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# JOURNAL

OF THE

## ASIATIC SOCIETY OF BENGAL.

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### Part II.—NATURAL SCIENCE.

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No. II.—1886.

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V.—*A List of Butterflies taken in Kumaon.*—By WILLIAM DOHERTY, Cincinnati, U. S. A. Communicated by the NATURAL HISTORY SECRETARY.

[Received April 22nd;—Read May 5th 1886.]

Last year I spent several months catching butterflies in Kumaon, a British district in the middle portion of the Himálayas, lying between the district of Garhwál and the independent kingdom of Nepál. The results of my visit are embodied in the following pages. In August, I made a rather successful excursion to the Pindari Glacier in the north-west of the district, and, from the latter part of September till early in December, I was engaged in a much longer expedition to the north-east. This time I was unfortunate; I found the low country too dry, and the high country too cold, and failed in both. Circumstances repeatedly delayed me, and when in the middle of October I finally succeeded in reaching Tagla Khar in Chinese Tibet, I found the ground frozen solid, and all the butterflies gone. So I would suggest to any entomologist resorting to these regions, that the three summer months are the only good ones for collecting, either on the desert plains of Tibet, or in the deep valleys of the Himálayas sheltered by the Outer Range from the violence of the monsoon rains.

A few remarks on the local distribution of butterflies may not be amiss. The great Desert Region of India does not approach the Himálayas, though a few stragglers of the genera *Callosune* and *Idmais* may be seen in the wide marshy meadows of the Tarai. The characteristic



butterflies of this region (which covers all India proper except the Himálayas, Bengal, Malabar, and the forest-covered districts of the Eastern Gháts and the Central Provinces) are usually of African genera, and often of African species, *e. g.*, *Charaxes fabius*, *Yphthima nareda* and *Y. asterope*, *Apatura misippus*, *Junonia œnone* and *J. orithyia*, *Hypanis ilithyia*, *Tarucus theophrastus*, and *Pieris mesentina*. The next region is that of the Tarai, the Bhábar (or *dry Tarai*), the foot-hills, and the low valleys, reaching up to three thousand feet. Its fauna is more or less tropical, and should rather be called Indian than Himálayan, the genera being for the most part spread over wide areas in the East. In Kumaon it is covered with forest containing a great variety of trees. The next region, which may be called the Lower Himálayan, extends from 3,000 to 7,000 feet, and is in Kumaon covered with a thin and open growth of the 'chir' pine (*Pinus longifolia*). Above this lies what I may call the Upper Himálayan tract, extending from 7,000 to 10,000 feet, and clothed with a dense forest of oaks, firs, and rhododendrons. These two regions contain nearly all the typical Himálayan forms. To the first belong many species of *Lethe*, *Ilerda*, *Yphthima*, *Mycalesis*, *Libythea*, *Dodona*, *Abisara*, *Neptis*, *Athyma*, *Symbrenthia*, and a considerable variety of the *Theclinae*. In the second such genera as *Zephyrus* (*Thecla*), *Rhaphicera*, *Zophoessa*, and *Aulocera* abound. Above 10,000 feet one comes to a fauna chiefly Palæarctic. My collecting in this region was a failure, but it seems to me that there must be a difference between the butterflies of Dárma and Byáns—Alpine valleys covered with great pine-woods and rich meadows of heather and grasses—and those of the Chinese province of Ngári or Hundes, a lofty and desert country with but a few inches of rainfall (in June, July, and August), and hardly any vegetation, except on the banks of streams and at the edge of the snow, the melting of which affords moisture throughout the warmer months.

These zoological zones are by no means well-defined, and some species seem to set all laws of distribution at defiance. At Baghi north of Simla, I have observed a *Parnassius* and a *Oatopsilia* alight on the same flower. In Kumaon, where I have seen palms and pines growing side by side, a troop of monkeys on a birch tree, and a flock of parrots on a fir, similar contradictions occur. An *Aulocera* is common in the Kali Valley down to 2,500 feet and even less; I saw a straggling specimen of *Colias fieldii* at the same place; and *Papilio machaon* is common at Bagheswar (3,000 feet) in the valley of the Sarju, and even at the crossing of the Rám-ganga near Gangolihát a thousand feet lower still. On the other hand, I caught *Terias hecabe* flying over Bireg Mountain at nearly 12,000 feet elevation. The largest range in elevation known to me is



that of *Vanessa kaschmirensis*, which I found in the Kali and Sarju valleys at less than 2,500 feet, and again at the summit of the Lepu Lek Pass over 18,000 feet above the sea.

As I spent less than six months in Kumaon, I cannot be sure how many broods of butterflies occur there, or in what months they appear. So far as my four years' experience goes, there are four broods of Indian tropical and subtropical butterflies; two in the wet season—in May or June and in August or early September, and two in the dry season—in October or late in September and in the first warm weather of March—respectively. These periods vary in different localities, the amount of the rainfall being the chief cause of change. In Kumaon, the second wet-season brood, a numerous one, appeared from the middle to the end of August, and the first dry-season brood, less important, especially in the drier valleys, came out in the last week of September, my first specimen of *Mycalesis visala* having been taken September 22nd. In Travancore, there was a small brood of dry-season forms early in March, and a very large one in the second week of May. In Orissa and Ganjam, the first wet-season brood did not appear till the end of July (the monsoon coming late that year), and was poor in numbers. In the Chittagong Hill Tracts, the last dry-season brood, including a vast number of species and of specimens, appeared in the middle of March, while the first wet-season brood, both there and in Arakan, came out at the end of May, and was a very small one. At Bassein, Burma, the first dry-season brood, which, as I have said, appeared in Kumaon near the end of September, was delayed till the middle of November. All butterflies do not have four broods. A few seem to keep coming out at short intervals throughout the year, many are found only in the wet season, and some perhaps only in the dry. It is said that still others are found in but one month of the year, and so have only one brood instead of four. Nevertheless, I think I may generalize my experience into the brief statement that there are four broods, two of the wet, two of the dry season, each of them simultaneous with, or preceding by about a month, the beginning and the end of the season after which I have named them.

