THE BUTTERFLIES OF THE NILGIRI MOUNTAINS OF SOUTHERN INDIA (LEPIDOPTERA: RHOPALOCERA)[1]

TORBEN B. LARSEN[2]

This paper is an account of the three hundred or so butterflies to be found in the Nilgiri Mountains of southern India. Special emphasis is placed on placing the butterflies in perspective in relation to a number of defined ecological zones. Following a description on the climate, topography and vegetation zones in the Nilgiris is a section on the history of entomological exploration. The major part of the paper is devoted to a summary account of each species known to occur in the Nilgiris. Every attempt has been made to update the nomenclature which is cross-referenced to that of Wynter-Blyth (1957) whose nomenclature actually dates back to the 1930ies. Since this nomenclature is the same for most of peninsular India and since the Nilgiris contain populations of virtually all species known to occur in southern India, the paper should also be useful out of the specific Nilgiri context. The data included will be the basis for a later analysis of the ecological and zoogeographical nature of the Nilgiri butterflies, but some initial non-quantitative conclusions are discussed.

INTRODUCTION

The Nilgiri Mountains

The Nilgiri Mountains are situated in South India with their centre at 11°25′N and 76°45′ E. The name means Blue Mountains and was bestowed upon them by the plains people at least 700 years ago when the Nilgiris were only seen rising in the distance from the steaming and insalubrious jungles that surrounded them.

The Nilgiris are a well-defined massif that forms the southern limit of the main Western Ghats system that stretches unbroken from Bombay in the north. To the immediate south of the Nilgiris is the Palghat Gap, a stretch of dry lowlands separating the South Sahyadri from the main Ghats system. The distance is not great and on a good day the nearest of the South Sahyadri ranges, the Annamalais, is clearly visible from the Nilgiri plateau.

To the northeast the precipitous Moyar Gorge creates a narrow boundary between the Nilgiris and the Biligiriranga Mountains. The latter can be looked at as the southwestern link, though at best a tenuous one, with the Eastern Ghats system.

The Nilgiris may be described as a right-angled triangle with the right angle placed in the northwestern extremity. The western slopes of the main plateau rise abruptly from levels of 100 to 300 m through a steep escarpment to 1800 m or so. At this level the Nilgiri Plateau commences. Though less precipitous the same situation pertains to the southern slopes. The northern slopes rise from the Mysore Plateau from levels of 700-900 m in a less precipitous manner still, and they are hence rather less imposing. However, the Nilgiris most certainly are a sharply defined geographical feature.

[1] Accepted January 1987.

[2] Snoghoj alle 29C, 2770 Kastrup, Denmark.

The plateau of the Nilgiris is hardly a plateau in the strict sense of the word. Valleys drop to 1600 m and peaks rise to more than 2500 m, but most of the area is an undulating landscape confined within the 1800 m contour of the scarp and technically the expression plateau is correct (though slightly disconcerting to an author from a country in which the highest point is some 180 m and lovingly known as the Mountain of Heaven).

Just to the north of the Nilgiris proper lie the Ouchterlony Valley and the Wynaad with an average elevation of 1200-1300 m, providing level country at an altitude not found elsewhere in the range. They form an integral part of the Nilgiris as well as the link with the Western Ghats proper and will be included in the systematic part of the paper.

When making ones way through the Nilgiris, whether by car or by foot, it is easy to forget how small a geographical feature they actually are. The western slopes extend some 40 km due south, the southern and the northern slopes are both some 60 km. As will be seen there can be few areas of similar size with as much ecological variation within its boundaries.

The area covered by this paper is the Nilgiris as a geographical feature, from the surrounding lowlands to the highest peaks. Most of this falls into the administrative Nilgiri District (PIN 643 000) of Tamil Nadu State, but much of the lower parts of the western slopes fall into the Mallapuram and Palghat districts of Kerala State, while portions of the southern slopes fall into Coimbatore District of Tamil Nadu.

The northern borders of the area covered are clearly defined by the Moyar river, and most of the southern border is defined by the Bhavani river. Elsewhere the limit is simply taken as the foot of the mountains and the immediate surrounding plains.

Climate

Situated at 11° north the Nilgiris are well into the tropical zone with the result that temperature variations during the year are relatively modest. Mean monthly averages between the coldest month (December or January) are normally no more than 5°C below that of the warmest summer month (usually May). However, the altitudinal temperature differences are highly significant. The annual mean temperature is 28° at the foot of the southern slopes and only about 15° in Ooty at 2200 m. These altitudinal temperature differences have profound ecological effects. Average monthly temperatures for selected localities are given in table 1 below.

Rainfall patterns are dominated by the monsoon regime that affects all of India, but different parts of the Nilgiris are affected in different ways. The SW monsoon normally commences in the latter part of May or in early June, continuing till some time in September with the occasional pauses. This is India's life sustaining main monsoon, but the positioning and topography of the Nilgiris are such that the main effects of the SW monsoon are felt on the western and northwestern slopes. The southern and northeastern slopes are partly in a rain-shadow and receive as much of their total rainfall from the retreating NE monsoon as they do from the main monsoon. The plateau receives rain in an intermittent fashion from both the monsoons and from more localised thunder showers at other times of the year.

The first four months of the year (January to April, and much of May) are everywhere rather dry, though the southern slopes get some rain even then. Interestingly this dry season is most marked on those parts of the western slopes that otherwise receive more precipitation than any other areas of the Nilgiris. But for the very pronounced drought

TABLE 1

AVERAGE MONTHLY TEMPERATURE IN CENTIGRADE FOR SELECTED NILGIRI LOCALITIES

Month	Bhavani S. 290 m	Kallar 457 m	Silent Valley 914 m	Coonoor 1747 m	Ooty Bot. 2225 m
JAN.	25.3	23.9	17.8	13.7	13.1
FEB.	29.9	25.8	19.5	15.2	13.8
MAR.	29.4	28.3	22.3	17.0	15.2
APR.	31.6	28.9	23.6	18.7	16.4
MAY	31.5	29.0	23.5	19.6	16.8
JUN.	31.0	27.7	20.7	18.8	15.4
JUL.	29.9	26.8	18.8	18.2	14.4
AUG.	30.0	27.0	19.2	18.1	15.2
SEP.	29.9	26.9	19.8	17.6	15.4
OCT.	28.1	26.4	20.1	17.1	15.1
NOV.	26.5	25.0	19.3	15.5	14.1
DEC.	25.0	23.5	18.3	14.1	13.3
ALL YEAR	28.8	26.6	20.2	16.9	14.9

Source: von Lengerke (1977)

the wetter parts of the Nilgiris would doubtless be even more rich in flora and fauna than they already are. I suspect that the exceptional richness of the flora and fauna at Kallar, a locality with a relatively modest 1500 mm of rain a year, is due to the fact that it is exceptionally well distributed in time, avoiding periods of pronounced drought. Some illustrative examples of rainfall patterns are given in table 2 below.

The volume of rainfall varies by a factor of more than twelve in the Nilgiris. Both lowland and highland areas of the western slopes that are fully exposed to the SW monsoon receive more than 6000 mm a year, and more than 3500 mm is normal in this area. The driest parts of the Moyar Gorge, an area in permanent rain shadow, receive less than 500 mm. Some examples are given in table 3 below, compressing data from table 2 above.

Ecology

Rainfall patterns, temperatures and to a lesser extent topography combine to produce in the small area covered by the Nilgiris a network of very complex ecological conditions with a degree of variation that is not usually found in so small an area. Given the statistics this is not surprising: Elevation ranges from 100 m to well over 2500 m; rainfall from less than 500 mm a year to more than 6000 mm, perhaps in some cases much more; the lowest temperature ever recorded at the foot of Nadgani Ghat is about 18°, while frost is a regular feature at Ooty and elsewhere on the plateau.

While broad ecological zones of considerable diversity can be identified the net result is not always a very tidy pattern because of topographical quirks, rain-shadows and local peculiarities. To give one example. The

TABLE 2

ANNUAL RAINFALL IN SELECTED NILGIRI LOCALITIES (BY MONTH AND YEAR TOTAL IN MM)

Locality	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	ANNUAL TOTAL
Mukurti Ridge 2545 m	11	7	17	76	311	1358	2279	1259	583	309	83	37	6330 mm
Woodbriar 1143 m	12	10	21	122	163	415	580	346	196	195	90	29	2179 mm
Kargudi 1173 m	8	1	5	58	120	295	251	208	95	102	37	19	1199 mm
Ooty Obs. 2249 m	21	9	22	76	172	113	177	135	108	195	111	60	1200 mm
Kotagiri 1982 m	16	3	9	77	159	123	191	134	103	241	156	52	1264 mm
Kodanad 1951 m	48	17	33	106	175	78	104	99	129	317	245	106	1457 mm
Kinakorai 1737 m	66	55	57	109	94	38	73	56	66	270	288	147	1319 mm
Kallar Gdns 457 m	74	100	73	136	103	35	64	86	98	288	315	106	1478 mm
Mettupalayam 329 m	26	32	33	73	89	20	35	40	54	188	172	61	823 mm
Bhavanisagar 290 m	7	35	53	48	89	30	30	42	70	183	131	37	775 mm
Nadgani 747 m	7	15	12	64	172	545	898	690	333	246	100	25	3107 mm
Silent Valley 914 m	13	7	47	70	289	786	1106	788	348	338	142	34	3968 mm
Moyar Gorge 880 m	12	2	8	41	102	17	50	32	49	128	65	32	538 mm
Glenburn 1067 m	93	96	78	116	107	54	82	94	105	306	335	141	1607 mm

Source: von Lengerke (1977).

Nadgani site where many of the species recorded in the systematic part were observed probably had a rainfall of about 6000 mm a year, but just two kilometres further west, where I usually camped, rainfall was down to 3000 mm. On many occasions I was repeatedly drenched during a day's collecting only to come back and find that there had been no rain at the camp site.

TABLE 3

TOTAL RAINFALL IN FOUR SELECTED NILGIRI LOCALITIES AND ITS DISTRIBUTION BETWEEN SW MONSOON MONTHS, NE MONSOON MONTHS AND THE DRY SEASON IN PERCENT

Season	Western Silent Valley 914 m	Southern Kallar 457 m	Northern Moyar 880 m	Plateau Kotagiri 1982 m
SW Monsoon (May-Sep.)	83.5	26.1	46.5	56.2
NE Monsoon (Oct.-Dec.)	13.0	47.9	41.8	35.5
Dry Season (Jan.-Apr.)	3.5	26.0	11.7	8.3
TOTAL	100	100	100	100
Rainfall mm	3968	1478	538	1264

Source: Calculated from table 2.

