



A Guide to the Butterflies of Sabangau

The Orangutan Tropical Peatland Project

July 2012



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The following photographs are courtesy of OuTrop Staff:

Nick Marchant: *Polyura schreiber*, *Lexias canescens*, *L. cyanipardus*, *Tanaecia godartii*, *Mycalesis anapita* ♀, *Graphium delessertii*, and *Saletara panda*.

Marc Dragiewicz: *Tanaecia godartii*

Chariklia Kapsali: *Papilio iswara*

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Cover photo: *Paralaxita damajanti* ♀

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Introduction

The 6,000 km² Sabangau Forest in Central Kalimantan, Indonesia, is the largest non-fragmented area of lowland rainforest remaining in Indonesian Borneo and is of major conservation importance for its high biodiversity, as a globally significant carbon store, and for its natural resource functions that benefit the surrounding communities. Sabangau supports the largest extant population of the Bornean orangutan (*Pongo pygmaeus*) with 6,900 individuals estimated to occur here, representing 12.5% of the estimated remaining world population of this endangered species. It also supports the largest known population of southern Bornean gibbons (*Hylobates albibarbis*) and significant numbers of many other threatened plant and animal species. Sabangau is therefore considered one of the last strongholds for apes in Borneo and one of the top priority sites for their conservation. In 1994, the Natural Laboratory for the Study of Peat-Swamp Forest (NLPSF) was created to protect and study this unique ecosystem, and in 2004 the Sabangau National Park was declared throughout the remainder of this forest to conserve its biodiversity.

The forest has been subject to extensive logging in the past, initially as a legal logging concession, and subsequently by widespread uncontrolled illegal logging. A network of timber-extraction channels has drained the forest, and the drained forest has suffered several severe fire events since 1997, with an estimated 15% of the forest area burnt between 1997 and 2009. CIMTROP established a local Community Patrol Team in 2002 to combat these problems, and succeeded in stopping illegal logging in 2004. They continue to prevent damage to the ecosystem and fight fires during the dry season. The focus is now on preserving Sabangau's biodiversity and ecosystem services, encouraging regeneration and helping to restore it back to its natural condition.

A number of different butterfly studies have been undertaken at the Setia Alam Research Station by Peter Houlihan (2009), and Kate Brady (2004, 2006). In addition, a year-long project is currently underway which aims to investigate seasonal variations in butterfly species abundance and the associations of different species with habitat types or levels of disturbance. Here, we document all species recorded in the Sabangau forest to date, and discuss some features of their ecology.

To date, a total of 48 species have been recorded in the Sabangau Forest. The list includes 27 species that are attracted to fermenting fruit and can be monitored using fruit-bait traps. The remaining species can be seen around the NLPSF base camp or along transects in the forest feeding on various items, including carrion and nectar. For many years, fruit-feeding butterflies were the only recorded species in Sabangau, generating a poor representation of the forest's butterfly diversity. We have compiled a list of species with records from PRH's 2009 collection and species he observed in September 2011. Recent monitoring efforts have expanded on a macro-habitat scale to include fruit-bait trapping in the low- and tall-pole interior forests, while also continuing work in additional microhabitats of the mixed-swamp forest. These efforts have already added several species to the list and those are also included here. Future monitoring work will include field trips to additional sites.

The increased attention toward butterfly monitoring has contributed to a greater understanding of Sabangau's butterfly community and will certainly result in a much lengthier list of species in the years to come. Thus, we anticipate future revisions to this guide, as we are nowhere near a stopping point on the total forest's species accumulation curve. We hope, however, that this guide will provide a better understanding of what we know now and help us to continue advancing our knowledge of peat-swamp forest butterflies.

Location

Most trapping has taken place at the Setia Alam Field Station, in the Natural Laboratory for the Study of Peat-swamp Forest (NLPSF), S2°19'00.3" E113°54'29.3", Sabangau, which is 15 km south of the Central Kalimantan provincial capital of Palangka Raya (Figure 1). The NLPSF covers an area of 500 km² in the northeast section of the Sabangau Forest, bordering the Sebangau National Park to the south and west, and was established for the purpose of scientific research in 1997. Sampling has also been carried out at a number of remote sites within the NLPSF.

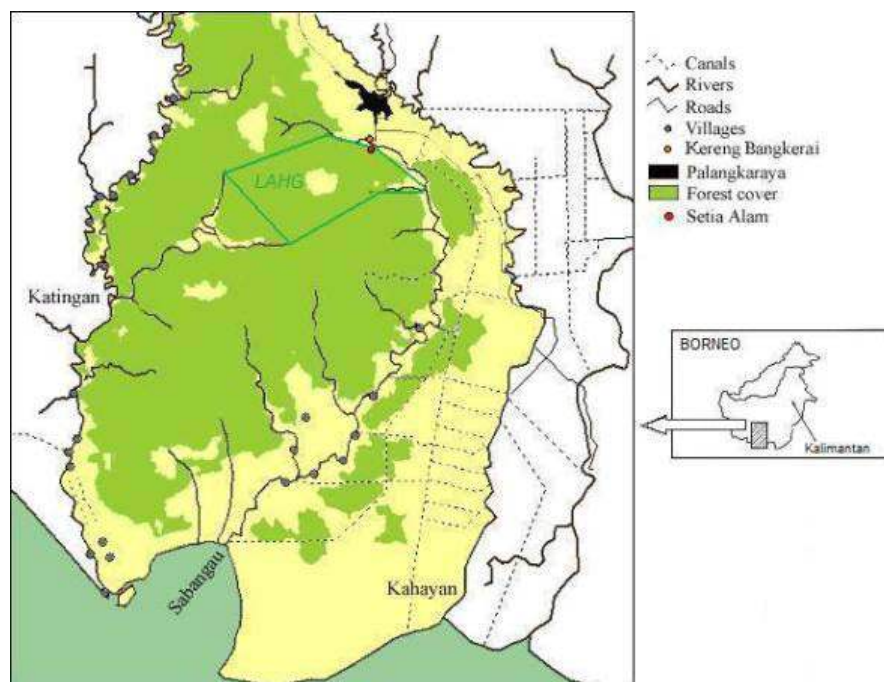


Figure 1. Location of the Natural Laboratory for Peat Swamp Forest (marked as LAHG – Laboratorium Alam Hutan Gambut) and the Setia Alam Research Station.

Identification

Identifying Lepidoptera

As in all insects, the bodies of butterflies are comprised of three main parts: head, thorax, and abdomen (Figure 2). Although wing shapes and colour patterns are the most apparent and distinguishable traits, knowledge and understanding of additional anatomical features is often required in order to accurately identify butterflies to the proper species. This familiarity is especially pertinent given the overwhelming presence of mimicry in the Lepidoptera, in which coloration may not be the most reliable source of identification. Knowing these anatomical features will make identification easier and more accurate.

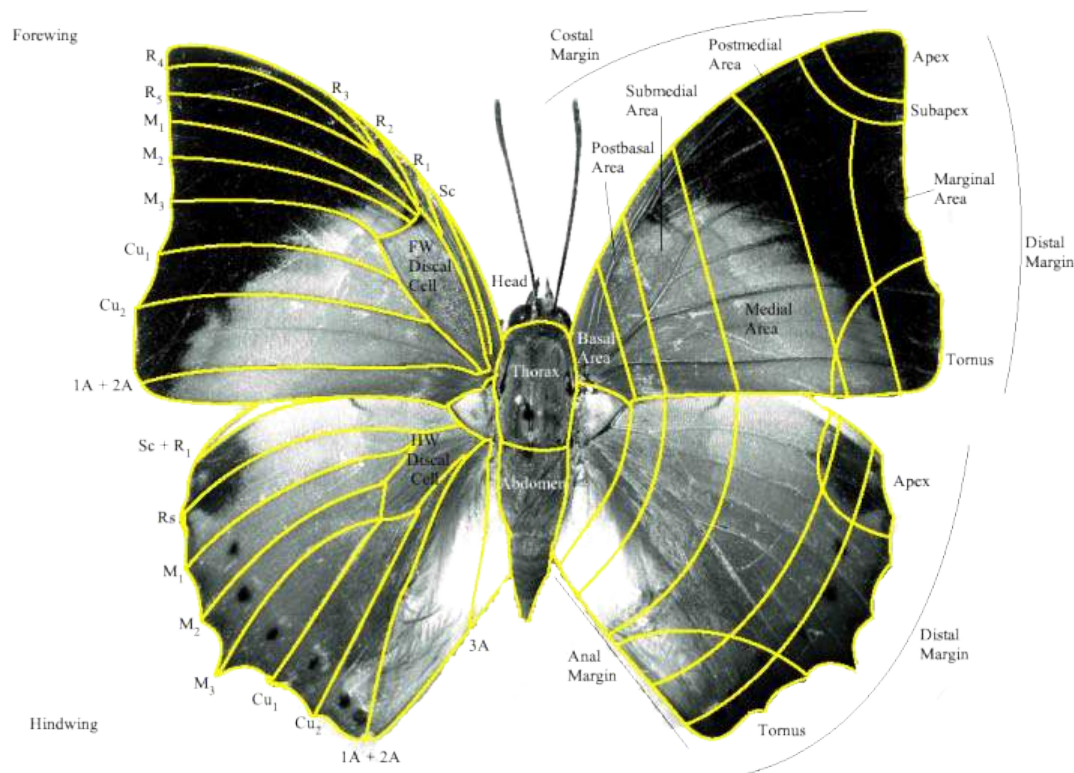


Figure 2. Wing venation (left) and wing regions (right) on *Charaxes bernardus* (photo & drawing by P.R. Houlihan).