Between the two broods of dry-season butterflies (October and March), and between the two broods of wet-season butterflies (May—June and Aug.—Sept.), I have never observed any difference. But between specimens of the wet and dry-season broods there are in many genera very perceptible differences. There is a difference in size, the wet-season specimens being usually smaller, and there are minor differences in the angulation of the wings and in the tone and purity of the colouring below. But the most remarkable difference is in the presence of large eye-



like spots on the underside of the wet-season forms, either absent or greatly reduced in those of the dry season. To give an example, the Sarju valley was on September 20th full of ragged specimens of a strongly ocellate butterfly (*Mycalesis mineus* proper), which a week later was succeeded by swarms of a larger, more angulate, non-ocellate insect (*Mycalesis visala*), precisely similar in its structure, and especially in those very complex organs, the prehensores, which in general mark by strong differences the slightest specific variations. In the same way *Melanitis leda* was succeeded by the non-ocellate *M. ismene*, and *Junonia asterie* by the non-ocellate *J. almana*. Such facts are best studied in countries where the wet and dry seasons are very well marked, and there is none better than Travancore, where in 1882—3 I first observed these curious metamorphoses. Hitherto I have only found them to exist in *Junonia*, *Ypthima*, *Melanitis*, and in the following groups of *Mycalesis*:—*Calysisme*, *Orsotricena*, *Telinga*, *Gareris*, *Virapa*, and *Samanta*. Many genera of the *Satyridæ* seem to produce only the two wet-season broods, and so fail to show what variations the weather would produce in their markings. Again, some dry countries produce only the dry forms, and some wet countries only the wet ones. For instance, I believe that Sindh produces only the dry-weather form, *Junonia almana*, while the wet climate of Ceylon and Singapore produces only *J. asterie*. In dry Orissa, the wet and dry forms of *Orsotriæna medus* and *O. runeka* are tolerably distinct, and *O. runeka* is the commoner of the two. But on the damp Malabar coast, of the representative forms *O. mandata* and *O. mandosa*, the latter, the dry-weather one, is scarce and imperfectly differentiated. The cause of this seasonal dimorphism would be a curious subject of study, but I have no suggestions to offer myself. Mr. de Nicéville has recently observed to me that perhaps, owing to the rank vegetation of the rainy season, the butterflies are better concealed, and have therefore been free to assume these handsome spots, under the influence, perhaps, of sexual selection. This view is I think somewhat strengthened by certain facts. The dry-season forms are all more or less leaflike in shape and colouring, while in the wet-season ones there is no such mimicry. This argues greater exposure to danger in the dry season. Remembering, however, the remarks of Darwin and Wallace on the protective nature of the ocelli of birds, borne out by the testimony of all sportsmen, and observed by me in the case of the common wild peacock, I am inclined to think that the ocelli are a direct protection to the insect during the rains. Certainly that is likely to be the case in the Himalayas, insectivorous birds being especially numerous there during the south-west monsoon, when the ocellate type of butterfly prevails.



For the last three years I have been studying the eggs of Indian butterflies, in the hope of thereby throwing new light on the grouping of these beautiful insects. In this hope I have not been disappointed. In most cases a genus is well and easily defined by its venation, but that venation only very imperfectly expresses the relationship in which it stands to other genera. To define families and subfamilies, one must, I think, study the 'ovation'. For example, the group called by Kirby the subfamily of the *Nymphaliniæ* now presents a confused mass of many genera the relations of which *inter se* are extremely vague and uncertain. When the ovation is studied, these genera fall into convenient groups, defined by constant and peculiar forms of egg. I am aware that this classification is not likely to become a popular one: the student will always prefer to separate his genera by an artificial key based on the venation. But that these groups of mine are natural ones, and indicate in most cases the true line of descent, I do not doubt. All considerations of markings, shape, habits, geographical range, and sexual variation indicate the affinity of the genera here placed together.

Unfortunately my work is still very imperfect. The study of the eggs of butterflies is a difficult one. I may state as an example of this, that I examined the bodies of more than forty females of *Melanitis leda* before I obtained a single egg. I was for two years almost equally unfortunate with the much rarer females of *Charaxes*. My method was in all cases to obtain the egg by pressure from the abdomen of the female. Now the egg of some butterflies, including many of the *Satyridæ*, is marked with highly characteristic lines of tubercles appearing some time after it is laid. These I have hitherto been unable to study, and am unable to say whether they extend to the closely allied groups of the *Morphidæ* and *Elymniadæ*. On account of the deficiencies of my early notes, I am not able to place such common genera as *Curetis* and *Loxura*, though from my vague descriptions these genera seem to belong to the *Deudorix* group. Many of the rarer forms I have not yet obtained; the eggs of *Calinaga*, of *Neurosigma*, and of the true *Gerydus* are still unknown to me. Owing to these great imperfections, I have delayed, and shall delay for another year or two, the publication of my studies of the eggs of eastern butterflies. But I take the opportunity to give a short synopsis of the results hitherto obtained, as a kind of *prodromus* or precursor of the perfected work, defining each group as briefly as I can. I omit certain points not yet thoroughly tested, such as the distinction between the *Vanessa* and *Apatura* groups of the *Apaturidæ*. My division of the *Hesperiadæ* is a tentative one. The two last groups, though typically very distinct, show a tendency to coalesce, and I include them under the head of the single subfamily *Baorinæ*, for



which name I would willingly substitute *Pamphilinae*, but for my ignorance of the type of *Pamphila*.

I am not sure that the eggs form a good guide to a *primary* division of butterflies. Even if I were sure, I should hardly have the courage to alter the received classification to the required extent. I have consequently adopted Bates' division by the feet, substituting, for the sake of convenience, Constant Bar's simple and obvious names of *Tetrapoda*, *Heteropoda*, and *Hexapoda*. I do not think, however, that this grouping represents the real relations of the families of butterflies. Judged purely by the egg the classification of butterflies would be something like this :—

1. *Danaiform Group*, including the *Danaidæ*, *Acraeidæ*, and *Heliconiadæ*, connected with the *Apaturidæ* by *Cynthia* and *Cethosia*. (Egg radiate, much higher than wide, leathery).

2. *Satyriform Group*, including the *Satyridæ*, *Elymniadæ*, *Morphidæ*, and *Brassolidæ*, connected with the *Apaturidæ* by *Kallima*. (Egg usually smooth, globular, translucent, hard).

3. *Nymphaliform Group*, including the *Nymphalidæ*, connected with the *Apaturidæ* by *Charaxes*. (Egg reticulate, spiny, soft, with translucent ribs enclosing pentagonal or hexagonal spaces).

4. *Apaturiform Group*, including the *Apaturidæ* and *Eurytelidæ*. (Egg varies greatly, radiate, opaque, rarely much higher or lower than wide, hard).

