



# Butterflies of the Lesan River Protection Forest, Borneo

By Nanda Lestari and Roy Wiles







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2019



Orangutans are common in the Sungai Lesan Protection forest.  
*Drawing A3 pencil, P. R. Wiles 2017*



## Acknowledgements

We are indebted to the students and staff (too numerous to list here) of the schools whose help in collecting specimens and data for this and other studies proved invaluable. A special thanks to our butterfly local guide Abet, for his enthusiasm, butterfly catching skills and bush craft. Also thanks to the staff of the Operation Wallacea Trust (Indonesia) who are working to conserve the Indonesian forests. We were impressed by their knowledge, professionalism, hard work and enthusiasm. Finally, we thank the Dayak Lesan Community who were so welcoming and who are fighting to keep their forests for future generations..

## Schools List

Kattegattgymnasiet, Sweden  
 The Primary Collegiate Academy, Taiwan  
 Copenhagen International School, Denmark  
 Sacred Heart College, Australia  
 Mansfield State High School, Australia  
 UTC Portsmouth, UK  
 The British School of Tokyo, Japan  
 Kingsmead School, UK  
 Knights Templar School, UK



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## Guides

Abet – Butterfly Guide  
 Ajong, Acang, Johanas, Jon, Iwan, Marison, Pak Barnabas, Sapree, Tony, Yusa.

## Aims

We intend that this small publication will motivate people to visit, describe, study and appreciate rainforests for their complexity, beauty and diversity and especially, for their butterflies.

It is intended to show the amazing diversity of butterflies that were collected and identified in and around a basecamp in the Lesan River Protection rainforests of Berau, Kalimantan, Borneo as part of a biodiversity survey. We wish to promote tourism to the area and support the efforts of the Lesan Dayak community and the Operation Wallacea Trust to keep the remaining secondary lowland tropical forests, all that remains of the once mighty forests that covered the lowlands of Borneo.

2019 was a mass flowering year for the Dipterocarp trees and more than 100 butterfly species were collected and photographed (1500+ photographs) in 6 weeks in June-July by the students and staff of Operation Wallacea (Opwall.com). They represent about 10% of the butterfly species to be found in one of the most diverse areas of wildlife on Earth. This diversity is declining as the forest is destroyed, fragmented and completely removed to be replaced with farms, plantations and industry in a human landscape. Across the planet most of the lowland evergreen moist tropical rainforests have gone and with them the thousands and millions of species that were never known.

## Ecological Perspectives.

**Human impacts.** Humans have already severely and fundamentally changed the world and now all wildlife is precious. If we were to weigh all life on earth approximately 82% would be plants, bacteria 14%, humans 0.01% and everything else 5%. Viruses weigh 3x as much as humans, and insects 17x as much; 85% of life is on land and only 1% in the sea. By weight only 4% of mammals are wild, 96% are humans and their livestock. Only 30% of birds are wild, 70% are chickens by weight (Yinon et al., 2018). In other words, humans have already severely impacted wildlife.

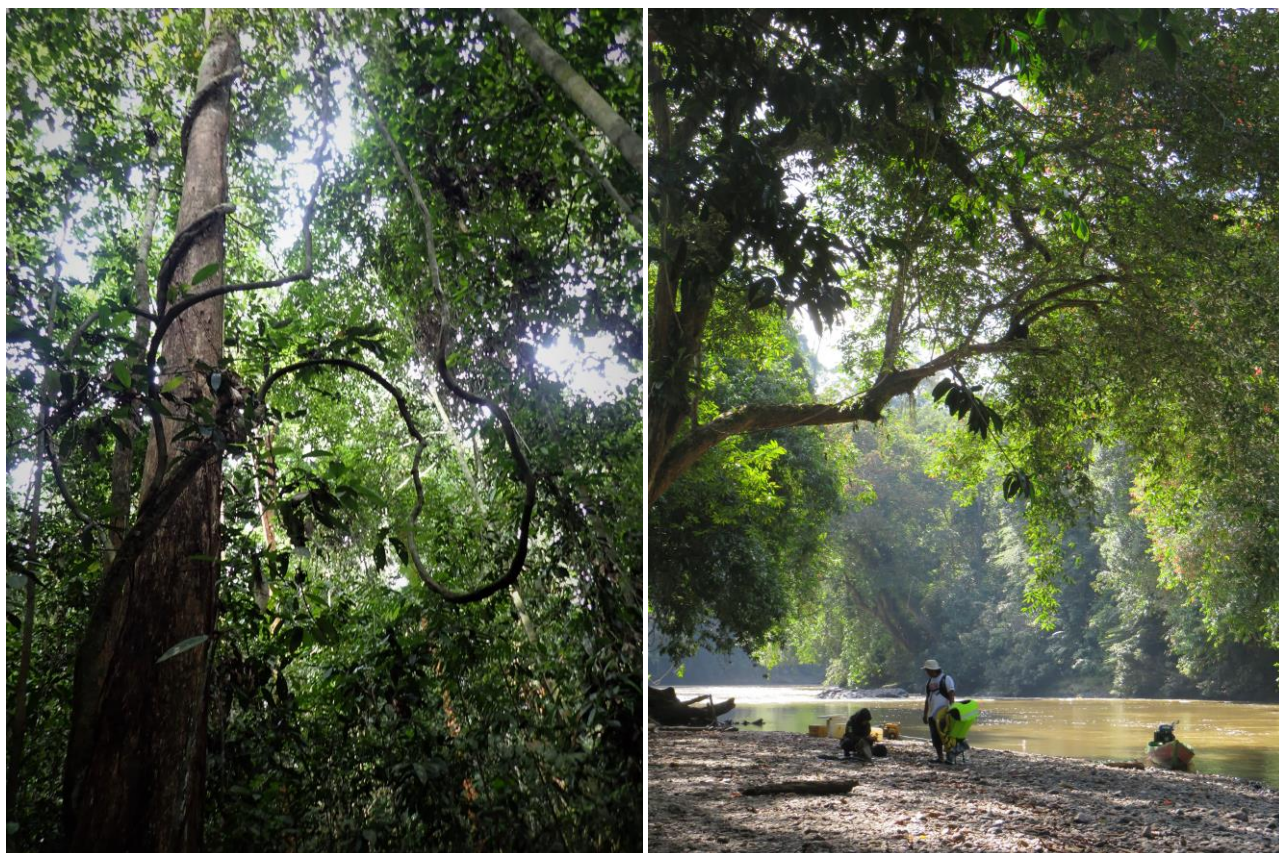
**A Dynamic Earth.** It is important to emphasise that life from the first cells 4.5 billion years ago has been ever changing in complexity, mass, and diversity. It is always changing in a changing universe. It is never unchanging. We say it is dynamic. Change is continuous from fractions of a second to vast periods of time. So, we should view life more like a living avalanche hurtling through space-time, changing in mass and diversity, tumbling and turning this way and that, never staying still. Cycles are more like 'slinkies' bouncing here and there, some fast, some slow but always changing. There is no balance of nature, populations are ever changing. We may perceive "balances", but these depend on the time frame from which they are viewed. They are always changing. The world changes continuously and wildlife with it. Nature is dynamic. We often think that "Nature knows best" and that humans should let nature get on by itself. However, a fenced piece of rainforest fragment left to itself will decline in species diversity (Bradford and Andres, 2018). The smaller the area, the fewer the species, and forests are fragmenting and disappearing. Humans are here and will continue to fragment forests and exploit natural resources for the foreseeable future. Left without management the remainder of the natural world will diminish still further.

Within the forest new species arise, the result of changes in environment and pressures from other organisms; others become extinct. Each generation is a bit different to the previous one. Thus, there are no truly sustainable systems and we cannot preserve things for more than a short time. What we can do is manage the change and try to direct it to include wildlife. We are the major force for change and we can see our effects on wildlife. We need to be gardening for wildlife and allowing it to prosper. Achieving this is the challenge for present and future generations.



**Rainforests** originated approximately 100 million years ago and were the dominant forest type at the time of the disappearance of the dinosaurs (65 million years ago). They represent the world's oldest extant biome, although current tropical forests certainly differ from the earlier ones. The forests of Borneo have joined and separated from other landmasses repeatedly down the ages, a process that generated more and more species. Areas under the sea have been repeated reforested as the sea has withdrawn to the poles with each ice age. Some areas are particularly important as places where many different species accumulate. They act as centres of dispersal. We call these diversity hotspots. The rainforests of Borneo were in a hotspot.

Unfortunately, there has been much forest clearance. First the forest giants were selectively logged, often repeatedly, to produce secondary lowland forests. However, most of the lowland forest has been removed completely for mining, agriculture and urbanisation. In Berau there is the opportunity to save something of the old primary forests through the regeneration of significant areas of remaining secondary forest. It is thought that the remnants of the species that were in the primary forests still exist and could be managed for wildlife. It may take centuries to grow the old, now forgotten, forest giant trees but even now we can wonder at the sheer complexity, diversity and beauty of the Berau rainforests.



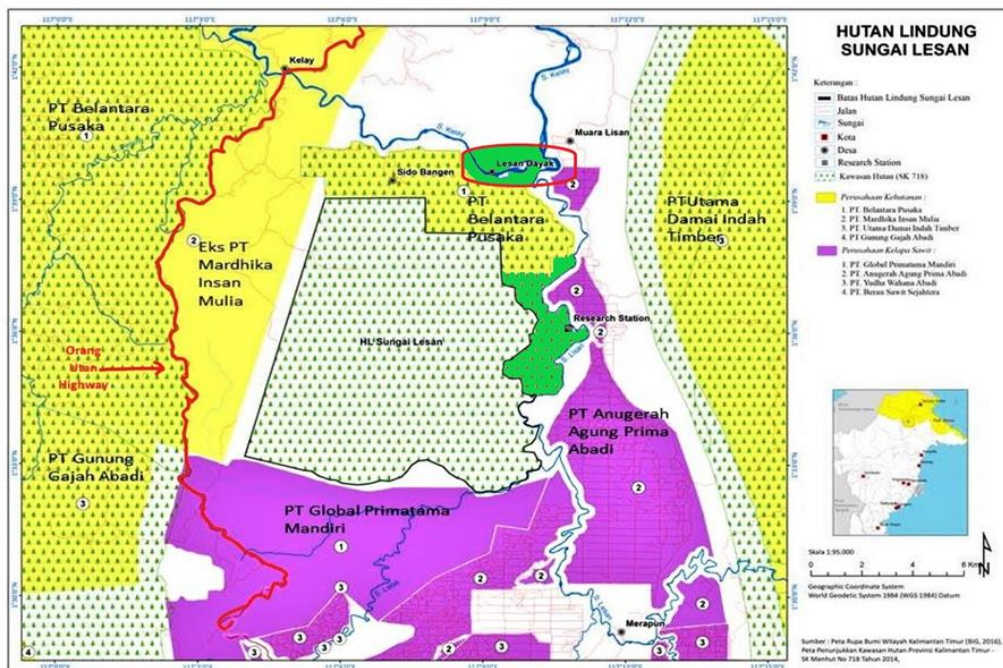
Butterflies were often high in the canopy. Other “mudpuddling” species aggregated on beaches of the Sungai Lesan

**The Dayak Lesan Community** consists of some 1,800 people, in four villages Muara Lesan, Lesan Dayak, Merapun and Sidobangen located in Kelay district.

The people of Lesan Dayak are Dayak Ga'ai and proud of their cultural roots. They once lived in the forests and the oldest people in the community were born into that culture, where people thought all organisms had souls and that the forest was their protector. Traditionally, they hunted, fished, farmed and collected honey, gaharu (fragrant resin) and bird nests and so were, and still are, dependent on rainforest. Eventually, people were moved into a permanent village (Lesan Dayak) and grew crops including rubber. The community now has people of different religions which are mutually tolerated. Togetherness is highly valued.

The rainforests that were once home to the Dayak Ga'ai have been heavily exploited and cleared in the past few decades to make way for oil palm, forestry and farming. The rivers have become more silted and it has been reported that the rains are less predictable and less frequent and the temperatures higher than when the forest were intact. However, the remaining secondary forest of 13,565ha was designated a protected area in 2014; the Sungai Lesan Protection Forest (SLPF). The local community are eager to maintain, restore and protect it.

**The Sungai Lesan Protection Forest** is located in the administrative area of the Kelay District, Berau Regency, East Kalimantan Province, Borneo. It is part of the Muara Lesan forest group and covers an area of 13,565.58 ha consisting of: (1) Protected Forest Areas covering 10,240.82 ha and (2) Production Forest Areas covering an area of 3,324.76 ha (01 ° 32 '20.26" - 01 ° 40 '29.67" North Latitude and between 117 ° 03'58,19" - 117 ° 11 '13,47" East Longitude). Three villages, Sido Bangen, Lesan Dayak and Muara Lesan lie to the north and one, Kampung Merapun, is to the south.