Male vs. Female

There are several ways to determine the sex of a butterfly. Many species are sexually dimorphic in their wing colour or pattern and are so sexes can be easily distinguished. Photographs of males (♂♂) and females (♀♀) are included in this guide for this purpose. However, in species that are monomorphic, sexual identification requires more careful observation. Even in these species, females can be found to possess slightly less striking

colours, including more shades of brown. The definitive answer obviously lies in the genitalia, but each species is different, often making this a tedious process. In general, males possess a slit at the tip of the abdomen, while females have a more circular opening for oviposition. Females, especially those that are pregnant, will usually have rounder abdomens than the long, more slender abdomens of males. Males in some species have androconia (or scent patches) on their hindwings used in attracting mates via pheromones. Androconia come in a variety of forms. One more diagnostic trait of males and females is often size. In monomorphic species, a larger wingspan can often be used to distinguish females from males. Observing behaviour can also help in identifying the sex of a butterfly, especially when it is not possible to capture the individual, or if there are several individuals in a group. Males tend to be more territorial and have more sporadic flight. Females are generally less active, remaining in areas of host plants for both themselves and their offspring. The distinction is certainly easiest in dimorphic species, but there are several additional ways to determine the sex of a butterfly, with analysis of the genitalia being the most accurate and reliable.



Figure 1. *Xanthotaenia busiris* seen feeding on fallen fruit in the leaf litter (Photo: P.R. Houlihan, September 2011).

List of Species

All 48 species are arranged according to Family [centered] and then by subfamily [underlined]. An alphabetical listing of species is located in the index at the end of this guide. * = Species found in fruit-bait traps (27 species to date).

Nymphalidae

Charaxinae

*Agatasa calydonia**
*Charaxes bernardus**
*Charaxes borneensis**
*Charaxes solon**
*Polyura hebe**
*Polyura schreiber**
*Prothoe franck**

Danainae

Euploea mulciber
Euploea radamanthus
Ideopsis vulgaris

Heliconiinae

Vindula dejone

Limenitidinae

*Athyma asura**
*Athyma prava prava**
*Dophla evelina**
Pandita sinope

Morphinae

*Amathusia phidippus**
*Faunis stomphax**
*Thaumantis klugius**
*Thaumantis noureddin**
*Zeuxidia aurelius**
*Zeuxidia doubledayi horsfieldi**

Nymphalinae

*Euthalia kanda kanda**
Hypolymnas bolina
*Lexias canescens**
*Lexias cyanipardus**
*Lexias pardalis**
*Tanaecia clathrata clathrata**
*Tanaecia godartii vacillaria**
*Tanaecia munda**

Satyrinae

*Coelites euptychioides euptychioides**
*Melanitis leda**
*Mycalesis anapita**
Xanthotaenia busiris

Papilionidae

Papilioninae

Graphium agamemnon
Graphium antiphates
Graphium delessertii
Graphium doson
Graphium evemon
Graphium sarpedon
Papilio demoleus
Papilio iswara

Riodinidae

Riodininae

Paralaxita damajanti
Paralaxita orphna
Paralaxita telesia

Pieridae

Pierinae

Saletara panda

Hesperiidae

Coeliadinae

*Burara etelka**

Lycaenidae

Lycaeninae

Arhopala sp.

Theclinae

Eooxylides tharis

Species Accounts

Photographic plates follow the written species accounts. Plate numbers associated with each species are listed in bold next to the species name of each account, and are also listed in the index.

Agatasa calydonia

II

FW: ♀ = 50mm, ♂ = 47mm

Abundance: Abundant

Identification: A well-known visitor to fruit bait traps, *Agatasa calydonia* is easily identified with its distinctly vibrant ventral pattern.

Similar species: *Prothoe franck* is a smaller species with a similar wing shape, however *A. calydonia* has a larger wingspan and the dorsal color is white instead of blue. The dorsal side of *Polyura hebe* is also strikingly similar to *A. calydonia*, but the ventral colors and patterns are drastically different.

Ecology: Lacks a shade preference and is often found in disturbed sites or forest gaps. Slightly more common in high traps although still great in number at low traps. Note: This species was overly abundant around camp in September 2011, which was not so noticeably observed June-August 2009. Recaptured individuals have been known to travel up to 2km between traps and live for as long as 40 days.

Amathusia phidippus

VIII

FW: 55mm

Abundance: Rare

Identification: Dorsal colour is a light brown with more pronounced yellow bands along on ♀♀ in the distal margin and in the submedial area. The ventral side is striped with varying shades of brown.

Similar species: Other species in the same genus share great resemblance, but lack the yellow dorsal bands and have straighter ventral stripes. *Thaumantis noureddin* is a large brown butterfly, also in the Morphinae subfamily, but its wing shape and metallic blue sheen make it unique.

Ecology: I captured an individual fluttering in front of the project house on Semeru. Although it is believed to be a resident of dense intact forest, the only other record has been on transect PH along the forest edge.

Arhopala sp.

FW: 15~45mm

Abundance: Common genus

Identification: This genus consists of many species that all look very similar in appearance. The species are seemingly impossible to identify without capturing. Most have metallic blue scales covering the dorsal sides of the wings with elaborate grey ventral patterns. Some species may have a green or purple dorsal colour.

Ecology: Many lycaenids can be found flying just above the forest floor and resting on leaves along transects, particularly on the railway. More Lycaenidae specimens are required to identify which species are present in Sabangau.

Athyma asura

III

FW: 30mm

Abundance: Common in forest gapsIdentification: Large relative to others in the *Athyma* genus. The common black and white pattern is distinguished in *A. asura* by the additional white spot in the submedial area of the costal margin of the forewing.Similar species: *Athyma pravara* is smaller and lacks the additional white spot found on the forewing of *Athyma asura*.Ecology: Similar to *A. pravara*. Most frequently observed in gaps and clearings.***Athyma pravara pravara***

III

FW: 22mm

Abundance: Common in forest gapsIdentification: Black nymphalid with three white stripes. The top stripe near the costal margin of the FW lacks the white spot on the lateral end as found in *A. asura*.Similar species: See *Athyma asura*. The black and white pattern on this species is similar to that of many other members of the *Athyma* and *Neptis* genera.Ecology: Individuals of this genus do not commonly visit baited traps, but they can be seen resting on leaves at edges and in gaps that expose them to direct sunlight.***Burara etelka***

FW: 28mm

Abundance: CommonIdentification: An erratic orange skipper frequently encountered on Transect PH, in camp, and along open pathways like the railway. (Not pictured)Similar species: Orange hesperids are common in gaps and along the forest edge on Transect PH.Ecology: While these individuals are likely to comprise several species of skippers, *Burara etelka* is the only species identified thus far, which is occasionally attracted to fruit-bait traps. However, skippers are not known to be regular visitors.**GENUS: CHARAXES**

The *Charaxes* are among the most common and well-studied butterflies in Sabangau. Largely due to their great abundance, *Charaxes* species are frequently captured in fruit traps. They have large thoraxes, especially relative to their wingspan. The morphology of the *Charaxes* permits their strong flight and widespread range. In Sabangau, all three recorded species are more consistently found in higher traps and in more disturbed forest.