5. *Lycæniform Group*, including only the *Lycænidæ*. (Egg reticulate, generally not spiny, hard, with opaque white ribs enclosing tetragons).

6. *Pieriform Group*, including the *Pieridæ* and *Libytheidæ*. (Egg radiate, ampulliform, twice as high as wide).

7. *Hesperiform Group*, including the *Papilionidæ*, the *Hesperiadæ*, and probably the *Erycinidæ*. (Egg smooth, prickly or radiate with minute flattened ribs, not so high as wide, opaque, dome-shaped).

The classification here adopted is as follows. I purposely omit all differences except those of ovation. By *radiate*, I mean having ribs diverging from a point at the apex; by *reticulate*, having a plexus of crossing lines bearing no relation to the apex or axis of the egg.

Both sexes with imperfect fore-feet	...	...	TETRAPODA.
Male only	„	„	HETEROPODA.
Both sexes	„	perfect	HEXAPODA.

#### TETRAPODA.

**DANAIDÆ.** Egg much higher than wide, leathery, radiate, with numerous broad flattened ribs and distinct cross-lines, reticulate over



a small area at the apex. Two (*Danaïs*) or four (*Hestia*) anal tufts in the male.

**ACRÆIDÆ.** Egg similar, no anal tufts.

**SATYRIDÆ.** Egg about as high as wide, a little more or a little less, rather small, hard, typically translucent, and smooth or with obscure polygonal facets, sometimes subradiate, or even (*Aulocera*) with distinct, broadly-scalloped, anastomosing ribs, somewhat as in *Hesperia*. In some species it is covered with calcareous (?) accretions which do not appear till after some days' exposure to the atmosphere. Base of costal vein swollen, no præcostal cell. Cell of hindwing closed.

**ELYMNIADÆ.** Eggs similar, large, globular, translucent, hard, obscurely faceted, nearly as high as wide. Base of costal vein swollen, a præcostal cell in hindwing. Cell of hindwing closed.

**MORPHIDÆ.** Egg similar, globular, translucent, hard, not so high as wide, smooth (*Discophora*, *Thaumantis*), or obscurely faceted (*Clerome*). Base of costal vein generally not swollen, no præcostal cell. Cell of hindwing open.

**APATURIDÆ.** Eggs hard, small and numerous (except in the *Euripinæ*), opaque, never much wider than high, sometimes much higher than wide (in the *Cynthinæ*), radiate, with ribs generally slender and acute (except in the *Cynthinæ* and *Argynninæ*), and often serrate. Cross lines not very distinct. Type *Apatura* (*Hypolimnias*) *bolina*.

#### Subdivisions of the *Apaturidæ*.

**KALLIMINÆ.** Egg obsolescently radiate, as high as wide, somewhat *Morpho*-like.

**CYNTHINÆ.** Egg as in *Danaïs* but hard, much higher than wide. These two groups are aberrant, and should perhaps form separate families.

**ARGYNNINÆ.** Egg as high as wide or higher, ribs rather numerous, heavy, blunt, anastomosing, projecting at apex, with numerous distinct cross lines.

**APATURINÆ.** Egg not so high as wide, ribs few, sharp and prominent, usually projecting at apex, and often serrate.

**EURIPINÆ.** Eggs large, few, hardly as high as wide, ribs low, serrate, rather numerous, not produced at apex. The group seems somewhat transitional to the *Charaxidæ*.

**EURYTELIDÆ.** Eggs radiate, small, numerous, hard, nearly as high as wide, with radiating lines of erectile bristles. The *Eurytelidæ*, though I think them nearer to the *Apaturidæ* than to any other group, interrupt the sequence of the families.

**CHARAXIDÆ.** Eggs large, few, globular, hard, not so high as wide, with obscure ribs and cross-lines at the base only, forming (usually) tetragons, with minute projecting points at their intersection. *Charaxes* seems to connect the *Apaturidæ* with the *Nymphalidæ*.



**NYMPHALIDÆ.** Eggs very large, few, soft, not so high as wide, strongly reticulate with elevated, translucent, chitinous (?) lines crossing the surface asymmetrically, enclosing pentagonal and hexagonal spaces, and bearing long, acute, often bifid spines at their intersection. This group is a large and, so far as the eggs go, a very homogeneous one, but the caterpillars vary greatly. Type *Nymphalis (Limenitis) populi*.

#### HETEROPODA.

**LYCÆNIDÆ.** Eggs hard, small, numerous, much wider than high, reticulate, with a whitish, calcareous (?) accretion forming an asymmetrical network of tetragons.

##### Subdivisions of the *Lycænidae*.

**AMBLYPODINÆ.** Egg at least half as high as wide, convex above, widest well above the base, with numerous delicate intersecting ridges bearing acute spines at their crossing.

**DEUDORIGINÆ.** Egg similar, with short, truncate spines. Clasps (*harpagones*) small, aborted, attached immoveably to the projecting intromittent organ.

**THECLINÆ.** Egg fully half as high as wide, convex above, widest close to the base, with coarse, minutely vesicular reticulations forming large irregular pits over the surface, and bearing broad, depressed tubercles at their intersection.

**LYCÆNINÆ.** Egg less than half as high as wide, concave above, "turban-shaped" (as Mr. Scudder calls it), widest above the middle, reticulations coarse and asymmetrical.

**PORITINÆ.** Egg hexahedral, otherwise similar. This is the only egg known to me that is not round in horizontal section. I hope to figure this extraordinary form in my forthcoming article on this subject.

**GERYDINÆ.** Egg less than one-third as high as wide, delicately and sometimes obsolescently reticulate, sometimes carinate, flat above and below.

**ERYCINIDÆ.** Egg not so high as wide, smooth, granulate or prickly, neither reticulate nor radiate in the few genera examined by me.

**LIBYTHEIDÆ.** Egg ampulliform, shaped like a soda-water bottle, twice as high as wide, forming a short neck or stalk close to the apex, radiate, with strong and anastomosing ribs. Palpi long, pupa suspended. Of the affinity of this remarkable genus with the *Pieridæ* I have no doubt. Westwood remarks on the similarity of their larvæ.

#### HEXAPODA.

**PIERIDÆ.** Egg as in the *Libytheidæ*. Palpi short, pupa girt.

**PAPILIONIDÆ.** Egg dome-shaped, smooth or obscurely faceted, not so high as wide, somewhat leathery, opaque. The egg of *Parnassius*,



in my opinion, is that of a true papilionid, though Mr. Scudder compares it with those of the *Lycaenidae*.

