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KUALA BELALONG, BRUNEI: A HOTSPOT OF OLD WORLD BUTTERFLY DIVERSITY

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ABSTRACT.– Butterflies were sampled extensively over a two year period in an area, approximately 1 km² in extent, of lowland mixed dipterocarp forest in Brunei, N.W. Borneo. A total of 342 species were recorded, and from the species accumulation curve the total number of species present in the area was estimated to be 464, or nearly half the total Bornean fauna. With respect to the Bornean total, Papilionidae and Pieridae were proportionally better represented than Nymphalidae, Hesperiidae or Lycaenidae, a result which is probably partly a function of sampling bias, but may also reflect a more general distribution of species of the first two families. Of 151 commoner species, 80 were restricted in their distribution within the area, in some cases to very small areas of a few hundred m². When species recorded in this study and published records for the surrounding Ulu Temburong region (up to 2000m asl) were combined and compared with species lists for Gunung Mulu National Park, Sarawak (50 km distant), and Mount Kinabalu National Park, Sabah (200 km distant), slightly greater similarities were found between Temburong and Mulu, than Temburong and Kinabalu. Combining the species lists for the three areas leads to a total of 666 recorded species, or two thirds of the Bornean total, suggesting that ultimately almost all Bornean species could be found in these three areas.

KEY WORDS: Borneo, distribution, Hesperiidae, Lycaenidae, Malaysia, New Guinea, Nymphalidae, Oriental, Papilionidae, Pieridae, Riodinidae, Sabah, Sarawak, Southeast Asia, species-richness.

Borneo supports a butterfly fauna of almost 1000 species, largely shared with other parts of the Sundaland plate, including Java, Sumatra and Peninsular Malaysia (Corbet and Pendlebury, 1992; Otsuka, 1988; Otsuka, 1991a, 1991b). The island is characterized by a range of habitats suitable for butterflies, including four distinct lowland forest types (mixed dipterocarp forest, tropical heath, peat swamp forest and mangrove; Whitmore, 1984), and extensive areas of montane vegetation at higher altitudes, (ranging from lower montane oak-laurel forest to alpine heath in the uppermost zone; Corner, 1978). However, present evidence suggests that the broad variation in available habitat types contributes relatively little to butterfly species diversity, most of which is concentrated in lowland mixed dipterocarp forest, and to a lesser extent, in hill dipterocarp forest up to 1500 m. Other lowland forest types have mainly a diluted version of this core fauna (Holloway, 1984; Cassidy, 1985; Orr, unpublished data). The montane fauna is also relatively depauperate (Barlow *et al.*, 1971; Holloway, 1978), especially when compared with the rich high altitude fauna of New Guinea, the nearest comparable area of extensive tropical highlands.

Given that dipterocarp forest is known to exhibit substantial floristic heterogeneity owing to edaphic and topographic factors (Ashton, 1964), it is of interest to know the extent to which species may be concentrated within a single habitat type, and also the scale at which diversity is maintained within a habitat, and how this relates to overall patterns of species richness. It is of particular interest to know if all mixed dipterocarp forests support a roughly uniform diversity of butterflies, or if diversity is concentrated in particular areas of high floristic and or topographic heterogeneity. The forests of North Borneo, generally identifed as a global hotspot for all flora and fauna (Wilson, 1992), are under particular threat, and outside a limited system of national parks, almost all communities are vulnerable in the long term. Information on geographic patterns of species richness is therefore needed to provide benchmark data needed for planning conservation strategies which aim to preserve maximal diversity.

AREA AND METHODS

The Kuala Belalong Field Study Centre (KBFSC) was established in 1990 in the Batu Apoi forest reserve in the Temburong district of the tiny oil-rich sultanate of Brunei. The total area of protected forest within the reserve is around 1000 km² and ranges in elevation from just above sea level to peaks reaching 2000m on the periphery. The research station is located in primary mixed dipterocarp forest on the Belalong river at an elevation of about 60m asl (Fig. 8), and is flanked by ridges rising sharply to 300m asl. Mean annual rainfall for the area is about 4500mm and seasonality is not marked. The lowland forest has one of the highest tree species diversities ever measured (Ashton, 1964; Whitmore, 1984) and the dominant emergents are among the tallest rainforest trees in the world. Within this area we investigated the butterfly fauna over a period of more than two years within an area of approximately one km², centred on the research station (Fig. 1). General features of the area are described in Cranbrook and Edwards (1994).

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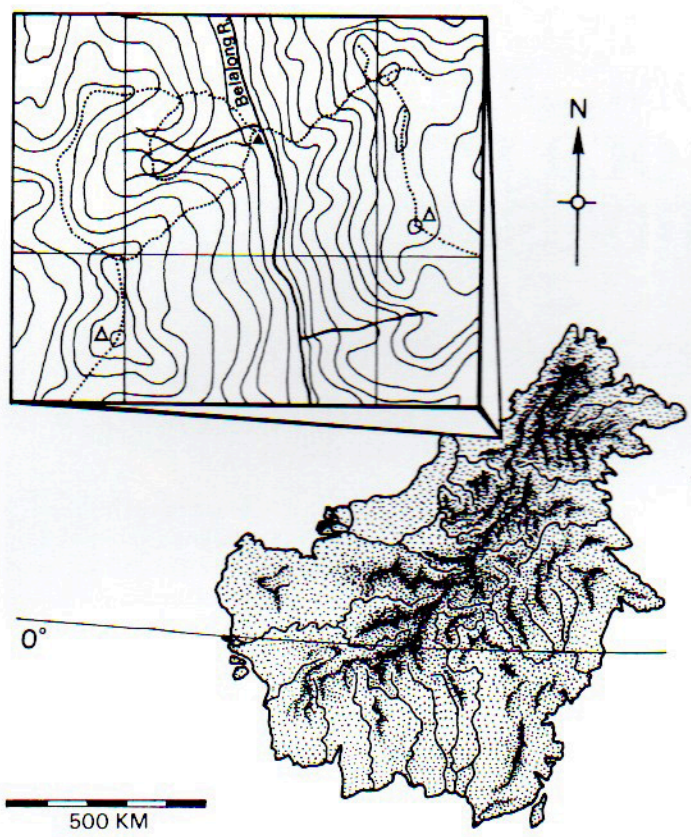

Fig. 1. Location of the study area in Borneo. Inset shows map of the approximate area sampled; contour intervals 100 ft; dotted lines indicate trails.

Spatial heterogeneity within the sample area was provided by the topography of the site, which is bounded on either side by two ridges running approximately north-south, and bisected by the Belalong river; hence the two slopes differ in aspect and there is an elevational range of about 250m. The high relief also gave visual access to the canopy and collecting along the ridges allowed many canopy species to be captured. We sampled for three to five days at intervals of one to three months over a period of two years. Sampling was mostly done along the river or along either of the two trails leading along the ridges, with efforts being concentrated around natural attractants, such as fallen fruit, and in sunspots and hilltops. For certain groups, quantitative estimates of species abundance patterns were made using transect walk techniques along each trail (Pollard, 1977). Records were based on both specimens captured and on sight records where these were reliable. We also made quantitative estimates of species mudpuddling at the station's sewage outlet.