*The Sungai Lesan Protection Forest (Operation Wallacea Trust 2018).*

*Note: the north / south “Orang Utan Highway” to the left and the green areas around Base Camp and Lesan Dayak village where butterflies were surveyed. Purple areas are oil Palm Plantations and yellow areas production forest. The area between the orangutan highway and the Sungai Lesan forest in plain yellow is designated for oil palm plantations. This would be a disaster, leaving the reserve as an isolated forest island.*



Elsewhere the area is surrounded by oil palm and forestry company concessions. However, to the east, the Wehea forest is currently linked across the north / south “Orang utan highway”, Jl. Berau-Samarinda (the Tanjung Redeb-Samarinda road), through an oil palm concession that has not yet been cleared and planted. To the west across a narrow neck of oil palm plantation it links to further forest, across limestone country and on to the coast near Talok. If a plan to manage this larger area for wildlife were to be developed with people, tourism and industry collaborating in a shared vision for Berau that includes their wildlife, it is possible that these forests may be big enough to survive and regenerate into the future.

The (SLPF) forest in the study area is a secondary and old secondary lowland tropical rainforest. It receives variable rainfall between years: 1871mm / year (2018) and 2080mm (2016) with a variable wetter period around January and a drier period in July/August. Soils are generally acid with a low fertility. Forests are dominated by Dipterocarp trees and has a high diversity of fruit trees which supports over 52 mammal, 118 bird, 31 amphibian and 31 reptile species including the iconic (but declining) orang utan (2011 figures). However, systematic collections of invertebrates including butterflies are yet to be carried out in this area. For further information contact the Operation Wallacea Trust, Indonesia.

**Butterflies and species diversity measurements.** Butterflies are one of the best-known groups of insects. Most species, approximately 20,000, have been described but new species are still being discovered at an annual rate of 100-300 species worldwide. Operation Wallacea found a new species of swallowtail on Fiji in 2017. Given their visibility and diversity, it is not surprising that butterflies are used to monitor change. Many are easily identified on the wing and in temperate regions they have been successfully used in wildlife management. However, there are considerable problems in tropical rainforests for Lepidopterists to address before they can be a useful management tool.

Diversity is a measure of number of species (species richness) and abundance (number of individuals). Knowing what makes a species is therefore critical. Generally, we think of groups of organisms that are reproductively isolated. However, this is not established commonly when describing new species and we use morphology (the structure of the body) as a measure of breeding isolation. In butterflies wing pattern is the most conspicuous morphological feature used but taxonomists also use genitalia, antennae and other body parts to separate species. More recently differences in the structure of DNA are used. If groups look different then this probably reflects a difference in the way they live their lives and therefore indicates breeding isolation. However, many butterfly species have variable wing patterns (polytypic) and some species are so similar that they can only be separated on small differences in the structure of their genitalia or their DNA. Species may have variant populations in different parts of their range. On different islands and in different geographical regions wing patterns of a species are slightly different. These variants are often called subspecies. Changing subspecies to species can make significant changes to species diversity estimates. Similarly, butterflies at different geographical locations have been named as different species when they are really one widely dispersed species. It is not uncommon for there to be 20 subspecies of a widely distributed species, each named from different geographical locations.

There are other reasons why wing patterns vary within a species. Mimicry, where an edible species evolves similar wing patterns to those of distasteful species, is complex. It may involve many species or one species may mimic different distasteful species depending on location and timing. Many unrelated species may evolve a common warning pattern. Some species have seasonal forms. This makes it difficult to identify butterflies without a good knowledge of variation, a keen eye, good photographs and for most species it probably requires capture. Even then, with specimens pinned and photographed, it may not be possible to reliably identify a species (e.g. Oakblue butterflies of the genus *Arhopala*) without an examination of the shapes of genital appendages or DNA. There is a huge lack of knowledge about butterflies. In the tropics there are large numbers of rare species compared to common species. These turn up infrequently and so can affect our species abundance estimates.

Then there is the problem of observation in the field. Many species live high in the canopy and are not seen. In some species males are seen to come to the forest floor looking for salt, but females stay in the canopy. Therefore, it is difficult to estimate abundance (the number or relative number of individuals of a species) in lowland tropical rainforests.

Finally, we have the problem of interpretation of the data we might collect. Due to our sparse knowledge of butterfly ecology in tropical rainforests, we cannot put a meaning to changes we observe. We barely have more than a name tag for most species and we have no idea what they do for a living, their food, interactions with other species, parasites and predators or how they deal with their environment, how they respond to change and for whom they are important.

Given these difficulties means that the utmost care is needed when designing and setting the limits of butterfly surveys. They are useful as part of a general survey programme to indicate species richness but their use as a tool to monitor change is in its early stages.



Rajah Brooke butterfly is an iconic species found in the Sungai Lelan Protection forest. It is a protected species and a challenge to photograph.

**Methods of collection and photography.** Butterflies were mostly collected with butterfly nets on forest walks and by boat locally along the Lesan River. Examples of each species were taken for pinning and photography.

Butterfly traps baited with fruit or fish were emptied daily and the species present noted. Examples of each species were taken for pinning, the rest were freed after examination. We also photographed wherever possible living butterflies. A most difficult exercise that met with limited success.

Living butterflies for the collection were put into waxed paper bags. Back at base camp they were placed in a killing-jar and killed with ethyl acetate vapour in the traditional way. A killing-jar is lined with plaster of Paris and liquid ethyl acetate is added. The specimens, still in their paper bags, are then placed in the jar and pinned out the following morning. Sometimes they were kept for longer but were still pliable enough for pinning out onto polystyrene pinning boards. Pinned specimens were labelled with a unique code e.g. C21 and the boards kept in sealed boxes with silica gel to dry specimens. In addition, they were partially dried at basecamp in the sunshine but the humidity meant that they never dried sufficiently for the permanent collection.

When dry enough to take photographs, the specimens were taken from the pinning boards and the dorsal and ventral views photographed under natural light. They were then placed in sealed boxes with silica gel for a collection for the Lesan Dayak community and the Operation Wallacea Trust (Indonesia). Photographs were used to identify the butterflies during the following months and processed using PowerPoint. The background was removed, and the identified species made into plates for this book.





## **Butterflies.**

Butterflies (Lepidoptera) evolved some 200 million years ago. They share a common ancestor with Caddis Flies (Trichoptera) and have several features in common with them. They are both different from all other insects in that females have dissimilar sex chromosomes. They differ in that Trichoptera have hairy wings and Lepidoptera have scales on their wings. Scales can be rubbed off to reveal a clear membranous wing. Clearwing butterflies lack scales on the clear regions of their wings. Wings are made of a double membrane supported by supported by a network of veins that radiate from the wing base. The pattern of veins is a feature that can be used to classify butterflies.

The most obvious feature used to identify butterflies are the wing patterns. The colourful patterns are the result of two alternating scale types that cover the wing membrane like roof tiles. Pigmentary scales have pigments and structural scales diffract light to make the rainbow iridescent colours as the butterfly moves its wings.

Some scales have sacs at the base which contain sex pheromones. These are the androconia. These scales may be arranged in patches to form sex brands or in pockets. They may be on the forewing or hindwing such that when wings are moved a pheromone trail is wafted into the air to attract a mate.

The wing patterns of butterflies are used to avoid predators and attract mates. The patterns may mimic plants that they settle on or break up their outline or they may be transparent to avoid visual predators. Some may have patterns that scare predators such as eyespots that they flash when they open their wings. Others use eyespots to misdirect predators, especially birds into pecking at the wing rather than the head which would be fatal. Many of our specimens showed damage due to bird attack.

Wing patterns may also advertise their unpalatability to birds. Yellow and black stripes or red and black conspicuous colours are recognised by birds that learn when they find a butterfly distasteful not to attack another one. Distasteful butterflies therefore survive bird attacks as most are not attacked. However, some species that are edible mimic the patterns of distasteful species. This is Batesian mimicry and was discovered in Amazonia by Henry Bates in the 1850's. Some butterflies often distantly or unrelated, that are all distasteful, may come to mimic each other with the same wing patterns. These are Mullerian mimics and they can form mimicry rings of multiple species. It is therefore very difficult to tell these species apart.

## **Butterflies and moths**

Lepidoptera includes moths and butterflies. The distinction between the groups is however blurred in that there are moth like butterflies and butterfly like moths. Generally butterflies have club shaped tips to their antennae. Butterflies are in two suborders: Hesperioidea and Papilionoidea. There is one family in the Hesperioidea and six in the Papilionoidea. The species collected have been arranged in order of families and thereafter in alphabetical order.

For a more detailed account of butterflies I recommend the works of Adrian Hoskins F.R.E.S. given in the references section.

Bright hindwing  
colours of a moth in  
our butterfly trap.





# Superfamily Hesperioidea

Family Hesperiidae



Family Hesperiidae  
Subfamily: Hesperinae  
Group Ancistroides

**1 *Koruthaialos sindu*** (C. & R. Felder, 1860)  
Bright Red Velvet Bob

**Specimens:** C193

**WL** 17mm

**Distribution:** India to Indonesia.

**Notes:** Caught around base camp. Took up salts from drying clothes. In secondary Lowland rainforest. Life cycle partially known.



**1 *Hasora taminatus* (Hübner 1818) ?**

**Specimens:** C214

**WL** (not recorded)

**Distribution:** India to Indonesia. The subspecies reported for Borneo is the widespread *H. t. malayana* (C. & R. Felder 1860). However, our specimen has a pale diffuse area on the under forewing. It is very similar to *H. vitta* and *H. chromis*.

Notes: Caught around base camp. Took up salts from drying clothes. In secondary Lowland rainforest.

**2 *Hasora badra* Moore 1858 sp. ?**

Common Awl

**Specimens:** C189

**WL** mm

**Distribution:**

Notes: Caught around base camp. In secondary lowland rainforest. Life cycle known.

**3 *Isma iapis iapis* (de Nicéville 1890) ?**

Plain Tufted Lancer

**Specimens:** C190

**WL** 22mm

**Distribution:** Burma to Borneo. Several similar species and the above designation is not confirmed.

Notes: Caught around base camp in secondary Lowland rainforest.

4 ?

**Specimens:** C92

**WL** 30mm

**Distribution:**

Notes:





# Superfamily Papioionoidea

Family Papilionidae



***Papilio (Menelaides) memnon*** (Linnaeus 1758)  
Great Mormon



Mixed group of nine species of mudpuddlers on the Sungai Lesan riverbank.



Papilionaceae mudpuddling on the Sungai Lesan riverbank.

**1 *Trogonoptera brookiana* Wallace 1885**

Rajah Brooke's birdwing

**Specimens:** photographs only.

**WL** reported 75-85mm

**Distribution:** Peninsular Malaysia Sumatra and Borneo,

**Notes** Protected species. Found by us in secondary lowland rainforest along margins forest margins and riverbanks. Mudpuddling behaviour common along river margins. Males common, females remain in the canopy. Photographs show the dorsum and venter of a male and detail of the genital opening.