Such differences make the development of a broad ecological framework difficult, though such a framework will be essential for a subsequent interpretation of the total Nilgiri butterfly fauna in ecological biogeographical terms. I have however, attempted to make such a framework based on the work of previous authors, leaning heavily on a simplified version of the forest classification by Champion & Seth (1968), as well as on my own observations and conclusions.

Ecological framework for the Nilgiris

For the purposes of analysing the butterfly fauna I have arrived at a classification framework covering twelve main ecological zones. The first, and rather crucial division is one based on altitude, the attendant climatic differences, and their joint effect on the floristic and faunistic composition. On this basis the Nilgiris may be divided into three major divisions as follows:

TROPICAL/LOWLANDS	100-1500 m
SUBTROPICAL/MIDDLE LEVELS	1500-1900 m
MONTANE/PLATEAU	1900 m+

The exact altitudes of change from one division to the next is subject to local variation and there is often a transition zone. Where the subtropical division merges directly with evergreen tropical forest it may be difficult to define when the transition between the two has actually been effected.

The following paragraphs briefly characterise the salient features of each of the eleven zones, which are then again summarised in table 4.

TROPICAL DIVISION

1. *Rainforest zone.* Where rainfall exceeds 3500 mm a year in the lower part of the tropical division, and if topography does not militate against it, the climax vegetation becomes a fully developed rainforest system approaching that called giant evergreen by Champion & Seth (1968). There is a closed canopy and several storeys with an amazing faunal and floral diversity. Most of the Nadgani Ghat and some areas near Mukkali at the base of the Silent Valley access road belong to this zone. Were it not for the fact that the dry period from January to April was very severe the number of species would be even greater, but some species without diapause mechanisms cannot survive. A significant number of the most interesting South Indian butterflies are effectively limited to this zone.

2. *Wet Evergreen zone.* This zone is characterised by a lower rainfall than the previous

one, ranging from 1800 mm a year to 4000 mm at the higher levels of the tropical division. Visually it is less grandiose, the trees lower, and the typical storied structure of true rainforest has become a confused tangle. It covers the West Coast Tropical Evergreen of Champion & Seth (1968), and in the zone I also include the patches of evergreen found on the southern slopes which they would classify as Semi-Evergreen. From a butterfly point of view it is characterised by a great degree of species diversity, the absence, or near absence, of the true rainforest elements, and the fact that species from the more open formations still do not penetrate. Much of the forests of the western slopes fall into this category. I have not worked any spot in this zone consistently, but Kallar forms a transition between it and the mixed deciduous forest (see 4 below).

3. *Wet Agricultural zone.* Till a few centuries ago the entire western slopes and good parts of the southern slopes were covered with evergreen forests of the two types discussed above. Both are very fragile eco-systems that do not take kindly to human interference and where wood has been exploited virtual ecological deserts result, clad only in grasses and one or two dominant dicotyledons. Such areas are entomologically useless, but unfortunately they prevail over long stretches. Much of the area has been under agriculture for the past few centuries, with rice, bananas, turmeric, rubber, palm crops, pistachio and various fruits as the main crops. Plantation teak is the worst of all. Any butterflies that remain are found in fringing riverine forest and untidy gardens, but they are not many. A very few skippers thrive on the rice and some common butterflies of the more open formations manage to establish populations, but on the whole wet agricultural lands are disappointing for butterflies, except that the occasional forest species maintains a surprising foot-hold here and there.

4. *Mixed Deciduous Forest zone.* Much of the lowland southern slopes and the central parts of the northern slopes consist of dense mixed deciduous forest with considerable floral and faunal diversity and a wide range of micro-habitats in response to climatic and topographical variation. Wherever permanent moisture is available there is an admixture of evergreen plants, occasionally leading to local almost evergreen patches. The rainfall regime is usually in the range of 1000 to 1800 mm. The physical aspect is a low, but very dense forest, at times almost impenetrable. At the upper levels it merges gradually with the sub-tropical evergreen forest on the southern slopes. The mixed deciduous forest is very different from the moist-deciduous forests of the Wynaad and the Mudumalai Wildlife Sanctuary, which are very open with tall teak as the dominant tree. Moist-deciduous forest is a relatively poor butterfly habitat which is weakly represented in the Nilgiris proper and not dealt with separately in this paper, though notes are given at relevant points in the systematic part. The whole of the Kotagiri Ghat below Kunjapannai is typical of the mixed deciduous forest zone.

5. *Thorn Forest zone.* Once rainfall drops to between 500 and 1000 mm the natural climax vegetation becomes some form of savanna-like forest which visually is not dissimilar to parts of East Africa and where, in fact, much of the dominant vegetation has African affinities, not least species of *Acacia.* This is also the home of one of the Indian antelopes, the Blackbuck. The floral and faunal composition is much less diverse and varied than the mixed deciduous forest. Most of the area between Masinagudi and Bhavanisagar via the Moyar Gorge forms part of this zone, but it is also represented at many places in

the foothills of the southern slopes, when rainfall is not high enough to support mixed deciduous forest. It is also the home of the most typically African of the South Indian butterflies.

6. *Dry Agricultural zone.* Most of the land at the foot of the forested slopes now consists of non-irrigated farmlands, much of which would have been thorn forest, and in favoured localities mixed deciduous forest. Often rocky outcrops and natural fences are left untended. Such areas contain many of the species characteristic of thorn forest, but by and large it is a very poor butterfly habitat. Here and there irrigated agriculture prevails. Except where trees and palms are grown, such areas mainly contain the most common plains species and those that have adapted to man-made environments. At Kallar, with its extensive plantations, some forest species, even those of the evergreen forests, survive. Most of these would probably be absent if Kallar were not immediately adjacent to undisturbed forest.

SUBTROPICAL DIVISION

7. *Subtropical Evergreen Forest zone.* The exact altitudinal boundaries of the subtropical zone vary from 1200/1500 m to 1800/1900 m depending on local circumstances, and once these elevations are reached the extreme differences in annual precipitation that create such diversity in the tropical zone have largely disappeared. Consequently the range of vegetation zones has also narrowed, and the predominant climax vegetation of the western and the southern slopes is subtropical evergreen forest, except where the scarps are so steep that forest cannot cling to them. Where the subtropical forests abut tropical evergreen forests (e.g. at Silent Valley) the transition between the two is both visually and floristically very gradual. Elsewhere the transition between mixed deciduous and subtropical evergreen is abrupt and very noticeable, such as on the Kotagiri Ghat. Climax subtropical evergreen forest is often almost impenetrable. As far as the butterflies are concerned this zone has a small, but conspicuous, special element. Most of my own experience of this zone is from the forests at Glenburn and Kunjapannai.

8. *Sub-climax Subtropical Forest zone.* In areas of low rainfall on the northern slopes and in disturbed and rocky areas of the southern slopes the subtropical evergreen forest cannot develop fully. The result is some impoverished associations drawing from the evergreen and deciduous zones the most hardy species, interspersed with grasslands. These are very poor habitats with no major influence on the Nilgiri fauna.

9. *Subtropical Agricultural zone.* Most of the subtropical zone has been converted to plantation agriculture, with coffee at the lower reaches and tea at the upper. On the whole these are poor butterfly habitats, not least because weedicides and pesticides are applied liberally, frequently and consistently. Butterflies are only found along streams which, at least in the coffee country, often has a belt of fringing, riverine vegetation. Tea country is a virtual ecological desert, only a handful of butterflies managing to survive. The grassland areas are indicators of recent forest destruction and are not natural habitats for any species.

MONTANE DIVISION

10. *Montane Evergreen Temperate Forest zone.* The plateau of the Nilgiris, mainly above 1900 m, has two characteristic types of natural vegetation. The evergreen forests known as *sholas,* often growing only in sheltered places, and rolling open grasslands with only a few *Rhododendron* trees. The sholas are dark, almost impenetrable forests, their edges often shaped by the prevailing winds. Typical *sholas* develop under rainfall regimes from as

low as 1200 mm to as high as 6000 mm+ without displaying much difference in floral composition or physical aspect. The reason for this is that the *sholas* in the most heavy rainfall area have a rapid run-off of excess water. Patches of *shola* remain over most of the plateau, and extensive forests may still be found in the Kundahs, at Avalanche and in the Mukurti Peak area. One of the prettiest and most accessible is the Longwood Shola near Kotagiri, which has a most attractive bog at its centre. The floral composition is characterised by a large proportion of plants with Palaearctic and Oriental montane affinities.

11. *Montane Grasslands zone.* In between the *sholas* the normal vegetation consists of rolling grasslands, but this is now in evidence only in the remoter parts towards the western escarpment between the Sispara Pass and Mukurti Peak. Elsewhere they have been converted to tea. These grasslands are the home of the famed Nilgiri Tahr. Champion & Seth (1968) are insistent that the grasslands are derived and that the entire plateau was once clad in forest. The presence everywhere of the fire resistant *Rhododendron* is their main evidence. Ranganathan (1938) takes issue with this (referring to the first edition of Champion), pointing out that wind and frost would preclude *shola* vegetation in some parts of the plateau. Blasco (1971) would appear to support the latter viewpoint. I do not have the expertise to settle the matter, but certainly the vegetation of the grasslands is both more complex and more varied than in the recent grasslands of Sumatra and Papua New Guinea which are definitely the result of human intervention. Grasslands were extensively present when the first explorers visited the Nilgiris just 150 years ago. It is difficult to see how a tiny handful of Toda pastoralists could, or for that matter should, have indulged in massive deforestation.

12. *Montane Agricultural zone.* Whether or not the montane grasslands are derived, it is a fact that more than three quarters of the plateau has been heavily modified by human intervention. Beginning in 1832 large areas have been forested with exotic trees, especially of Australian origin (*Acacia dealbata, A. decurrens, A. melanoxylon* and *E. globulus*). One of the latter is now at 78 m one of the tallest trees in all of India. Somewhat later a number of temperate conifers were also planted. Virtually any tree from anywhere that was of potential promise has been tried out in the Nilgiris and remnants are sometimes found in surprising places. The amount of tree planting may well have exceeded the deforestation in some areas, but diversity was sacrificed for monoculture. In the Ooty area some homesick English gentlemen spent their summers strewing about the seeds of broom and gorse on the downs, with the result that these plants are locally dominant. Since their arrival some 400 years ago the local Badaga have concentrated on the cultivation of vegetables with potatoes, carrots and cabbages as the main crops, though wild boar is a perennial problem. However, in terms of both area and visual impression it is tea, tea and yet more tea that predominates as a never-ending ecological desert.