RESULTS

In total, we identified 342 species at Kuala Belalong during 47 days of sampling (see appendix). As usual, the cumulative number of species recorded rose rapidly at first, then more slowly to produce a characteristic collector's curve (Fig. 2). At the end of the sampling period, the number of species recorded was still increasing at a rate of about one every two days. From this, one could estimate that the total number of species for Belalong is very likely to exceed 400, or to be `464´ using the model species

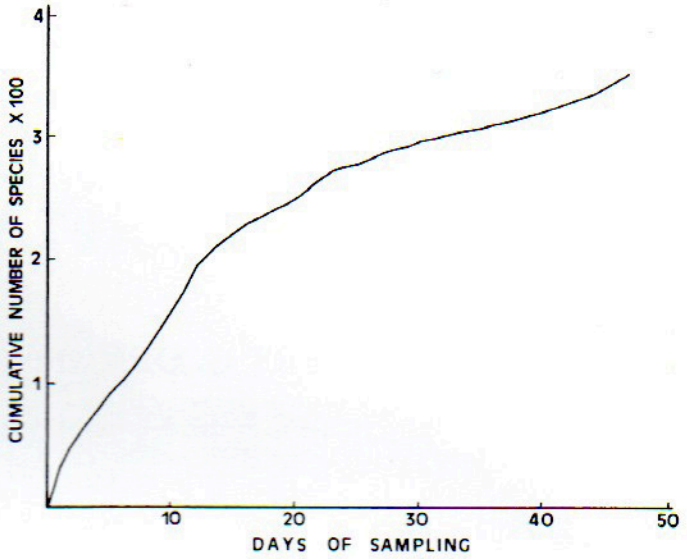

Fig. 2. Cumulative number of species plotted against sampling effort (man days).

accumulation curve of Clench (1979) recently applied to calculating species richness at two locations in the neotropics by Ragusa and Llorente-Bousquets (1990), and Lamas *et al.* (1991).

Of all butterflies recorded, 53 species were considered common, with 50 or more records, 101 species were moderately common, at least sporadically, with between 10 and 49 records, and 183 species were represented by fewer than 10 records, in many cases by only a single specimen. Although this follows the usual pattern in the tropics of few common and many rare species, these figures probably do not very accurately reflect the true patterns of species abundance within the community studied. It is probable that many species were represented disproportionally due to unevenness in sampling of the various groups, especially since the likelihood of detecting and recording a species almost certainly increased after the first record, as our search images became attuned to that species. Sampling unevenness is also apparent from the proportions of the Bornean fauna for each family represented by the respective samples (Table 1), with Papilionidae and Pieridae being considerably better represented than Lycaenidae or Hesperiidae.

Spatial distribution of species within the study area was not uniform. Of 151 species for which we have adequate records, 71 (47%), including most papilionids and pierids, were apparently fairly generally distributed, while the remaining 80 species (53%) were localized to some extent (Fig. 3). Twenty-five species,

TABLE 1. Proportions of butterfly familiies with respect to the total number of species recorded and to the Bornean total for each family respectively.

	Total species recorded	Proportion of total species	Proportion of Bornean total
Papilionidae	25	7.4%	57%
Pieridae	29	8.6%	71%
Nymphalidae	124	36.4%	52%
Lycaenidae	109	32.0%	28%
Hesperiidae	55	15.7%	24%
TOTAL	342	100%	36%

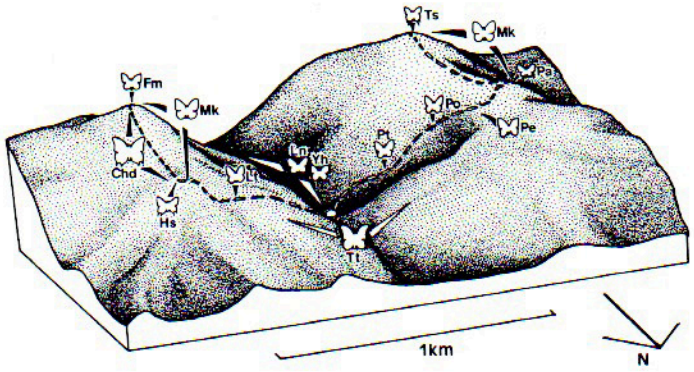

Fig. 3. Isometric view of the sampling area, looking up river and indicating several types of localization in distribution: General riverine - *Leptosia nina* (Ln), *Ypthima hanburyi* (Yh); lower parts of slopes - *Terinos terpander* (Tt); generally on ridges - *Mycalesis kina* (Mk); restricted to one ridge - *Charaxes durnfordi* (Chd); and very localized - *Flos morphina* (Fm), *Horaga syrinx* (Hs), *Laxita teneta* (Lt), *Paralaxita telesia* (Pt), *P. orphna* (Po), *Poritia erycinoides* (Pe), *Pyroneura aurantiaca* (Pa) and *Thrix scopula* (Ts).

chiefly nymphalids such as *Ypthima hanburyi* but including also the pierid *Leptosia nina* (Fig. 13) and the papilionid *Papilio memnon*, were restricted to the riverbank and to open areas beside the banks. Sixteen nymphalid species were found only on the lower regions of the slopes no more than 100m above the river. Twenty-nine species were recorded only on the ridges, including 5 pierids, 6 nymphalids, 13 lycaenids and 3 hesperiids. Some of these may be generally-distributed canopy and subcanopy species which can only be accessed along the ridges, but others such as *Mycalesis kina* (Satyrinae) (Fig. 17) and *Pyroneura* sp. (Hesperiidae), are found only in the understorey near the summits and are undoubtedly restricted to this microhabitat.

Within these general areas, a number of species were even more localized. A few nymphalids were restricted to only one of the two ridges, for example *Charaxes durnfordi* on the east ridge, or *Elymnias nessaea* on the west ridge, perhaps reflecting local variation in hostplant dispersion. On a finer scale some species, chiefly lycaenids, were found only in one or more very small patches of only a few hundred square metres. At least nine lycaenids were highly restricted in this fashion, including members of the Riodininae, Poritiinae and Theclinae. Vertical stratification in distribution of all groups was evident, and all canopy and subcanopy species flew noticeably higher early in the morning and descended as the day progressed, correlated with a sharp fall in humidity in the canopy (Aoki *et al.*, 1978). Thirty-five species were virtually restricted to the understorey at all times, including all amathusiines, most satyrines, and many members of the nymphaline tribe Euthaliini (*Lexias, Tanaecia, Bassarona, Dolpha*). The total period of activity for most strictly diurnal groups was remarkably short, with maximal activity between 0930h and 1330h, and very little activity after 1430h (sunrise 0605-0636h). A pronounced lull in activity around midday (see Askew, 1980) was not noted.

The quantitative surveys showed substantial and irregular fluctuations in abundance of most species but there were no clear seasonal trends in species richness or in the phenology of any one species. Analysis of the monthly turnover of papilionid and pierid species visiting soaks indicated a continually changing community structure which was not repeated. Detailed analysis of species phenology is presented elsewhere (Orr and Häuser, in press).