*In May 2009 at Ulu Gerok I came across one of the most stunning butterfly spectacles I have ever seen - a massive group of over 100 pristine Rajah Brooke's Birdwings settled on a small patch of ground on a quiet forest track. No photograph, video clip or words can begin to do justice to the incredible beauty of these creatures, and to see such a huge aggregation was a sight guaranteed to blow the mind of the most experienced butterfly enthusiast.*

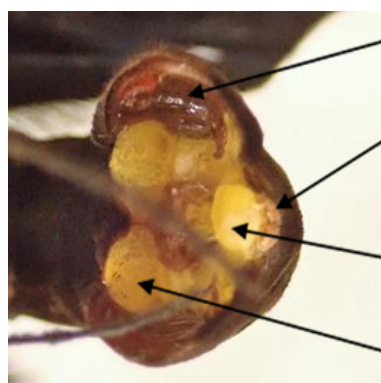
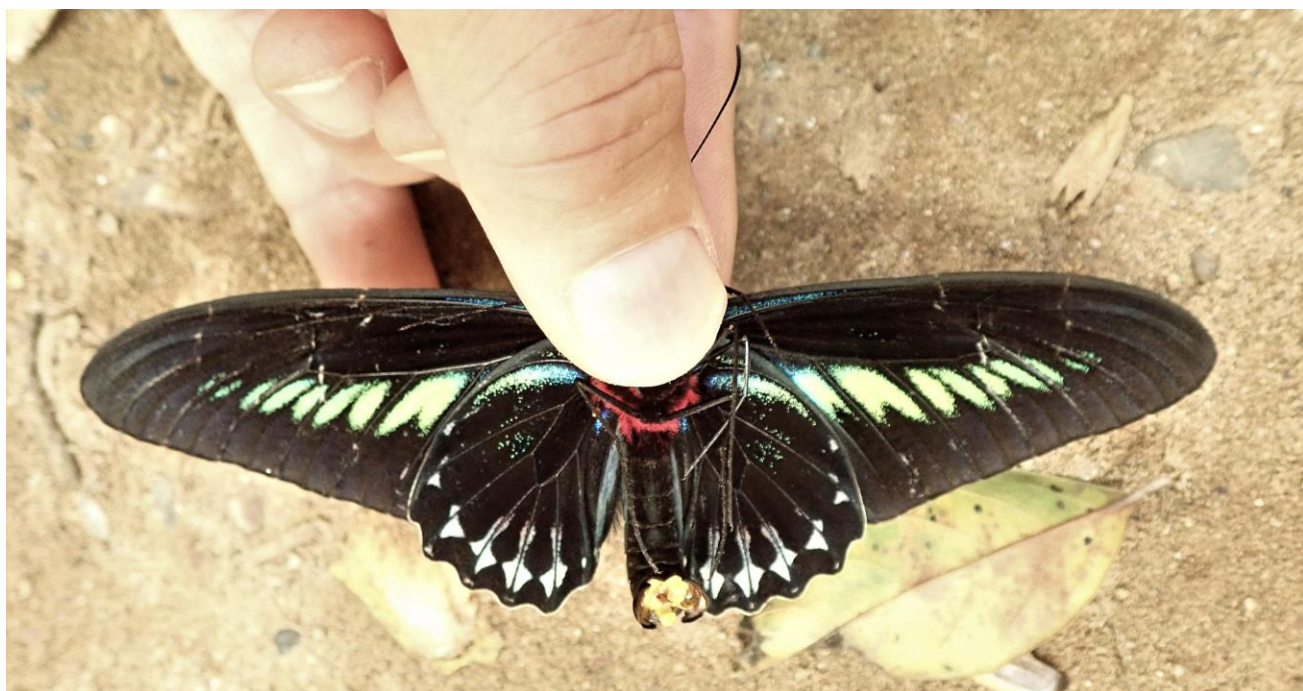
*Try to imagine 100 butterflies, each measuring over 17cms, 7 inches across, a quivering mass of shimmering iridescent green wings, packed together on a patch of ground the size of a small dining table. Then try to imagine the thrill of being so close that you could reach down and touch them. After taking a few photographs you edge gently away but the whole group erupts into flight, and you are surrounded by a swirling mass of glittering green wings. You freeze on the spot, hoping not to scare them away, and they respond by gliding closely around you. Then one by one they resetttle on the ground until they encircle you. At first they nervously quiver and flutter, but after a couple of minutes they all relax and spread their glorious wings. You are mesmerised, and the huge privilege of such an experience is something you never forget.*

*Adrian Hoskins*

*<http://learnaboutbutterflies.com/About%20the%20author2.htm>*



Family Papilionidae  
Subfamily: Papilioninae  
Tribe: Troidini



clasper

uncus

anal tube

valve



**1 *Pachliopta antiphus* (Fabricius 1793)**

Borneo Black Rose

**Specimens:** C130

**WL** 70mm

**Distribution:** India to Indonesia.

Notes *Pachliopta antiphus antiphus* (Fabricius 1793) is reported from Borneo. Observed in lowland secondary forests and along river margins. Life cycle well known.

**2 *Papilio helenus* (Linneus 1758)**

Red Helen

**Specimens:** C53, C209

**WL** 57mm

**Distribution:** India, Japan to Indonesia and Australia.

Notes: Many subspecies. The Borneo subspecies is *Papilio helenus enganius* (Doherty 1891).

Seen along river margins in secondary lowland forest and in mixed species flocks “mud puddling”. Life cycle known and caterpillars feed on a wide variety of plants especially Rutaceae

**3 *Papilio nephalus* (Boisduval, 1836)**

Black and White Helen

**Specimens:** C54, C201

**WL** 55mm

**Distribution:** India, China to Indonesia.

Notes: Many subspecies. *P. n. albolineatus* (Forbes, 1885) is reported from Borneo. Observed in lowland secondary forests and along river margins.

Family Papilionidae  
Subfamily: Papilioninae  
Tribe: Papilionini



**1 *Papilio polytes* (Linnaeus 1758)**  
Common Mormon

**Specimens:** C131 ♂

**WL** 45mm

**Distribution:** Malaysia to Indonesia.

Notes: *P. p. theseus* (Cramer 1777) is the subspecies from Borneo. Sexually dimorphic species. Polymorphic females are classic Batesian mimics of unpalatable species.

**2 *Papilio (Menelaides) memnon* (Linnaeus 1758)**  
Great Mormon

**Specimens:** C39

**WL** 70mm

**Distribution:** India, Japan to Indonesia.

Notes: Many subspecies. *P. (M.) m. memnon* (Linnaeus 1758) is reported from Borneo. Observed in lowland secondary forests and along river margins.

**3 *Papilio demoleus* (Linnaeus 1758)**  
Lime / Lemon / chequered Swallowtail

**Specimens:** C129

**WL** 49mm

**Distribution:** Global tropics: Cuba, West Indies, Arabia, to China to Australia.

Notes: Pest species of cultivated Limes and Citrus species. Invasive species having invaded Borneo to become one of the more common species of butterfly. Found in cultivated landscapes, savannahs and secondary forests. Mud-puddler found along river margins on gravel shoals. It is reported to feed on blue and purple flowers.



Family Papilionidae  
Subfamily: Papilioninae  
Tribe: Papilionini



**1 *Graphium sarpedon* (Linneus 1758)**

Common Bluebottle

**Specimens:** C17, C141, C207

**WL** 48mm

**Distribution:** India, China to Indonesia and Australia.

Notes: Many subspecies.

Seen along river margins in secondary lowland forest and in mixed species flocks “mud puddling”. Observed feeding on rotting fruit. They were never more than 10% of the individuals in a mixed species group. Wings always quivering and vibrating when imbibing liquids. Known to migrate. Life cycle known and caterpillars feed on a wide variety of trees.

**2 *Graphium doson* (C. & R. Felder 1864)**

Common Jay

**Specimens:** C61, C144, C168, C235

**WL** 42mm

**Distribution:** India, China to Indonesia.

Notes: At least 12 subspecies of which *G.d. evemonides* (Honrath 1884) is reported from Borneo.

Seen along river margins and in mixed species flocks “mud puddling” where they were the majority of individuals in mixed species groups. Wings always quivering when imbibing liquids.

**3 *Graphium bathycles bathycloides* (Honrath 1884)**

Striped Jay

**Specimens:** C202

**WL** 44mm

**Distribution:** Widely reported from Thailand, the Philippines and Borneo.

Notes: The taxonomy of *Graphium* is not yet fixed and species recognised may be subject to change. *G. chironides* (Honrath 1884), the Veined Jay, is one such species. It was considered to be a subspecies of *G. bathycles* (Zincken 1831) and especially close to *G. b. bathycloides* (Honrath 1884) such that according to Wilson et al 2014, it is not possible to unambiguously to separate them on morphology and comparing DNA indicated a close relationship. Our specimens are very similar to those from Brunei identified as *G. b. bathycloides*.

Family Papilionidae  
Subfamily: Papilioninae  
Tribe: Leptocircini



1



2



3





**1 *Graphium antiphates* (Cramer 1775)**

Five-bar Swordtail

**Specimens:** C199, C200

**WL** 36mm

**Distribution:** India, Indonesia and Australia.

Notes: Males and females are similar. Several subspecies of which 3 are reported from Borneo: *G. antiphates itamputi*, *G. a. simpulensis* and *A. a. sinabungensis*. Seen along river margins and in mixed species flocks “mud puddling” or alone along riverbanks in secondary lowland forest areas. Life cycle known and caterpillars reported to feed on a wide variety of plants. Adults, like other *Graphium* species, suck up salt rich water, absorb dissolved minerals and pump fluid from the anus so it can be re-imbibed again.

**2 *Graphium agamemnon* (Linneus 1758)**

Tailed Jay / green spotted triangle

**Specimens:** C15, C184, C196

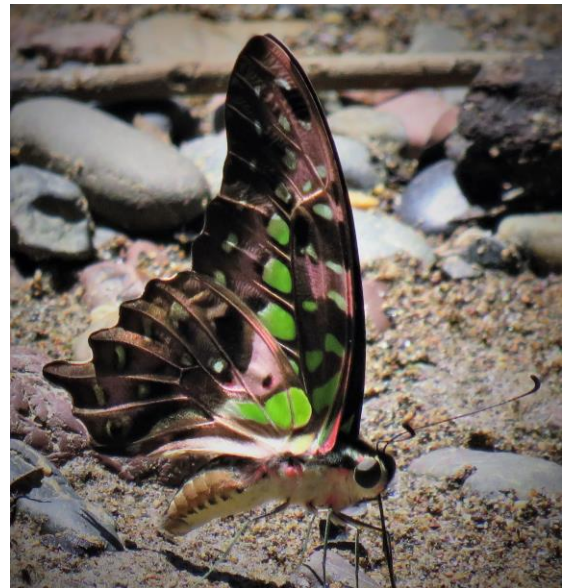
**WL** 46mm

**Distribution:** India to Australia.

Notes: Many subspecies .

Seen along river margins and in mixed species flocks “mud puddling” . Males were observed flying fast along the margins of secondary lowland forests, often chasing another individual.

Family Papilionidae  
Subfamily: Papilioninae  
Tribe: Leptocircini



Family Papilionidae  
Subfamily: Papilioninae  
Tribe: Leptocircini

**1 *Lamproptera meges* (Zinken-Sommer 1831)**  
Green Dragontail

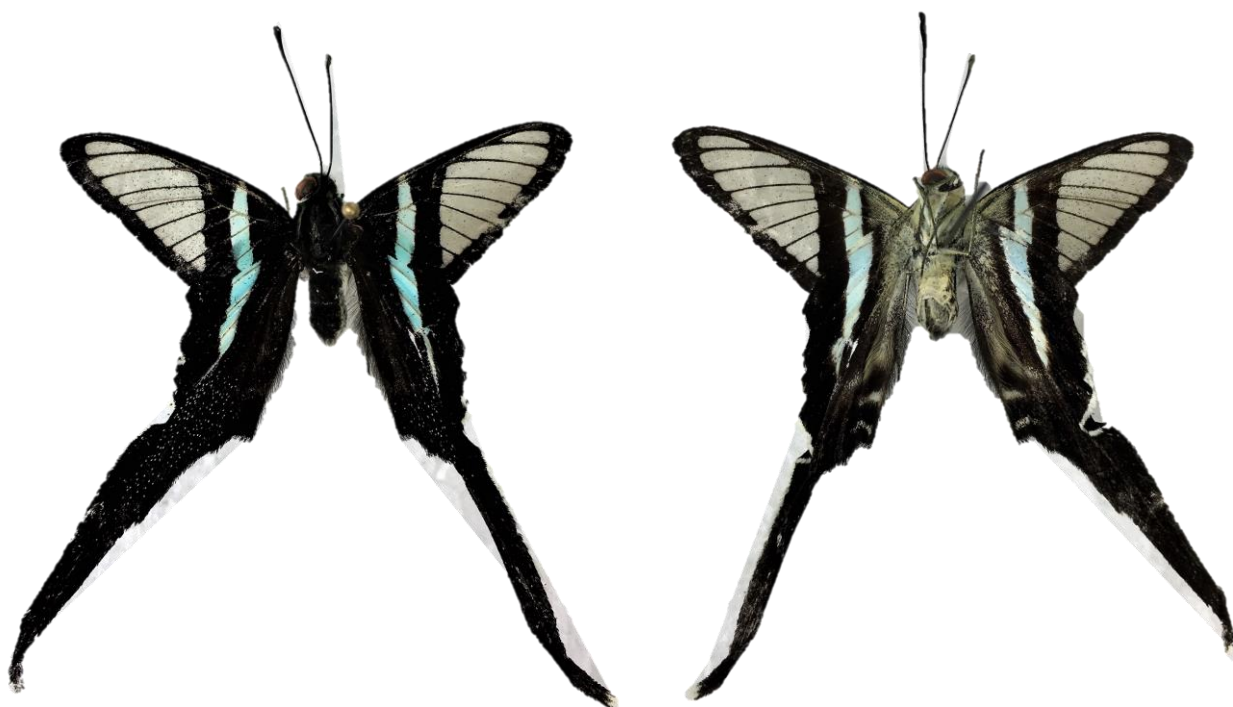
**Specimens:** C232

**WL** *reported 20mm*

**Distribution:** India, Indonesia.

**Notes:** Found along riverbanks of secondary lowland rainforest. Mudpuddling species.  
Life cycle known and larvae feed on Rutaceae.