**HESPERIADÆ.** Eggs very large, very few (except in the first group), only one or two matured at a time; opaque, dome-shaped, smooth; or with delicate, depressed serrate ribs, few or very numerous, and with distinct cross lines.

#### Subdivisions of the *Hesperiadæ*.

**HESPERINÆ.** Egg small, hard, seven-eighths as high as wide or even higher, constricted at base, with wide, scalloped, anastomosing ribs. This group is very distinct. The only Indian genera belonging to it are *Hesperia* (*Pyrgus*) and *Gomalia*.

**SUASTINÆ.** Egg lower, dome-shaped, large, hard, constricted at base, with a few broad depressed, delicate, biserrate ribs. This group does not seem to be represented in Europe or North America.

**BAORINÆ.** *Cyclopides*-Group. Egg similar, two-thirds as high as wide, constricted at base, with very numerous slender ribs.

**BAORINÆ.** *Baoris*-Group. Egg half as high as wide, leathery, limpet-shaped, widest, and often carinate at base, smooth, generally overlaid with pigment above, as in many *Papilios*, sometimes with numerous obsolete ribs. This group seems to be equivalent to the *Astyci* as defined by Scudder.

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In the following list I have given the exact localities of all the rarer butterflies that I caught in Kumaon, and I have endeavoured briefly to indicate the range of most of the species in height. The figures given are however very uncertain, representing but a limited experience. In most cases I have given a rough estimate of the height of the highest and lowest points at which I have taken the species, making allowance, in a few very common kinds, for "straggling." The fauna of the district changes considerably as one goes from west to east. On the west, the Pindari Valley forms a part of the Garhwál river-system, and its butterflies are distinctly those of the North West Himálayas. The successive river-valleys to the eastward thence partake more and more of the nature of the Eastern Himálayas. Some Sikkim forms seem to extend westward to the Sarju or the Rám-ganga and no farther. And a very large number seem bounded by the Káli, the river separating Kumaon from Nepál. The valley of this river forms a genuine zoological boundary. Among the species that seem to extend no farther west, are *Papilio paris*, *Melanitis zitenius*, *Elymnias leucocyma*, *Symbrenthia hypselis*, *Neptis vikasi*, *Euthalia apiades* and *E. lubentina*, and such genera and subgenera as *Dyctis*, *Rohana*, *Dichorrhagia*, *Moduza*, *Haridra*, *Zemeros*, *Ohersonesia*, *Chliaria*, *Remelana*, and *Cheritra*. Three larger groups, the



family of the *Morphidæ* and two aberrant divisions of the *Lycænidæ* (the *Gerydinæ* and the *Poritinæ*), seem to extend no farther west than the Káli and its branch the Sarju.

A few remarks may be permitted on the curious habits of the larvæ of certain *Lycænidæ*. Dr. Thwaites (in Moore's "Lepidoptera of Ceylon") has the following remarks on the subject, "Nature, however, finds a protection for these said helpless individuals" [larvæ of *Lycænidæ* unspecified] "in the instincts of a species of ant (*Formica smaragdina*, Fabr.), which finding a substance most palatable to it secreted naturally from a glandular defined spot upon the bodies of these helpless larvæ, takes possession of them as 'cows,' surrounding each separate one, and the leaf on which it feeds, with a few silken strands of its web, protecting them jealously and attacking most fiercely any living thing intruding upon them." Besides a remark of Herrich Schæffer's, quoted in Distant's "Rhopalocera Malayana," that *Gerydus symethus* inhabits ants' nests, I have met with no other mention of this singular habit. I have myself observed it in quite a number of Indian *Lycænidæ*, belonging to several distinct groups, and feeding on the leaves of various trees and herbs. My observations are still in progress, and I reserve for a future occasion a fuller account of them, and descriptions of the larvæ on which they have been made. The larvæ in question are all very helpless and inactive grubs, sluglike in shape, tapering at both ends, pubescent, green or brown, with a very small retractile head. On each side of the penultimate segment above, there is a short protuberance, from which can, in most cases (*e. g.*, *Tarucus theophrastus*), be extended a brush of hairs (apparently absent in some species, *e. g.*, *Azanus ubaldus*). This is, I have no doubt, a scent-gland, and may be intended to attract the notice of the purblind ants. On the dorsal line of the preceding segment, the eleventh, there is another short tubercle exuding a viscid juice. It exists in all the *Lycænidæ* known to me, whether they are maintained by ants or not, and from it issues a gummy thread by the aid of which I believe the caterpillars sometimes swing themselves from branch to branch, or attach themselves to leaves. But though in all probability acquired for such purposes, it is peculiarly attractive to the ants, which at all hours surround the poor caterpillar and, by stroking and tickling it with their antennæ, induce it to yield up this sweet (?) liquid. I have not yet found any caterpillar in the possession of web-making or arboreal ants such as *Formica smaragdina*, and no restraint such as Dr. Thwaites mentions was placed upon any larva observed by me. But the ants would always remain near the caterpillar, and would always fly fiercely to the rescue if anything molested it. When it had attained its full growth, the ants, forming a circle round it, would forcibly drive it down to their



nest at the foot of the tree. This sight is rather an amusing one, the caterpillar often showing the greatest reluctance to leave its pasture-ground, and manifesting strong doubts as to the intentions of its escort. I was struck with the forbearance and patience of the ants, which carefully abstained from any violent use of their formidable jaws, though the journey was thereby sometimes prolonged to six or seven hours. Having arrived at the foot of the tree, the ants deposited the caterpillar in an open space just within the mouth of the nest, whereupon the latter immediately attached itself to the bark, and commenced its transformations. I have counted as many as thirteen chrysalids of *Azanus ubaldus* so attached in one nest at the foot of a kind of bábul tree (*Acacia leucoplœa*). All were uninjured and all produced perfect butterflies. The instinct which induces the ants to preserve these caterpillars in their nests, thus sacrificing a large present supply of food to the possibility of a future supply of the sweet juice they are so fond of, strikes me as one of the most remarkable things in nature.

A kind of hermaphroditism seems to occur sometimes in the *Hesperiadæ*. From the body of (apparent) males of *Suastus eltola* and of *Coladenia dan*, both having perfect prehensores of the form characteristic of their respective species, I obtained one or two well-developed eggs exactly similar to those taken from the females of the same species. Also, from a male of *Suastus toona* (the egg of that species being, except for this, unknown to me) I obtained a single immature blood-red egg. I have not observed this in any of the higher groups of butterflies.