Summary

This concludes the brief overview of the Nilgiri ecology and outlines the twelve ecological zone which will later be used for an analysis of the ecology and zoogeography of the butterfly fauna. Table 4 below gives a brief summary of the information. As already mentioned a somewhat robust approach is called for when dealing with major ecological zones in a area where so much variation can be found within a few kilometres.

Only a robust approach can impose some element of order into what sometimes appears to be anarchy; it should not be used to obscure the fact that genuine anomalies exist and that surprises do occur. It is also necessary to highlight once again the fact that much of the area, especially that above 1200 m, has been the subject of very intensive human intervention for the past 150 years. It its good to know, though, that representative portions have been maintained for posterity. The proposed inclusion of the Nilgiris in the World Biosphere Reserves scheme will hopefully ensure that the environment is gradually improved. Few places contain as much diversity within so little space as the Nilgiris. As an ecosystem it demands our respect.

TABLE 4

SUMMARY OF THE TWELVE MAJOR ECOLOGICAL ZONES OF THE NILGIRIS

TROPICAL DIVISION (100-1500 m)

1. RAINFOREST ZONE

Rainfall 3500 mm+; temperature range 22-30°. Tall closed canopy forest with little undergrowth except where bamboo prevails. *Hopea, Dipterocarpus,* many Guttiferae, many Anacardiaceae, Sapotaceae, Meliaceae, etc. Great floral and faunal diversity. Strong affinities to Sundaland. Only western slopes and not usually above 1000 m.

2. WET EVERGREEN ZONE

Rainfall 1800-3500 m; temperature range 18-28°. Dense closed forest, lower than previous zone, and often with well-developed undergrowth. Much local variation and transition to moist-deciduous or to semi-evergreen depending on specific circumstances. Most of western slopes and part of southern slopes.

3. WET AGRICULTURAL ZONE

Rainfall 2000-5000 mm; temperature range 18-30°. Main crops rice, coconut, coffee, cardamom, fruits and plantation trees. Mainly at the foot of the western slopes. Some of the slopes are grasslands of little diversity slowly regenerating to forest.

4. MIXED DECIDUOUS FOREST ZONE

Rainfall 1000-1800 mm; temperature range 20-30°. Low dense forest with thick undergrowth though patches of teak and figs may be taller. Typical trees *Anogeissus, Boswellia, Tamarindus, Santalum, Moringa.* Some penetration of African derived flora. Mainly southern slopes and parts of Mudumalai, but also in western slopes rain-shadows.

5. THORN FOREST ZONE

Rainfall 500-1000 mm; temperature range 22-33°. Open savanna forest with *Acacia, Zizyphus, Euphorbia* and other African elements as dominants and much admixture of Afrotropical flora. The eastern half of the northern slopes, the eastern third of the southern slopes, and locally on the southern foothills where not disturbed by agriculture.

6. DRY AGRICULTURAL ZONE

Rainfall 500-2000 mm; temperature 20-35°. Crops are mainly rain-fed millets and certain pulses. Many tropical weeds and some remnants of thorn forest vegetation. Very dry during dry season, prone to drought. Much of the plains adjacent to the southern and northern Nilgiris where forest has been lost.

SUBTROPICAL DIVISION (1300-1900 m)

7. SUBTROPICAL EVERGREEN FOREST ZONE

Rainfall 1300-4000 mm; temperature range 15-25°. In some respects transitional between tropical and montane evergreen but with some special elements. *Olea dioica* is typical. Dense dark forests, now much reduced in extent. Most of western and southern slopes where not cut down, and parts of the NW slopes above the Wynaad and Ouchterlony.

8. SUBCLIMAX FOREST FORMATIONS ZONE

Rainfall 1000-1600 mm; temperature range 18-30°. Impoverished version of (7) above where rainfall and soil is deficient. Often clumps of isolated trees in grasslands. Here and there on northern and southern slopes but of marginal importance.

9. SUBTROPICAL AGRICULTURAL ZONE

Rainfall 1100-4000 mm; temperatures 15-30°. Coffee at lower levels, tea at upper reaches, with vestiges of forest along rivers and where too steep for plantation crops.

MONTANE DIVISION (1800 m++)

10. MONTANE EVERGREEN FOREST ZONE

Rainfall 1400-6000 mm; temperature range 10-20°. Dense evergreen forest with Oriental montane and many Palaearctic plants. Among trees members of genera such as *Ternstroemia, Eugenia, Michelia,*

Gordonia, Rhododendron, etc. Many low montane plants (*Begonia, Lobelia, Impatiens*) and Palaearctic plants (*Fragaria, Viola, Rubus*). Dotted throughout the plateau, but much reduced in extent.

11. MONTANE GRASSLANDS ZONE

Rainfall 1300-3500 mm; temperature range 10-20°. Open rolling grasslands with a somewhat complex structure, much variation in structure according to soil, exposure, drainage and rainfall. Only fire resistant tree is *Rhododendron* but exotic gorse and broom prevalent in many areas. Now mainly from western escarpment system to Mukurti.

12. MONTANE AGRICULTURAL ZONE

Rainfall 1300-3500 mm; temperature range 10-20°. Three types: monoculture of exotic *Acacia, Eucalyptus* etc; monoculture of tea; and vegetable gardening (carrot, potato, cabbage and others) with some fallow land. Presently covers most of the plateau.

History of exploration

General

The Nilgiri Mountains long lay as an isolated and unknown 'jewel of nature' protected by a wide band of malarious jungles, guarded by tigers and fierce elephants, largely unknown to the outside world. On the plateau lived the pastoral Todas exploiting the extensive grasslands, with primitive hunters and gatherers in the surrounding forests, but never exceeding the 10.000 mark as far as population was concerned. Their impact on the environment must have been marginal, but they developed a culture and a matrilineal kinship system that has been the delight of anthropologists. More must have been written per capita of the Todas than of any other people. The Kotas provided supplementary skills in the type of symbiotic relationship that pastoralists often develop with other groups. Lower down the mountain lived primitive hunter-gatherer societies, Irula, Kurumba, Panniya and related tribes. Their numbers were, in total, somewhat larger than that of the Todas, but they lived in harmony with nature and had neither the skill nor the inclination to encroach in any major way on the natural conditions.

Some four hundred years ago the Badaga appeared on the scene. They were Kannada speaking people fleeing some political upheaval in what is now Karnataka, possibly the repercussions of the Bijapur Muslim conquest of the Vijayanagar empire. They were the first agriculturalists on the plateau and settled in the villages that still carry their original names, digging their fields, but not maintaining much contact with their area of origin. Though probably more in number than the resident Todas, it seems that a *modus vivendi* was arrived at so that frictions between the radically different life styles of the two groups were minimised. Life probably went on much as it had always done, except for the compact Badaga villages and their agriculture. We do not know, it has to be said, because information on the Nilgiris was almost nil and no written tradition exists.

Just around 1600 the modern world made its way to the Nilgiris. Rumours of Christian communities in the distant mountains, derived from the visit of the Apostle Thomas in the early days of Christianity, reached the court of the Bishop of Calicut. He sent off a group of Portuguese priests to investigate matters, but his judgment in choice of emissaries was not too sound. They came back with a report that was not 'so sure and complete as was desirable', a rather nice turn of phrase. So a few years later, in 1603, heavier guns were brought to bear. The Jesuit Father, Jacomo Ferreira, led an expedition on behalf of the Bishop of Malabar in Calicut. He brought back a fair amount of circumstantial and anecdotal information, but of one thing he was certain .... there were no Christians in the Blue Mountains, and so the Portuguese lost interest.

In 1799, after the defeat of Tipu Sultan at the hands of the East India Company, the Nilgiris were part of the territory ceded to the Company through the treaty of Srirangapatna, though probably Tipu never held much actual sway north of the Wynaad. The mountain was visible to the large British garrison and civil establishment at Coimbatore, but it was only in 1812 that the first representative of the colonial power visited the mountain itself. This was in the form of a somewhat unimaginative tax collector whose only comment was that the Nilgiris were not worth any particular efforts on his behalf A more official and less single-minded party set off during the winter of 1818-1819. They reported back with enthusiasm on the climate, vegetation and wildlife of the plateau, in fact describing a paradise on earth. They were perhaps overenthusiastic, because their reports were flatly disbelieved at Fort St. George in Madras .... or at least as flatly as bureaucratic niceties would allow: It is somewhat difficult to accept ..... the understandable enthusiasm of a group of men ..... notwithstanding .... etc.

But truth will not be concealed, and soon the Collector of Coimbatore became the driving force in the establishment of the Nilgiris as a major hill resort. By 1827 there were seventeen European houses in Ooty and five in Kotagiri. Ten years later large scale establishment of plantations was in full swing and the destiny of the Nilgiris was changed forever. The population swelled with an influx of Tamil speaking plains people, needed for the tea and coffee plantations. The main towns of Ooty, Coonoor and Kotagiri became trading centres over and above their recreational function. By 1860 the foundations of what the Nilgiris still are to-day were laid.

Entomological exploration

Butterflies from India reached the scientific community already at the time when Carl von Linné published his tenth edition of SYSTEMA NATURAE (1758), the starting point of zoological nomenclature. This book contains many Indian species, and many more were described by Fabricius and Cramer in 1775. Soon after the Nilgiris were opened up they were visited by explorers and naturalists, both professional and amateur. The first of these was the Austrian nobleman and naturalist. Baron von Hügel in the late 1830ies. His material was described by Kollar and the Felders. It is, however, striking how relatively late some of the more prominent South Indian endemic butterflies were actually described as evidenced by the list below :

Pachliopta pandiyana Moore 1881
Papilio liomedon Moore 1874
Papilio dravidarum Wood-Mason 1880
Papilio buddha Westwood 1872
Prioneris sita Felder & Felder 1865
Colias nilagirtensis Felder & Felder 1859
Celatoxia albidisca Moore 1884
Parantica nilagiriensis Moore 1877
Idea malabarica Moore 1843
Mycalesis adolphei Guérin-Méneville 1843
Ypthima chenui Guérin-Méneville 1843
Calaenorrhinus ambareesa Moore 1867
Thoressa honorei de Nicéville 1887
Oriens concinna Elwes & Edwards 1897

The first systematic account of the Nilgiri butterflies dates back almost exactly a century when Sir George Hampson [1888 (1889)] made a comprehensive list based on his five years of residence in the Nilgiri Wynaad as a coffee planter. He collected mainly in the northwestern corner, including the Nadgani Ghat, but only in that part which lay in the Madras Presidency, and not the Malabar side, now in Kerala State. His energies were subsequently transferred to moths. On his return to the United Kingdom he joined the British

Museum (Natural History) and produced the magnificent series on moths published as part of FAUNA OF BRITISH INDIA. His total output outstrips most other entomologists that have ever lived, yet despite this, the quality and accuracy of his work is legendary.