1





# Superfamily Papilionoidea

Family Pieridae



***Delias baracasa*** Semper 1890  
Common Yellow Jezebel

**1 *Catopsilia pomona* Fabricius 1775**

Lemon Emigrant

**Specimens:** C40, C94, C120

**WL 41- 42mm**

**Distribution:** The type species is widely distributed between India to Australia and Madagascar. Colour forms vary depending on photoperiod and temperature during growth. Our specimens are *pomona* forms which have spots on the underside of the wings. The form *cerocale* lacks rings. *C. pomona* is known to migrate, and the life cycle has been recorded. Commonly observed around the margins of secondary forest, in Kampongs and along roadsides.

Family Pieridae  
Subfamily: Coliadinae



1



**1 *Eurema nicevillei nicevillei* (Butler 1898)**

Banded Grass Yellow

**Specimens:** C227

**WL** (reported 19-23mm)

**Distribution:** Thailand, Malaysia, Sumatra and Borneo.

Notes: The yellow veins across the black margin of the upper forewing are diagnostic for the species. Collected in secondary lowland tropical rainforest.

**2 *Eurema hecabe hecabe* (Linnaeus 1758)**

Common Grass Yellow

**Specimens:** C1, C22, C32a, C46, C109, C110

**WL** 23-27mm

**Distribution:** Africa, Asia and Australia.

Notes: Widely distributed pest species of *Acacia* plantations. Mud puddler observed along riverbanks congregating with other species. Very common.

**3 *Eurema simulatrix tecmessa* (de Nicéville & Martin 1896)**

Changeable Grass Yellow / de Nicéville's grass yellow

**Specimens:** C32

**WL** 24mm

**Distribution:** Burma to Borneo.

Notes: Mud puddler observed along riverbanks congregating with other species. Less common than *E.hecabe* and found around base camp at the edge of secondary lowland rainforest. Life cycle needs reviewing.

Family Pieridae  
Subfamily: Coliadinae



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**1 *Gandaca harina* (Horsefield 1829)**

**Tree Yellow**

**Specimens:** C158

**WL** 24mm

**Distribution:** India to New Guinea.

Notes: Holotype described from Java with several subspecies in other geographical locations. ***Gandaca harina distanti*** Fruhstorfer 1910, commonly found on Peninsular Malaysia, is probably the Bornean subspecies. Reported from inland forests and wet areas.

Our specimen was at the margins of secondary lowland rainforest.

**2 *Leptosia nina* (Fabricius 1793)**

**Psyche**

**Specimens:** C219, C222

**WL** reported 20mm with wide size variation. Wingspan 25-53mm.

**Distribution:** India, China to Australia.

Notes: *L. n. malayana* Fruhstorfer 1910, is the Bornean subspecies. Reported common in human landscapes and secondary forest clearings and roads.

Our specimen was at the margins of secondary lowland rainforest. *Capparis zeylanica* is a reported foodplant, a widely distributed climbing shrub.



Family Pieridae  
Subfamily: Pierinae



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Family Pieridae  
Subfamily: Pierinae  
Tribe Pierini  
Subtribe Appiagina  
Genus Appias  
Subgenus Catophaga  
Group Glabra

**1 *Appias nero* (Fabricius 1793)**  
Orange Albatross

**Specimens:** C95

**WL** 39mm

**Distribution:** The type species is widely distributed between India and Indonesia, the subgenus from Malaysia to Australia.

**Notes:** There more than 15 subspecies recorded for this geographically variable species. The subgenus is distributed from Malaysia to Australia. The subspecies reported for Borneo is *A. n. chelidon* (Fruhstorfer, 1905) (Brower et al 2010).

We encountered males mud-puddling along secondary lowland rainforest river shoals. Females are reported to be more common at higher elevations above 500m and fly in the forest canopy.

Family Pieridae  
Subfamily: Pierinae  
Tribe: Pierini

**2 *Cepora judith* (Fabricius, 1787)**  
Orange Gull

**Specimens:** C72 ♀, C171

**WL** 34mm

**Distribution:** The type species is widely distributed between Burma and Indonesia and some 30 subspecies are described. *C. j. montana* (Fruhstorfer 1899) is found in Northern Borneo and *C. j. meridionalis* (Fruhstorfer 1899) in S.E. Borneo.

**3 *Delias baracasa* Semper 1890**  
Common Yellow Jezabel

**Specimens:** C142

**WL** 39mm

**Distribution:** The type species is widely adistributed between Malaysia, the Philippines and Indonesia. There are 6 subspecies reported. *D. b. cathara* Grose-Smith 1893 is found in Borneo.

Family Pieridae  
Subfamily: Pierinae  
Tribe Pierini  
Subtribe Appiadina  
Genus Appias  
Subgenus Catophage  
Group Glabra



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Family Pieridae  
Subfamily: Pierinae  
Tribe: Pierini



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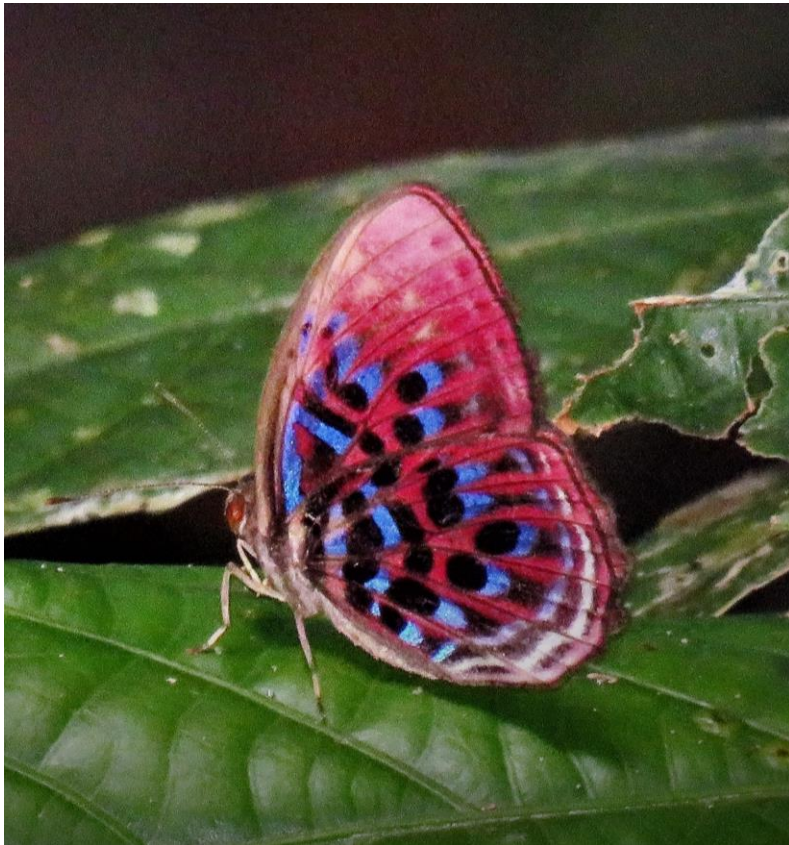
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# Superfamily Papilionoidea

Family Riodinidae



***Paralaxita telesia*** (Hewitson 1861)  
Red Harlequin

**1 *Zemerus emesoides*** C. & R. Felder 1860  
Malayan Punchinello

**Specimens:** photo only

**WL** (not measured)

**Distribution:** Malaysia to Indonesia.

Notes *Zemerus emesoides eso* Fruhstorfer 1904 is the subspecies on Borneo. We only got a photograph of this species taken at a distance.

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**2 *Paralaxita telesia*** (Hewitson 1861)  
Red Harlequin

**Specimens:** C9, C226

**WL** 24mm

**Distribution:** Thailand to Indonesia.

Notes *P. t. pistyrus* (Fruhstorfer 1914) is reported from Borneo. Observed in lowland secondary forests and along river margins. Life cycle well known.

2



# Superfamily Papilionoidea

Family Lycaenidae



*Amblypoda* sp. ?



## **Introduction.**

Lycaenidae are particularly diverse in Indomalayan tropical forests. More than 118 species of Lycaenidae have been reported from Borneo. Generally called blues they are often difficult to identify from wing patterns. Often species are distinguished by their genitalia and more recently from DNA.

We have identified those we can from wing patterns by comparing them with published images. The work of Yasua Seki et al 1991 (Butterflies of Borneo volume 2) has been most useful. We have also referred to various papers in the scientific literature and accredited websites given in the references. Where we are uncertain of our species designation we have added a ?. If we cannot identify a butterfly we simply call it sp., and if we can see a difference with another species we label it A,B C etc..

The highest percentage of Lycaenidae are in the canopy butterfly fauna. This makes survey work particularly difficult. They, like most butterflies, need a good deal of research to find even basic information. If we have made mistakes please send us a correction. This booklet is to encourage tourism but it is clear that comprehensive expert revision is needed and a reference book produced based on good scientific research.

**1 *Curetis sperthis sperthis* (C. & R. Felder 1865)**

**Specimens:** C40a, **C63**, C70, C105, C215

**WL** 19-21mm

**Distribution** Malaysia, Borneo.

**Notes:** Resembles superficially to *C. santana* and can be differentiated by its post-discal band which is almost parallel to the forewing outer margin (termen) while in *C. santana* it is much more angled towards the outer margin of the forewing (oblique). This is difficult to see. Undersides powdered with black dots like in *C. santana*. On the upperside, the male hindwing costa is black.

Common species in secondary lowland rainforest. Attracted to fruit and fish and seen on river beaches mudpuddling.

**2 *Curetis santana malayica* (C & R Felder 1865)?**

Malayan Sunbeam

**Specimens:** C64

**WL** 19mm

**Distribution:** Burma to Indonesia. Similar to *C. sperthis sperthis* (see above.). Also there appear to be red spots on the palps whereas *C.s.sperthis* has white palps.

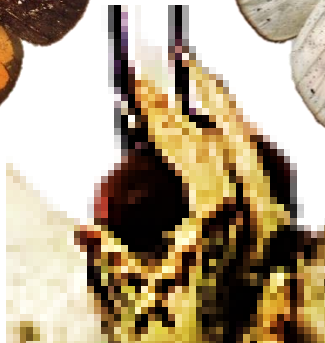
Family Lycaenidae  
Subfamily Curetinae



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**1 *Allotinus (Paragerydus) leogoron normani* Eliot 1967**

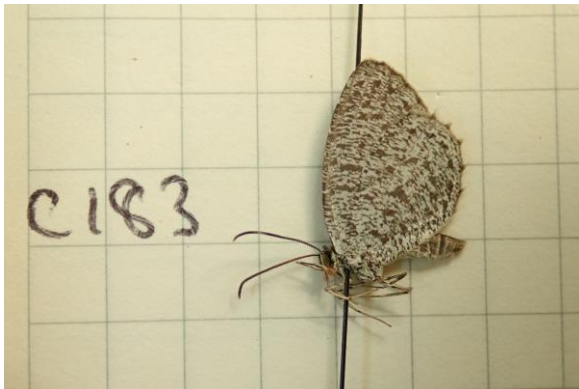
**Specimens:** C11 ♀ C183, C68

WL 16mm

**Distribution:** Thailand to Sumatra and Borneo.

***Allotinus leogoron normani*** Eliot 1967 (Brunei, Borneo) fits most closely. It is similar to the variable ***Allotinus unicolor unicolor*** C. & R. Felder, 1865 of which two of the 8 subspecies occur in Borneo. *A. U. Unicolor* is widespread. *A. u. moorei* (H. H. Druce, 1895) is reported from Mt. Kinabalu, Sabah. The butterfly was earlier known and is still sometimes classified by some authorities as *Allotinus horsfieldii* Moore.

Notes: Observed flying low along the margins of small forest streams and over dense vegetation, low down in secondary forest glades. Adult butterflies milk sap sucking Hemiptera inserting their long proboscis into honey dew droplets secreted by the bug. *A. unicolor* caterpillars are predators of sap sucking insects: aphids, coccids, psyllids and membracids.



**1 *Allotinus (Fabitaras) sarrastes* Fruhstorfer 1913**

**Specimens:** C86 ♂ C87 ♀ C153, (photograph above right)

WL 18mm ♂, 15mm ♀

**Distribution:** Thailand to Borneo.

There are several very similar species of *Allotinus*. We have tentatively identified these specimens as *A. sarrastes sensu* Seki et al (Butterflies of Borneo, volume 2). Our specimens have clear white spots around the margins of the underwings.

