dr. Lee D. Miller, Dr. Jacqueline Y. Miller, Mr. Philip E. Ackery, Dr. Henri Descimon, Mr. James Mast de Maeght, Dr. Gerardo Lamas and Dr. James Miller reviewed the manuscript and made helpful comments.

Museum curators have kindly permitted study of their collections and photographing and loan of specimens. They include Dr. P. H. Arnaud (CA); Dr. M. D. Bowers (MZ); Dr. G. Bernardi (MP); Dr. J. F. Clarke and Dr. R. Robbins (SI), Dr. H. Descimon (HD); Mr. J. P. Donahue (LA); Dr. J. Cândido de Mello Carvallo (MN); Dr. G. Lamas (UN); Dr. F. Fernández and Sr. L. Otero (UC); Dr. O. Mielke (UP); Dr. A. M. Young and Ms. S. S. Borkin (MM); and Dr. F. H. Rindge (AM).

I am especially indebted to Mr. Phil Ackery for loan of  $\delta$  genitalic dissections which he made several years ago; to Dr. Keith S. Brown for loan of specimens and photographs of larvae and host plants; to Dr. Gerardo Lamas for photographing types in the Berlin Museum, and to Dr. Henri Descimon for his discussions on *Asterope* mimicry and for showing me his collections. Figures 4 and 5 of *Asterope* larvae by A. Miles Moss were reproduced by permission of the British Museum (Natural History).

I wish to thank my wife Joanne F. Jenkins for helping to collect *Asterope* in tropical countries, for helping to curate our collection, for providing excellent secretarial and computer assistance, and for inking all drawings.

#### **REFERENCES CITED**

Bates, H. W. 1859. Notes on South American butterflies. *Trans. Ent. Soc. London*. NS 5: 3. Bates, H. W. 1864. Contributions to an insect fauna of the Amazon Valley. Lepidoptera

- Nymphalinae. J. Ent. 2(10): 175-213, pls. 9-10.
- Butler, A. G. 1874. Lepidoptera Exotica. p. 12. pl. 5 f. 1 & 2. Janson, London.
- Butler, A. G. 1877. On the Lepidoptera of the Amazonas collected by J. W. H. Trail, during the years 1873-1875. Trans. Ent. Soc. London 1877: 105-156.
- Descimon, H. 1977. Biogeographie, mimetisme et speciation dans le genre Agrias Doubleday. (Lep. Nymphalidae Charaxinae). Pub. du Lab. de Zoologie de l'Ecole Normale Superieure. No. 9: 307-344.
- De Vries, P. J. 1987. The Butterflies of Costa Rica and Their Natural History. Princeton Univ. Press, New Jersey. pp. 327, 50 pl.
- Druce, H. 1903. Descriptions of some new species of Lepidoptera from tropical South America and one from Australia. Ann. Mag. Nat. Hist. 1(12): 220-223).
- Fassl, A. H. 1920. Callithea leprieuri dürcki m. subsp. nov. und über Callithea raupen. Ent. Zeit. 34(25): 98-99.
- Fassl, A. H. 1922. Neue Schmetterlingsformen aus Brasilien. Ent. Zeit. 36(10): 4-5.
- Feisthamel, J. F. P. 1835. A note: Callithea leprieuri. Mag. Zool, 5: pl. 22, et. explic.

Felder, C.& R. 1861. Lepidoptera nova Columbiae. Wien. Ent. Monat. 4: 107-108.

- Godman, F. du C., & O. Salvin. 1878. Descriptions of new species of Rhopalocera from Central and South America. Ann. Mag. Nat. Hist. 1(5): 264-265.
- Hemming, W. F. 1967. The generic names of the butterflies and their type species (Lepidoptera: Rhopalocera). Bull. Br. Mus. Nat. Hist. (Ent.) Suppl. 9, 509 pp.
- Hewitson, W. C. 1869. Remarks on and descriptions of new species of butterflies, collected by Mr. Buckley. *Equatorial Lepidoptera*, Part 2, 29 (no. 52): 62-66. Van Voorst; London.
- Honrath, E. G. 1884. Neue Rhopalocera. Berl. Ent. Zeit. 28(1): 208-209, Pl. 7, f. 6 & 6a.
- Hübner, J. 1806[1838]. Sammlung Exotischer Schmetterlinge. Augsburg, 3 vol. 228 pp., 500 pls. Vol. 1, 1806[1819], Vol. 2, [1819][1827], Vol. 3, [1827-1838].
- Kaye, W. J. 1919. New species and genera of Nymphalids, Syntomidae, and Sphingidae in the Joicey Collection. Ann. Mag. Nat. Hist. (9)4: 86.
- Klots, A. E. 1970. Lepidoptera, pp. 115-130, in Tuxen, S. L. (Ed.) Taxonomists Glossary of Genitalia in Insects. Copenhagen, Munksgaard.
- Lathy, P. I. 1903. A new species of *Callithea* from Peru. *Entomol.* 36: 105-106, pl. 2, f. 1 & 2.
- Lathy, P. I. 1929. A new race of Callithea buckleyi Hew. (Lepidoptera). Ann. Mag. Nat. Hist. Ser. (10)3: 194.
- Lewis, H. L. 1973. Butterflies of the World. Follett Pub. Co., Chicago. 312 pp., 208 pls. Mickevich, M. F. 1982. Transformation Series Analysis. Syst. Zool. 31(4): 461-478.
- Moss, A. M. Unpublished paintings of South American Lepidoptera, mostly larvae and pupae (BMNH collection).
- Rebel, H. 1912. Diagnosen zweir neuer Tagfelterarten. Verh. Zool. Bot. Ges. Wien 62: 218-221, f. l.