Hampson's list contained 275 entries and he expected that 'no more than about twenty species would be added to it'. On current taxonomical view the list actually contains somewhat less than 260 species. In all just about forty species have in fact been added since, but as a first effort it certainly is no mean achievement. It is a great shame that none of his copious field notes were included. They are available in the British Museum (Natural History) but I have not been in a position to avail myself of them.

It is hardly surprising that the nomenclature adopted by Hampson is often difficult to decipher for a contemporary reader. We are therefore indebted to Yates (1935) for 'translating' Hampson's list to the language used by Evans (1932) which is largely intelligiblle to-day, and for adding quite a few species from smaller contemporary collections. Many of Yates's additions were species from the lower parts of the Nadgani Ghat. Yates's list comes to 282 entries, some of which are now considered forms or synonyms.

The next list of Nilgiri butterflies is that of Wynter-Blyth (1944, 1946). At the time he was headmaster at the school at Ketti below Coonoor. Most of his collecting was done at Ketti, and on the Ghat between Coonoor and the plains, and not least at Kallar, a magnificent place for collecting butterflies to this very day. He did make a number of visits to the Nadgani Ghat, but because of wartime petrol rationing he did not visit the lower parts on the Kerala side. In his day, of course, the forests stretched much more east, almost to Gudalur.

His list came to 290 entries, later supplemented with a further twenty or so. Some of these were again synonyms or forms, and one or two were erroneous. His paper is a very solid one with which I have few quarrels. Wynter-Blyth was later to publish the most recent guide to Indian Butterflies (1957) and the influence of his work in the Nilgiris is clearly visible in his book.

Various taxonomic works have since scooped up old unpublished material, and I have collected six or seven species never before recorded from the Nilgiris, so that the present list contains 299 valid species. As shown at the end of the list of Nilgiri butterflies there are about a score of South Indian butterflies that have not yet been recorded from the Nilgiris. Some of these, probably about a dozen, will one day be found also there. They will be an incentive to future collectors, but more precise ecological data and better ethological observations than my own should be the priority, and a much more satisfying prospect that the record of a few additional species.

Current study

I deliberately chose to study the Nilgiri fauna because it was already relatively well known, and because I had some opportunities for comparison stretching back a hundred years. It was clear from the outset that the number of new records would be relatively small, but I was more interested in the general ecology of the area. After publishing this systematic account of the Nilgiri butterflies it is my plan to convert the data into a more formal ecological-cum-biogeographical analysis over the next few years. Also of interest was an assessment of the extent to which the ecological degradation that has taken place in the Nilgiris over the past 100 years had influenced the butterfly fauna. When choosing

the Nilgiris I was not unmindful of the fact that most of the southern mountains in India are basically very similar as far as the butterfly fauna is concerned, except that if tropical rainforest is absent, then so are several of the more interesting butterflies. Had I chosen the Ghats below Sultan's Battery to somewhere in the South Sahyadri I would have had the pleasure of filling out some — largely predictable — distributional blanks, but it would have been at the cost of data on the ecology of the butterflies concerned.

I was in the Nilgiris, with occasional visits to the Annamalais, the Biligiriranga Mountains, and Kanara, from 11.iv to 18.x.1986. During this time I spent roughly half my days in the field visiting all the ecological zones as often as possible. My main areas of work were the Longwood Shola at Kotagiri, the forests around Glenburn, Kotagiri Ghat, Kallar, Nadgani Ghat and especially the little river at its foot, the area around Masinagudi and the Coonoor Ghat. Many other localities were visited once or twice.

It is a pity that I was not able to spend a whole year in the area. The profound dry season from January till April has a very definite effect on the butterflies and it would have been interesting to study this not least in the Nadgani Ghat area. Some species are mainly on the wing during dry season in the rainforest zone. However, I do not think this loss of information has introduced serious bias into the systematic part that follows.

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I have not bracketed the names of authors where the genus has been reassigned since the original description since virtually all Indian butterflies are no longer in their original genus.

Systematic part

The systematic part that follows gives the basic data on each of the species that I accept

as having been genuinely reported from the Nilgiris. The basic sequence is that of Eliot (1978) except that the Lycaenidae have been placed before the Nymphalidae in accordance with modern usage. The subfamilies of the Nymphalidae were in older literature usually accorded family rank, but there is increasing agreement that they should not be.

Every effort has been made to refer to the butterflies according to the most modern nomenclature, much of it adopted from Eliot (1978) and a number of recent revisions. It has not been thought the place to discuss nomenclature in any detail, except where excessive confusion might be engendered, or where I have deviated from current practice. Where a name in Wynter-Blyth (1957) differs in genus or species, the name used by him is given in brackets below the current one.

Under each species I have endeavoured to give the status and the distribution in the Nilgiris, with whatever other information that might be of special interest. I have also summarised in brief terms the global distribution of the Nilgiri species. These are not meant to be definitive, but simply to give an impression of how the South Indian fauna is related to its neighbouring regions.

Systematic list of the Nilgiri butterflies

Papilionidae

Papilioninae

TROIDINI

001. **Troides minos** Cramer
(*Troides helena*)

The SOUTHERN BIRDWING is the largest of the Nilgiri butterflies, being endemic to southern India and the Western Ghats. It is replaced by *Troides darsius* Gray in Sri Lanka, while its closest relative in the Himalayas is *Troides aecus* Felder & Felder rather than, as often assumed, *Troides helena* Linné. Haugum & Low (1982-1985) discuss these relationships. The species is not rare and may even be common on the western slopes during the monsoon and immediate post-monsoon months. The main habitat is lowland evergreen forest, but the species is at home also in mixed deciduous forest and the subtropical evergreen. It is a good coloniser of agricultural lands and is often common in coffee plantations. Wandering specimens are not infrequently met with on the plateau itself though it cannot breed there. The biggest concentration I ever saw was on some land that had been cleared for coffee a few years ago at Kokode Estate near Sholarmuttam. Hundreds were feeding from Lantana growing among the forest trees that had been left as shade trees. The species is active in the early morning, coming down from the tree-tops to feed from *Lantana* and *Mussaenda.* By 10.30 they once again ascend and are then very difficult to catch. Females will often be found sitting with the wings open with up to three males assiduously courting them. The adults do not come to water. In captivity, on cold mornings, the butterflies will increase their body temperature by wing-quivering in the manner of many moths, being able to fly actively under conditions where other lowland species are immobilised. The food plants are *Aristolochia indica* and in the wet zone especially *Thottea wallichi*, a Troides food plant not mentioned by Haugum & Low (1982-85). Much concern has been expressed over the conservation status of Birdwing butterflies worldwide, and the European Economic Community has banned their import and export even for scientific use. The Southern Birdwing is by no means a threatened species, and in some cases its numbers increase through the agricultural activities of man.

002. **Pachliopta pandiyana** Moore
(*Tros pandiyana*)

The MALABAR ROSE is an unusual swallowtail which is endemic to the wetter parts of the Western Ghats system and it is closely related to the Sri Lankan endemic *Pachliopta jophon* Gray. It appears to be strictly limited to the wettest type of rainforest, where it is somewhat local, but sometimes very numerous indeed. I have seen hundreds of fresh specimens of both sexes at *Lantana* on the Nadgani Ghat. Activity began as early as 06.45 when the only other butterflies about were skippers, and it was not unusual to find specimens flying even in heavy rain. It normally flies in dense forest but will visit clearings and roads where flowers grow; at such times the three South Indian *Pachliopta* may be seen side by side though they are normally ecologically segregated. In the forest the flight of the species is very slow at the lower level of the canopy and despite their great difference of pattern the resemblance to *Idea malabarica* is great, though I will not go so far as to postulate a co-mimicry relationship. A specimen escaped from a photo session in Kotagiri and was immediately snapped up by a Red-whiskered Bulbul (*Pycnonotus jocosus*). By the time the bird had moved out of sight the wings of the butterfly had been crumpled up, but the body not yet damaged. I unfortunately did not see whether the butterfly was actually eaten. It is obviously a protected species, but the bulbul would not have known this.

As far as is known the only larval food plants are *Thottea siliquosa*; according to Jason Weintraub this is characteristic for the group to which this species belongs.

003. **Pachliopta aristolochiae aristolochiae** Fabricius
(*Tros aristolochiae*)

The COMMON ROSE is often referred to as being very common, but this is not normally the case in my experience, though it is widespread and obvious. Normally numbers are not all that large, though I did see a huge migration at Kotagiri in autumn of 1957 including millions of this species and of *Pachliopta hector* in roughly equal proportion. It is at home in most types of habitat with the exception of dense, wet forest, but it occurs on the plateau only as a straggler. Contrary to the two other members of the genus the Common Rose will visit water, usually early in the morning well before the Pierids and the *Papilio* begin. Large quantities of water are ingested and immediately excreted through the anus, so obviously salts or nitrogenous substances are extracted metabolically. The flight is slow and deliberate. Flowers are frequently visited and the species often spends the night in communal roosts with *P. hector.* The species is found practically throughout the Oriental region, being replaced by *P. polydorus* Linné in New Guinea. One of the female forms of *Papilio polytes* is an excellent mimic of this butterfly, and in nature it is often necessary to look twice before being certain which of the two species is involved. The female of the Zygaenid moth *Histia nilgira* Moore is a fine example of co-mimcry. I saw it only once, at Glenburn, and it took some considerable time before I realised that it was not a small *P. aristolochiae.* The moth is certainly aposematic and exuded a foul smelling yellow substance from the tegulae when handled. At rest it adopted the normal Zygaenid posture and all resemblance to a swallowtail was lost.