Charaxes bernardus

I

FW: ♀ = 42mm, ♂ = 41mm

Abundance: Abundant in all forest typesIdentification: The ♂ is a brown-red colour inferior to the medial area of the FW. Lateral to this point, the entire apical region is a solid black. The apex of the HW is also black, which proceeds into black spots at end of each cell along the distal margin. The FW of the ♀ is a lighter brown, and the area between this inner brown basal region and the outer black apical region is interrupted by a yellow band that runs medially across the FW and fades into the HW.Similar species: See *Charaxes borneensis*

Ecology: A frequent visitor to fermenting fruit, *C. bernardus* is the most abundant of the *Charaxes* species in Sabangau. Common in gap and closed canopy sites, this strong flier has a far greater distribution than the many butterflies that are restricted to the forest interior and is difficult to observe without capturing.

Charaxes bernardus is usually twice as abundant in high traps than in low traps, however, the species is widespread throughout the mixed swamp forest, visiting disturbed areas such as the inter-rail most frequently

Charaxes borneensis

I

FW: ♀ = 48mm, ♂ = 47mm

Abundance: Less Common

Identification: Very similar to *Charaxes bernardus* ♀, however, it displays a broad white medial band instead of yellow. This medial band is present in both the FW and HW of the ♀, but only the FW of her mate. This species is often confused with *Charaxes bernardus*. See below.

Similar species: *Charaxes bernardus* ♀ is lighter with a tannish-brown colour inside of the submedial area, which contrasts from *Charaxes borneensis*' darker orange-brown coloration in this area. The medial area of *Ch. bernardus* ♀ is yellow in contrast to the white fill on *Ch. borneensis*. *Charaxes borneensis* also displays a darker brown border extending from the postmedial area out to the distal margin on both the FW and HW. This band encloses several white spots on the FW.

Ecology: *Charaxes borneensis* visits bait traps on a regular basis, but less frequently than *Charaxes bernardus*. Individuals tend to visit high traps more frequently.

Charaxes solon

I

FW: ♀ = 37mm, ♂ = 36mm

Abundance: Uncommon visitor to high traps in gaps, edges, and other disturbed forest areas

Identification: The only black *Charaxes* species on Borneo, the vertical yellow bands across the dorsal FW and HW help to distinguish this small species.

Similar species: None.

Ecology: *Charaxes solon* is an uncommon visitor to high traps in forest gap and edge sites. Most captures are in the highest traps in the canopy between 15-25 meters. Studies in Sabangau report that captures of *Charaxes solon* only occur along the forest edge or in the most disturbed forest area of the inter-rail. Although I have managed to capture individuals in a few low traps within montane forests of central Borneo, it is a difficult species to capture in Sabangau. Sabangau's topography may contribute to this species' difficulty in penetrating the interior, which may be aided elsewhere in hill forest.

Coelites euptychioides

IX

FW: 33mm

Abundance: Uncommon in tall pole forest of Sabangau and abundant elsewhere in dryland dipterocarp forests

Identification: *Coelites euptychioides* is largely unmistakable with purple dorsal hindwings on both ♂♂ and ♀♀.

Similar species: *Melanitis leda* is comparable in wing shape, but differs in lacking the purple that dominates *Coelites euptychioides*' hindwings.

Ecology: *Coelites euptychioides* is a common species in intact dryland forests

where individuals fly swiftly up and down transects at about ankle height. It is likely that this species would therefore be a more frequent visitor of low traps. Individuals appear to be highly territorial, particularly along transects where they appear to patrol a regimented distance.

This species, recently recorded in traps at the low pole draws attention to more species-specific habitat preferences of Sabangau's butterflies. No records of this species have been recorded in the mixed swamp forest, yet the first expedition surveying butterfly diversity in the tall pole (2011) revealed this locally common species. Species of the *Coelites* genus are far more abundant in parts of Borneo where the forest floor is drier than the often-flooded mixed swamp forest habitat around camp. This species is probably even more abundant in the tall pole, perhaps slightly extending its range during the dry months of the year.

Dophla evelina

III

FW: ♀ = 52mm, ♂ = 44mm

Abundance: Abundant in all forest types

Identification: The red spot on the dorsal margin of each forewing and the wing shape easily identify this large brown species. The ♀♀ are noticeably larger than ♂♂ in wingspan by as much as 1cm, and often have a very robust abdomen. When approaching traps, *Dophla evelina* can be identified by its tendency to walk around the inside of the trap, opening and closing its wings very slowly.

Similar species: Other brown butterflies may appear similar, such as *Melanitis leda*, but the massive size and distinct red spot on the forewing make this species difficult to confuse.

Ecology: *Dophla evelina* varies in vertical behaviour throughout the year, becoming more abundant in high or low traps at different times. Consistent with several other butterflies in the forest, this behaviour seems to be largely dependent on seasonal variations and fruiting events. Although *D. evelina* is recorded in microhabitat sites with the highest canopy cover, it is found in all macrohabitat areas. Recaptured individuals have travelled over 2km and one individual lived for nearly three months.

Eooxylides tharis

XIII

FW = 16mm

Abundance: Common

Identification: Species in the *Eooxylides* genus stand out from other lycaenids with their long hindwing tails. Individuals can be seen resting on leaves along transects.

Similar species: *Cherita freja* lacks the broad horizontal white band across the dorsal and ventral HW of *E. tharis*.

Ecology: *E. tharis* is the most encountered of these lycaenid species in Sabangau, usually seen flying along transects or edges around 1-2 meters above the ground and resting on leaves overhanging the path.

Euploea mulciber

X

FW: 47mm

Abundance: Common in gaps/clearings

Identification: The ♂ FW is most distinctly covered in a glossy metallic blue that progresses from dark to light blue toward the apical region. The ♀ lacks much of the sheen found on her mate, which is replaced by a dark brown colour. However, a faint metallic blue is present in

the apical region of her FW. Both sexes display whitish spots across the outer region of the FW. The ♂ HW is distinctly separated into three colours, from a solid charcoal hue around the tornus to a white band bordering the FW above.

Similar species: The ♀ resembles some species from the *Tirumala* genus, but the metallic blue portion of the FW distinguishes *Euploea mulciber*. See also *E. radamanthus*.

Ecology: Most likely to be seen around camp near the kitchen and badminton court, but can also be seen in large gaps like the bat tower clearings or near the forest edge.

***Euploea radamanthus* X**

FW = 40mm

Abundance: Common in gaps/clearings

Identification: Most easily recognized by the white and blue spots on the ♂, the ♀, though sexually dimorphic, possesses a similar, less vibrant pattern. Both have a broad white patch along the medial area of the costal margin, which is more robust in the ♂. Several dots mark the apex of the FW and the distal margin of the HW, blue in ♂♂ and white in ♀♀. The anal margin of the HW is paralleled by three vertical white stripes in the ♂, whereas several brief white lines radiate out from the basal area of the ♀ HW.

***Euthalia kanda kanda* VI**

FW: ♀ = 33mm, ♂ = 27mm

Abundance: Uncommon

Identification: A distinct *Euthalia* wingshape of a pointed FW apex and concave distal FW margin help to separate this species and others of the

same genus from the *Tanaecia*. The ♂ lacks the white dorsal spotting that is so common in these two genera. A moderate zig-zag lines the FW and HW postmedial area. The ♀ expresses similar shape and pattern as her mate with the addition of faint white filling along the jagged distal line.

Similar species: *Euthalia monina*. See also: *Tanaecia clathrata* and *Tanaecia munda*.

Ecology: Flies in the understory resting on leaves with wings open.

***Faunis stomphax* VIII**

FW: 31mm

Abundance: Common – Low Pole, Mixed swamp forest

Identification: The dorsal side is solid brown. The ventral HW contains several ocelli that display great spatial and temporal polyphenism. Some ♂ forms have a ventral white band crossing the subapical area.

Similar species: *Faunis kirata* has yellow dots along the postmedial area of the ventral HW and FW, and do not show as pronounced HW ocelli as *F. stomphax*.

Ecology: Like other members of this genus, flight tends to be low along the forest floor. *Faunis stomphax* was recently recorded in the low pole and is more frequently seen than captured in the mixed swamp forest. This species is more common in dryland dipterocarp forests.

GENUS: *GRAPHIUM*

Graphium species are common around puddles and wash areas at camp. Thus far, six species have been recorded in Sabangau. With the exception of *G. agamemnon* and *G. antiphates*, and *G. delesserti*, species in this genus are very similar in appearance but can be properly identified with careful attention. These species are largely sexually monomorphic.

***Graphium agamemnon* XI**

FW = 39mm

Abundance: Abundant

Identification: This species is easily identified from other members of the genus by its dark green spots on the dorsal side.

Similar species: None. The vibrant green pattern is quite distinct.

Ecology: Shares muddy patches and stream banks with other *Graphiums*, as well as pierids. Second only in abundance to *Graphium sarpedon*.