- Röber, J. [1916]. In A. Seitz, Macrolepidoptera of the World.
- Vol. 5. Callithea, pp. 490-493. Stuttgart.
- Röber, J. [1924]. In A. Seitz, Macrolepidoptera of the World (additions). Vol. 5:1031, pl. 102C. Stuttgart.
- Salvin, O. 1869. Descriptions of new species of butterflies from tropical America. Ann. Mag. Nat. Hist. 4(4): 163-181.

Smart, P. 1975. The International Butterfly Book. T. Y. Crowell Co., New York. pp. 275.

- Staudinger, O. in Staudinger, O., and E. Schatz. 1884-1888. Exotische Tagfalter in systematischer Reihenfolge mit Berücksichtigung neuer Arten Vol. 1:334 pp., 100 pls. 1885, Vol. 1, pp. 35-102, pls. 31-60; 1886, Vol. 1, pp. 103-174, pls. 61-80]; 1888, Vol. 1, pp. 235-333, pls. 96-100.
- Stichel, H. 1936. Neu namen für neotropische Rhopalocera (Lep.). *Mitt. D. Ent. Ges. Jahrg.* 6: 63-64.
- Swofford, D. L. 1985. Phylogenetic Analysis Using Parsimony, Version 2.4.1. PAUP Users Manual. Ill. Nat. Hist. Survey, Champaign, Ill.
- Swynnerton, C. F. M. 1926. An investigation into the defences of butterflies of the genus Charaxes. Proc. Intern. Cong. Ent. (3)2: 478-506.
- Watrous, L. E. and Q. D. Wheeler. 1981. The outgroup comparison method of character analysis. Syst. Zool. 30(1): 1-11.



Figures 68-69. 👌 genitalia and hypandria of Asterope. 68, Asterope batesii, 69, Asterope degandii.



Figures 70-71.  $\hat{O}$  genitalia and hypandria of Asterope. 70, Asterope markii. 71, Asterope buckleyi.



Figures 72-73.  $\eth$  genitalia and hypandria of Asterope. 72, Asterope whitelyi. 73, Asterope sapphira.



Figures 74-75.  $\rotom{3}$  genitalia and hypandria of Asterope. 74, Asterope leprieuri. 75, Asterope optima.



Figures 76-79. Sterigma, ductus bursae and associated structures of  $\circ$  genitalia of Asterope. 76, Asterope batesii. 77, Asterope degandii (also shows corpus bursae with signa). 78, Asterope markii. 79, Asterope buckleyi.



Figures 80-82. Sterigma, ductus bursae and associated structures of  $\circ$  genitalia of Asterope. 80, Asterope sapphira. 81, Asterope leprieuri. 82, Asterope optima.



Figure 83. Distribution of Asterope batesii.



Figure 84. Distribution of subspecies of Asterope degandii,  $\bullet = degandii$ ;  $\bullet = degandii$ ;  $\bullet = degandii$ ;  $\bullet = degandii$ ;  $\bullet = degandii$ .



Figure 85. Distribution of subspecies of Asterope markii,  $\bullet = markii$ ;  $\blacksquare = boyi$ ;  $\blacktriangle = ackeryi$ ;  $\bigcirc = hewitsoni$ ;  $\square = davisii$ .



Figure 86. Distribution of Asterope buckleyi.



Figure 87. Distribution of subspecies of Asterope whitely i,  $\bullet = whitely$ ;  $\circ = srnkai$ .



Figure 88. Distribution of Asterope sapphira.



Figure 89. Distribution of subspecies of Asterope leprieuri, O = leprieuri; O = leprieuri;



Figure 90. Distribution of subspecies of Asterope optima, O = optima;  $\bullet = philotima$ .

This public document was promulgated at a cost of \$6,125.00 or \$8.75 per copy. It makes available to libraries, scholars and all interested persons the results of researches in Entomology.