DISCUSSION

Previous local surveys of butterflies in Borneo and West Malaysia have recorded between 232 species (Endau Rompin, West Malaysia: Tan *et al.*, 1991) 276 species (Gunung Mulu National Park, Sarawak: Holloway, 1984) and 340 species (Mount Kinabalu National Park and other localities in Sabah: Barlow *et al.*, 1971), for an often unspecified collecting effort, generally including as many habitat types as possible and concentrated in a relatively short space of time. When the species tally for any single small area of lowland forest or hill dipterocarp forest is extracted from these lists, in no case does it exceed 200 species. However these figures are apparently derived from limited collecting effort in any one locality, and probably do not reliably estimate local species diversity. For example, Holloway and Robinson's (1978) checklist of butterflies for Kinabalu National Park, Sabah, omits several species from Poring Hot Springs which we observed there on a casual visit. Moreover, previous studies fail to include much of the temporal component of diversity. Many species fluctuate irregularly in abundance by one or two orders of magnitude, and during any short-term sampling period, a large number of species will be too rare to be discovered (Orr and Häuser, in press). By regular sampling over an extended period, many of these rare species can be encountered during peaks in their abundance. As a result, a very high species diversity, representing almost half the butterfly fauna of Borneo, was found within a very small and relatively homogeneous area, a result which has not been previously demonstrated in the old world tropics. It is interesting to note that the megadiverse areas of the new world, Tambopata (Lamas, 1981), Pakitza (Lamas *et al.*, 1991), and Rondonia (Emmel and Austin, 1990) all have about 10-15% of the neotopical total. Kuala Belalong appears to have about 12% of the Oriental region fauna as estimated by Heppner (1991); hence, placed in its biogeographical context, it is as impressively rich as those areas.

It is notable from the results that the different families are present in very different proportions relative to the Bornean total. Such disparity could arise from several causes including: 1) differing distributional patterns; for example, papilionids and pierids are almost certainly wider ranging and more evenly distributed than are many lycaenids and hesperiids, which may be so fragmented and local in their micro-distribution that a 1 km square will be unlikely to include all the species occurring within the habitat; 2) differential proportions of the various families being confined to other habitat types; and/or 3) uneven sampling within the area. Uneven sampling probably accounts for much, but not all, the disparity. The large, conspicuous Pieridae and Papilionidae which both contain significant montane elements absent from this sample, are represented by 71% and 57% of the total Bornean fauna for those families, respectively. If all families were present in the same proportions as the combined average for Papilionidae and Pieridae (63.5%), then the estimated total number of species in the area would exceed 600. Intuitively, this seems excessive, and it is likely that Lycaenidae and Nymphali-

dae, and probably Hesperiidae, are less well represented in the sample area largely because they include many species which are habitat-specific and localized.

The species list for Kuala Belalong can be extended to form a representative sample for the whole of the Batu Apoi forest region (= Ulu Temburong; Cassidy, 1982), if we also consider records from Bukit Belalong (1000m) and those listed by Cassidy (1982, 1985) who includes species collected between 300m and 2000m in the Batu Apoi area. This results in the addition of 69 species to our list, or a total of 411 species. This list can be compared with species lists for other areas in north Borneo for which extensive samples over an altitudinal transect have been made, including: 1) Mulu National Park, Sarawak (Holloway, 1984), situated 50 km from Batu Apoi but with an altitudinal range of 100-2500m, and a wider range of habitat types, including tropical heath and dipterocarp forest growing on limestone as well as on shale-derived soil; and 2) Kinabalu National Park, Sabah (Banks *et al.*, 1971; Holloway and Robinson, 1978), where collections were made from approximately 400-4000m in primary and secondary vegetation.

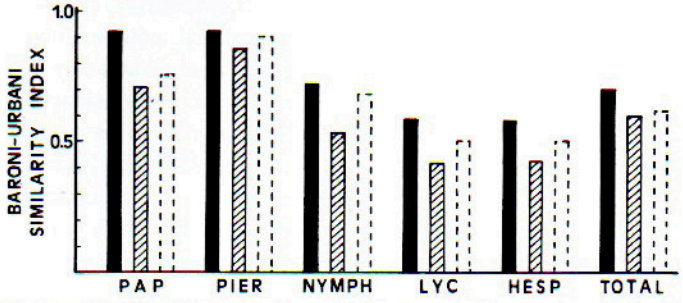

Fig. 4. Baroni-Urbani index of similarity for the 5 main butterfly families between the Batu Apoi forest reserve and Mulu National Park, Sarawak (solid bar), Batu Apoi and Kinabalu National Park, Sabah (hatched bar). The comparison for Mulu and Kinabalu is indicated by the dashed open bar.

For a comparison of the three areas, the Baroni Urbani similarity index (Fig. 4) was calculated for all families for pairwise comparisons of Batu Apoi, Mulu, Batu Apoi and Kinabalu. In all cases a greater similarity was found between Batu Apoi and Mulu than between Batu Apoi and Kinabalu. This result was also true when the Jaccard index was used. Using the Baroni Urbani index consistently resulted in an intermediate level of similarity between Mulu and Kinabalu, but this was not consistent using the Jaccard index. In this analysis the Baroni Urbani index is probably better than the more familiar Jaccard because it takes into account absences from both samples, hence partially compensates for uneven sampling. Considering the comparisons of Batu Apoi with the other two localities, the order of similarity in terms of families was: Pieridae > Papilionidae > Nymphalidae > Lycaenidae = Hesperiidae. Surprisingly perhaps, the greater difference between Kinabalu and Batu Apoi appears to be attributable mostly to lowland elements and to the inclusion of species from secondary habitats in the Kinabalu sample. A substantial proportion of the montane fauna, such as the large polyommatine genus *Celastrina* (sensu lato), was present at higher altitudes in all three areas. Differences within families could often be attributed mainly to a particular subfamily or genus. For example, in the Nymphalidae the greatest dissimilarities were in the Satyrinae and Amathusiinae, which include mainly lowland species. Within the Lycaenidae, the Polyommatinae were far more similar between all sites than were the Theclinae, much of the dissimilarity in the latter being attributable to the huge, mostly lowland genus *Arhopala*, which showed very little overlap between sites.