My thanks are due to the Superintendent of the Indian Museum, Calcutta, who has given me the freest access to the fine collections under his charge; and to Mr. de Nicéville, who has given me the benefit of his advice and assistance on several difficult points.

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Suborder RHOPALOCERA TETRAPODA, Constant Bar.

Family DANAÏDÆ, Felder.

1. DANAIS AGLAÏA, Cram. (*aglea*) = *melanoïdes*, Moore. Common in the Tarai and in the Sarju and Káli valleys up to 4,000 feet.
2. DANAIS LIMNIACE, Cram. Ránibágh at the foot of the hills.
3. DANAIS SEPTENTRIONIS, Butler. Sarju and Káli valleys, 2—4,000 feet.
4. DANAIS TYTIA, Gray. Pindari, Gori, Sarju, and Káli valleys, 3—6,000 feet. Mimicked by *Hestina nama*.
5. DANAIS CHRYSIPPUS, Linn. Ránibágh, Káli valley to Dhárchula (3,000 feet), not common.



6. *DANAIS GENUTIA*, Cram. Common everywhere, up to Kháti, 7,000 feet.

7. *EUPLŒA MIDAMUS*, Linn. = *linnæi*, Moore. Káli valley to Dhárchula, Gori, and Sarju valleys, 2—4,000 feet, common.

8. *EUPLŒA CORE*, Cram. Common as high up as Kháti, 7,000 feet.

Family *ACRÆIDÆ*, Doubleday.

9. *PAREBA VESTA*, Fabr. Common locally, 4—5,000 feet. Taken on the Dhoaj, 6,500 feet.

Family *SATYRIDÆ*, Swainson.

10. *MYCALESIS (GARERIS) SANATANA*, Moore. The non-ocellate dry-season form, Askot, 5,000 feet, October. The ocellate, wet-season form (*gopa*, Felder), Rámgarh and Tákula, Western Kumaon, 5,500—6,000 feet, August, rare.

11. *MYCALESIS (CALYSISME) PERSEUS*, Fabr. The dry-season form, first seen on the Lower Gori, 2,500 feet, September 29th; also in the Káli valley and the Bhábar, 1—3,000 feet. The wet-season form (*blasius*, Fabr.) common in the same localities, Aug.—Sept.

12. *MYCALESIS (CALYSISME) MINEUS*, Linn. Wet-season form, commoner than the preceding species in all the valleys up to 5,000 feet, Aug.—Sept. The dry-season form (*visala*, Moore) first seen on the Lower Sarju, about September 23rd. Caterpillar taken by me at 10 P. M. in a meadow at Sonakala, Southern Orissa. It is fusiform, brownish-green, tapering greatly at both ends. Head rather large, finely pubescent, dark fuscous marbled with paler, a smooth plate in the middle of the forehead, two short, rough triangular horns. Neck greatly constricted. Body rough and prickly rather than pubescent, finely wrinkled transversely, six wrinkles to each segment, the second twice as broad as the others. A faint darker dorsal line chiefly visible posteriorly, a lateral line of oblique dark streaks, one to each segment. Last segment prolonged and ending in two rough, triangular, slightly divergent horns. It has the habit of resting for hours with its chin strongly retracted, and its horns projecting forwards. The fourth eye from above is very much larger than the others, and the head with its short, ear-like horns looks very much like a cat's. The larva of *Melanitis* has on the contrary the horns long and slender, and the eyes subequal. Before undergoing its metamorphosis, the larva of *mineus* became in colour a clear transparent green (like the normal colour of that of *Melanitis*), unmarked except by the black dots of the spiracles.

Chrysalis green, smooth, its envelope transparent, shorter and thicker than the chrysalis of *Melanitis*, strongly constricted between



the thorax and abdomen. The period varied in my specimens from five days and six hours to six days and eight hours.

The caterpillar feeds on various grasses. That of *Melanitis* I always captured on young growing rice. Both are strictly nocturnal.

13. MYCALESIS (SAMANTA) MALSARA, Moore. Wet-season form, Káli, Gori, and Sarju valleys, 2—4,000 feet, Aug.—Sept. Dry-season form (*lepcha*, Moore) Lower Káli valley, 3,000 feet, November, rare. My specimens, both ocellate and non-ocellate, all have the white band below very narrow, whereas the usual form of the species in Sikkim has it wide. The dry-season form of this latter variety is *rudis*, Moore, which I have taken abundantly in the Chittagong Hill Tracts.

14. MYCALESIS (SAMANTA) HERI, Moore. My two specimens from Kápkot and Baghrihát, 2—5,000 feet, differ from a Sikkim specimen in the Indian Museum, Calcutta, in having the band below almost obsolete. One has only two ocelli on the forewing below, the other has two additional smaller ones between them. Both have only two ocelli on the hindwing above. I have also the dry-season form (one male, Jhulaghát, 2,000 feet), lacking the ocelli below, but otherwise similar, especially in the prehensores. Those who do not accept the doctrine of the seasonal variation of the *Satyridæ* will consider this a new species. In the same way *nicotia*, Hewitson, is represented in the dry season by *langii*, de Nicéville.

15. LETHE EUROPA, Fabr. Ránibágh at the foot of the hills, 1,000 feet.

16. LETHE DYRTA, Felder. Lower Himálayan tract, 3—6,000 feet.

17. LETHE HYRANIA, Koll. Kumaon generally, 3—7,000 feet. My specimens are somewhat transitional to *dinarbas*, being quite as dark, and tinged with lilac in certain lights. These two probably form one species.

18. LETHE MAITRYA, de Nicéville. Dhánkuri, Khati in Western, Sosa in Eastern, Kumaon, 7,000—11,000 feet. (Upper Himalayan tract.)

19. LETHE SIDONIS, Hew. Naini Tál, 6—7,000 feet, small specimens, a large dark variety at Kháti, N. W. Kumaon, 7—8,000 feet.

20. LETHE VAIVARTA, n. sp., allied to *nicetas* and *sidonis*. Dhan-kuri, Kháti, Dwáli, N. W. Kumaon; near Khela, East Kumaon, 7—11,000 feet.