***Graphium antiphates* XI**

FW: 43mm

Abundance: Rare

Identification: Different in wing shape from the other *Graphium* species in Sabangau, *G. antiphates*' swordtail features and green and white stripes make it a distinct species. A patch of hair is present on the HW near the thorax on the ♂.

Similar species: *Graphium agetes*, *G. decolor*, *G. stratiotes*. Few *G. antiphates* individuals have been recorded in Sabangau, and none of these similar species have been confirmed. *G. antiphates* has a distinct black spot above

the tail on the ventral HW where the other species have a red spot or no spot at all.

Ecology: Found in congregations of other *Graphium* species on moist soil, yet usually as a singleton amongst numerous *G. sarpedon* and/or *G. agamemnon*. Occasionally observed in gaps, on stream banks, or around camp where it visits the soapy wash area.

***Graphium delesserti* XI**

FW: 48mm

Abundance: Rare

Identification: Pronounced black bands border the white cells of *G. delesserti*, which are dotted with one black spot at the marginal end of each cell. Both sexes possess wavy black bands in the dorsal discal cell of the FW, and ♂♂ display a ventral yellow patch.

Similar species: *Ideopsis vulgaris* and other members of the genus are similar, but most apparent is the absence of the black bands in the discal cell of the FW.

Ecology: Most common along streams and forest edges.

Graphium doson

FW: 38mm

Abundance: Uncommon

Identification: Strikingly similar to the other *Graphium* species, *G. doson* is distinguished by the red spot separating the shorter and more lateral of the two black hindwing bands at the intersection of the Sc+R₁ vein on the ventral side. (Not pictured)

Similar species: See *G. evemon* and *G. sarpedon*.

Ecology: Similar to other *Graphium* species, ♂♂ often feed in groups on moist soils and ♀♀ fly amongst flowers feeding on nectar.

Graphium evemon

XII

FW: 38mm

Abundance: Uncommon

Identification: Resembles others in the same genus, but the ventral HW is unique in that it possesses a vertical black band that splits toward the costal margin of the HW, forming a “Y.” The only red markings are located around the bottom of this “Y.”

Similar species: *Graphium doson* has a red mark on the upper region of the ventral HW costal margin. The vertical black band is also separated from the mark containing the red spot instead of forming a “Y.”

Ecology: Similar to others in the genus and often found amongst others.

Graphium sarpedon

XII

FW = 37mm

Abundance: Abundant

Identification: The bands on *Graphium sarpedon* are wider than others in the genus and of a turquoise colour. The uniformity of these bands contrasts the spotted bands of other species.

Similar species: *Graphium doson*, *G. evemon*, and others in the genus. These species have a more greenish wing colour, the spots are separated in distinct patterns, and ventral hindwing patterns can be more easily distinguished by the presence and location of red spots.

Ecology: *Graphium sarpedon* ♂♂ spend the majority of their time puddling along

streams, feeding on nutrients in the soil. *G. sarpedon* ♀♀ are primarily nectar feeders along the forest edge. This is the most abundant of all *Graphium* species found in Sabangau.

Hypolimnias bolina

FW: ♀ = 45mm, ♂ = 37mm

Abundance: Rare

Identification: Mostly black with the exception of three white spots, one in the medial area of the HW, one band across the subapical area of the FW, and one spot in near the apex of the FW. Light blue dots line the costal margin of the FW. The ♀ has a fainter white patch on the HW that has a bluish tint and also displays a more pronounced white spotted line along the distal margin of the HW.

Similar species: Others in the *Hypolimnias* genus.

Ecology: An occasional sight in gaps and along forest edges, but by no means common.

Ideopsis vulgaris

X

FW: 36mm

Abundance: Uncommon

Identification: Marked by thick horizontal black bands on the FW that radiate out from the body on the HW. The ♀ has a slightly more blueish tint to the white filling and ♂♂ tend to have a somewhat concave distal margin on the FW compared to ♀♀.

Similar species: *Ideopsis juvena* is paler and has thinner black bands. *Graphium delesserti* has four distinct wavy bands in the discal cell of the FW. It also has a striking resemblance to *Parantica crowleyi*, a species found in the highlands,

which varies only most noticeably in the spotted/lined pattern near the apical region of the FW.

Ecology: It feeds mostly on nectar and although it is not regularly seen, when found it is not unusual to encounter numerous individuals feeding together on flowers.

Lexias canescens

IV, V

FW: ♀ = 44mm, ♂ = 37mm

Abundance: Uncommon

Identification: Smaller in size than *Lexias pardalis*, the ♂ also contrasts in the ventral HW, which is covered in a dusting of yellow scales instead of orange. Though the pattern is similar between sexes, the ♀ is larger than her mate and the yellow markings on the dorsal side become a fainter white near the margins.

Similar species: See *Lexias cyanipardus* ♀ and *Lexias pardalis* ♀.

Ecology: An uncommon capture in disturbed forest sites such as on PH, interrail, and the jelutong pondok. A significant increase in abundance was associated with the other *Lexias* sp. in April.

Lexias cyanipardus

IV, V

FW: ♀ = 68mm, ♂ = 58mm

Abundance: Uncommon

Identification: Both sexes are larger in size than *L. pardalis*. The ♂ HW is more robust and rounded than *L. pardalis*. The ventral side also lacks the orange and yellow dusting found in the other species and instead displays a purplish-blue tint. The spotting on the dorsal side of the ♀ is white rather than yellow, which fades into

a whitish blue near the distal margin of the HW.

Similar species: *L. pardalis* and *L. canescens* are both smaller and are slightly different in the shades of yellow both ventrally and dorsally.

Ecology: Added to the list at the same time as *L. canescens* during a boom in abundance from all *Lexias* sp., very little is known yet regarding the behaviour of these species. Occasional sightings in the forest interior around Transect 0.4.

Lexias pardalis

IV, V

FW: ♀ = 46mm, ♂ = 40mm

Abundance: Common

Identification: The ♂♂ are black with blue margins on the HW extending midway up the FW. The dorsal FW contains orange spots while ♀♀ are black with yellow spotting. The ventral side of the ♂ is covered in a dusting of orange scales.

Similar species: *Lexias dirtea* has nearly identical yellow spotting as *L. pardalis*, but its antennae are completely black whereas *Lexias pardalis* has orange tips on its antennae, most noticeable from the underside. See *Lexias canescens* and *Lexias cyanipardus*. *L. pardalis* ♂♂ can be confused with *Euthalia molina* and *Tanaecia clathrata* ♂♂, but it has a much larger wing span than each of these other species with much deeper colors.

Ecology: Individuals can be seen flying along transects and congregating to feed on rotting fruit on the forest floor. *Lexias pardalis* is often found in shade traps across all forest types (MSF, LP & TP), and almost exclusively found in low traps. A brief spike in captures of *Lexias pardalis* was recorded in April, 2012 during recent monitoring and is possibly due to

opportunistic feeding in traps during times of lower fruit availability.

Melanitis leda

IX

FW: ♀ = 35mm, ♂ = 36mm

Abundance: Common

Identification: The seasonal phenotypic plasticity of *Melanitis leda* often confuses many observers into thinking individuals belong to different species. While the wet season individuals are generally monomorphic with pronounced ventral hindwing eyespots, small dorsal eyespots, and more pointed forewings, the dry season individuals are far more variable. These individuals display a spectrum of ventral patterns from light brown to black. The ventral eyespots (or ocelli) are often reduced in size to the point of being completely eliminated. Dorsal forewings also tend to display more orange around the apical ocelli. The thorax is unusually rounded and as a whole, the body is very fragile and must be handled with care.

Similar species: Some *Mycalesis* species have similar patterns on the dorsal sides but differ in wing shape. Ventral coloration also differs. As described above, the seasonal forms of *M. leda* can be confused for being several separate species. See *Dophla evelina*.

Ecology: Common in low and high traps throughout the mixed swamp forest, low pole, and edges.

Mycalesis anapita

IX

FW: 19mm

Abundance: Rare – Mixed swamp forest; Uncommon – Low/tall pole forest

Identification: Small orange nymphalid with a thick black border along the FW

and HW margins in ♂♂, and slightly less broad and dark on the FW of ♀♀. Black border is absent on the ♀ HW. A key identifying feature is the large ocellus in cell 2. The HW in both sexes is lined with ocelli along the dorsal and ventral sides of the distal margin. The black FW band of the ♀ is slightly thinner around the ocellus.