004. **Pachliopta hector** Linné
(*Tros hector*)

The large and beautiful CRIMSON ROSE is endemic to Sri Lanka and South India, being found mainly south of the Godavery river and in West Bengal. There are records also from

eastern Burma and the Andaman Islands. It is sometimes very common indeed, may migrate by the million, and congregates in small forests and fruit tree groves in communal roosts during winter. One such roost at Mahabalipuram in December 1985 must have contained many tens of thousands and possibly more than 100,000. I have never seen as many large butterflies in one place [though of course the wintering sites of the American Monarch *Danaus plexippus* (Linné) would vastly surpass it in numbers]. *P. hector* is very fond of flowers, but never comes to water. The main habitat is open dry deciduous forest and ill-kept agricultural land at low altitudes, though migrants and vagrants will be found to the highest peaks. I once saw the species literally fall out of the sky at Kallar. On closer investigation it turned out that a supernumerary male had attached itself to a copulating couple, clinging so tenaciously to it that the threesome could be lifted off the ground by holding a wing of any of the specimens. The species would repay systematic investigation into diapause and migration.

PAPILIONINI

005. **Chilasa clytia clytia** Linné

The COMMON MIME, in both sexes, occurs in two forms. The typical form, *clytia,* is an excellent mimic of species of *Euploea,* while form *dissimilis* is an equally good mimic of the two *Tirumala* and of *Parantica aglea.* The slow and deliberate flight of the Danaid models is beautifully copied, but try to miss a specimen with the net — off it goes at a speed which would give even a Charaxid a good run for its money. In nature the mimicry, as it often the case, is much more convincing than in cabinet specimens, and I have rarely been quite certain whether I actually had a Mime in front of me before taking it out of the net. Working on Sri Lankan material Clarke & Karunaratne (1967) found that *f. clytia* was the ancestral form, and as in Sri Lanka my own Nilgiri observations indicate that there are two specimens of *dissimilis* to every specimen of the ancestral form. As in *Papilio polytes* the relative proportion of the two forms may vary from place to place. Near Karkala in South Kanara Gordon Thompson and I found *f. clytia* to be more common than *dissimilis.* In the Nilgiris the butterfly is quite rare and at best two or three are seen on any one day. Their main habitat seems to be the mixed dry-deciduous forests at low levels and the lowland evergreen forest. It penetrates the lower level of the subtropical evergreen zone and at Kallar may be found in the Arecanut plantations, probably because the larval food plant *Cinnamonum* is grown there. The adult butterfly will come to both flowers and to water where its habit of hovering above the flower or puddle will tell it apart from the models. The larva is very conspicuous (see frontispiece in Woodhouse) while the twig-like pupa is one of the natural masterpieces of camouflage. The species is found throughout the Oriental region, each subspecies carefully tuned to mimetic resemblance of the local Danaids. It would doubtless be a fascinating laboratory insect for further genetic research.

006. **Papilio demoleus** Linné

The LIME BUTTERFLY is common and may be found anywhere in the Nilgiris, though it does not spontaneously enter the densest and the wettest of the lowland evergreen forests.

However, numbers fluctuate considerably in time and space in a somewhat unpredictable way. It is a pest on cultivated citrus, but it also feeds readily on any type of wild rutaceous plant. I have not found it on cultivated fennel, and it is perhaps surprising that none of the South Indian swallowtails has managed to transfer to this plant. In the immediate pre-monsoon period *P. demoleus* is an avid

participant in mudpuddling assemblies, as many as one hundred being found in tight groups, shoulder to shoulder. The distribution of this Oriental species is somewhat puzzling. The core area includes India to Malaya and southern China, with a secondary area in the Australian region. During the past seven hundred years it has colonised Arabia (Larsen 1983) where it feeds exclusively on cultivated *Citrus* and where it is almost in contact with the African vicariant *P. demodocus* Esper. It invaded southern Iraq from Iran only since 1957 (Larsen 1977a). In recent years it has established populations also in Sumatra and on the Philippines, almost certainly in response to human interference with the natural environment. It is greatly to be hoped that the recent invasions will be well chronicled.

007. **Papilio liomedon** Moore

The MALABAR BANDED SWALLOWTAIL is a close relative of the Oriental *Papilio demolion* Cramer, but is definitely specifically distinct and endemic to the Western Ghats, chiefly in the wettest parts of the lowland evergreen forest zone. It is a rather scarce butterfly which is also somewhat localised. The few Nilgiri records are all from the Nadgani Ghat, and here, too, I saw my own only Nilgiri specimen on flowers (19.0) just on the TN/Kerala border. In behaviour it is much like the other swallowtails, though according to Gordon Thompson it does not come to water. It is certainly much more common in Kanara than in the Nilgiris, and in late September to early October good series may be collected on the globular red flower heads of *Clerodendron paniculatum* in suitable localities.

008. **Papilio dravidarum** Wood-Mason

The MALABAR RAVEN is another endemic of the Western Ghats system, its closest relative being a species from Assam and Thailand. It is rather more common than *P. liomedon*, but is not frequently met with. The habitat is chiefly the wettest of the lowland evergreen forests and in the Nilgiris the main locality is Nadgani Ghat, though Gordon Thompson has occasionally taken it at Kallar. The colour pattern is reminiscent of the *Euploea* but the flight is very rapid and whether a genuine mimetic relationship is involved is perhaps doubtful. The butterfly has the disconcerting habit of suddenly emerging at furious speed from dense jungle through a road or clearing, only to vanish immediately again. It may be hard to distinguish from *P. polytes* on the wing. Wynter-Blyth (1957) states that it never seems to visit flowers, but that is not the case. I have caught several of my few specimens on Lantana. The species is regularly found at mud patches during the drier months and on hot days.

009. **Papilio helenus daksha** Moore

The RED HELEN is the third largest butterfly of the Nilgiris and is common in the subtropical evergreen forests, relatively common on the plateau, and less common at lower elevations. It is a good coloniser and exists well outside of natural forest, and it is one of the few large butterflies to be found in tea plantations. It is, however, unable to survive in the drier thorn forests. It is very fond of Lantana blossoms and will sometimes assemble on mud patches, usually in the company of other swallowtails, but not usually with the large agglomerations of Pieridae. The weaving, random flight looks most haphazard, but in fact the butterfly makes rapid progress and is very difficult to catch. It seems to feed on virtually all available rutaceous plants and is easily bred. The global distribution covers almost the entire Oriental region as well as the southern fringes of the Palaearctic in China and Japan. Colour pattern apart, the similarity between this species and *P. paris tamilana* is strong, and it is interesting that the

South Indian subspecies of both should be the largest of them all.

010. **Papilio polytes polytes** Linné

The COMMON MORMON is indeed a common butterfly at lower and middle heights, but it does not ordinarily breed on the plateau, though from time to time it is seen even on the highest peaks. Like others of its kind it does not really penetrate virgin evergreen forest, though it colonises whenever it is disturbed by human activity. It comes to flowers readily and sometimes large numbers of males are seen mudpuddling. Such assemblages are usually independent of the Pierid agglomerations, occupying somewhat shady spots, often in the company of *P. crino* and other swallowtails. The largest assembly that I have personally witnessed consisted of 34 *P. polytes*, 5 *P. crino*, 1 *P. demoleus*, and 2 *Graphium doson*. Two of the three female forms are excellent mimics of two of the red-bodied swallowtails, the Common and the Crimson Rose respectively, while the third female form is almost like the male. The flight pattern of the mimetic forms is also a wonderful copy of the slow and deliberate flight of the models. During my frequent visits to Kallar I noted all females seen in nature, though in many cases it was necessary to check the body colour to be quite certain whether model or mimic was involved. At Kallar the two mimetic forms predominated, the male-like form being rare and constituting less than 5 percent of the total female population. The two mimetic forms were equally common. The precise data are as follows: *hector*-mimic 50.4%, *aristolochiae* mimic 45.7%, and male-like 3.9%. This is in marked contrast to the Delhi population of the same species, where some 60% were mimics of *aristolochiae* and about 40% male-like. *P. hector* does not occur in Delhi and the mimetic form is very rare, certainly less than one in a thousand (Larsen 1987). Such differences constitute powerful support for the concept of balanced polymorphism as discussed by Ford (1975). Fryer (1913) bred the species extensively in Ceylon to work out the genetics and found that the male-like form constituted nearly 50% of the total. These results were puzzling to me till I realised that he was breeding the species at an altitude where the models are scarce indeed, just as in Delhi. The Common Mormon is, by any standards, among the world's most interesting butterflies and an excellent insect for both field and genetic studies. An indispensable starting point for any research is the paper by Clarke & Sheppard (1972) on the genetics of the species.

011. **Papilio polymnestor** Cramer

The BLUE MORMON is the second largest of the South Indian butterflies, and it is a pleasure that such a large and handsome butterfly should be common practically everywhere. Only in the driest lowland habitats is it generally absent, though stray specimens will turn up even there. I have seen the occasional specimen at Masinagudi. It is endemic to Sri Lanka and peninsular India, but is closely related to the widely distributed Oriental *P. memnon* Linné. The latter species has a host of mimetic female forms, some being quite similar to *Pachliopta pandiyana*, and it is perhaps surprising that the female of the Blue Mormon is similar to the male. Occasional females have bright red spots at the base of the forewing upperside, a feature which enters the mimetic pattern of some *memnon* forms. This red spot is very much more frequent in Sri Lanka than in the Nilgiris. Possibly the very narrow range and habitat choice of *P. pandiyana* makes it an unsuitable model. The Blue Mormon is found in all types of habitat, flying with a rapid weaving flight, covering long distances. It visits flowers avidly and comes freely to water. Unlike many swallow-

tails it comes to foul substances, otter droppings being a great favourite. I once found three males deep inside a cave where a group of otters had been dismembering crabs. The eggs are laid on all the natural rutaceous plants as well as on cultivated citrus.

012. **Papilio paris tamilana** Moore

The large and brightly coloured South Indian subspecies of the PARIS PEACOCK is the largest of all, and it qualifies among the finest butterflies anywhere in the world. It is found in all types of evergreen forest from near sea level till at least 2400 m, but I suspect its main habitat is the subtropical evergreen forest. It is found locally also in the moist-deciduous forests of the Wynaad and Mudumalai. Wandering specimens may be encountered in open country, even in the centre of Ooty, but this really is exceptional. Normally it does not stray from dense forest. The species is not really rare, though never numerous, but it may be very difficult to catch. Early in the morning it may be caught at flowers, and on hot days it visits damp patches, sometimes settling with the wings held flat against the substrate, which is somewhat unusual in the family. Unusual, too, is the fact that females are often found in this way. At Sholayar in the Annamalai Mountains I found the species hilltopping along a ridge in primary forest and saw two copulating pairs. I can subscribe to the view of old observers that *P. paris* has fixed patrol routes in its jungle habitats .... if you miss a specimen it is likely to reappear an hour or so later from the same direction. They are fond of flowers, and when half a dozen or so are feeding on the same Lantana patch, the sight is a highlight of all that is enjoyable in natural history. The species is found in South India (but not Sri Lanka), in Orissa, and then from Kumaon east to most of the Oriental region. It is curiously absent from Malaysia.