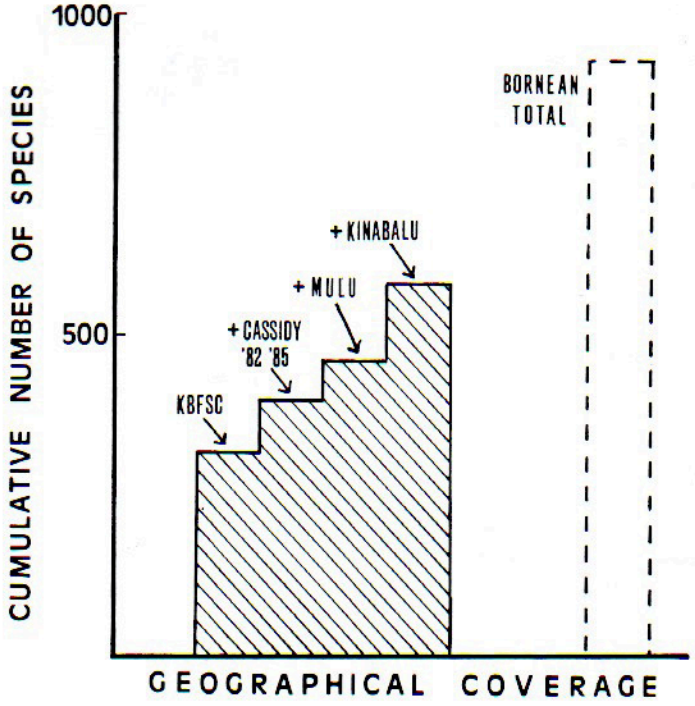

Fig. 5. Cumulative total species recorded as species lists for the broader Batu Apoi region, (from Cassidy, 1982, 1985), Mulu (from Holloway, 1984) and Kinabalu (from Holloway and Robinson, 1978), are added to the species list for the 1 kilometer square around the KBFSC.

Overall relationships between sites are reflected in the number of additional species included if species lists for Batu Apoi and Mulu, and then Kinabalu are combined sequentially (Fig. 5). The resulting total is 578 species, or about 60% of the Bornean fauna. As it is certain that none of these lists represents complete samples for their respective areas, it seems likely that the great majority of all Bornean species could eventually be found in these three areas. This might seem heartening in terms of the long-term future of the Bornean fauna. However, the large number of species found within the small area around Kuala Belalong should not be taken to imply that rich communities are sustainable within small forest reserves. Apart from the limited genetic diversity allowed for species occurring at low abundance, some species may be lost from the area during periods when their overall densities are low, as a result of stochastic and other processes.

The present results appear not to support conclusions reached by Prendergast *et al.* (1993) on the non-coincidence of species-rich hotspots and rare species based on the present-day distribution of butterflies and four other animal and plant taxa in the British Isles. These different results, probably reflecting the fundamental differences between a temperate, highly fragmented, long-managed landscape, and a tropical site encompassing still largely undisturbed areas of rainforest, suggest greater caution is needed when drawing general conclusions from singular case

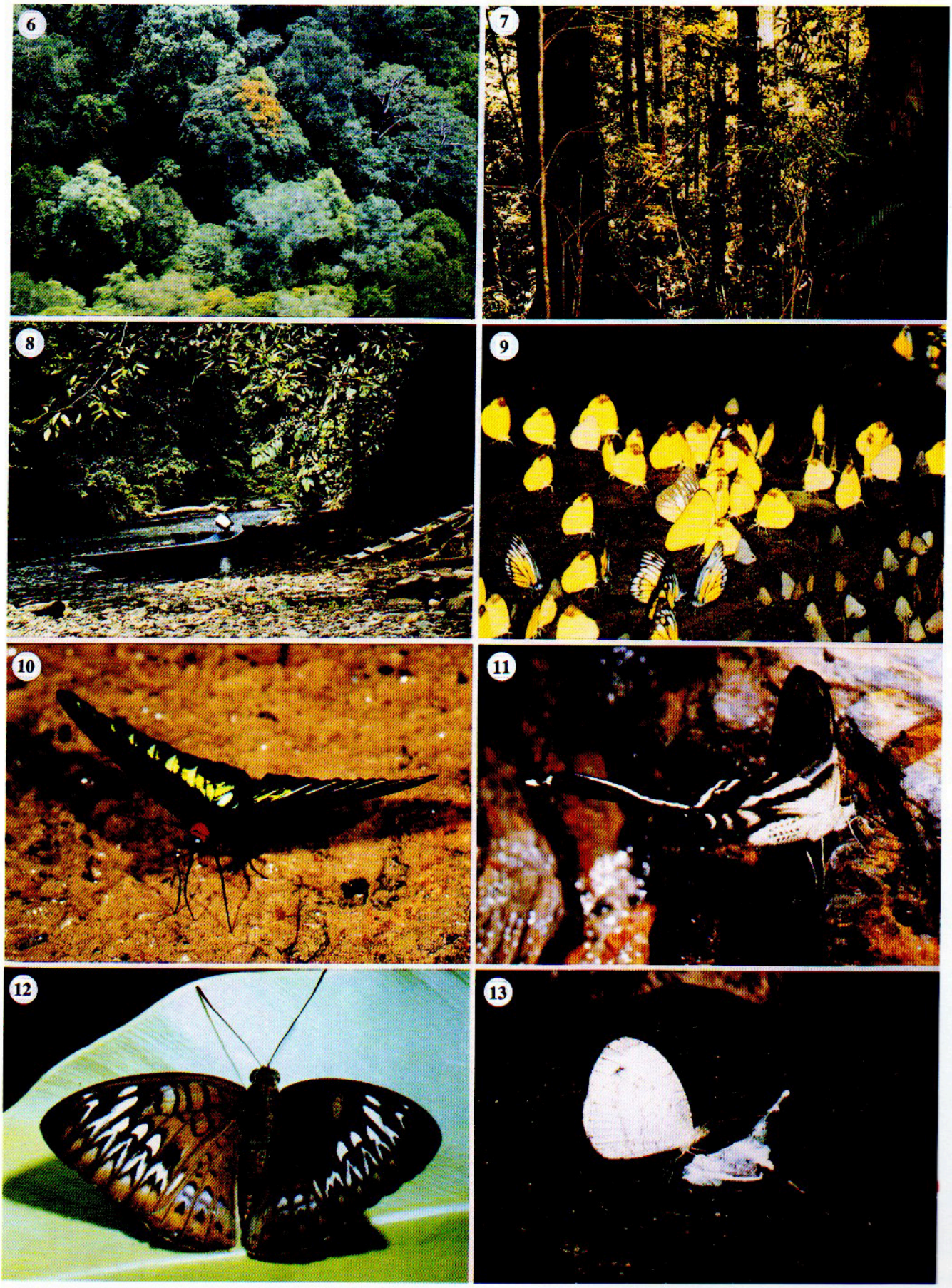

Fig. 1-13.– **6**. Canopy of mixed dipterocarp forest near KBFSC as seen from a helicopter. **7**. View from inside dipterocarp forest on the west ridge near KBFSC. **8**. Kuala Belalong (river), view upstream from KBFSC (to the right). **9**. Group of pierids and lycaenids on the river bank, including *Eurema*, *Cepora*, *Appias*, *Prioneris*, *Nacaduba*, and *Ionolyce helicon*. **10**. *Trogonoptera brookiana* (male), mudpuddling. **11**. *Lamproptera curius*, mudpuddling. **12**. *Tanaecia aruna*. **13**. *Leptosia nina*.

Fig. 14-24.– **14**. *Idea stolli*. **15**. *Charaxes distanti*. **16**. *Thauria aliris*. **17**. *Mycalesis kina*. **18**. *Tanaecia orphne*. **19**. *Ragadia makuta*. **20**. *Lexias dirtea*. **21**. *Prothoe franck*. **22**. *Faunis stomphax*. **23**. *Thaumantis odana*. **24**. *Polyura moori*.