Similar species: *Mycalesis patiana* and *M. pitana*. *M. anapita* has a striking FW ocellus, whereas the ocellus in *M. patiana* is interrupted by the broader, more encroaching black border. The wing colour of *M. anapita* is also an orange hue rather than the red-brown found on others.

Ecology: Another recent addition to the species list from trips to the low pole. *Mycalesis* species are common in more intact dryland forests but it can also be found in the interrail area of the mixed swamp forest. These small-bodied butterflies are fragile and must be handled carefully.

Pandita sinope

XIII

FW: 28mm

Abundance: Common

Identification: Distinguished by somewhat concentric bands of orange and brown radiating out around the body on the wings.

Similar species: *Vindula dejone* is larger, and lacks the concentric brown bands.

Ecology: Found in gaps and intermediate forest types resting on leaves in the sunlight. Often found resting just above head height.

Papilio demoleus**XII**

FW = 43mm

Abundance: This swallowtail is a common resident on flowers around Palangka Raya

Identification: *Papilio demoleus* is easily recognized by the dorsal yellow bands that run along the medial area of the forewing and hindwing. The tornus is also rounded and lacks a tail.

Similar species: None.

Ecology: Feeds on nectar and is thus found feeding on flowers in gardens and sunny areas. So far, this species has only been recorded in Palangka Raya, where it is abundant, but it is a likely visitor of edges, gaps, and canopy of Sabangau in the vicinity of flowering plants.

Papilio iswara**XII**

FW: 70mm

Abundance: Common along edges and in gaps

Identification: Large black swallowtail distinguished by four white spots on the HW. The ventral FW has horizontal white streaks in the marginal area and the ventral HW has two red ocelli near the tornus.

Similar species: *Papilio helenus* has three white HW spots instead of four and *Papilio fuscus* has five.

Ecology: Several large black swallowtail species can be seen fluttering amongst flowers at the forest edge by camp. *P. iswara* is the most common and some individuals may occasionally be seen descending to visit the wash area or resting on leaves along the forest edge. Individuals are often seen in groups competing for mates.

Paralaxita damajanti**Cover**

FW: 21mm

Abundance: Common

Identification: The ♂ lacks white on the dorsal FW that is common in *P. orphna* and *P. telesia*. The FW of both sexes is red, fading into brown in the HW. The ♀ displays red streaks along the veins of her dorsal HW. The ventral side is darker than *P. telesia*, which also has more silvery ventral markings than the metallic blue of *P. damajanti*. *P. orphna* lacks much of the ventral FW pattern present in *P. damajanti* and is replaced with a red apical region. (Pictured in the cover photo. Not in the photographic plates).

Similar species: *Paralaxita orphna* and *P. telesia*.

Ecology: Similar to others in the same genus.

Paralaxita orphna**XIII**

FW: 21mm

Abundance: Common

Identification: Sexually dimorphic. A white band runs diagonal across the ♂ FW from the submedial area on the costal margin to the tornus. This band is absent in the ♀, and instead the FW is a solid red.

Similar species: See *Paralaxita damajanti* and *P. telesia*.

Ecology: Flies as if slowly skipping low to the ground, resting on leaves often around 1-2m in height. Frequently found along transects and more common in denser vegetation.

Paralaxita telesia**XIII**

FW: 21mm

Abundance: Common

Identification: Sexually dimorphic. Unlike the white band on *P. orphna* ♂♂, the FW of *P. telesia* has a white spot in the medial area of cells 1-3. The ♀ has a distinct yellow band along the subapex of the FW.

Similar species: See *Paralaxita damajanti* and *P. orphna*.

Ecology: Similar to the two other *Paralaxita* species found in Sabangau. Found frequently skipping ahead while walking on the transect.

Polyura hebe**II**

FW: 34mm

Abundance: Uncommon

Similar species: Other members of this genus are similar in appearance but can be distinguished by the width of their green bands (*Polyura athamas*). See also, *Agatasa calydonia*.

Ecology: These strong fliers are more common in high traps and show little preference for shade or gap sites. On occasion, they may be viewed in camp.

Polyura schreiber**II**

FW: 40mm

Abundance: Rare

Identification: A solid vertical white band lies in the medial area of the FW and HW, fading out near the HW tornus where two tails flare out. On either side of this white band is a light pastel blue hue. The apical region of the FW has two white spots.

Similar species: *P. hebe* is greenish-yellow in color.

Ecology: Largely unknown.

Prothoe franck**II**

FW: ♀ = 41mm, ♂ = 43mm

Abundance: Common, but populations can vary drastically between seasons or from year to year.

Identification: This pastel blue butterfly has brilliantly unique ventral patterns.

Similar species: See *Agatasa calydonia*.

Ecology: *Prothoe franck* has shown drastic variations in seasonal numbers over the past few years. These fluctuations have been apparent through monitoring traps. Most frequently captured in low traps, especially further within the forest, this species can be seen resting with its wings open on the trunks of trees several meters above the ground. Known to travel up to several kilometres, *Prothoe franck* has a large range relative to other Sabangau species.

Saletara panda**XIII**

FW: 26mm

Abundance: Uncommon

Identification: The FW of *Saletara panda* comes to a sharp edge that is bordered on the costal and distal margin by a thin black band in the ♂ and a thick black band in the ♀ that also borders the distal margin of the HW. The ♂♂ are completely white on the dorsal region while ♀♀ display a slight yellow tint on the HW. The ventral side is a vibrant and solidly filled with a sulphuric yellow.

Similar species: The *Appias paulina* complex is remarkably similar and is complicated by its seasonal variability.

Ecology: The ♂♂ often congregate in groups on moist soils while the ♀♀ fly more actively in search of nectar.

***Tanaecia clathrata clathrata* VI**

FW: ♀ = 34mm, ♂ = 27mm

Abundance: Common in the dry season, less common during the wet season

Identification: The ♂♂ of this sexually dimorphic species are more easily distinguished due to the blue coloration along the distal margins of the HW and FW. Unlike *Lexias pardalis* ♂, the blue on *T. clathrata* ♂ extends all the way to the anal and distal margins, where each blue cell contains a small black vertical stripe. However, the brown pattern of *T. clathrata* ♀ presents numerous identification difficulties due to its similarity to other species.

Similar species: It is best to distinguish *T. clathrata* from *T. munda* by having broader forewings with straighter distal margins. *Euthalia* sp. are frequently confused with the *Tanaecia* group, however Sabangau's *E. kanda* has less pronounced white dorsal spots and a distinctive zig-zag border along the anal and distal margins.

Ecology: Found in many of the forest types in Sabangau, displaying some spatial and temporal variation like many of the species in this peat swamp forest.

***Tanaecia godartii vacillaria* VI**

FW: 37mm

Abundance: Rare

Identification: More easily distinguished than the other *Tanaecia*, *T. godartii* has several pronounced white ovals in the apical region of the FW.

Similar species: *T. munda* and *T. clathrata*

Ecology: A relatively recent record (October 2011) of this species from the tall pole has added yet another species to the list. This species has not been observed in any trap surveys of the mixed swamp forest.

***Tanaecia munda* VI**

FW: ♀ = 34mm, ♂ = 27mm

Abundance: Uncommon

Identification: Both sexes are highly variable. Horizontal rounded white cones are present in cells 2 and 3 of the forewing, and are slightly smaller and more triangular in the ♀.

Similar species: See *Tanaecia clathrata*, *T. godartii* and *Euthalia monina*. *Tanaecia munda* has relatively smaller palpi.

Ecology: Fruit feeder, but not as abundant as *T. clathrata*. It often rests on leaves, especially near bait traps, with its wings spread.

Thaumantis klugius

FW: ♀ = 47mm, ♂ = 39mm

Abundance: Rare throughout, but possibly more common along canals or any streams

Identification: The dorsal side of both sexes displays a metallic blue sheen, although it covers more of the wing surface on the ♂. The distal margin of the ♀ is filled with a wavy light brown pattern that borders the inner metallic scales. Androconia are present on the ♂ HW. (Not pictured)

Similar species: *Thaumantis noureddin* is comparable in shape and size, but lacks

the glimmering metallic blue that covers much of *T. klugius*' dorsal wing pattern.

Ecology: *Thaumantis* species are often encountered flying along forested streams. They appear to be more active around dusk and will flee from the trees immediately on approach. Appropriately, this species was captured in a trap near one of the canals within the mixed swamp forest.

Thaumantis noureddin

VIII

FW: 50mm

Abundance: Rare, occasional sightings along canals

Identification: Dark brown with a metallic blue lustre around the basal area. Yellowish spotting marks the postmedial area of the ♂ FW, and also borders the HW on his mate. A subapical yellow band is also present on the ♀ FW.