Notes: Observed flying low along the margins of small forest streams and over dense vegetation, low down in secondary forest glades. We observed and caught a mating pair which are shown in the photograph. Males have more pointed wings than females. (note that there are shadows on the underside of the female hindwing).

Family Lycaenidae  
Subfamily Miletinae  
Tribe Miletini



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**1 *Logania regina*** (Druce 1873)

Rounded Mottle

**Specimens:** C44

**WL** 12mm

**Distribution:** Malaysia, Philippines, Indonesia.

Notes:

**2 *Logania malayica*** Distant 1884

Malayan Mottle

**Specimens:** C30, C91

**WL** 14mm

**Distribution:** Malaysia, Philippines, Indonesia.

Notes: It is reported that adult butterflies rest at night with aphids of the genus *Pseudoregma* and protected by ants of the genus *Leptothorax*. Adult butterflies feed on the aphid honeydew. Caterpillars are attacked by ants that “milk” honeydew from the aphids. It is suggested that caterpillars will feed on aphids.



Family Lycaenidae  
Subfamily Miletinae  
Tribe Miletini



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Family Lycaenidae  
Subfamily Polyommatainae  
Tribe Polyommataini  
Group Upolampes

**1. *Discolampa ethion* (Westwood 1851)**  
**Banded blue Pierrot**

**Specimens:** C151 ♀, C155 ♀ (lower), C181 ♂ (top), C205 ♂ (middle),  
**WL 12mm**

**Distribution** India to Indonesia.

Notes: Frequently by small streams in Lesan Dayak secondary forest. Mud puddling species. Life cycle known.

**2. *Caleta elna* (Hewitson 1876)**  
**Elbowed Pierrot**

**Specimens:** C84

**WL 14mm**

**Distribution** India to Indonesia.

Notes: At least 6 subspecies reported. The Subspecies reported from Borneo is *C. e. elvira* (Fruhstorfer 1918). Collected along shallow stream in secondary lowland rainforest. Known to settle on wet soils in mixed species aggregations, mud puddling. Less frequent than the more common Blue banded Pierrot in Lesan Dayak forests.

Family Lycaenidae  
Subfamily Polyommatainae  
Tribe Polyommatini  
Group Upolampes



Family Lycaenidae  
Subfamily Polyommatainae  
Tribe Polyommataini  
Group Lycaenopsis

**1 *Lycaenopsis haraldus* (Fabricius 1787)**  
Felder's Hedge Blue

**Specimens:** C150 ♀

**WL** 14mm

**Distribution** India to Indonesia.

Notes: Several subspecies reported. *Lycaenopsis haraldus cornuta* (Druce 1873) is the subspecies reported from Borneo.

Uncommon. Collected in secondary rainforest.

**2 *Neopithecops zalmora* (Butler 1870)**  
Inordinate Blue, Quaker

**Specimens:** C4

**WL** 12mm

**Distribution** India, China to Malaysia.

Notes: Uncommon. Collected in secondary rainforest. Our specimen was greatly damaged and the only one we found. Larvae reported to feed on Ebony trees and citrus.

Family Lycaenidae  
Subfamily Polyommatainae  
Tribe Polyommataini  
Group Nacaduba

**3 *Nacaduba kurava* (Moore 1858)**  
Transparent Six-line Blue

**Specimens:** C78 ♂, C79, C80 ♂, C89 ♂

**WL** 13mm

**Distribution** : There are at least 29 subspecies of *N. kurava* reported from India to Indonesia. Since *N. perusia* Felder 1860 has been synonymised with *N. kurava nemana*, the subspecies for Borneo is *Nacaduba perusia nemana* Fruhstorfer 1916.

Notes: Caterpillars reported to feed on *Embelia* in the Primulaceae.



Family Lycaenidae  
Subfamily Polyommatainae  
Tribe Polyommatini  
Group Upolampes



Family Lycaenidae  
Subfamily Polyommatainae  
Tribe Polyommatini  
Group Nacaduba



**1 *Anthene lycaenina miya* (Fruhstorfer 1916)**

Pointed Ciliate Blue

**Specimens:** C2, C10, C27 ♂, C28 ♂, C78, C220 ♂

WL 13mm

**Distribution :** There are several subspecies of *A. lycaenina* (C. Felder 1868) between India and Indonesia. Our specimens agree well with descriptions of subspecies *A. l. miya* from Sabah which, like our specimens lacks the black pigment within in the white circle on the under hindwing costa (cell 7) as found on the type species.

Notes: common in secondary lowland rainforest along trails and near water.

**2 *unidentified tiny blue A***

**Specimens:** C29,

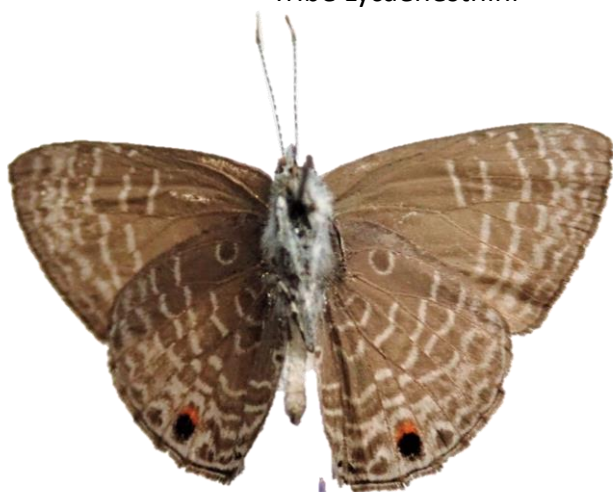
WL 13mm

**3 *unidentified tiny blue B***

**Specimens:** C8a, C90,

WL 12mm

Family Lycaenidae  
Subfamily Polyommatainae  
Tribe Lycaenesthini



Family Lycaenidae  
Subfamily Theclinae  
Tribe Arhopalini  
Group Arhopala

**1 *Arhopala elopura* (Druce,1894)?**

Oakblue

**Specimens:** C13♂, C45 ♀, C57 ♀, C106♂, C170♀, C112♀?,  
WL 22mm (C106♂), 28mm (C57♀)

**Distribution :** *Arhopala elopura elopura* is found in Borneo, Sumatra and Peninsular Malaysia.

Notes: Subspecies *A. e. dama* Swinhoe 1911 has been reported from Burma and Thailand to Vietnam and Langkawi and Mergui. C112 has a more defined underwing pattern that looks similar to *Arhopala vihara vihara* (C. Felder & R. Felder, 1860)?, the Large Spotted Oakblue. However, it was collected with the other specimens and so I have recorded it as

*Arhopala elopura* (Druce,1894)?

At least 91 species in this genus are reported from Borneo. In the Alitaeus Group, these specimen most closely resembles *A. elopura* from Brunei. *Arhopala vihara vihara*, *A. democritus*, *A. denta* and *A. pseudomuta* have very similar wing patterns. It is identified by the lack of a spot at the base of space 10 on the under forewing and underwing markings that barely contrast with ground colour. However, some specimens have a clearer wing pattern than others in our samples. Clearly this genus is in need of research and revision.

Sexually dimorphic; dorsally, males are pure blue, females have dark borders to the wings.



Family Lycaenidae  
Subfamily Theclinae  
Tribe Arhopalini  
Group Arhopala



C13



C106



C57



C112

1

Family Lycaenidae  
Subfamily Polyommatainae  
Tribe Polyommataini  
Group Catochrysops

**1 *Catochrysops panormus* (C. Felder 1860)**

Silver forget-me-not

**Specimen:** C126 ♂ C175♂

**WL** 17mm

**Distribution:** India to the Philippines and Australia.

**Notes:** Known to feed on Mimosaceae and Papilionaceae and is associated with ants.

Family Lycaenidae  
Subfamily Polyommatainae  
Tribe Polyommatini  
Group Catochrysops



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Family Lycaenidae  
Subfamily Polyommatainae  
Tribe Polyommadini  
Group Jamides

**1. *Jamides philatus* (Snellen 1887)**  
Burmese Caerulean

**Specimen:** C221 ♂ (blue form) C60 ♂ (pale form) , C66 ♀, C121 ♀, C152 ♀.

**WL** 17mm ♂, 15mm ♀

**Distribution :** *jamides philatus* (Snellen 1887) is widespread from Burma to Indonesia. The subspecies found on Borneo is *J. p. aamathaeus* (Frustorfer 1916). The wedge shaped black submarginal spots are characteristic of this species. Sexually dimorphic, Females have dark wing tips. There are paler and more blue male specimens in our catch.



Family Lycaenidae  
Subfamily Polyommatainae  
Tribe Polyommatini  
Group Jamides



Family Lycaenidae  
Subfamily Theclinae  
Tribe Catapaecilmatini

**1 *Catapaecilma elegans* (Druce 1873)**

**Specimens:** C65, C68, C120a, C169

**WL** 12mm

**Distribution:** Malaysia and Indonesia.

Notes: Borneo is the type location for this species. *Catapaecilma harmani* Cassidy 1982, a very similar species, is reported from Brunei. It is a darker species.

Found in shady areas near streams in secondary lowland rainforest.

Family Lycaenidae  
Subfamily Theclinae  
Tribe Amblypodini

**2 *Amblypodia narada* (Horsfield 1828)**

Leaf Blue

**Specimens:** C170

**WL** 25mm

**Distribution:** Malaysia and Indonesia.

Notes: *Amblypodia narada salvia* Fruhstorfer, 1907 is a reported Bornean subspecies. Found in secondary lowland rainforest. The photograph taken in the field looks very much like the photograph in Wikipedia names as *A. anita* (Moore 1862).

Family Lycaenidae  
Subfamily Theclinae  
Tribe Catapaecilmatini



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Family Lycaenidae  
Subfamily Theclinae  
Tribe Amblypodini



2

**1 *Ritra aurea*** (Druce 1872)

**Specimens:** C217

**WL** (reported wingspan 35-40mm)

**Distribution:** Malaysia Philippines, Sumatra, Borneo.

Notes: Borneo is the type location for this species. There are four subspecies *R.a.aurea* is the subspecies for Borneo.

Found in shady areas near streams in secondary lowland rainforest.

**2 *Drupadia cindi*** Cowan 1974

**Specimens:** C157

**WL** 11-12mm

**Distribution:** Malaysia Borneo.

Notes: Borneo is the type location for this species.

Found in shady areas near streams in secondary lowland rainforest.



Family Lycaenidae  
Subfamily Theclinae  
Tribe Cheritini



Family Lycaenidae  
Subfamily Theclinae  
Tribe Cheritrini

**1 *Drupadia naisca* (Rober 1886)**

Posy

**Specimens:** C103, C41, C102, C223, C228, C230

**WL** 16mm

**Distribution :** There are at least 12 subspecies reported, two from Borneo, *Drupadia niasica thaenia* (Druce 1895) and *Drupadia niasica ultra* Cowan 1974. Our specimens were common in the lowland secondary forest of Lesan Dayak.

Family Lycaenidae  
Subfamily Theclinae  
Tribe Hypolycaenini

**2 *Hypolycaena amasa maximinianus* (Fruhstorfer 1912)**

**Specimens:** C31

**WL** 14mm

**Distribution :** There are 7 subspecies of *Hypolycaena amasa* (Hewitson 1865) reported from India to Indonesia. *H. a. maximinianus* (Fruhstorfer 1912), the Bornean subspecies was common in the lowland secondary forest of Lesan Dayak and particularly near small, shady, shallow streams.

Family Lycaenidae  
Subfamily Theclinae  
Tribe Cheritriini



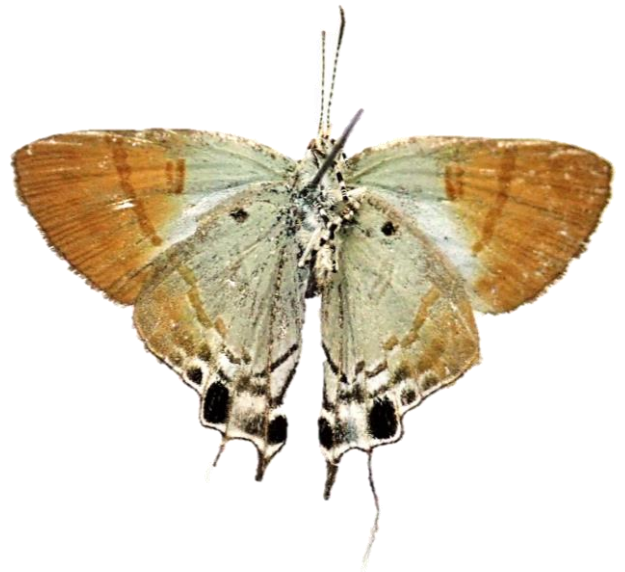
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Family Lycaenidae  
Subfamily Theclinae  
Tribe Hypolycaenini



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Family Lycaenidae  
Subfamily Theclinae  
Tribe Deudorini  
Group Deudorix

**1 *Rapala varuna*** (Hewitson 1863)  
Indigo Flash

**Specimens:** C42, C43

**WL** 14mm

**Distribution:** India and China to Australia. There are 12+ subspecies. *R. v. saha* Fruhstorfer 1912 is the subspecies reported for Borneo.