013. **Papilio crino** Fabricius

The COMMON BANDED PEACOCK is endemic to peninsular India and Sri Lanka. I have seen no phylogenetic reconstruction of the group, but it would appear that the species is fairly isolated. In South India it is more or less restricted to lowland mixed deciduous forest, with only the slightest of colonising ability. I have, however, in December 1983 seen it in the centre of Mysore, from where it was not recorded in lists from early this century (Watson 1890). The closest South Indian relative of *P. crino* is *P. buddha* which is essentially limited to the wettest parts of the evergreen zone with the result that the two species are hardly ever sympatric. *P. crino* is somewhat migratory so it may on occasion be found far from its natural habitats. The species is not very common in the Nilgiris, except at Kallar, where it may abound about the time of the onset of the monsoon. A few years ago several thousands were caught during one season on behalf of Japanese commercial collectors, but the population does not seem to have suffered. The species is very fond of mudpuddling and I have seen more than a dozen assembled, though none was a female. Both sexes come to Lantana, though visits to flowers are infrequent at the time when mudpuddling is at its maximum. The courtship display, with the male hovering below the female, is very similar to that of *P. polytes*. The larval food plant is known to be *Chloroxylon*, the Satinwood tree, but it seems that no-one has found the larva recently, and I was wholly unsuccessful in this respect.

014. **Papilio buddha** Westwood

The BUDDHA PEACOCK is arguably the finest butterfly in South India. The general pattern is not unlike that of *P. crino* and on photographs they may look alike. In real life the Buddha is so much brighter and more

beautiful than the other gloss swallowtails, and it is a sight of rare beauty. The species is limited to wet lowland evergreen forest but is not usually found where rainfall is much less than 4000 mm a year, and it seems unable to survive in severely disturbed forest. On the Kanara Ghats, however, where paddy fields are interspersed with primary forest, the Buddha Peacock emerges from the forest to feed on *Lantana* and on *Clerodendron paniculatum*. The latter plant is also a great favourite of the Purplebacked Sunbird, which attacks the Buddha in the belief that the butterfly is a supernormal rival, since the green colour of Buddha matches the green crown and the wing shoulders of the bird (Larsen 1987c). Normally the butterfly flies in dense forest at canopy level with a furious flight and is almost impossible to net except when visiting flowers. There are no records from damp patches, though *P. crino* is an avid mudpuddler. In the Nilgiris it is limited to the western slopes and though not uncommon is difficult to collect. It is more common in Kanara. The chief season is just after the end of the SW monsoon in late September and early October, but individuals may be met with at any time. Bell *et al.* have data on diapause in Kanara. It should be mentioned that Gordon Thompson once caught a male at Glenburn, an illustration of the potential dispersal power of such a strong butterfly. I have given a more detailed account on the ecology and habits of this species elsewhere (Larsen 1987).

LEPTOCIRCINI

015. **Graphium sarpedon teredon** Felder & Felder
(*Zetides sarpedon*)

The COMMON BLUEBOTTLE is a genuinely common butterfly in the Nilgiris from the lowest levels to the highest peaks, and it is the one species able to colonise agricultural lands. However, it will not survive permanently in the driest tracts. It is an avid visitor to both flowers and damp patches, but at lower levels it is often outnumbered by *G. doson*. By disposition it is a very nervous insect and is not easy to catch. More than most swallowtails it is attracted to natural baits such as rotting grasshoppers and cicadas. I have found the larva on *Cinnamonum*, but it feeds on numerous other plants as well. The world-wide distribution covers practically all of the Oriental region.

016. **Graphium doson eleius** Fruhstorfer
(*Zetides doson*)

The COMMON JAY is essentially a butterfly of the evergreen forest zone at both tropical and subtropical levels, but it is occasionally found away from forest proper. At low levels in evergreen forest it is sometimes more numerous than is *G. sarpedon*. Large numbers may be seen mudpuddling just before the onset of the SW monsoon, and when the monsoon changes in Sep./Oct. My childhood records indicate that we did occasionally see it as high as 2000 m, but this is exceptional. The world-wide distribution covers Sri Lanka and southern India, suitable spots of the Eastern Ghats, and then most of the Oriental region.

017. **Graphium agamemnon menides** Felder & Felder
(*Zetides agamemnon*)

The TAILED JAY with its apple green markings is among the more attractive Nilgiri butterflies, but on the whole it is less common than the previous two members of the genus. Its relative scarcity is a bit surprising since it is common in cities such as Mysore, Bangalore and Madras. It is absent from the very driest tracts and not normally resident on the plateau, though it may breed there during summer. While it is an avid visitor to flowers

it is much less of a compulsive mudpuddler than the two preceding species. The global distribution covers the entire Oriental region.

018. **Pathysa nomius nomius** Esper

The SPOT SWORDTAIL may be very common during the dry season at the foot of the Kotagiri Ghat and at Kallar, but it is rare elsewhere and at any other time. It seems to be a species of dry mixed deciduous forest, sharing this habitat with *Papilio crino*. Just as the latter species has hardly any overlap with *Papilio buddha,* so *P. nomius* hardly overlaps with the rainforest species *P. antipathes*. Hampson caught only a few specimens on the northern slopes, and on the Nadgani Ghat I have only caught one, though *P. antipathes* may be common indeed. Normally the species flies high and fast, but in spring (March to early June) it is an avid visitor to damp patches. It is a migrant and specimens are seen on the plateau from time to time, but it does not breed there. The global distribution covers virtually the entire Oriental region. I agree with Eliot (1978) that it is legitimate to maintain the generic name *Pathysa* for the Swordtails, rather than to subsume them under *Graphium*.

019. **Pathysa antipathes alcibiades** Fabricius

The FIVE BAR SWORDTAIL is a dramatic insect that is limited to the wettest rainforests of southern India and Sri Lanka. Generally it is considered to be scarce, but in the right spots it may actually be very common indeed. The flight is fast and furious, and when on the wing the butterfly looks more like a fast Pierid than like a swallowtail. During February/March, the main season, it is an inveterate mudpuddler. When disturbed on a mud patch specimens will often perch on vegetation close by. It is reputed to visit flowers but I have never personally witnessed this. The species is found in Sri Lanka, S. India, then again from Nepal east to most of the Oriental region. The South Indian subspecies has usually been referred to as ssp. *naira* Moore. However, Fabricius described ssp. *alcibiades* after specimens from 'Tranquebar', then a Danish colony and examination of the Fabrician types in Copenhagen by Harish Gaonkar clearly show them to be of South Indian origin (though Tranquebar cannot be the correct locality).

PIERIDAE

PIERINAE

020. **Delias eucharis** Drury

The COMMON JEZEBEL is one of the most striking Indian butterflies and it is generally not rare, occasionally being locally abundant. It may be found practically everywhere in the Nilgiris, and it seems that the absence of frost and the presence of the larval food plant, *Loranthus* are the only ecological requirements. The adult butterfly is very fond of Lantana flowers, but unlike the montane members of the genus in Papua New Guinea it is not attracted to water. The species is endemic to India and Sri Lanka and unlike other members of the genus which are forest dwellers, *D. eucharis* is common even in major towns and cities. This trait is shared with *D. hyparete* Linné which replaces it from Burma eastwards. When handled the species feigns death and it is almost certainly aposematic. In *Prioneris sita* it has a beautiful mimic.

021. **Leptosia nina nina** Fabricius

The PSYCHE is the only Oriental representative of an African genus with half a score or so of very similar species. Eliot (1978) suggests that the Oriental species might be conspecific with the African *L. alcesta* but this seems unlikely in view of significant differences in haploid chromosome numbers (n=19 in *nina* and n=12 in *alcesta*). The species is very common all year at Kallar but otherwise

it appears to be remarkably scarce in the Nilgiris, though I have found it as high as 1900 m near Kotagiri in the 1950ies. It seems to avoid the wettest of the evergreen forests and I have not come across it at Nadgani. The flight is weak and fluttering, probably the most feeble of any South Indian butterfly. Flowers are visited, with *Tridax* as a firm favourite, while water is only occasionally attractive. I have once seen an African member of the genus actually alight on a pool of water. The species is distributed throughout the Oriental region.

022. **Prioneris sita** Felder & Felder

The PAINTED SAWTOOTH is not rare on the western slopes of the Nilgiris and on occasion it may be very common on the Nadgani Ghat during the dry season when large numbers are to be found on damp patches in the company of *Graphium doson* and *Pathysa antipathes*. It is distinctly uncommon during the rainy season and is only very rarely found outside of the wettest evergreen forest zone. I have taken a male (23.v) and a female (4.vi) at Kallar, but this is most exceptional. Both sexes are excellent mimics of *Delias eucharis*, a butterfly with a much wider range. The male, it is true, sometimes flies much faster than the model, in the manner of *Hebomoia glaucippe*, but at other times, such as when circling round a damp patch, the flight is quite like that of the Jezebel model. The species is endemic to Sri Lanka and the Western Ghats system.

023. **Artogeia canidia canis** Evans
(*Pieris canidia*)

The INDIAN CABBAGE WHITE is a Palaearctic butterfly that is very common on the plateau above 1800 m, flying in a series of broods throughout the year. The original habitat must have been the edges of sholas, but it is now especially common in agricultural areas where it is a moderately serious pest of cabbages. In northern India the species is migratory and visits the plains in winter (Larsen 1986a), but I have seen no evidence of migration in the Nilgiris. The Bangalore record that so puzzled Wynter-Blyth (1957) probably came as a pupa with agricultural produce. The butterfly spends most of its time flying around in search of flowers and will occasionally visit damp patches on hot, dry days. It is found on the higher South Indian mountains but is absent from Sri Lanka. In all probability the total area above 1900 m on that island was too small to support a viable population. Outside of South India it is found from the Himalaya east to Japan, just penetrating the tropics in suitable localities.