Shape of wings very much as in *sidonis*, except that the angle at the upper median branch of the hindwing is obsolescent, those at the ends of the lower median branches being more produced. Wings wider and costa more bent than in *nicetas* and *maitrya*. Lustrous brown, cilia alternately dark and pale. Two dull ochreous spots on costa of forewing



at  $\frac{1}{5}$  and  $\frac{2}{5}$  from apex respectively, more distinct in the female. Faint traces of a pale transverse band in continuation of the inner spot. *Hindwing* with five distinct black spots, the last smallest, extending from the first subcostal to the lower median, encircled in the female by pale bronzy rings. *Below*, *forewing* basally fuscous brown, becoming paler and more reddish apically, an irregular dark line obliquely from middle of costa to the submedian vein near the lower angle of the wing, separating the dark base from the pale outer portion. Along its outer edge a strong ochre band extends from the costa to the upper radial, thence faintly marked as a pale band, angulate, but not broken as in *nicetas*. A subapical pale band from the costa, where it is ochreous, to the upper median, containing four dark spots pupilled with whitish dots. Cell with a pale band across it a little beyond the middle. *Hindwing* with four broken irregular lilac lines across base and disc besides two short ones defining the discocellular veins. The outer line is bordered by a very angular dark brown band, widest from costa to upper median, where it is acutely angled; a faint trace of ochreous beyond its upper portion. Cell crossed by three lilac lines besides those at the end. Ocelli seven, all set in lilac rings, and forming a curved line much as in *sidonis*; the anal two small and set in the same lilac ring, the 2nd, 3rd, and in a less degree the 4th strongly blurred, their lilac rings being also somewhat diffused, especially in the female. The other ocelli are distinct, pupilled with white. A continuous marginal line of dull reddish ochreous, bounded by a slender black line within and without; along its inner edge a wavy band of bright lilac narrowed at the veins and extending from the upper median to the submedian vein.

This species is more variegated in colour than *sidonis*, and less than *nicetas*; the 2nd, 3rd, and 6th ocelli are always blurred, and the 1st, 5th, 6th, and 7th perfect, thereby differing from *maitrya* (in which they are all blurred), from *nicetas* (in which they are all perfect), and from *sidonis*, in which the 2nd and 4th are slightly blurred. From *sidonis*, its nearest ally, it also differs in the ochreous marks on the forewing above and below, and in the distinct black spots of the hindwing above. Prehensores close to those of *sidonis*. The uncus, however, is more bent down, appearing truncate from above and flattened laterally, while in *sidonis* it appears acute from above and is cylindrical. In both species the uncial branches viewed from the side are distant from the uncus, and much shorter, and come to meet it at an angle, while in *maitrya* the uncus and its branches are nearly equal, nearly parallel, and approximate. The clasp also, is simply hooked instead of being set with numerous barbs as in *sidonis* and *vaivarta*.



21. *LETHE* (*TANSIMA*) *VERMA*, Koll. Lower Himálayan tract, 2,500—6,000 feet, not very common.

22. *LETHE* (*TANSIMA*) *ROHRIA*, Fabr. Lower Himálayan tract, 2,500—7,500 feet, common. The subcostal veins of these two species are differently arranged, but they agree in the very broad cell of the forewing, in the white apical stripe common to both sexes, in the first ocellus of the hindwing below being withdrawn from the series, and, as regards the prehensores, in the curiously palmate branches of the uncus.

23. *LETHE* (*ZOPHOESSA*) *JALAUROIDA*, de Nicéville. Dhánkuri, Kháti, Dwáli, North-West Kumaon, 7—11,000 feet. The female only differs from the male in its larger size, broader wings, and somewhat paler markings.

24. *LETHE* (*ZOPHOESSA*) *GOALPARA*, Moore. Dhánkuri, Kháti, 7—9,000 feet.

Subgenus *CHARMA*, nov. Forewing, outer margin straight or slightly convex, cell rather short and broad, upper radial from the end, 2nd and 3rd subcostals from just before the end, of the cell, approximate, discocellulars slightly convex. *Hindwing* narrow, almost equally angled at the first and third median branches. The apical angle obsolescent, that at the 1st subcostal more distinct, the lower discocellular joining the median just before its last bifurcation. A glandular patch of peculiar black scales on the hindwing of the male in the space between the costal and subcostal veins, extending into the cell and just within the fork of the 1st and 2nd subcostals. By this patch, and by the displacement of the first ocellus of the hindwing behind the line of the others, this group may be distinguished from other *Lethe*. What I regard as of more importance is the extraordinary structure of the prehensores; the uncus (which is provided with rather short and slender branches) being cleft into two strong lobes lying in the same vertical longitudinal plane, and resembling the open claw of a lobster, the lower point being slightly the longer, a structure unknown among all other tetrapod butterflies. Type *baladeva*. The genus probably includes *andersonii*, Atkinson, and perhaps other species.

25. *LETHE* (*CHARMA*) *BALADEVA*, Moore. Pindari Valley, 7—8,000 feet, darker than Sikkim specimens, the silver bands narrower.

26. *LETHE* (*NEOPE*) *PULAHA*, Moore. Kháti, Kápkot, 7—8,000 feet, rare.

27. *RHAPHICERA* *MOOREI*, Butler. Dhánkuri, Kháti, Dwáli, Chaudáns, 7—11,000 feet. The female only differs in its larger size, slightly paler colouring, and broader wings.

28. *AMECERA* *SCHAKRA*, Koll. Kumaon generally up to 9,000 feet, seen as low as Dhárchula, 3,500 feet.



29. *AULOCERA PADMA*, Koll. The female described by Kollar is evidently of the same species as Moore's male type of *avatara*. Kollar's description and plate are unmistakeable. There are, however, two allied species now passing under the name of *padma*. Of the true *padma* I have both sexes from Nárkanda near Simla and from the Galis north of Mari, but in Kumaon I obtained only females, taken in October and November in the Kali Valley, ranging from 7,000 feet at Juti in Chandans to 2,500 feet at Garjiaghát and even lower. This species is much the larger of the two; my females are all over four inches spread. The cell of the forewing is covered with long shining hair; the male mark on the forewing is more distinct, the male lacks the white spots diverging to the costa from the macular band; in the female these are three in number, and rather blurred. The female has the surface below heavily striated with whitish; the band is not at all definite outwardly and is nearly white in colour.