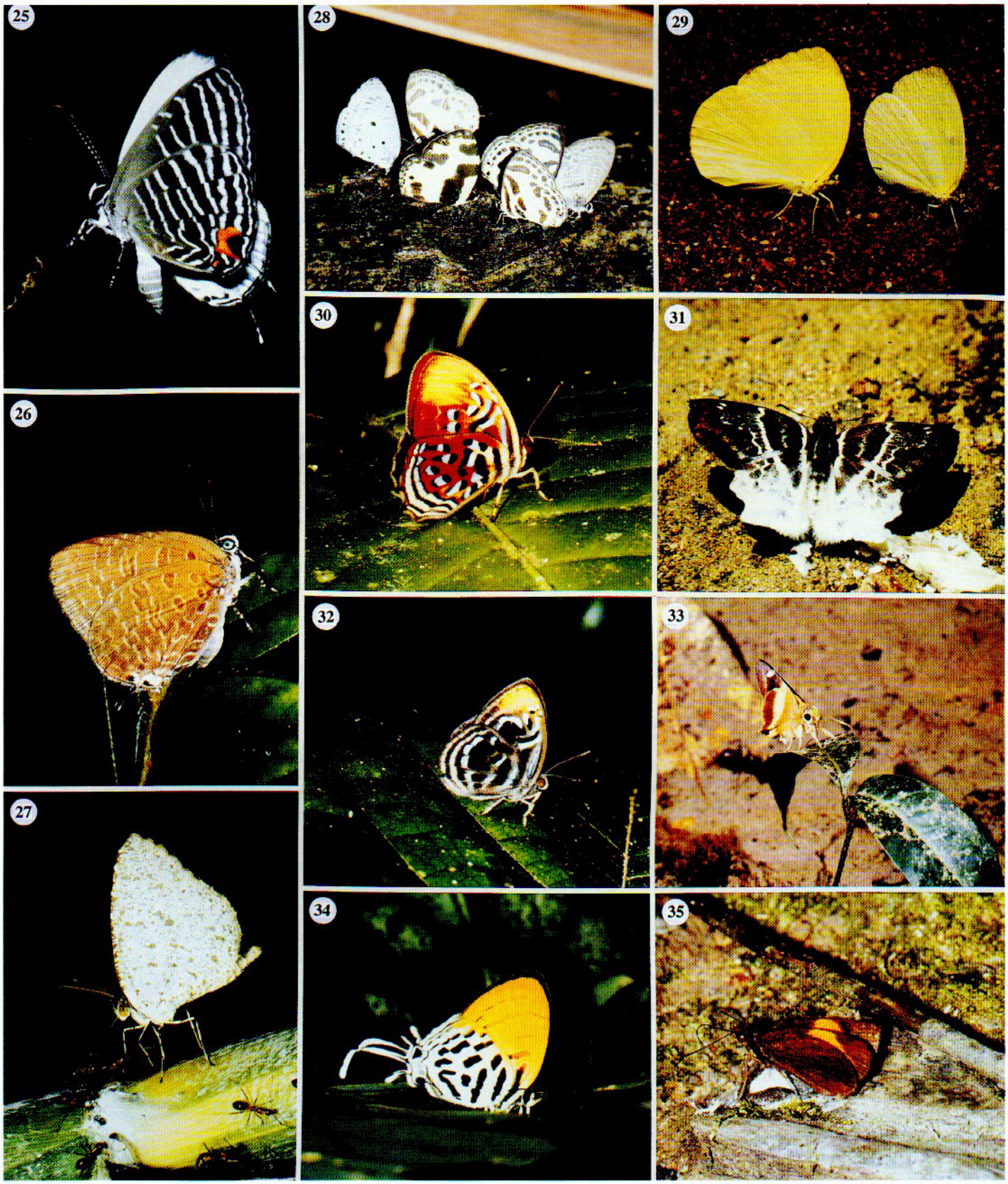

Fig. 25-35.– **25**. *Jamides* sp. (male). **26**. *Arhopala* sp. **27**. *Allotinus horsfieldi*. **28**. Group of Lycaenids, including *Callenya lenya, Discolampa ethion, Caleta elna, Nacaduba* sp. **29**. *Gandaca harina*. **30**. *Paralaxita orphna* (female). **31**. *Odontoptilum pygela*. **32**. *Laxita teneta*. **33**. *Hasora schoenherr*. **34**. *Drupadia theda*. **35**. *Koruthailos rubecula*.

studies. In any case, the main importance in identifying areas of high diversity such as Kuala Belalong is that they can provide a focus for conservation planning, which is urgently needed — and not just for northern Borneo.

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APPENDIX: CHECKLIST OF THE BUTTERFLIES OF KUALA BELALONG

Family PAPILIONIDAE
TROGONOPTERA Rippon, 1890
T. brookiana brookiana (Wallace, 1855)

TROIDES Hübner, 1819
T. miranda miranda (Butler, 1869)
T. amphrysus flavicollis (Druce, 1873)

PACHLIOPTA Reakirt, 1865
P. aristolochiae antiphus (Fabricius, 1793)

ATROPHANEURA Reakirt, 1865
A. nox noctis (Hewitson, 1859)
A. neptunus doris (Rothschild, 1908)

PAPILIO Linnaeus, 1758
P. karna carnatus Rothschild, 1895
P. demolion demolion Cramer, 1776
P. nephelus albolineatus Forbes, 1885
P. helenus enganius Doherty, 1891
P. fuscus dayacus Rothschild, 1908
P. iswara araspes Felder & Felder, 1859
P. memnon memnon Linnaeus, 1758

CHILASA Moore, 1881
C. paradoxa telesicles (Felder & Felder, 1864)

MEANDRUSA Moore, 1888
M. payeni brunei (Fruhstorfer, 1893)

GRAPHIUM Scopoli, 1777
G. sarpedon luctatius (Fruhstorfer, 1907)
G. evemon eventus (Fruhstorfer, 1908)
G. eurypylus mecisteus (Distant, 1885)
G. bathycles bathycloides (Honrath, 1884)
G. agamemnon agamemnon (Linnaeus, 1758)

PARANTICOPS Wood-Mason & de Nicéville, 1887
P. ramaceus ramaceus (Westwood, 1872)
P. delesserti delesserti (Guérin-Méneville, 1839)

PATHYSA Reakirt, 1865
P. antiphates itamputi (Butler, 1885)

LAMPROPTERA Gray, 1832
L. curius curius (Fabricius, 1787)
L. meges meges (Zinken, 1831)

Family PIERIDAE
Subfamily Pierinae
LEPTOSIA Hübner, 1818
L. nina malayana Fruhstorfer, 1910

DELIAS Hübner, 1819
D. ninus parthenia Staudinger, 1892
D. hyparete diva Fruhstorfer, 1889
D. henningia pandemia (Wallace, 1867)
D. singhapura indistincta Fruhstorfer, 1897

PRIONERIS Wallace, 1867
P. philonome vollenhovii Wallace, 1867
P. cornelia (Snellen van Vollenhoven, 1865)