024. **Cepora nerissa phryne** Fabricius
(*Huphina nerissa*)

The COMMON GULL is chiefly a butterfly of the drier lowland habitats, though it may be found in clearings at middle heights. Mixed deciduous forest, ill-kept agricultural land, and thorn forest are the main haunts of this generally common butterfly. Due to strong migratory tendencies it is also met with on the plateau from time to time but I cannot agree with Wynter-Blyth (1946, 1957) that it is resident much above 1400 m. In spring large numbers may be seen mudpuddling with other Pierids. In behaviour it is more or less a tropical replacement for the Small Cabbage White (*Artogeia rapae*) and it is much less of a quarrelsome species than the two *Ixias*. The distribution covers practically the entire Oriental region.

025. **Cepora nadina remba** Moore
(*Huphina nadina*)

The LESSER GULL is limited to the wetter parts of lowland evergreen forest and is never seen in open country. Hampson noted that

it was sometimes common, but generally it is uncommon. Usually only single specimens are met with. It spends most of its time flying in the forest where it is almost impossible to collect, but one or two can usually be found on a good mudpuddling patch and occasionally on flowers. Its behaviour and general aspect in nature contrast so strongly with those of *C. nerissa* that it is difficult to accept them as congeneric. Apart from in Sri Lanka and South India the species is found from Nepal east to Taiwan and Sumatra.

026. **Anaphaeis aurota** Fabricius

The CAPER WHITE is linked to the drier tropical habitats, but owing to a great migratory potential it may occasionally be found in numbers practically anywhere. Vast swarms are sometimes encountered and, like many migrants, numbers fluctuate considerably in a most unpredictable way. In the Nilgiris it is most consistently common in the thorn forests around Masinagudi. Under good conditions this butterfly breeds faster and more profusely than practically any other and it may completely strip all available food plants for miles around. The species is Palaeotropical, being found on the Indian subcontinent, Arabia and all over Africa. It occasionally invades the Mediterranean area (Larsen 1986b).

027. **Appias indra shiva** Swinhoe

The PLAIN PUFFIN is a rather scarce butterfly that seems to be centred on the subtropical evergreen forest zone, though it may be found both below and above this level. There are few Nilgiri records. I took one at Tamizagham in Ooty (ii.1984) and it seems to have a headquarters of sorts on the Coonoor Ghat between Wenlock Bridge and Benhope where Wynter-Blyth caught most of his material and where I have seen it on several occasions. I have seen it once only at Kallar (31.viii) and Gordon Thompson has a few taken at water on the Nadgani Ghat where I never saw it. No clear pattern emerges. It comes freely to flowers. In Sri Lanka the species is considered even more of a rarity than is the case in South India. Otherwise it ranges from Nepal east to most of the Oriental region where it is often common.

028. **Appias libythea libythea** Fabricius

The name STRIPED ALBATROSS is something of a misnomer for the South Indian population where the males are practically immaculate except for some dark apical shading. The underside of the hindwing is chalky white lacking the cream overlay of the otherwise similar *A. albina*. A certain distinction between these two species lies in the cell of the forewings. *A. libythea* has the end cell vein forming a 90° angle to the costal edge, while in other *Appias* the angle is only 30°. Hampson considered it to be a rare species while Wynter-Blyth failed to find it. I have taken it on the Kotagiri Ghat, at Glenburn, Kallar, Ronningtown and even on Nadgani Ghat. It appears to be most unpredictable, possibly because it is migratory, but its headquarters are probably the mixed deciduous forests, though it might be without a permanent headquarters. It is certainly most erratic in the Delhi area (Larsen 1987b). The range covers Sri Lanka and India, east to the Philippines and Malaysia. Numbers have increased significantly in Malaysia this century (Eliot 1978) probably because the butterfly does well in secondary vegetation in the wetter tropics.

029. **Appias lyncida latifascia** Moore

The CHOCOLATE ALBATROSS is easily recognised by the deep yellow colour of the hindwing underside and the broad chocolate borders. These are not obscured by the considerable level of individual and seasonal variation. I find it a most enigmatic butterfly in the Nilgiris, difficult to interpret in ecolo-

gical and distributional terms. Hampson records it simply in the words '1000 to 3000 ft'. Wynter-Blyth took only three at Kallar, commenting that it was reputed to be common on the Kotagiri Ghat, where I never saw it. On 1.v and 2.v I saw single males flying towards the SW in Kotagiri town in the manner of normal migrants. I have seen small numbers on about half of my visits to Nadgani Ghat, where it sometimes came to water. Four were collected in mixed deciduous forest at Ronningtown. This is a pattern singularly lacking in consistency. The worldwide distribution covers Sri Lanka, the Western Ghats, and then from Nepal east to most of the Oriental region. An apparently isolated population exists in Orissa.

030. **Appias albina darada** Felder & Felder

The COMMON ALBATROSS is indeed the most common of the Nilgiri *Appias,* but like other members of the genus it is somewhat unpredictable. I would not, however, concur with Wynter-Blyth's statement that it is 'most abundant everywhere'. I have taken specimens in most of the localities visited from time to time, though this species will not be found in the drier lowland forests where *A. libythea* may be met with. The headquarters appears to be in the drier parts of the lowland evergreen forest where it merges with the mixed deciduous. It may be caught at flowers but more usually at damp patches. In the large migration that took place in late May and early June of 1986 (Larsen 1987b) this species contributed less than 0.5% of the total (some 20.000 individuals). In the migrations of my childhood (Larsen 1978a) there were millions. It ranges from Sri Lanka and the Western Ghats, through suitable places in peninsular India to Sikkim, and from there east to practically the entire Oriental region, New Guinea and NE Australia.

031. **Appias wardii** Moore

The LESSER ALBATROSS is inappropriately named since males are usually larger and more dramatically marked with black than those of the other species of the genus. The taxonomy of this and related species is difficult. There is something to be said for uniting the large number of often disjunct and distinctive taxa under the '*paulina*' umbrella, but the South Indian form is so different from the Sri Lankan that specific status seems the best solution till a full revision of the species-group has taken place. In the wet season form the South Indian taxon is easily identified since it has the black markings normally characteristic of female *A. albina.* The dry season forms are very similar to male *A. albina,* though vestiges of the black apical markings sometimes remain. Hampson confused the genus so thoroughly that whether he obtained this species or not is uncertain. Wynter-Blyth did not mention it in his main Nilgiri paper. I have caught it on several occasions at Glenburn, once near Naduvattam, and on a few occasions at Nadgani. It is decidedly uncommon. The range is similar to that of *A. albina,* but the species is much less common, confined to dense evergreen forest, and populations are often disjunct.

032. **Colotis amata amata** Fabricius
(*Colotis calais*)

The South Indian subspecies of the SMALL SALMON ARAB has traditionally been known as ssp. *modesta* Butler, but the Fabrician type is from South India and has been checked by Harish Gaonkar. At best the name *modesta* is applicable to the Sri Lankan population, but that hardly merits a name of its own. From North India and west through Arabia and the African Sahel it flies in the very different ssp. *calais* Cramer. The Small Salmon Arab is chiefly found in the thorn forest formations and surrounding agricultural land, though I

have seen specimens also in the mixed deciduous forest of the Kotagiri Ghat. The South and Central Indian subspecies is very different from the North Indian and African one, and its main food plant seems to be *Azima* rather than the more normal *Salvadora.* There might be a case for considering the two taxa specifically distinct, and certainly the presence of the two subspecies in India would appear to be due to a multiple invasion from Africa. In the Nilgiris area the species is quite localised but usually common where found, often in the company of the other *Colotis* species. The distribution covers all of tropical Africa, much of Arabia, the drier parts of the Indian subcontinent. and NE Sri Lanka.

033. **Colotis etrida** Boisduval

The SMALL ORANGE TIP is a common butterfly in the drier lowland habitats, but it pushes further up the mountain and further into the wetter zones than do the other members of genus. There is a considerable degree of individual and seasonal variation, and the species is often wholly absent during the wettest months of the year. Occasional specimens are met with on the plateau indicating some capacity for dispersal. The butterfly comes avidly to flowers, especially *Tridax,* but neither this nor other members of the genus come to water, despite being found in very dry habitats. The genus is African, but the species is endemic to Sri Lanka and the Indian peninsula.

034. **Colotis eucharis eucharis** Fabricius

The PLAIN ORANGE TIP is a fairly local butterfly, but it is usually not rare where its food plant, *Cadaba indica* grows. This is normally on rocky ground in the thorn forest of the foothills, or along the hedges growing at the edge of fields. It is almost invariably found in the company of *Colotis danae* with which it shares the larval food plant. Usually most of their time is spent flying about stands of *Cadaba* in search of partners, but they will feed from flowers. On exceptionally hot days the warmest hours are spent in the shade of dense trees, usually right down amongst the roots. The species is an intruder from the Afrotropical region, where it is found throughout the tropical zone. In India it is limited to the Deccan and southern India, being found in NE Sri Lanka as well, but not in Sind and Saurashtra where the Afrotropical species usually occur. This is a classical Sudano-Deccanian distribution pattern.

035. **Colotis danae danae** Fabricius

In South India CRIMSON TIP butterfly is quite parallel in distribution and habits to *Colotis eucharis* but it is rather more common. If only one of the species is present it is almost invariably *C. danae.* The nominate subspecies is found on Sri Lanka and in peninsular India as far north as Madhya Pradesh. A different subspecies inhabits the area from Saurashtra to Baluchistan. Usually known as ssp. *dulcis* Butler, I find it impossible to separate it from the Arabian ssp. *eupompe* Klug. Different subspecies are found throughout dry, tropical Africa.

036. **Madais fausta fulvia** Wallengren (*Colotis fausta*)

The SALMON ARAB is a pretty and vivacious butterfly of the drier foothills where it may be, on occasion, quite common. It penetrates higher up the mountains and deeper into the evergreen forests than most of the related *Colotis* species. The flight is rapid and dancing and it is often difficult to capture a good series of specimens. As elsewhere in India, the larval food plants are *Maerua,* though the nominate subspecies from the Middle East feeds on *Capparis* as well. The species visits flowers freely, not least *Tridax,* but never comes to damp patches. The subspecies from

peninsular India differs from the others through invariably having white females. In northern India ssp. *fulvia* has dimorphic females, while in the nominate subspecies all females are salmon. The Indian populations appear to be highly sedentary though the nominate subspecies in Arabia and the Middle East is strongly migratory. The genus is monobasic, very close to *Colotis,* and the single species is found in Arabia, the Middle East and the Indian subcontinent, just penetrating the East African coastal regions north of Kenya.