30. *AULOCERA LOHA*, n. sp., is the other form of *padma*. Smaller, cell of male smooth, sex-mark not very plain, male distinguished by the divergent white spots from the median band to the costa, the female by the band of the hindwing below being narrow, well-defined, and ochreous. This insect is darker than the other, the apex of both wings glossed with lilac below, and the base of the hindwing greenish. It may perhaps be only a seasonal form of the preceding species. I am unluckily unable to compare the prehensores, having no drawing of those of *padma*. I found *loha* common on Bireg mountain, North-West Kumaon, in August and September, 9—12,000 feet, the species thus occurring at the same elevation as *brahminus*, the prehensores of which are altogether different. The *padma* from Sikkim mentioned (P. Z. S. 1882) by Mr. Elwes are of this species.

31. *AULOCERA SWAHA*, Koll. Found on all the hills of the Pindari district 7—10,000 feet, also on the outer ranges, Jágheswar, Tákula and the Dhoaj, 5,500—9,000 feet, and in Chaudáns in East Kumaon, 5—7,000 feet. A common species. I did not obtain the form which has the band of the forewing bright yellow.

32. *AULOCERA BRAHMINUS*, Blanch. Pindari District, 10—12,000 feet, not very common.

33. *AULOCERA SCYLLA*, Butler. Pindari Glacier, and Mount Byeri above Furkya, North-West Kumaon, 12—14,000 feet, Garbyán, 12,000 feet, Lepu Lek, 16,000 feet, North-East Kumaon. The prehensores are distinct from those of *brahminus*. The latter has the uncus, seen from above, longer and its branches more slender. Seen from the side, *scylla* has the uncus and its branches parallel and nearly in the same horizontal plane, and the top of the uncus is knobbed, while in *brahminus* it is



smooth and the branches diverge downwards from it. The clasp has its upper limb toothed horizontally, in *scylla* vertically. Colonel Lang's type of *werang* seems to me only a small *brahminus* from high elevations. Mr. Butler's *scylla* I have not seen. The present species is small, ochreous-gray below, with a discal line of white spots on the hind-wing below, the band there crooked; on the forewing below, the ocellus is pupilled with white and the band is wide and united. I have caught it flying with *brahminus*, from which I consider it distinct, in the meadows near Furkya.

34. *AULOCERA SARASWATI*, Koll. Pyura, above Loharkhet, the Dhoaj, Takula, 5—9,000 feet. It is the most distinct of the *Aulocera*. The egg has 23 ribs, that of all the other *Aulocera* having 26—28.

35. *CENEIS PUMILUS*, Feld. A single female found on the moist ground at the edge of the snow-line on the northern side of the Lepu Pass, Chinese Tibet, 17,000 feet.

36. *CALLEREBIA SCANDA*, Koll. Above Loharkhet, Kháti, Dhankuri, N. W. Kumaon, 7—11,000 feet.

37. *CALLEREBIA HYBRIDA*, Butler. Kumaon generally, 6—9,000 feet. Probably the wet-season brood of *annada*.

38. *CALLEREBIA NIRMALA*, Moore. Two males, above Loharkhet, 7—8,000 feet.

39. *CALLEREBIA ANNADA*, Moore. Kumaon generally, 5—7,000 feet. First specimens taken Sept. 22nd. The above forms are easily separated, but the differences can hardly be called specific. Except in *scanda* the prehensores are very similar in all. The next species is very distinct.

40. *CALLEREBIA HYAGRIVA*, Moore (*Ypthima hyagriva*). The venation of the forewing shows this species to be a true *Callerebia*, both the 1st and the 2nd subcostals being emitted before the end of the cell. The structure of the prehensores shows the same thing. All the *Satyridae* known to me, except *Ypthima* and *Melanitis*, have the uncus branched, and in *hyagriva* this part is branched precisely as in other *Callerebia*. The prehensores are scarcely to be distinguished from those of *annada*. I found *hyagriva* not uncommon at various points in Kumaon, 3—7,000 feet, during the rains.

41. *YPHTHIMA* (more properly *IPHTHIMA*) *NAREDA*, Koll. Kumaon generally up to 9,000 feet, common. This species is somewhat transitional to *Callerebia*. The uncus is not exactly lobed, but flattened out horizontally like a tile, appearing from above very broad and square-cut.

42. *YPHTHIMA SAKRA*, Moore (= *nikæa*, Moore). Kumaon generally, 3,000—11,000 feet, common in the higher regions, varies greatly.

43. *YPHTHIMA ASTEROPE*, Klug. (= *ariaspa*, Moore), Bágheswar, Takula, Lower Sarju, Lower Gori, 2,000—6,000 feet.



44. *YPHTHIMA HUEBNERI*, Kirby. Bágheswar, Rámbagh, Kápkot, 1,000—4,000 feet.

45. *YPHTHIMA SINGALA*, Felder. Bágheswar, Kápkot, Tákula, Lower Sarju, 2,000—6,000 feet. Fresh specimens have faint traces of a male mark on the forewing above, as in *philomela*. The forewing above is always ocellate in the female, non-ocellate in the male. I found an allied species, ocellate in both sexes, common at the extreme summit (5,000 feet) of Mahendragiri, Ganjam district, Eastern Gháts, and perhaps identical with *thora*. The form I call *singala* is common in many parts of India; I am not sure of its identity with the Ceylonese species.

46. *YPHTHIMA AVANTA*, Moore. River-valleys generally, 2,500—5,000 feet. The sex-mark is more prominent than in *singala*. Ocellus on forewing above sometimes obsolete in the male.

47. *YPHTHIMA PHILOMELA*, Joh. Valleys up to 6,000 feet. The sex-mark is very prominent. These seven species are all very distinct, and all have the prehensores differently formed. The dry-season forms are all more or less non-ocellate. That of *sakra* is still unknown to me. The seasonal forms are not so well separated in *Ypthima* as in *Mycalesis*.

48. *MELANITIS LEDA*, Linn. Wet-season form, Tarai and low valleys up to 4,000 feet, August—September. Dry-season form (*ismene*, Cram.), same localities, October—November. This species is hardly distinct from the next two. The prehensores, which in this family and in the *Lycænidæ* are almost infallible tests of species, here show no good distinctions.

49. *MELANITIS ZITENIUS*, Herbst. Káli valley, 2—4,000 feet.

50. *MELANITIS BELA*, Moore. Wet-season form, Baghrihát, Káli Valley, 2,500 feet, rare. Dry-season form (*aswa*, Moore), Toli, Káli Valley, 2,500 feet, rare. I consider *tristis*, Felder, *suyudana*, Moore, and *abdullæ*, Distant, all synonyms of this species.