CEPORA Billberg, 1820
C. pactolicus (Butler, 1865)
C. iudith hespera (Butler, 1899)

APPIAS Hübner, 1819
A. lyncida enarete (Boisduval, 1836)
A. paulina athena (Fruhstorfer, 1902)
A. indra plana Butler, 1879
A. nero chelidon (Fruhstorfer, 1905)
A. cardena cardena (Hewitson, 1861)

SALETARA Distant, 1885
S. liberia distanti Butler, 1892

IXIAS Hübner, 1819
I. pyrene undatus Butler, 1871

HEBOMOIA Hübner, 1819
H. glaucippe borneensis (Wallace, 1863)

PARERONIA Bingham, 1907
P. valeria lutescens (Butler, 1879)

Subfamily Coliadinae
DERCAS Doubleday, 1847
D. verhuelli gobrias (Hewitson, 1864)

CATOPSILIA Hübner, 1819
C. pomona pomona (Fabricius, 1775)

GANDACA Moore, 1906
G. harina elis Fruhstorfer, 1910

EUREMA Hübner, 1819
E. hecabe hecabe (Linnaeus, 1758)
E. ada ada (Distant & Pryer, 1887)
E. blanda blanda (Boisduval, 1836)
E. simulatrix tecmessa (de Nicéville, 1895)
E. andersoni albida Shirozu & Yata, 1982
E. sari sodalis (Moore, 1886)
E. tilaha nicevillei (Butler, 1898)

Family NYMPHALIDAE
Subfamily Danainae
TIRUMALA Moore, 1880
T. septentrionis microsticta (Butler, 1874)

PARANTICA Moore, 1880
P. aspasia aspasia (Fabricius, 1787)
P. agleoides borneensis (Staudinger, 1885)

IDEOPSIS Horsfield, 1858
I. gaura daos (Boisduval, 1836)
I. vulgaris interposita (Fruhstorfer, 1910)

IDEA Fabricius, 1807
I. lynceus fumata (Fruhstorfer, 1897)
I. stolli virgo (Fruhstorfer, 1903)

EUPLOEA Fabricius, 1807
E. modesta lorzae (Moore, 1883)
E. camaralzeman scudderii (Butler, 1878)
E. sylvester tyrianthina (Moore, 1883)
E. mulciber portia Fruhstorfer, 1904
E. midamus aegyptus (Butler, 1866)
E. phaenareta butleri (Moore, 1883)
E. radamanthus lowii (Butler, 1878)
E. algea zonata (Druce, 1873)
E. eyndhovii strix Bryk, 1937

Subfamily Satyrinae
MELANITIS Fabricius, 1807
M. leda leda (Linnaeus,1758)

COELITES Westwood, 1850
C. epiminthia epiminthia Westwood, 1851
C. euptychioides euptychioides Felder & Felder, 1867

NEORINA Westwood, 1850
N. lowii neophyta Fruhstorfer, 1911

ERITES Westwood, 1851
E. elegans elegans Butler, 1868
E. argentina argentina Butler, 1868

RAGADIA Westwood, 1851
R. makuta umbrata Fruhstorfer, 1911

MYCALESIS Hübner, 1818
M. maianeas kadasan Aoki & Uemura, 1982
M. orseis borneensis Fruhstorfer, 1906
M. fusca adustata Fruhstorfer, 1906
M. horsfieldi hermana Fruhstorfer, 1908
M. anapita fucentia Fruhstorfer, 1911
M. kina Staudinger, 1892
M. amoena Druce, 1873

YPTHIMA Hübner, 1918
Y. fasciata fasciata Hewitson, 1865
Y. hanburyi Holloway, 1984

ELYMNIAS Hübner, 1818
E. hypermnestra nigrescens Butler, 1871
E. nesaea hypereides Fruhstorfer, 1902
E. kuenstleri rileyi Corbet, 1933
E. penanga konga Grose-Smith, 1889

Subfamily Amathusiinae
FAUNIS Hübner, 1819
F. kirata kirata (de Nicéville, 1891)
F. gracilis gracilis (Butler, 1867)
F. stomphax stomphax (Westwood, 1858)

XANTHOTAENIA Westwood, 1858
X. busiris burra Stichel, 1906

AMATHUSIA Fabricius, 1807
A. phidippus phidippus (Linnaeus, 1763)
A. masina masina Fruhstorfer, 1904

AMATHUXIDIA Staudinger, 1887
A. amythaon ottomana (Butler, 1869)

ZEUXIDIA Hübner, 1826
Z. amythystus wallacei C.& R. Felder, 1867
Z. doubledayi horsfieldii C.& R. Felder, 1867
Z. aurelia euthycrite Fruhstorfer, 1911

THAUMANTIS Hübner, 1826
T. klugius lucipor Westwood, 1851
T. odana panwila Fruhstorfer, 1912
T. noureddin chatra Fruhstorfer, 1905

THAURIA Moore, 1894
T. aliris aliris (Westwood, 1858)

DISCOPHORA Boisduval, 1836
D. sondaica symphronia Fruhstorfer, 1911
D. necho cheops Felder & Felder, 1867

Subfamily Nymphalinae
CUPHA Billberg, 1820
C. erymanthis erymanthis (Drury, 1773)

PHALANTA Horsfield, 1829
P. alcippe alcippoides Moore, 1900

VAGRANS Hemming, 1934
V. egista creaghana (Pryor & Cator, 1894)

VINDULA Hemming, 1934
V. erota montana (Fruhstorfer, 1889)

PADUCA Moore, 1886
P. fasciata fasciata (Felder & Felder, 1860)

CIRROCHROA Doubleday, 1847
C. tyche thilina Fruhstorfer, 1905
C. emalea emalea (Guérin-Méneville, 1843)
C. malaya calypso Wallace, 1869
C. satellita satellita Butler, 1869
C. orissa orissa Felder & Felder, 1860

TERINOS Boisduval, 1836
T. terpander terpander Hewitson, 1862
T. clarissa praestigiosa Fruhstorfer, 1914

CETHOSIA Fabricius, 1807
C. hypsea hypsea Doubleday, 1847

RHINOPALPA Felder & Felder, 1860
R. polynice helionice Fruhstorfer, 1912

DOLESCHALLIA Felder & Felder, 1860
D. bisaltide borneensis Fruhstorfer, 1899

DICHORRAGIA Butler, 1869
D. nesimachus derdas Fruhstorfer, 1903

AMNOSIA Doubleday, 1849
A. decora buluana Fruhstorfer, 1908

CHERSONESIA Distant, 1883
C. rahria rahria (Moore, 1858)
C. peraka peraka Distant, 1884
C. risa risa (Doubleday, 1848)

CYRESTIS Boisduval, 1832
C. nivea borneensis Martin, 1903
C. theresae theresae de Nicéville, 1895

PANTOPORIA Hübner, 1819
P. hordonia dora Eliot, 1969
P. dindinga (Butler, 1879)
P. paraka paraka (Butler, 1879)
P. aurelia aurelia (Staudinger, 1886)

LASIPPA Moore, 1898
L. tiga empat Tsukada & Kaneko, 1985
L. viraja hera Tsukada & Kaneko, 1985