037. **Ixias marianne** Cramer

The two Indian *Ixias* are almost identical in distribution and habits, though in most of India the WHITE ORANGE TIP, *I. marianne,* is slightly less common than *I. pyrene.* They are both common in the mixed deciduous forest, in thorn forest and in ill-kept agricultural land at low levels. There is little penetration into the subtropical zone, nor into the lowland evergreen forests. In May and June both are among the most prominent species in the mud-puddling assemblages, and both were prominent in the large migration that I observed in late May and early June (Larsen 1987b). Normally the butterflies are seen flying about the open scrubland in search of flowers, mates or food plants. *I. marianne* is endemic to India and Sri Lanka.

038. **Ixias pyrene sesia** Fabricius

The use of subspecific names for the YELLOW ORANGE TIP in India has been the subject of some confusion. I follow Gabriel (1943) in using the name *sesia.* There is, in any case, so much seasonal and individual variation that the designation of subspecies is difficult. The habits are like those of the preceding species and were the ground colour of the two not different they would be impossible to distinguish in the field. The range stretches from Sri Lanka, throughout India east to Hong Kong and Malaysia.

039. **Hebomoia glaucippe australis** Butler.

The GIANT ORANGE TIP is one of my favourite butterflies. It is the largest of the Indian Pierids, and it is a beautiful sight to see it swooping down the mountains along densely clad water courses with the wings held three-fourths open. It is generally common enough in mixed deciduous and open evergreen forest at low levels, sometimes being found also in subtropical evergreen forest. It is not a good coloniser of agricultural land and is rarely found in disturbed areas. It comes to flowers but is then very wary. Often it hovers on the flower in the manner of the Papilionidae, the only Pierid to do so. The species is an avid mudpuddler actively following river systems on the look-out for good spots which may well be situated some distance from the forest edge. In the afternoon they may be seen moving up-river again. When mudpuddling, together with myriads of other Pierids and some Papilionids, the camouflage pattern of the underside may be seen at its best. Never mind how carefully you study the assemblage, one or two *H. glaucippe* will be overlooked. The larva is a startlingly effective snake mimic. When handled it rears up its head, revealing a couple of blue eye-spots that are concealed when the larva is at rest. Most likely this is a defence against the Bonnet Macaque Monkey whose instinctive fear of snakes is almost comical in its manifestations (try throwing a little bit of rope out of a car and watch the results). The species is distributed in suitable country throughout the Oriental region.

040. **Pareronia valeria hippia** Fabricius
(*Parenonia* (*sic*!) *valeria*)

The COMMON WANDERER appears to be very rare in the Nilgiris. Hampson mentions it with

no detail, Wynter-Blyth and I failed to find it, though there is a genuine specimen from Kallar in the Bombay Natural History Society collections. This scarcity is difficult to understand as it is common enough in forested country around Bangalore and as the forests on the northern slopes seem very suitable for the species. It is worth mentioning that the South Indian population throws up the occasional female of the form mimicking *Parantica aspasia* Fabricius, a Danaid that does not occur in peninsular India. The species is not found in Sri Lanka, but stretches from India deep into the Oriental region.

041. **Pareronia ceylonica** Felder & Felder
(*Parenonia* (*sic!*) *ceylonica*)

The DARK WANDERER is endemic to Sri Lanka and southern India where it is more of a wet zone butterfly than is the preceding species. The South Indian population is listed as ssp. *pingasa* Moore by d'Abrera, but I agree with Talbot that it is not worthwhile separating it from the nominate Sri Lankan. It will be found in the mixed deciduous forests as well as in tropical evergreen at Nadgani. It is normally somewhat scarce but may be quite common at Kallar. The flight is fast and restless through dense vegetation and even when coming to flowers it is wary, so procuring a good series is not always easy. I have never seen it at water, though I have seen a picture of one of the *Pareronia* in a mudpuddling assemblage. On the wing the female is a most effective mimic of *Parantica aglea*, very much more so than one would suspect from cabinet specimens.

COLIADINAE

042. **Catopsilia pomona** Fabricius
(*C. pomona* & *crocale*)

The LEMON EMIGRANT is a large and powerful butterfly that is strongly migratory. Almost a million participated in the relatively modest migration that I documented in May/June of 1986 (Larsen 1987b), and many millions were involved in a month or more of intermittent, generally southwards migration during September and October. Its main base is the drier lowland formations, but it can be found breeding practically anywhere except on the highest plateau. It is an avid mudpuddler and has a great liking for flowers. There are two chief forms: f. *crocale* has black antennae and has immaculate undersides; f. *pomona* has reddish antennae and the underside has dark irroration as well as spots at the end of the cell. Intermediates are found but they are not very common. There is no doubt that they represent forms of one species, but the relative frequency of the two forms varies and their respective functions are quite unknown. The large numbers that settled on damp patches at Kallar in May 1986 were 95% *crocale*, while during the wet season the two forms were roughly equal in number. Both forms participate in the migrations so we are not faced with the type of phases so well known from migratory locusts. A thorough study of the dimorphism in this species would be most interesting. The range covers the entire Oriental region, New Guinea, parts of Australia to well out in the Pacific. A Malagasy species (*Catopsilia thaurama* Reakirt) is sometimes, in my view not correctly, linked to *C. pomona.*

043. **Catopsilia pyranthe** Linné
(*C. pyranthe* & *C. florella*)

The MOTTLED EMIGRANT is a common butterfly with both sexes showing a high degree of variation. The *florella* form with very narrow forewing borders and with well-developed, red-ringed silver spots at the end cell of the underside has traditionally been accorded specific status, especially since it is relatively constant in Africa, while the *pyranthe* form is fairly constant in eastern Asia. However,

in India's drier tracts both forms and intermediates occur with little consistency, except that the *florella* form is most frequent during the dry season. The species is common in the Nilgiris, sometimes very much so, usually in the *pyranthe* morph. The species is strongly migratory and the progeny of migrants sometimes breed even on the plateau, though it is mainly a species of the lowland drier tracts. It is fond of both flowers and damp patches. The distribution covers all of tropical Africa, southern Arabia, the entire Oriental region, New Guinea and parts of Australia.

044. **Eurema brigitta rubella** Wallace
(*Terias libythea*)

The SMALL YELLOW is a common butterfly with the widest possible of distributions, both geographically and ecologically. In the Nilgiris it may be found at all levels in most types of habitat, though it tends to avoid the dense evergreen forests. It is, in fact, one of those butterflies that seem to thrive particularly well in areas disturbed by the activities of man. It is not very common and somewhat local in the Nilgiris. Flowers are avidly visited, but the species is rarely seen at damp patches. It has been known to migrate but I have seen no evidence of this in the Nilgiris. *E. brigitta* was one of the few permanent residents of my compound in Kotagiri, the population usually consisting of four to eights individuals at any given time. One specimen was seen captured in flight and eaten by the Whitespotted Fantail Flycatcher (*Rhipidura albicollis*). The range covers all of tropical Africa, southwestern Arabia, most of the Oriental region and parts of New Guinea and Australia. From Sundaland eastwards it becomes a rather scarce and local grasslands species, possibly because of competition from the many other members of the genus in that area (Holloway 1973 gives an interesting review of the genus).

045. **Eurema laeta laeta** Boisduval
(*Terias laeta*)

The SPOTLESS GRASS YELLOW is normally a common species, but on the whole this is not the case in the Nilgiris. Wynter-Blyth was a long time before finding it in numbers near Coonoor and at Gudalur. I have found only modest colonies in one or two places on the Nadgani Ghat and at Masinagudi. Obviously colonies may be found in nearly all types of terrain. There is strong seasonal dimorphism, but I have seen only wet season forms in the Nilgiris. The species has a limited distribution compared to some of the other *Eurema*, being found only in Sri Lanka and from India to Burma, Thailand and Indo-China.

046. **Eurema hecabe simulata** Moore
(*Terias hecabe*)

The COMMON GRASS YELLOW is just that, very common practically everywhere. Since it also has a vast range it is probably among the top ten of the world's most numerous butterflies. In the Nilgiris it may be found literally anywhere, though it is least common in dense evergreen forest where it is replaced by *E. blanda*. Indeed, *E. hecabe* is often particularly common in habitats that have been modified by human activity. The species is a known migrant, but large scale migration has not been observed in the Nilgiris, though some did follow the May 1986 migration (Larsen 1987b). It visits flowers and often comes to damp patches. The range covers the entire old world tropical zone from Africa and Arabia to India and the Oriental region, to New Guinea, Australia, Japan, Fiji and Tonga.

047. **Eurema blanda silhetana** Wallace
(*Terias blanda*)

The THREE SPOT GRASS YELLOW is restricted to lowland forests where it is sometimes very common indeed. The flight is often higher

above the ground than in the other species of the genus, probably because the larval food plants are tall trees like *Albizzia* and associated creepers like *Wagatea spicata*. Contrary to the other *Eurema* the present species lays its eggs in large batches and the larvae and the pupae are gregarious throughout, the black pupae being situated so close to each other as to almost touch, sometimes up to fifty at a time. The species may assume pest proportions in *Albizzia* plantations. *E. blanda* is found in Sri Lanka, South India's wetter tracts, Eastern Ghats and then east to practically all the Oriental region to at least Papua New Guinea.

048. **Eurema andersonii ormistoni** Watkins (*Terias andersoni*)

The ONE SPOT GRASS YELLOW is the odd man out among the South Indian *Eurema* inasmuch as it is a genuinely rare and local species. In the Nilgiris it seems limited to evergreen tropical forest below 1500 m, which means that it just penetrates the subtropical level. Wynter-Blyth collected a few at Kallar where I have also taken the species. I also have a few from the Glenburn forests as well as one from an evergreen patch on the Kotagiri Ghat. The flight is weak and irresolute, the butterfly coming to both flowers and wet patches. It occurs from Sri Lanka through suitable wet tracts of peninsular India to Malaysia, and it seems to be scarce and local everywhere.

049. **Colias nilagiriensis** Felder & Felder (*Colias erate*)

The NILGIRI CLOUDED YELLOW is quite common on the plateau above 1900 m, flying throughout the year, especially in places with some moisture. The biggest concentration I have seen is in the beautiful bog at Longwood Shola near Kotagiri where hundreds may be seen on a good day, buzzing about just above the surface. The larval food plant here is *Parochetus communis*, though I suspect other plants are used elsewhere. All South Indian females of this butterfly are white, though in all its closest relatives females occur in both white and yellow forms. While related to the Palaearctic *C. erate* Esper I can see little reason for not accepting the isolated and morphologically very distinctive South Indian taxon as specifically distinct. As such it is a South Indian endemic species of obvious Palaearctic origin.

(*to be continued*)