Similar species: Unlike *Thaumantis klugius*, the distal margin of the FW comes to a point just below the apex, near the R₅ vein. The metallic blue sheen of *T. noureddin* is more conservative than the striking shimmer of *T. klugius*. See also: *Amathusia phidippus*.

Ecology: Similar to that of *T. klugius*.

Vindula dejone

FW: 43mm

Identification: The vibrant orange colour of the ♂ *Vindula dejone* contrasts greatly from the sexually dimorphic grey ♀. (Not pictured here)

Similar species: *Pandita sinope* is smaller and has brown bands interspersed within the orange wing pattern.

Ecology: The ♂♂ typically feed by puddling on nutrients in moist soil, but their diet also includes items from fermenting fruit to carrion. The ♀♀ do not expose themselves as readily as their mates and are largely dependent on nectar for nourishment. This species is widely distributed throughout SE Asia and is often seen in the sun along edges or in larger gaps.

Xanthotaenia busiris

6

FW: 33mm

Abundance: Uncommon

Identification: The forewings of this species are marked by a yellow band running diagonally from the costa through the marginal area of the distal edge.

Similar species:

Ecology: The only species of the genus *Xanthotaenia*, *X. busiris* spends the majority of its time feeding on the forest floor where it can be seen congregating amongst other fruit-feeding species such as *Lexias pardalis*, as well as other low-flying forest dwellers like *Faunis phaon*. Interestingly, this species has not yet been captured in bait traps, perhaps due to its strict adherence to fallen fruit in the leaf litter, however I have photographed the species on transect 1B (Page 6).

GENUS: ZEUXIDIA

For many years only one species of *Zeuxidia*, *Zeuxidia aurelius*, was known to inhabit Sabangau. I had long suspected the presence of additional species within the understory interior of Sabangau, but it was not until recently that studies recorded *Zeuxidia doubledayi*. The genera within the Amathusini tribe are

known to be restricted largely to the understory and it is likely that even more species are yet to be recorded, especially of the *Faunis*, *Amathuxidia*, and *Amathusia* genera.

Zeuxidia aurelius

VII

FW = 65-70mm

Abundance: Common

Identification: An unmistakable species due to its massive size, ♂♂ have an iridescent blue on the FW and HW while ♀♀ are even larger and have unique white spotting. Amathusids possess vibrant dorsal blues and camouflaging brown ventral patterns.

Similar species: See *Zeuxidia doubledayi*. *Amathuxidia amythaon* and *Zeuxidia amethystus* ♂♂ are both similar in appearance, but the former lacks blue on the HW and the latter is significantly smaller in size along with much darker ventral coloring.

Ecology: They can be attracted to rotting fruit, but are perhaps more strongly attracted to carrion and feces. Many *Zeuxidia* species are locally common and may be more abundant in some traps strictly as a result of microhabitat preferences. More research is necessary to understand the range of these individuals in the peat swamp forest. Another factor possibly contributing to particular traps attracting significantly

higher abundances could be that the androconia of captured ♂♂ serve as a pheromone attractant that may be stronger than the scent of the rotting fruit, thus stimulating higher capture rates.

Zeuxidia doubledayi horsfieldi VII

FW = 59mm

Abundance: Uncommon

Identification: Recently recognized in Sabangau, but likely a more common resident than previously thought. The ♂♂ have an iridescent blue sheen that is typical of other ♂♂ within the genus. However, its coloration forms a circle around the body. The ♀♀ are brownish in color, but the FW reflect a blue shimmer. The HW often has an orange tint as well.

Similar species: *Zeuxidia aurelius* is similar in color, but not so much in size or pattern. *Z. aurelius* ♂♂ have broad blue patches on the FW, as well as in the tornus of the HW. The FW length of *Z. aurelius* is also much larger than that of *Z. doubledayi*, in both ♂ and ♀. The HW of both sexes is also more robust than other species in the genus.

Ecology: As with *Z. aurelius*, this species is found in the understory of the forest interior.

Photographic plates

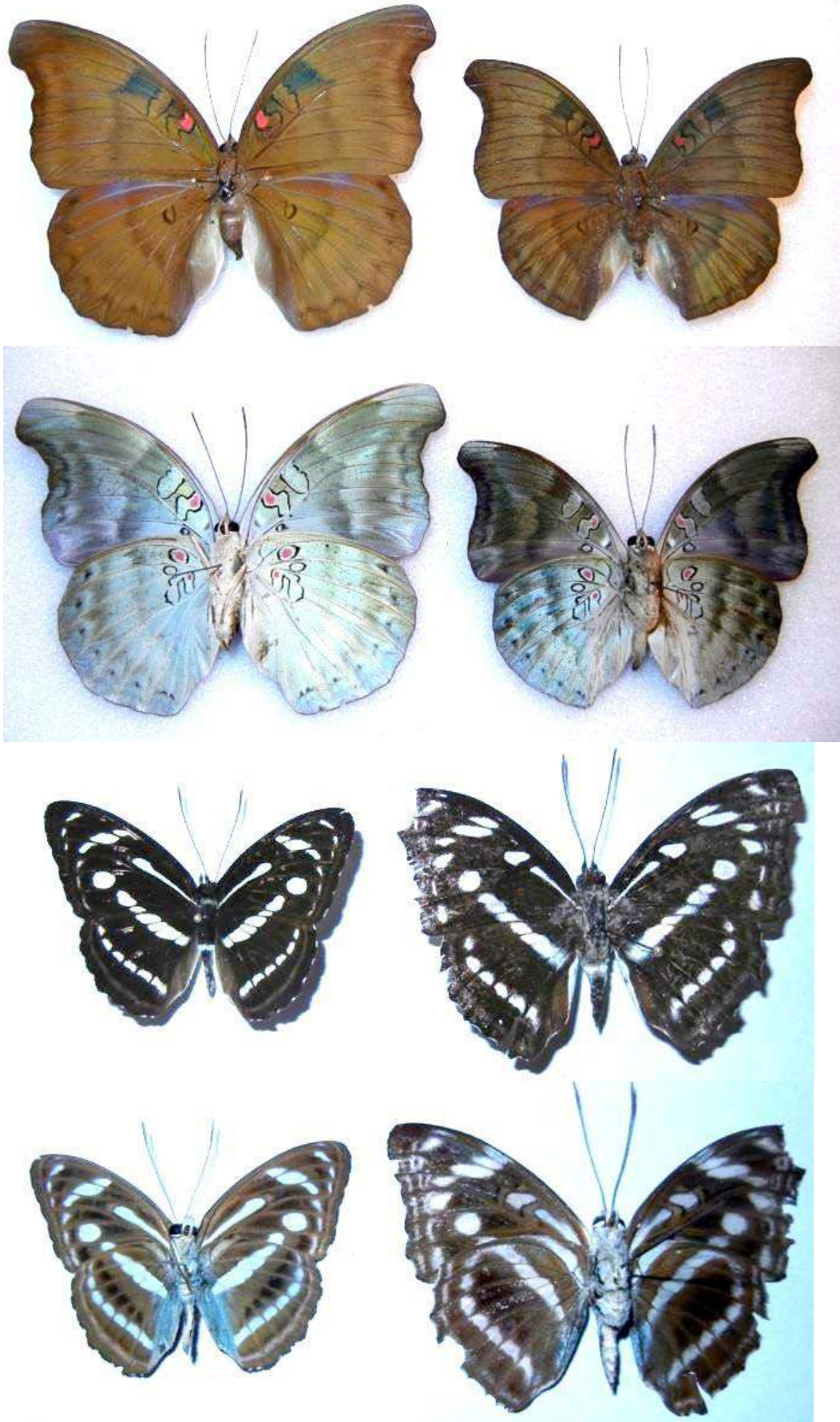
Species recorded in traps



Top to bottom: *Charaxes bernardus* ♂, *Charaxes bernardus* ♀, *Charaxes borneensis*, *Charaxes solon*



Top to bottom: *Agatasa calydonia*, *Prothoe franck*, *Polyura hebe*, *Polyura schrieber*



Top to bottom: *Dophla evelina* ♀ and ♂ (D)

Dophla evelina ♀ and ♂ (V)

Athyma pravara (D), *Athyma asura* (D);

Athyma pravara (V), *Athyma asura* (V)



Top to bottom: *Lexias pardalis* ♂, ♀; *Lexias canescens* ♂, ♀; *Lexias cyanipardus* ♂, ♀
Dorsal



Top to bottom: *Lexias pardalis* ♂, ♀; *Lexias canescens* ♂, ♀; *Lexias cyanipardus* ♂, ♀
Ventral