NEPTIS Fabricius, 1807
N. duryodana duryodana Moore, 1858
N. nata nata Moore, 1858
N. leucoporos cresina Fruhstorfer, 1908
N. miah digita Fruhstorfer, 1905
N. clinia ila Fruhstorfer, 1908
N. harita mingia Eliot, 1969
N. omeroda omeroda Moore, 1874

ATHYMA Westwood, 1850
A. pravara pravara Moore, 1857
A. asura idita Moore, 1858
A. kanwa kanwa Moore, 1858
A. reta reta Moore, 1858
A. nefte subrata Moore, 1858

SUMALIA Moore, 1898
S. daraxa viridescens (Fruhstorfer, 1899)

MODUZA Moore, 1881
M. procris agnata (Fruhstorfer, 1896)

PANDITA Moore, 1858
P. sinope sinope Moore, 1858

LEBADEA Felder, 1861
L. martha paduca (Moore, 1858)

PARTHENOS Hübner, 1819
P. sylvia borneensis Staudinger, 1889

TANAECIA Butler, 1869
T. munda munda Fruhstorfer, 1899
T. aruna aparasa (Snellen van Vollenhoven, 1862) ?
T. orphne (Butler, 1870)
T. pelea djataca (Fruhstorfer, 1913)
T. godartii vacillaria (Butler, 1868)
T. iapis ambalika (Moore, 1858)

DOPHLA Moore, 1880
D. evelina magama Fruhstorfer, 1913

BASSARONA Moore, 1897
B. dunya monara Fruhstorfer, 1913
B. teuta bellata (Distant, 1886)

EUTHALIA Hübner, 1819
E. aconthea sandakana (Moore, 1899)
E. monina bipunctata (Snellen van Vollenhoven, 1862)
E. kanda kanda (Moore, 1859)

LEXIAS Boisduval, 1832
L. dirtea chalcenoides (Fruhstorfer, 1913)
L. pardalis dirteana (Corbet, 1941)
L. canescens canescens (Butler, 1868)

EULACEURA Butler, 1872
E. osteria jambala Fruhstorfer, 1913

HERONA Doubleday, 1848
H. sumatrana schoenbergi Staudinger, 1890

AGATASA Moore, 1899
A. calydonia mahasthama (Fruhstorfer, 1913)

PROTHOE Hübner, 1824
P. franck borneensis Fruhstorfer, 1913

POLYURA Billberg, 1820
P. schreiber malayana (Rothschild, 1899)
P. athamas uraeus (Rothschild & Jordan, 1890)
P. moori saida (Preyer & Cator, 1894)
P. delphis concha (Snellen van Vollenhoven, 1861)

CHARAXES Ochsenheimer, 1816
C. durnfordi everetti Rothschild, 1893
C. distanti thespius Fruhstorfer, 1914
C. borneensis daemoniacus Fruhstorfer, 1914
C. bernardus repititus Butler, 1869

Family LYCAENIDAE
Subfamily Riodininae
ZEMEROS Boisduval, 1836
Z. emesoides eso Fruhstorfer, 1904

ABISARA Felder & Felder, 1860
A. geza litavicus Fruhstorfer, 1912
A. kausambi asoka Bennett, 1950

PARALAXITA Eliot, 1978
P. telesia ines (Fruhstorfer, 1904)
P. orphna orphna (Boisduval, 1836)

LAXITA Butler, 1879
L. teneta (Hewitson, 1861)

Subfamily Lycaeninae
PORITIA Moore, 1866
P. erycinoides pellonia Distant & Pryer, 1887
P. sumatrae milia Fruhstorfer, 1917
P. plateni Staudinger, 1889

SIMISKINA Distant, 1886
S. pharyge pharyge (Hewitson, 1874)
S. phalena phalena (Hewitson, 1874)
S. pheretia maina (Fruhstorfer, 1917)

DERAMAS Distant, 1886
D. nelvis osamui Hayashi & Otsuka, 1985
D. yasoda herdi Cassidy, 1985

MILETUS Hübner, 1819
M. gopara eustatius (Fruhstorfer, 1913)
M. cellarius (Fruhstorfer, 1913) ?

ALLOTINUS Felder & Felder, 1865
A. subviolaceus subviolaceus Felder & Felder, 1865
A. borneensis Moulton, 1911
A. horsfieldi permagnus Fruhstorfer, 1913
A. sarrastes Fruhstorfer, 1913
A. nicholsi nicholsi Moulton, 1911
A. substrigosus substrigosus (Moore, 1884)

LOGANIA Distant, 1884
L. regina regina (Druce, 1873)
L. malayica malayica Distant, 1884
L. marmorata hilaeira Fruhstorfer, 1914
L. distanti drucei Moulton, 1911

DISCOLAMPA Toxopeus, 1929
D. ethion icenus (Fruhstorfer, 1918)

CALETA Fruhstorfer, 1922
C. elna elvira (Fruhstorfer, 1918)

NEOPITHECOPS Distant, 1884
N. zalmora zalmora (Butler, 1870)

ACYTOLEPIS Toxopeus, 1927
A. puspa mygdonia (Fruhstorfer, 1917)
A. ripte (Druce, 1895)

CALLENYA Eliot & Kawazoé, 1983
C. lenya lenya (Evans, 1932)

CEBRELLA Eliot & Kawazoé, 1983
C. pellecebra moultoni (Chapman, 1911)

JAMIDES Hübner, 1819
J. virgulatus virgulatus (Druce, 1895)
J. bochus nabonassar (Fruhstorfer, 1916)
J. caeruleus caeruleus (Druce, 1873)
J. pura tenus (Fruhstorfer, 1916)
J. aratus adana (Druce, 1873)
J. elpis pseudelpis (Butler, 1879)
J. lugine (Druce, 1895)
J. zebra zebra (Druce, 1895)
J. celeno lawasa (Moulton, 1911)

NACADUBA Moore, 1881
N. subperusia lysa Fruhstorfer, 1916
N. hermus swatipa Corbet, 1938
N. calauria malayica Corbet, 1938
N. beroe neon Fruhstorfer, 1916
N. kurava nemana Fruhstorfer, 1916

PROSOTAS Druce, 1891
P. aluta aluta (Druce, 1873)
P. nora superdates (Fruhstorfer, 1916)
P. pia pia Toxopeus, 1929

IONOLYCE Toxopeus, 1929
I. helicon merguiana (Moore, 1884)

ANTHENE Doubleday, 1847
A. emolus goberus (Fruhstorfer, 1916)
A. lycaenina miya (Fruhstorfer, 1916)

ARHOPALA Boisduval, 1832
A. pseudocentaurus nakula (Felder & Felder, 1860)
A. hypomuta deva Bethune-Baker, 1896
A. aedias agnis Felder & Felder, 1860
A. epimuta epimuta (Moore, 1858)
A. lurida Corbet, 1941 ?
A. delta (Evans, 1957) ?
A. moorei moorei Bethune-Baker, 1896
A. antimuta timana Corbet, 1941
A. inornata emphesta Corbet, 1941 ?
A. democritus olinda (Druce, 1873)
A. denta (Evans, 1957) ?
A. elopura elopura (Druce, 1894) ?
A. alitaeus mira Corbet, 1941 ?
A. zambra zambra Swinhoe, 1911
A. borneensis Bethune-Baker, 1896
A. vihara vihara (Felder & Felder, 1860)
A. arvina adalitas Corbet, 1941 ?
A. labuana Bethune-Baker, 1896
A. abseus abseus (Hewitson, 1862)

FLOS Doherty, 1889
F. morphina morphina Distant, 1884

IRAOTA Moore, 1881
I. distanti nileia Fruhstorfer, 1904
I. rochana accius Seitz, 1926

CATAPAECILMA Butler, 1879
C. elegans elegans (Druce, 1873)

LOXURA Horsfield, 1829
L. cassiopeia amatica Fruhstorfer, 1912

EOOXYLIDES Doherty, 1889
E. tharis ecyla Seitz, 1922

HORAGA Moore, 1881
H. syrinx maenala (Hewitson, 1869)
H. amythystus Druce, 1902 ?