**Notes:** Known life cycle. Caterpillars feed on several families of plants including Lychee. Two specimens are depicted to show wing patterns.



Family Lycaenidae  
Subfamily Theclinae  
Tribe Deudorini  
Group Deudorix



# Superfamily Papilionioidea

Family Nymphalidae



Unidentified brown: Subfamily: Satyrinae,  
Tribe Satyrini, Subtribe Mycalesina



***Euploea eunice*** (Godart 1819)  
Bluish-White Spotted Crow / blue-banded king crow  
Hair pencils

Family Nymphalidae  
Subfamily: Danainae  
Tribe Danaini  
Subtribe Danaina

**1 *Danaus genutia intensa* (Moore 1883)**

Common Tiger

**Specimens:** C52 ♀,

**WL** 39mm

**Distribution:** *Danaus genutia* (Cramer 1779) is found from India to Australia. *Danaus genutia intensa* (Moore 1883) is the Bornean subspecies.

Notes: Distasteful to birds. Males have a black androconial scent patch on the dorsal hind wings which it flutters to attract females. Hair pencils that project from the tip of the abdomen also release pheromone in courtship. They were seen to patrol the margins of lowland secondary forests.

Life cycle well known. Larvae feed on and sequester toxins from Asclepiadaceae.

**2 *Parantica aspasia aspasia* (Fabricius 1787)**

Yellow Glassy Tiger

**Specimens:** C21

**WL** 44mm

**Distribution:** Vietnam to Indonesia.

Notes: Frequent species around secondary rainforests. Larvae feed on and sequester toxins from Asclepiadaceae. It is therefore distasteful to birds.

**3 *Ideopsis vulgaris* (Butler 1874)**

Blue Glassy Tiger

**Specimens:** C19, C20,

**WL** 42mm

**Distribution:** Burma to Indonesia. The Bornean subspecies is *I. v. interposita*.

Notes: Common species around secondary rainforests and kampongs. Larvae feed on and sequester toxins from Asclepiadaceae. It is therefore distasteful to birds and is mimicked by *Papilio clyta*, the common mime, which is edible to birds.



Family Nymphalidae  
Subfamily: Danainae  
Tribe Danaini  
Subtribe Danaina



Family Nymphalidae  
Subfamily: Danainae  
Tribe Danaini  
Subtribe Euploeina

**1 *Idea stolli* (Moore 1883)**  
Ashy white Tree Nymph

**Specimens:** C119

**WL** 72mm

**Distribution:** Malaysia to Indonesia. Several variations and subspecies. *I. s. virgo* (Fruhstorfer 1903) [Sabah] and *I.s. alcine* (Fruhstorfer 1910) [Sawarak] are the Bornean subspecies. Our species is most like *I. s. virgo*.

**Notes** Frequently seen along trails in lowland secondary forests. Life cycle well known. Feeds on the lianas such as *Aganosma cymose* (Roxb. 1832).

Family Nymphalidae  
Subfamily: Danainae  
Tribe Danaini  
Subtribe Euploeina

**2 *Euploea crameri* (Lucas 1853)**  
Spotted Black Crow

**Specimens:** C191

**WL** 42mm

**Distribution:** Burma to Indonesia. The holotype is from Borneo. There are two further subspecies *E. c. daatensis* (Moore 1883) and *E. c. labuana* (Moore 1883 reported from Pulau Daat and Labuan respectively).

**Notes:** Distasteful to birds. Our specimen was from the margins of lowland secondary forests.

Family Nymphalidae  
Subfamily: Danainae  
Tribe Danaini  
Subtribe Euploea



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Family Nymphalidae  
Subfamily: Danainae  
Tribe Danaini  
Subtribe Euploeina



2

Family Nymphalidae  
Subfamily: Danainae  
Tribe Danaini  
Subtribe Euploeina

**1 *Euploea mulciber* (Cramer 1777)**

Striped Blue Crow

**Specimens:** C55♂, C97♂, C139♂, C145♂

**WL** 44mm

**Distribution:** South Asia: China to Indonesia. *E. e. syra* (Fruhstorfer 1902) is the Bornean subspecies.

**Notes:** Distasteful to birds. Males have hair pencils that evert from the tip of the abdomen to release pheromone in courtship. Males were common along the margins of lowland secondary forests. Life cycle well known.

**2 *Euploea cameralzeman* (Butler 1866)**

Malayan Crow

**Specimens:** C38♂, C88

**WL** 57-64mm

**Distribution:** Burma to Indonesia. Several subspecies, *E. c. scudleri* (Butler, 1878) is the Bornean subspecies.

**Notes:** Distasteful to birds. Males have hair pencils that evert from the tip of the abdomen to release pheromone in courtship. Males were common along the margins of lowland secondary forests. Life cycle well known.

**3 *Euploea eunice* (Godart 1819)**

Bluish-White Spotted Crow / blue-banded king crow

**Specimens:** C6, C7, C85

**WL** 43mm

**Distribution:** South Asia: China to Indonesia. *E. e. syra* (Fruhstorfer 1902) is the Bornean subspecies.

**Notes:** Distasteful to birds as caterpillars sequester toxins from milkweed plants they eat. Males have hair pencils (photographs) that evert from the tip of the abdomen to release pheromone in courtship. They were seen to patrol the margins of lowland secondary forests. Life cycle well known.



Family Nymphalidae  
Subfamily: Danainae  
Tribe Danaini  
Subtribe Euploeina



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Family Nymphalidae  
Subfamily: Satyrinae  
Tribe Elymniini

**1 *Elymnias panthera* (Fabricius 1787)**

Studded or Tawny Palmfly

**Specimens:** C211, C213

**WL:**

**Distribution :** Malaysia and Indonesia. Of the approximately 18 subspecies, *Elymnias panthera lacrima* (Fruhstorfer, 1904) is reported from Borneo.

**Notes:**

Family Nymphalidae  
Subfamily: Satyrinae  
Tribe Zetherini

**2 *Neorina lowii* (Doubleday 1849)**

Malayan Owl

**Specimens:** C116

**WL 47mm**

**Distribution :** Malaysia to Indonesia.

**Notes:** Caught in traps baited with fruit.

Family Nymphalidae  
Subfamily: Satyrinae  
Tribe Elymniini



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Family Nymphalidae  
Subfamily: Satyrinae  
Tribe: Zetherini



2

Family Nymphalidae  
Subfamily: Satyrinae  
Tribe Amathusiini

**1 *Amathuxidia amythaon* (Doubleday, 1847)**

Koh-i-noor

**Specimens:** C162

**WL** 56mm

**Distribution:** India to Indonesia.

Notes: *A. a. octacilia* Fruhstorfer 1911 and *A. a. ottomana* (Butler, 1869) are subspecies reported from Borneo. Found in the secondary lowland rainforest . Reported to prefer dense vegetation.

**2 *Zeuxidia auirius* (Cramer 1777)**

Great Saturn

**Specimens:** C239 ♀,

**WL** (reported to be 70mm, wingspan 145mm))

**Distribution:** two subspecies reported for Borneo: *Zeuxidia aurelius aureliana* (Honrath 1885) and *Zeuxidia aurelius euthycrite* (Fruhstorfer 1906).

**3 *Thaumantis noureddin* Westwood 1851**

Dark jungle glory

**Specimens:** C165

**WL** 50mm

**Distribution :** Malaysia to Borneo. Blue iridescence on fore and hind wings.

Notes: *T. n. noureddin*, *T. n. chatra* Fruhstorfer, 1905 and *T. n. sultanus* Stichel, 1906 are reported from Borneo. Ours most closely resembles *T. n. chatra* Fruhstorfer, 1905



Family Nymphalidae  
Subfamily: Satyrinae  
Tribe Amathusiini



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Family Nymphalidae  
Subfamily: Satyrinae  
Tribe Satyrini  
Subtribe Eritina

**1 *Coelites euptychioides* (C. & R. Felder 1867)**

Restricted Catseye

**Specimens:** C159

**WL** 35mm

**Distribution:** Thailand to Borneo.

Notes: Found in the secondary lowland rainforest . Reported to prefer dense vegetation.

Family Nymphalidae  
Subfamily: Satyrinae  
Tribe Satyrini  
Subtribe Ragadina

**2 *Ragadia makuta* (Horsfield 1829)**

Striped Ringlet

**Specimens:** C122, C154, C172

**WL** 27mm

**Distribution:** Thailand to Borneo.

Notes: Found in the secondary lowland rainforest. Slow fliers along forest trails. Larvae reported to feed on *Selaginella*, spikemoss.

Populations reported to crash with too much rain or severe drought. It was common along our trails after a dryer period of several weeks.

Family Nymphalidae  
Subfamily: Satyrinae  
Tribe Satyrini  
Subtribe Eritina



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Family Nymphalidae  
Subfamily: Satyrinae  
Tribe Satyrini  
Subtribe Ragadina



2



Family Nymphalidae  
Subfamily: Satyrinae  
Tribe Satyrini  
Subtribe Mycalesina

**1 *Mycalesis anapita* (Moore 1858)**

Common Bush Orange / Common Bush Brown

**Specimens:** C174, C178

**WL** 27mm

**Distribution:** Burma to Borneo..

Notes: Grassland species found in oil palm plantations. Found in clearings and margins of secondary forest. Oil Palm Plantations were only 300 m away across a river from collection site.

**2 *Mycalesis mineus* (Linnaeus 1758)**

Dark Banded Bush Brown

**Specimens:** C180

**WL** 23mm

**Distribution:** Burma to Borneo..

Notes: *M. m. toshikoe* Hayashi & Iwanaga 1974, is a subspecies reported from Borneo (Kuching).



Family Nymphalidae  
Subfamily: Satyrinae  
Tribe Satyrini  
Subtribe Mycalesina

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2



Family Nymphalidae  
Subfamily: Satyrinae  
Tribe Satyrini  
Subtribe Ypthima

**1 *Ypthima pandocus* (Moore 1858)**

Common Three-ring

**Specimens:** C136, C137

**WL** 24mm

**Distribution:** Malaysia, Indonesia.

Notes: Type species from Borneo. Life cycle well known.

We observed this species low down near the forest floor in secondary lowland tropical rainforest and old rubber plantations. Some specimens were bluish grey and others brown (photographs).

**2 *Ypthima* sp.**

**Specimens:** C37, C182, C185, C187

**WL** 20mm

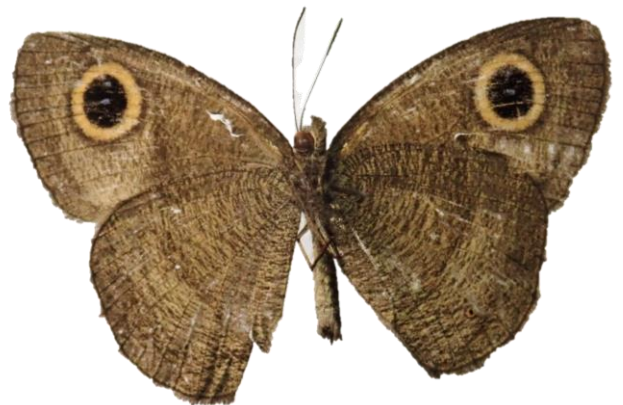
**Distribution:**

Notes: Found at same locality as *Y. pandocus*, but these specimens have only one spot (feint possibility of a second) on the hind underwing.

Family Nymphalidae  
Subfamily: Satyrinae  
Tribe Satyrini  
Subtribe Ypthima



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2

Family Nymphalidae  
Subfamily: Heliconiinae  
Tribe Cethosiini

**1 *Cethosia hypsea* (Doubleday 1847)**  
Malayan Lacawing

**Specimens:** C69

**WL 51mm**

**Distribution :** Burma to Indonesia and the Philippines.

Notes: Adults are toxic to birds. Larvae are also toxic and sequester toxins from their food plants *Adenia* sp. (Passifloraceae). They are found in lowland forests. We observed them in clearings, in glades, along trails and by river margins of secondary forests.

Subfamily: Heliconiinae  
Tribe Vagrantini

**2 *Cupha erymanthis* (Dury 1773)**  
Rustic

**Specimens:** C12, C56, C81, C99

**WL 29mm**

**Distribution** China, India to Indonesia.

Notes: At least 6 subspecies are reported, *C. h. lotis* (Sulzer 1776) being the Malaysian form. They are found in disturbed forests and We caught them in traps baited with tinned sardines. They are known to be attracted to carcasses in sunny glades. Caterpillars are reported to feed on Flacourtiaceae such as the Indian plum *Flacourtia rukam*.