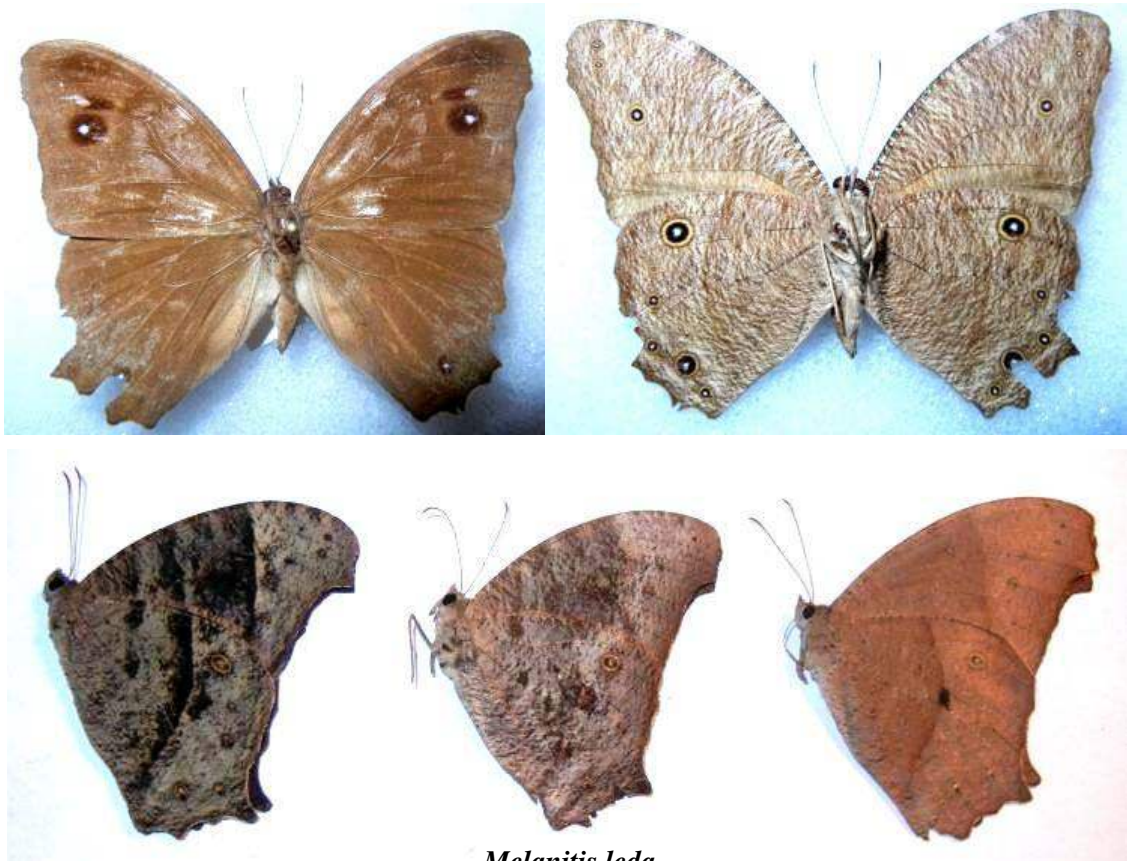
Top to bottom: *Tanaecia clathrata* ♂, *Tanaecia munda* ♀, *Euthalia kanda* ♂, *Tanaecia godartii*



Top to bottom: *Zeuxidia aurelius* ♂, *Z. aurelius* ♀, *Zeuxidia doubledayi* ♂, *Z. doubledayi* ♀

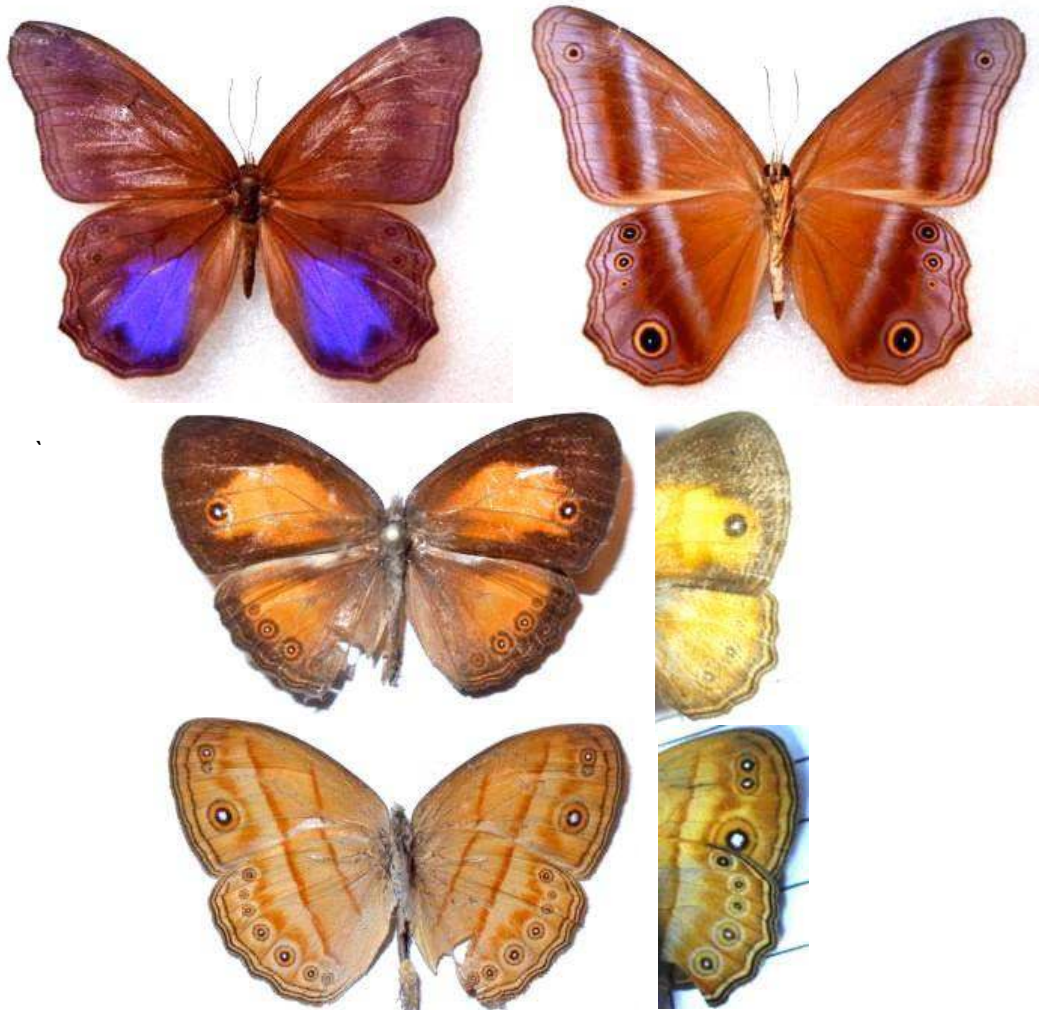


Top to bottom: *Thaumantis noureddin*, *Amathusia phidippus*, *Faunis stomphax*



Melanitis leda

Seasonal variation: The top specimen represents the wet season form of *M. leda* from Sabangau. The bottom three individuals were all captured in Murung Raya, but clearly show the phenotypic plasticity of the dry season forms.