CHERITRA Moore, 1881
C. freja pallida (Druce, 1873)

RITRA de Nicéville, 1890
R. aurea aurea (Druce, 1873)

TICHERRA de Nicéville, 1887
T. acte staudingeri (Druce, 1895)

DRUPADIA Moore, 1884
D. ravindra moorei (Distant, 1882)
D. rufotaenia kina Cowan, 1974
D. theda umara (Fruhstorfer, 1912)
D. niasica ultra Cowan, 1974
D. cinesia (Hewitson, 1863)
D. cineus (Grose-Smith, 1889)

DACALANA Moore, 1884
D. vidura azyada Fruhstorfer, 1914
D. sinhara sinhara Fruhstorfer, 1914
D. lowii (Druce, 1895)

THRIX Doherty, 1891
T. scopula scopula (Druce, 1873)

SUASA de Nicéville, 1890
S. lisides liris (Staudinger, 1889)

REMELANA Moore, 1884
R. jangala huberta (Fruhstorfer, 1907)

HYPOLYCAENA Felder & Felder, 1862
H. amasa maximinianus (Fruhstorfer, 1912)
H. thecloides thecloides (Felder & Felder, 1860)
H. amabilis phemis Druce, 1895
H. erylus teatus Fruhstorfer, 1912

DEUDORIX Hewitson, 1863
D. epijarbas epijarbas (Moore, 1858)
D. staudingeri Druce, 1895

RAPALA Moore, 1881
R. pheretima pheretima (Hewitson, 1863)
R. varuna saha Fruhstorfer, 1912
R. domitia albapex de Nicéville, 1897

VIRACHOLA Moore, 1881
V. subguttata malayana Pendlebury & Corbet, 1933

CURETIS Hübner, 1819
C. santana malayica (Felder & Felder, 1865)
C. felderi Distant, 1884
C. sperthis sperthis (Felder & Felder, 1865)
C. tagalica jopa Fruhstorfer, 1908

Family HESPERIIDAE
Subfamily Coeliadinae
BIBASIS Moore, 1881
B. sena uniformis Elwes & Ewards, 1897
B. tuckeri (Elwes & Ewards, 1897)

HASORA Moore, 1881
H. proxissima siva Evans, 1932
H. schoenherr chuza (Hewitson, 1867)
H. chromus chromus (Cramer, 1780)
H. quadripunctata gnaeus (Plötz, 1884)
H. vitta vitta (Butler, 1870)

CHOASPES Moore, 1881
C. plateni caudatus Evans, 1932

Subfamily Pyrginae
CAPILA Moore, 1866
C. phanaeus phanaeus (Hewitson, 1867)

CHARMION de Nicéville, 1894
C. ficulnea ficulnea (Hewitson, 1868)
C. sp.

CELAENORRHINUS Hübner, 1819
C. bazilanus paradoxus (Fruhstorfer, 1909)

TAPENA Moore, 1881
T. thwaitesi bornea Evans, 1941

DARPA Moore, 1866
D. striata striata (Druce, 1873)

MOOREANA Evans, 1926
M. trichoneura trichoneuroides (Elwes & Edwards, 1897)

TAGIADES Hübner, 1819
T. japetus balana Fruhstorfer, 1910
T. gana gana (Moore, 1866)
T. lavatus Butler, 1879
T. parra parra Fruhstorfer, 1910
T. toba toba de Nicéville, 1896
T. waterstradti waterstradti Elwes & Edwards, 1897

ODONTOPTILUM de Nicéville, 1890
O. pygela pygela (Hewitson, 1868)

Subfamily Hesperiinae
ARNETTA Watson, 1893
A. verones (Hewitson, 1878)

HALPE Moore, 1878
H. sikkima Moore, 1882
H. clara Cassidy, 1985

IAMBRIX Watson, 1893
I. stellifer (Butler, 1879)

KORUTHAIALOS Watson, 1893
K. rubicula rubicula (Plötz, 1882)
K. sindu sindu (Felder & Felder, 1860)

PSOLOS Staudinger, 1889
P. fuligo fuligo (Mabille, 1876)

ANCISTROIDES Butler, 1874
A. nigrita othonias (Hewitson, 1878)
A. armatus armatus (Druce, 1873)

NOTOCRYPTA de Nicéville, 1889
N. paralysos varians (Plötz, 1882)
N. clavata clavata (Staudinger, 1889)

SCOBURA Elwes & Edwards, 1897
S. woolletti (Riley, 1923)

CUPITHA Moore, 1884
C. purreea (Moore, 1877)

ZOGRAPHETUS Watson, 1893
Z. kutu Eliot, 1959

OERANE Elwes & Edwards, 1897
O. microthyrus neaera (de Nicéville, 1891)

HYAROTIS Moore, 1881
H. adrastus praba (Moore, 1866)

ISMA Distant, 1886
I. guttulifera kuala (Evans, 1932)
I. umbrosa umbrosa (Elwes & Edwards, 1897)

PYRONEURA Eliot, 1978
P. flavia fruhstorferi (Mabille, 1893)
P. latoia latoia (Hewitson, 1868)
P. niasana burmana (Evans, 1926)
P. aurantiaca aurantiaca (Elwes & Edwards, 1897)

LOTONGUS Distant, 1886
L. calathus calathus (Hewitson, 1876)

ZELA de Nicéville, 1895
Z. excellens (Staudinger, 1889)

GANGARA Moore, 1881
G. thyrsis thyrsis (Fabricius, 1775)
G. sanguinocculus (Martin, 1895)
G. lebadea lebadea (Hewitson, 1868)

ERIONOTA Mabille, 1878
E. thrax thrax (Linnaeus, 1767)
E. acroleuca apicalis Evans, 1932
E. sybirita sybirita (Hewitson, 1876)

HIDARI Distant, 1886
H. doesoena gloria Evans, 1949

EETION de Nicéville, 1895
E. elia elia (Hewitson, 1866)

ACERBAS de Nicéville, 1895
A. anthea anthea (Hewitson, 1868)

PIRDANA Distant, 1886
P. hyela hyela (Hewitson, 1867)