**3 *Cirrochroa satellita* Butler 1869**  
Banded Yeoman

**Specimens:** C111

**WL 30mm**

**Distribution** China to Indonesia. Two subspecies. *C. s. illergeta* Fruhstorfer 1912 is the subspecies reported from Borneo.

Notes: Our species was damaged and caught on a forest trail.



Family Nymphalidae  
Subfamily: Heliconiinae



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2



3



Family Nymphalidae  
Subfamily: Heliconiinae  
Tribe Vagrantini

**1 *Vindula dejone* (Erichson 1834)**

Lesser Cruiser

**Specimens:** C8 ♂, C100 ♂

**WL** 38mm

**Distribution** India to Indonesia.

**Notes:** At least 18 subspecies are reported, *V. d. dajakorum* (Fruhstorfer, 1906) is the Bornean subspecies. Found by us in secondary rainforest and was considered a species of the primary lowland rainforest in the past. Observed on river shores mudpuddling and feeding on rotting fruit. Sexually dimorphic. Females are grey with a white band running down both wings. Males were very common mudpuddling on river banks with the similar looking *Charaxes bernardus*, the Tawny Rajah (see photograph under *C. bernardus*).

Family Nymphalidae  
Subfamily: Heliconiinae  
Tribe Vagrantini



1



Family Nymphalidae  
Subfamily: Limentidinae  
Tribe Adoliadini

**1 *Dolpha evelina* (Stoll 1970)**

Red-spot Duke

**Specimens:** C108, C140

**WL:** 48mm

**Distribution :** India to Indonesia

**Notes:** The red spot on the forewing is surprisingly conspicuous in the gloom of the forest (photographs). We recorded this in traps baited with fruit (photograph). Common in Lesan Dayak forests. Life cycle well known.

**2. *Euthalia anosia* (Moore 1857 )**

Grey Baron

**Specimens:** C231

**WL:** (not measured)

**Distribution :** *E. a. yapola* Fruhstorfer, 1913 is the subspecies reported for Borneo.

Larval food unknown.



Family Nymphalidae  
Subfamily: Limenitidinae  
Tribe Adoliadini



1



2



Family Nymphalidae  
Subfamily: Limenitidinae  
Tribe Adoliadini

**1. *Euthalia dunya*** (Doubleday 1848)

The Great Marquis, Pearl's Necklace

**Specimens:** C124, C34, C104

**WL:** 48mm

**Distribution :** found in Borneo, Sunderland north to Burma. Common in Lesan Dayak Protection forest. *Bassarona dunya monara* Fruhstorfer 1913 is the subspecies reported from Borneo and Palawan. Larval food unknown.

**2. *Euthalia teuta*** (Doubleday 1848)

The Banded Marquis

**Specimens:** C161 ♀, C75 ♀, C77 ♂ (above ) C166 ♂

**WL:** ♀ 49mm, ♂ 39mm

**Distribution :** found in Borneo, Sunderland to India. Several subspecies. *Bassarona teuta bellata* (Druce 1873) is the subspecies reported from Borneo. Common in Lesan Dayak Protection forest. Females are larger than males and much paler with a bluish-white discal band. Larval food unknown.

Family Nymphalidae  
Subfamily: Limnethinae  
Tribe Adoliadini



1



2



Family Nymphalidae  
Subfamily: Limenitidinae  
Tribe Adoliadini

**1. *Tanaecia pelea*** (Fabricius 1787)

The Malay Viscount

**Specimens:** C51♂ (above ) C124a ♀,

**WL:** 34mm

**Distribution** :Burma to Indonesia. Common in Lesan Dayak Protection forest and found in fruit baited butterfly traps. ***Tanaecia pelea pelea*** (Fabricius 1787) is the subspecies reported from Borneo.

Notes. The colour and patterns of this species are variable.

**2 *Tanaecia* sp. ???**

**Specimens:** C224

**WL** not measured.

**Distribution**



Family Nymphalidae  
Subfamily: Limenitidinae  
Tribe Adoliadini



1



2

Family Nymphalidae  
Subfamily: Limenitidinae  
Tribe Adoliadini

**1 *Tanaecia* sp. ???**

**Specimens:** C233, C234

**WL** not measured.

**Distribution**

**2 *Lexias canescens***

Yellow Archduke

**Specimens:** C225

**WL** not measured.

**Distribution:**

**Notes**

Family Nymphalidae  
Subfamily: Limenitidinae  
Tribe Adoliadini



1



2



**1 *Lebadea martha*** (Fabricius, 1787)

**Specimens:** C203 ♀

**WL:** (reported as 29mm)

**Distribution :** Widespread from India to Indonesia. The subspecies, *L. m. paduka* (Moore, 1857) is reported from Borneo.

Notes: Sexually dimorphic. Females lack the red and white colour of the males. Several species have a similar wing pattern including *Tanaecia pelea* (Fabricius 1787).

Characteristic of wet lowland tropical forests including secondary forests, clearings, glades and along forest trails.

**2 *Moduza pocris*** (Cramer 1777)

Commander

**Specimens:** C18, C101

**WL:** 35mm

**Distribution :** Widespread from India to Indonesia. The subspecies *M. p. agnatha* (Frustorfer 1897) is reported from Borneo.

Notes: Characteristic of wet lowland tropical forests including secondary forests, clearings, glades and kampongs. It was seen on the river beaches by the Lesan Dayak protection forest with other mud puddling species but is known not to be attracted to carrion or rotting fruit. Its caterpillars feed on Rubiaceae plant species, especially *Mussaenda frondosa*, the Dhobi tree.



Family Nymphalidae  
Subfamily: Nymphalinae  
Tribe Limenitidini



1



2



3

**1. *Lasippa tiga* (Moore 1881)**

Malayan Lascar

**Specimens:** C173,

**WL:** 24mm

**Distribution :** Widespread from Burma to Indonesia. Found in and around secondary lowland forests.

Notes: Several similar species in the genus make them difficult to identify in the field.

The photograph of *Lasippa* is similar to C173 and I have included it here for completeness. However, it may be a different subspecies.

Family Nymphalidae  
Subfamily: Nymphalinae  
Tribe Limenitidini



1



**1. *Neptis leucoporus* (Fruhstorfer 1908)**

Burmese or Grey Sailor

**Specimens:** C132,

**WL:** 34mm

**Distribution :** Widespread from Burma to Indonesia. The similar species, ***Neptis duryodana nesia*** (Moore, 1858) is also reported from Borneo. However, the white colour of the anterior dorsal abdomen in line with the white anterior line of the hindwing is diagnostic of *N. leucoporus*. Four subspecies are reported from smaller islands. Common in Lelan Dayak Protection forest. Found in and around secondary lowland forests. Notes: Several similar species in the genus make them difficult to identify in the field.

**2. *Neptis duryodana nesia* (Moore 1858)**

Malayan Sailor

**Specimens:** C62, C96

**WL:** 28mm

**Distribution :** Widespread from Burma to Indonesia.

***Neptis duryodana nesia*** (Moore, 1858) has a greenish shiny anterior abdominal segment dorsally which contrasts with the white of *N. leucoporus*. The white markings of the underwings also differ in pattern. Flies in and around secondary lowland forests of Lelan Dayak.

**3. *Neptis vikasi ragusa* Eliot, 1969**

Dingy Sailor

**Specimens:** C135

**WL:** 29mm

**Distribution :** ***Neptis vikasi*** (Horsfield 1829) is Widespread from Burma to Indonesia. Our specimen is very similar to the subspecies *N. vikasi ragusa* from Sumatra.



Family Nymphalidae  
Subfamily: Lymentidinae  
Tribe Neptini



1



2



3



**1 *Charaxes durnfordi everetti* (Rothschild 1894)**

Chestnut Rajah

**Specimens:** C164♂

**WL:** 58mm

**Distribution :** found in Borneo. *Charaxes durnfordi* Distant 1884 is found from India to Indonesia. There are 6 subspecies.

**2 *Charaxes distanti* (Honrath 1885)**

Malay rajah

**Specimens:** photograph only

**WL:** -

**Distribution:** *Charaxes distanti* (Honrath 1885) found in Peninsula Malaysia and Indonesia. Subspecies *infernus* Rothschild 1903 is reported from Borneo. We observed these on river beaches aggregated in multispecies flocks with *C. bernardus*. We only have a photographic record.

**3 *Charaxes bernardus* (Fabricius), 1793**

Tawny rajah

**Specimens:** C73♂

**WL:** 38mm

**Distribution:** *Charaxes bernardus* (Fabricius 1793) found from India to Indonesia. There are at least 24 subspecies reported. *Charaxes bernardus repetitus* Butler 1896 is the Bornean subspecies.

Notes: In lowland secondary forest, we observed these on river beaches aggregated in multispecies flocks feeding on urine soaked gravel (photo foreground). The photo compares it to a similar species *Vindula dejone*, the lesser cruiser [in the background], with which it was commonly seen mudpuddling.

Family Nymphalidae  
Subfamily Cheraxinae



1



2



3





**1 *Polyura hebe ganymedes* (Staudinger 1886)**

Plain Naweb

**Specimens:** C47

**WL** 43mm

**Distribution** : *Polyura hebe* (Butler 1886) is found from Burma to Sumba.

Notes: It was seen on river beaches with *Graphium* species, around the margins of secondary lowland forest and kampongs.

Life History: Larvae are known to feed on Leguminosae, sub-family Mimosoideae including *Adenanthera pavonia* and *Parkia speciose*.

**2 *Polyura delphis* (Staudinger 1886)**

Jewelled Naweb

**Specimens:** C179

**WL** 50mm

**Distribution** : India to Indonesia.

Notes: It was seen on river beaches on urine patches on beaches on margins of secondary lowland forest.



Family Nymphalidae  
Subfamily Cheraxinae  
Tribe Cheraxinae



1



2



Family Nymphalidae  
Subfamily: Cheraxinae  
Tribe Prothoini

**1 *Prothoe franck* Godart 1824**  
Blue Begum

**Specimens:** C163

**WL** 44mm

**Distribution** : Indonesia.

Notes: The subspecies from Borneo is *P. f. borneensis* Frustorfer 1913. From secondary lowland rainforest. The white bar on the under forewing shows up in the low light of the forest. The blurred photograph shows a specimen in typical head down pose on a tree trunk..

Family Nymphalidae  
Subfamily: Apaturinae

**2 *Eulaceura osteria* (Westwood 1850)**  
Elegant Emperor

**Specimens:** C212 ♂

**WL** mm

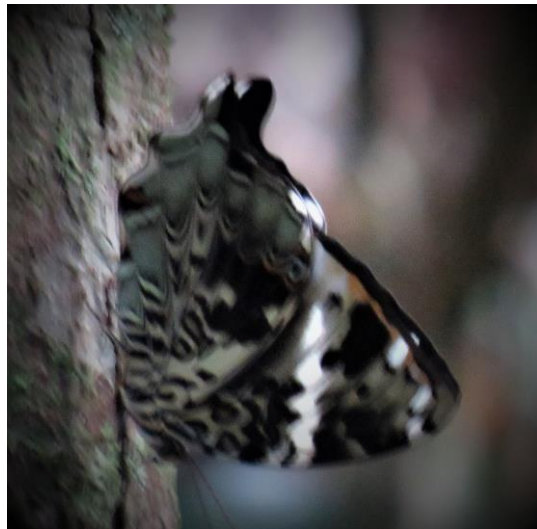
**Distribution:** *Eulaceura osteria* (Westwood 1850) is reported from Thailand to Indonesia. At least 9 subspecies are recognised, two from Borneo: *E. osteria jembala* (Fruhstorfer 1913) and *E. o. osteria* (Westwood 1850).

**Notes:** Sexually dimorphic. Male black with white streak above and shiny grey below. Female brown and patterned resembling the Malay Viscount.

Family Nymphalidae  
Subfamily Cheraxinae  
Tribe Prothoini



1



Family Nymphalidae  
Subfamily: Apaturinae



2



**1. *Melanitis leda*** (Linnaeus, 1758)

Common evening Brown

**Specimens:** C123, C238

**WL:** 41mm

**Distribution:** Africa through Asia to Australia.

**Notes:** Variable morphology that changes the wet and dry seasons.

Of the two specimens depicted the top form is most like a dry season form and the lower picture with the more barred underwings is more like a dry season form. They exhibit strong “chase” behaviours and resident forms are known to fight off visiting individuals at dusk. We caught them with traps baited with fruit.

Caterpillars feed on grasses.