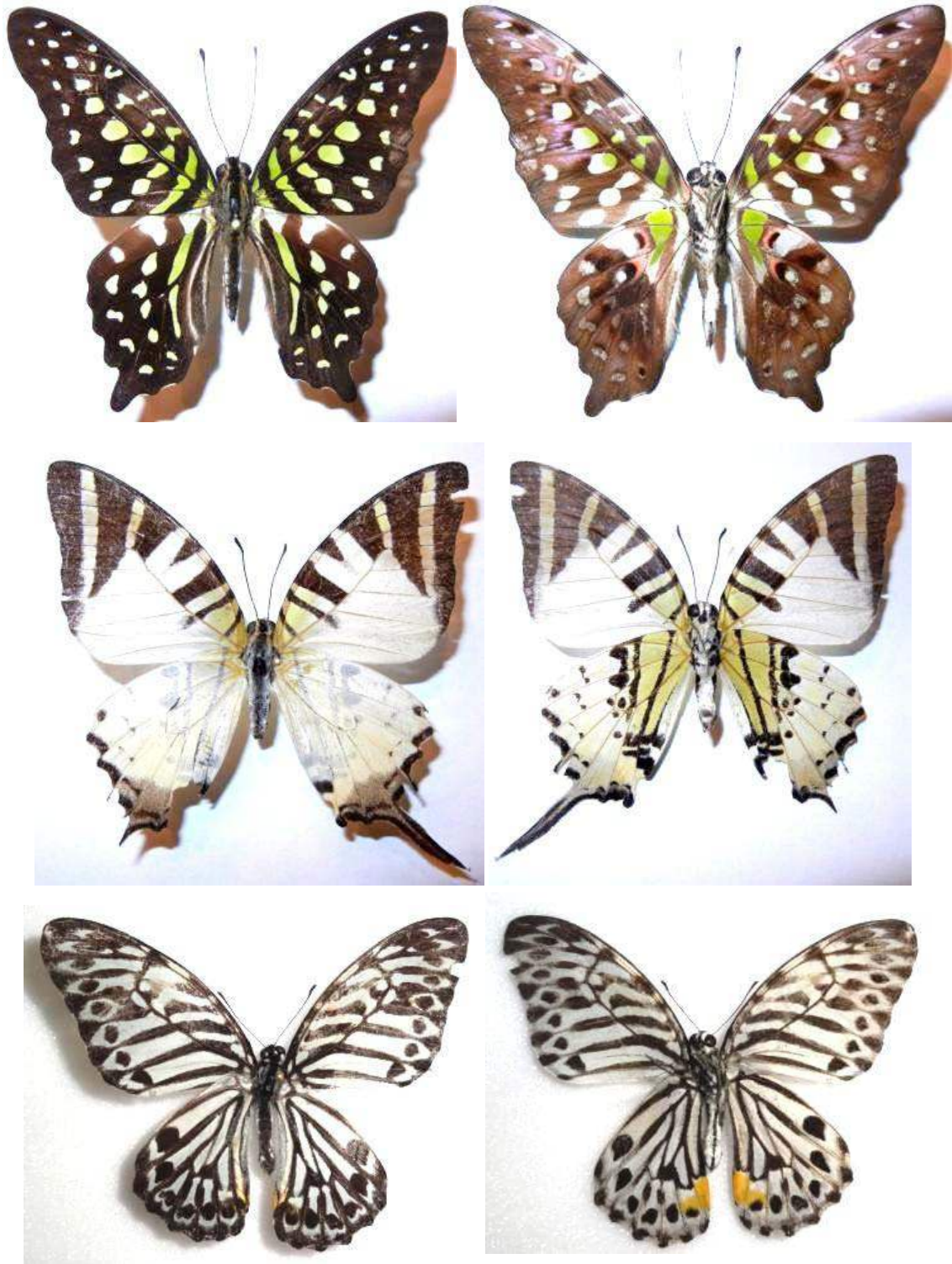


Coelites euptychioides euptychioides ♀, *Mycalesis anapita* ♂, ♀ (D), *Mycalesis anapita* ♂, ♀ (V)

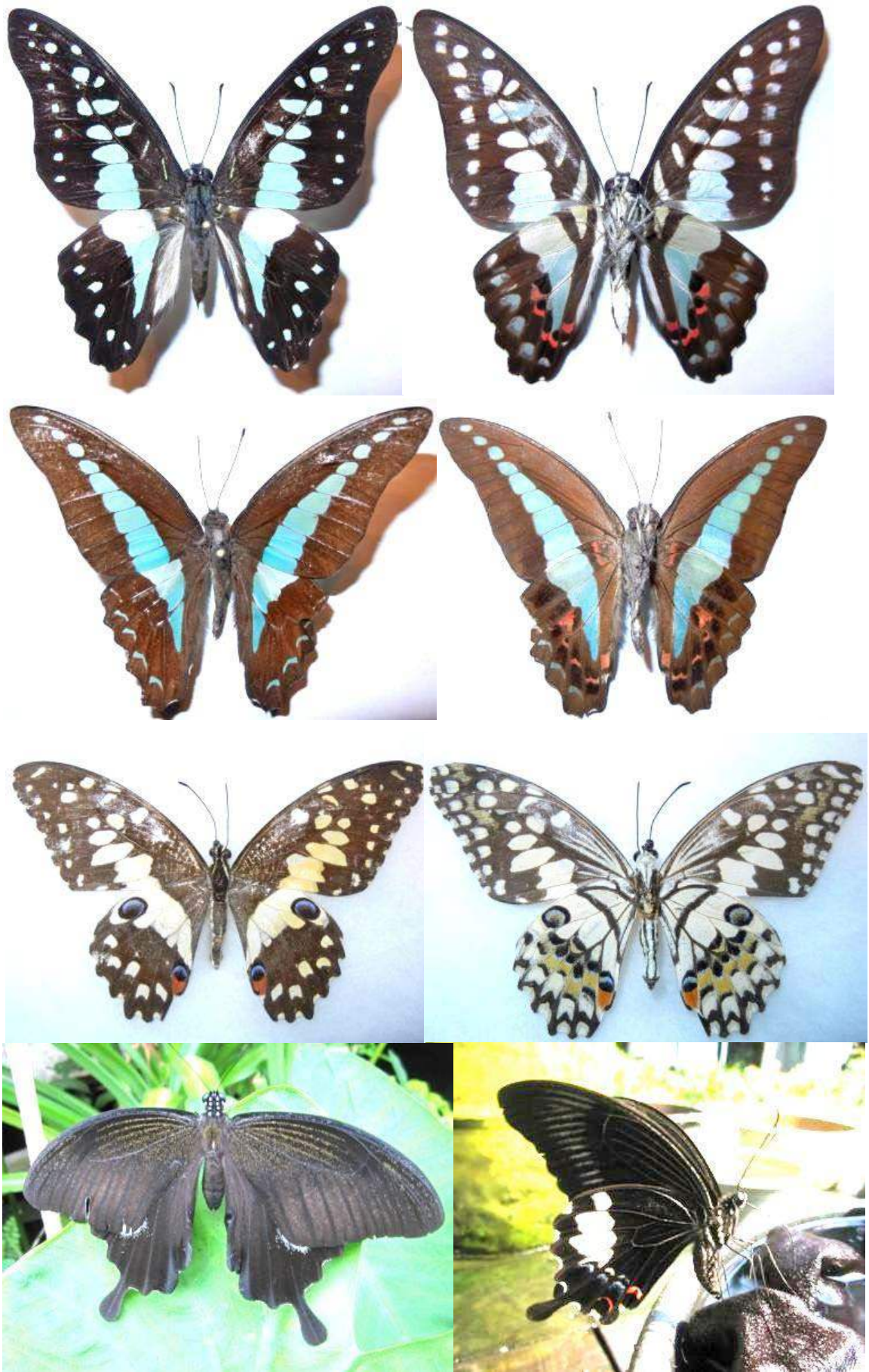
NON-TRAP SPECIES



Top to bottom: *Euploea mulciber* ♂, *Euploea radamanthus* ♂, *Ideopsis vulgaris* ♂



Top to bottom: *Graphium agamemnon*, *Graphium antiphates* ♂, *Graphium delesserti* ♂



Top to bottom: *Graphium evemon*, *Graphium sarpedon*, *Papilio demoleus*, *Papilio iswara*



Top to bottom: *Eooxylides tharis*, *Parallaxita orphna* ♂, *Parallaxita telesia* ♀, *Pandita sinope*, *Saletara panda*

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References

- Brady, K. (2004). Butterflies as indicators of habitat condition in the Sebangau National Park, Central Kalimantan, Indonesia. BSc thesis, University of Southampton, Southampton.
- Brady, K. (2006). Butterflies as indicators of habitat condition in the Sebangau National Park, Central Kalimantan, Indonesia: a protocol for future monitoring. OuTrop Report, Palangkaraya, Indonesia.
- Brakefield, PM & TB Larsen. 1984. The evolutionary significance of dry and wet season forms in some tropical butterflies. *Biological Journal of the Linnean Society*. 22: 1-12.
- D'Abrera, B. 1985. Butterflies of the Oriental Region. Part II. Hill House, Melbourne, Australia.
- D'Abrera, B. 1986. Butterflies of the Oriental Region. Part III. Hill House, Melbourne, Australia.
- DeVries PJ. 1987. The butterflies of Costa Rica and their natural history: Papilionidae, Pieridae, and Nymphalidae. Princeton University Press, Princeton, New Jersey.
- Houlihan PR., ME Harrison & SM Cheyne. Impacts of forest gaps on butterfly diversity in a Bornean peat-swamp forest.
- Otsuka, K. (2001). A field guide to the butterflies of Borneo and Southeast Asia. Hornbill Books.



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