Family Nymphalidae  
Subfamily: Apaturinae



1



Family Nymphalidae  
Subfamily: Biblidinae  
Tribe Biblidini

**1 *Laringa castelnaui*** (Felder & Felder 1860)

Blue Danay

**Specimens:** C93, C1001

**WL:** 25mm

**Distribution:** Burma to Borneo.

**Notes:** There are two species in the genus and 5 subspecies of *L. castelnaui*. *L. c. ochus* Fruhstorfer is the subspecies for Borneo

Family Nymphalidae  
Subfamily: Cyrestinae  
Tribe: Cyrestini

**2 *Chersonesia rahria*** (Moore 1858)

Wavy Maplet

**Specimens:** C16

**WL:** 18mm

**Distribution:** Africa through Asia to Australia.

**Notes:** Primary lowland rainforest species found by us in secondary forest. They were particularly noticeable in glades along forest trails. They sit with their wings outspread in the manner of moths.

Caterpillars are known to feed on *Ficus* species, protect themselves within their own faeces.

**3 *Cyrestis nivea*** (Zinken 1831)

Straight-line Mapwing

**Specimens:** C35

**WL:** 32mm

**Distribution:** South East Asia.

**Notes:** >13 subspecies reported: *C.n. nivalis* C&R Felder 1867 and *C. n. borneensis* Martin 1903 from Borneo.

Primary lowland rainforest species found by us in secondary forest.

Family Nymphalidae  
Subfamily: Biblidinae  
Tribe Biblidini



1



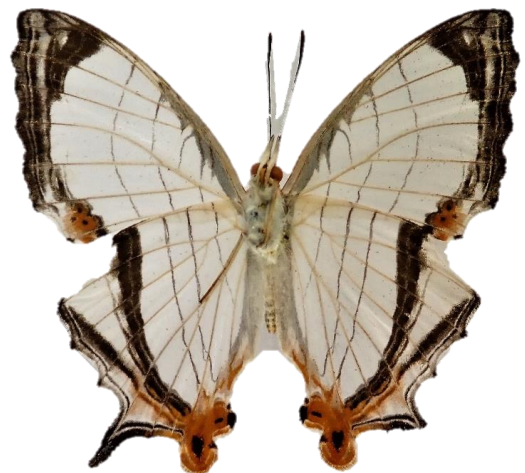
Family Nymphalidae  
Subfamily: Cyrestinae  
Tribe: Cyrestini



2



3





**1 *Hypolimnas bolima*** (Linnaeus 1758)

Blue Moon / Great Egg-fly

**Specimens:** C188 ♂ =1, C208=1a.

**WL** mm

**Distribution:** India, China to Australia.

**Notes:** Many subspecies. The type species and *H. b. philippensis* (Butler 1874) are reported from Borneo. *H. bolina* is extremely sexually polymorphic with females having multiple forms that mimic local distasteful species. Specimen 1a mimics the milkweed butterflies so common around our camp: *E. cameralzeman* and *E. mulcibar*. We observed this species in secondary lowland rainforest and along the gravel beaches of rivers, such as the specimen below.



**2 *Junonia hedonia*** (Linnaeus 1764)

Spotted Chocolate Soldier

**Specimens:** C133

**WL** -

**Distribution:** Philippines to Australia.

**Notes:** *J. h. dayak* (Hayashi 1972) is reported from Borneo.



Family Nymphalidae  
Subfamily: Nymphalinae  
Tribe Junoniini



1



1a



2



Family Nymphalidae  
Subfamily: Nymphalinae  
Tribe Kallimini

**1. *Kallima limborgii limborgii* Moore, 1878**

Malayan Oakleaf

**Specimens:** C36 ♀, C74 ♀

**WL** 51mm

**Distribution:** Thailand to Borneo.

Notes: Females are more drab and have less pointed tips to the wings than males. There is much variation in the underside wing pattern. Our winglength measurements are larger than those given (37mm) by Kirton (2018). Observed in forest glades, streams and the at margins of secondary lowland rainforest. Strong flier but settled quickly where it was difficult to see amongst dead leaves (photographed). However, several specimens observed showed damage consistent with bird attack (1a) where the spot on the front forewing has been targeted. Photographs below showing wing detail and how “tame” these butterflies can be.



**2 *Doleschallia bisaltide* (Cramer 1777)**

Autumn Leaf

**Specimens:** C98

**WL** 38mm

**Distribution:** India, China to Australia.

Notes: Many subspecies. *Doleschallia bisaltide borneensis* (Fruhstorfer 1899) is the subspecies reported from Borneo. We observed this species in Secondary Lowland rainforest along trails.



Family Nymphalidae  
Subfamily: Nymphalinae  
Tribe Kallimini



1



1a



2



## Full List of named Butterfly species identified.

*Allotinus (Fabitaras) sarrastes Fruhstorfer 1913*  
*Allotinus (Fabitaras) sarrastes* Fruhstorfer 1913  
*Allotinus (Paragerydus) leogoron normani* Eliot 1967  
*Amathuxidia amythaon* (Doubleday 1847)  
*Amblypodia narada* (Horsfield 1828)  
*Anthene lycaenina miya* (Fruhstorfer 1916)  
*Appias nero* (Fabricius 1793)  
*Arhopala elopura* (Druce 1894)  
*Caleta elna elvira* (Fruhstorfer 1918)  
*Catapaecilma elegans* (Druce 1873)  
*Catochrysops panormus* (C. Felder 1860)  
*Catopsilia pomona* Fabricius 1775  
*Cepora judith* (Fabricius 1787)  
*Cepora judith* (Fabricius, 1787)  
*Cethosia hypsea* (Doubleday 1847)  
*Charaxes bernardus* (Fabricius 1793)  
*Charaxes distanti* (Honrath 1885)  
*Charaxes durnfordi everetti* Rothschild 1894  
*Chersonesia rahria* (Moore 1858)  
*Cirrochroa satellita* Butler 1869  
*Coelites euptychioides* (C. & R. Felder 1867)  
*Cupha erymanthis* (Drury 1773)  
*Curetis santana malayica* (C & R Felder 1865)?  
*Curetis sperthis sperthis* (C. & R. Felder 1865)  
*Cyrestis nivea* (Zinken 1831)  
*Danaus genutia intensa* (Moore 1883)  
*Delias baracasa* Semper 1890  
*Discolampa ethion* (Westwood 1851)  
*Doleschallia bisaltide* (Cramer 1777)  
*Dolpha evelina* (Stoll 1970)  
*Drupadia cindi* Cowan 1974  
*Drupadia naisca* (Rober 1886)  
*Elymnias panthera* (Fabricius, 1787)  
*Eulaceura osteria* (Westwood 1850)  
*Euploea cameralzeman* (Butler 1866)  
*Euploea crameri* (Lucas 1853)  
*Euploea eunice* (Godart 1819)  
*Euploea mulciber* (Cramer 1777)  
*Eurema hecabe hecabe* (Linnaeus 1758)  
*Eurema nicevillei nicevillei* (Butler 1898)  
*Eurema simulatrix tecmessa* (de Nicéville & Martin)  
*Euthalia anosia* (Moore 1857)  
*Euthalia dunya* (Doubleday 1848)  
*Euthalia teuta* (Doubleday 1848)  
*Gandaca harina* (Horsefield 1829)  
*Graphium agamemnon* (Linnaeus 1758)  
*Graphium antiphates* (Cramer 1775)  
*Graphium bathycles bathycloides* (Honrath 1884)  
*Graphium doson* (C. & R. Felder 1864)  
*Graphium sarpedon* (Linnaeus 1758)  
*Hasora taminatus* (Hübner 1818) ?  
*Hypolimnias bolima* (Linnaeus 1758)  
*Hypolycaena amasa maximinianus* (Fruhstorfer 1912)  
*Idea stollii* (Moore 1883)  
*Ideopsis vulgaris* (Butler 1874)  
*Ilema vaneeckeii callima* (Collenette, 1932)  
*Jamides philatus* (Snellen 1887)  
*Junonia hedonia* (Linnaeus 1764)  
*Kallima limborgii limborgii* Moore 1878  
*Koruthaialos sindu* (C. & R. Felder, 1860)  
*Lamproptera meges* (Zinken-Sommer 1831)  
*Laringa casteinaui ochus* (Fruhstorfer)  
*Lasippa tiga* (Moore 1881)  
*Lebadea martha* (Fabricius, 1787)  
*Leptosia nina* (Fabricius 1793)  
*Lexias canescens* (Butler 1869)  
*Logania malayica* Distant 1884  
*Logania regina* (Druce 1873)  
*Lycaenopsis haraldus* (Fabricius 1787)  
*Melanitis leda* (Linnaeus, 1758)  
*Moduza pocris* (Cramer 1777)  
*Mycalopsis anapita* (Moore 1858)  
*Mycalopsis mineus* (Linnaeus 1758)  
*Nacaduba kurava* (Moore 1858)  
*Neopithecops zalmora* (Butler 1870)  
*Neorina lowii* (Doubleday 1849)  
*Neptis duryodana nesia* (Moore 1858)  
*Neptis leucoporus* (Fruhstorfer 1908)  
*Neptis vikasi ragusa* Eliot 1969  
*Pachliopta antiphus* (Fabricius 1793)  
*Papilio (Menelaides) memnon* (Linnaeus 1758)  
*Papilio demoleus* (Linnaeus 1758)  
*Papilio polytes* (Linnaeus 1758)  
*Papilio helenus enganius* (Doherty 1891)  
*Papilio nephalus* (Boisduval, 1836)  
*Paralaxita telesia* (Hewitson, 1861)  
*Parantica aspasia aspasia* (Fabricius 1787)  
*Polyura delphis* (Staudinger 1886)  
*Polyura hebe ganymedes* (Staudinger 1886)  
*Prothoe franck* Godart 1824  
*Ragadia makuta* (Horsfield 1829)  
*Rapala varuna* (Hewitson 1863)  
*Ritra aurea* (Druce 1873)  
*Tanaecia pelea* (Fabricius 1787)  
*Thaumantis noureddin* Westwood 1851  
*Trogonoptera brookiana* Wallace 1885  
*Vindula dejone* (Erichson 1834)  
*Ypthima pandocus* (Moore 1858)  
*Zemeros emesoides* C. & R. Felder 1860  
*Zeuxidia aurelius* (Cramer 1777)



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Postscript: November 2019

### **A new beginning and an exciting future.**

The proposal of a new capital city at Samboja, Kutai Kartanegara, is an exciting prospect and an Indonesian expression of a new optimistic future for Asia. The development of a visionary city fit for the 22nd century with past lessons learned and new technologies makes it is an ideal time to design a place where wildlife, people and metropolis can coexist. It becomes possible for a northern arc of lowland forest from the Talok peninsula to the central mountains to be integrated into a regional vision for the future. It is an area of forest large enough to support much of Bornean wildlife which is nearing extinction. Furthermore, it can facilitate the wellbeing of citizens, provide secondary services (e.g. water, weather, cultural and educational resources) and be a tourist destination.

For example, the Jl. Berau-Samarinda (the Tanjung Redeb-Samarinda road) could become the iconic new scenic “orang utan highway” linking international airports to the south and north via the diving / coastal resorts through lowland rainforests (cf route 66 in the USA, the garden route in South Africa, the Icefields Parkway in Canada). Cultural heritage from the oldest cave art and diverse tribal cultures to modern art and architecture can be incorporated and even mining areas can be turned into visitor attractions and eventually restored into amazing new places as coal becomes redundant as a fuel.

From east to west across Berau there are few bottlenecks of development (oil palm) that need to be recovered back to forest to enable a continuous forest to reach through the limestone mountains to the Talok Peninsula. If a plan to manage this larger area for wildlife were to be developed with people, tourism and industry collaborating in a shared vision for Berau and Borneo that includes their wildlife, it is possible that these forests may be big enough to survive and regenerate into the future. The best and most beautiful cities are those that include green spaces and integrate with the surrounding landscape. This is an exciting opportunity to set the standards for the future of the planet.

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### **The authors**

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Peter Roy Wiles PhD Reading, PGCE Oxford, MIBiol. (entomology), HND Applied sciences. Roy is a retired University lecturer with a long academic career teaching ecological subjects, supervising research and designing University degree programmes. Roy trained as an entomologist and later specialised as a freshwater ecologist and acarologist. He is an expert watermite taxonomist and ecologist who has described over 120 new species in some 50 academic papers. He has widely travelled from New Guinea to Thailand, South Africa, Central America to Ecuador with expeditions and more latterly with students. He has been at the forefront of teaching through fieldwork and pioneered ecology field courses in rainforests, on coral reefs and African Savannahs. Roy has been involved with Operation Wallacea almost from the beginning and is now enjoying working in rainforests with new generations of students and academics.