#### Family ELYMNIADÆ.

51. *ELYMNIAS UNDULARIS*, Dru. Ránibagh at the foot of the outer hills, 1,000 feet.

52. *ELYMNIAS LEUCOCYMA*, Godt. Káli valley at Balwakot and Toli, 2,500—3,000 feet. Compared with Sikkim specimens they are more striated and speckled with white below, and as in *patna* they all have an irregular line of whitish spots round the outer disc of the hindwing above.

53. *DYCTIS PATNA*, Westw. Two males, Garjiaghát, near the junction of the Káli and the Gori, Eastern Kumaon, 2,500 feet. They do not differ from Sikkim specimens.



## Family MORPHIDÆ, Westwood.

I did not capture any morphid in Kumaon, but in the great gorge of the Sarju below Kápkot, I observed several specimens of a magnificent new species, probably an *Amathusia* or a *Zeuxidia* (I think I noticed the acuteness of its wings), and an excellent mimic of *Euploea midamus*, which was common there. They had the true morphid flight, and always settled on the underside of leaves with folded wings. I spent half the day in trying to catch them, but was unsuccessful, owing to the dangerous and precipitous nature of the place.

## Family APATURIDÆ, Boisduval.

## Subfamily KALLIMINÆ.

54. KALLIMA INACHUS, Boisd. (*inachis*). River valleys, 2—5,000 feet.

## Subfamily ARGYNNINÆ.

55. CUPHA ERYMANTHIS, Drury. River valleys up to 5,000 feet.  
 56. ATELLA PHALANTA, Drury. Tarai and hills to 6,000 feet.  
 57. ATELLA SINHA, Koll. Káli valley, 2—3,000 feet, common.  
 58. ARGYNNIS ISSÆA, Gray. The dark basal area on the hindwing above is broad and undefined; the submarginal dark band of the hindwing below is distinctly broken by an ochreous space between the radial and the upper median. In these respects it differs from *latonia*, Linn. (*lathonia*). The prehensores also seem tolerably distinct. The species is common all over Kumaon from Bágheswar (3,500 feet) in the Sarju valley to the Lepu Lek, 16,000 feet. At very high altitudes the specimens are small.  
 59. ARGYNNIS CHILDRENI, Gray. Naini Tal, Kháti, 6,000—8,500 feet.  
 60. ARGYNNIS KAMALA, Moore. Dhánkuri, 10,000 feet.  
 61. ARGYNNIS JAINADEVA, Moore. Pindari Valley, 9,000 feet, rare.  
 62. ARGYNNIS NIPHE, Linn. Lower Himalayan region from the Káli valley, 2,500 feet, to Almora and above Pithoragarh, 6,000 feet.

## Subfamily APATURINÆ.

*Vanessa*-Group.

63. VANESSA KASCHMIRENSIS, Koll. From the Káli valley (2,500 feet) to the summit of the Lepu Lek, over 18,000 feet, far above the snow line. I also found it abundantly in Nepalese Tibet and in the dry valleys of Hundes (Chinese Tibet). The prehensores as drawn by me are different from those of *urticæ* figured by Dr. Buchanan White.



64. *VANESSA LADAKENSIS*, Moore. Near Kálápáni, Nepalese Tibet, 14,000 feet; another near Hindi, Chinese Tibet, 15,000 feet. The prehensores are quite different from those of *kaschmirensis*.

65. *VANESSA CANACE*, Linn. (*charonia*, Drury). Kumaon generally, 2,500—8,000 feet, rather scarce.

66. *GRAPTA C-ALBUM*, Linn. Kháti, N. W. Kumaon, 8,000 feet. Resembles my Mari specimens very closely.

67. *GRAPTA AGNICULA*, Moore. Pindari Glacier, 12,000 feet, Byáns valley, Eastern Kumaon, 12—15,000 feet. These species are closely allied, but I have been able to separate my own specimens by means of slight differences in the prehensores as well as by the shape and colouring. But I do not find the prehensores absolutely constant in the first three genera of this group.

68. *PYRAMEIS INDICA*, Herbst. Kumaon generally, 2,500—10,000 feet.

69. *PYRAMEIS CARDUI*, Linn. Ranging from Dhárchula (3,000 feet) to 16,000 feet on the Lepu Lek.

70. *CYRESTIS THYODAMAS*, Boisd. Kumaon generally, 2,000—8,000 feet, called the "map butterfly" by European collectors. The occasional yellowish specimens are perhaps cases of atavism, indicating descent from a red *Cyrestis*.

71. *CHERSONESIA RISA*, Doub. Káli valley, 2—3,000 feet. Kumaon specimens are lighter in colour and more delicately marked than Sikkim ones. Three of the bands below are in both sexes beautifully glossed with lilac on the hindwings and to a less extent on the forewings.

72. *SYMBRENTHIA HIPPOCLUS*, Cram. Low country and river-valleys, as far up as the Dhoaj, 6,500 feet, common. I have also found it in the Eastern Gháts of the Indian Peninsula, in the districts of Ganjam and Vizagapatam.

73. *SYMBRENTHIA HYPSELIS*, Godt. Káli valley, Eastern Kumaon, 2—4,000 feet, common.

74. *SYMBRENTHIA ASTHALA*, Moore. Pindari valley, N. W. Kumaon, 7,000 feet. The undescribed *female* differs from the male in the red markings above being paler, the apical band wider and longer, extending from the extreme costa almost to the outer margin, approaching the discoid band, remote from the lower band, having a deep sinus on its lower side and a streak given out upwardly from its outer end. Lower band of forewing broad, its upper part clavate, displaced outwardly above the lower median, discoid band irregular, heavy, its end produced below the middle median branch. Lower band of hindwing extends only to the second subcostal, with only a trace of a submarginal line beyond it. *Below*, nearly uniform orange-tawny, the base



of both wings and costa of forewing paler ochreous. The prehensores of these species are interesting. In *hypselis* the clasp seen from the side is curiously bent upwards in the form of the figure 2. In *asthala* the shape is still more bizarre, the tip bending down so as almost to form a complete circle. The base of the clasp is also more square, and the uncus more slender.

75. SYMBRENTHIA HYSUDRA, Moore. Pindari valley, N. W. Kumaon, 5—8,000 feet. The female is much like the male, but all the red markings are larger and more confluent. The prehensores are very different from those of the preceding species, the uncus having strong branches nearly as long as itself, and the clasp, seen from the side, being square-cut, with a short horizontal projection from its upper angle.

#### *Junonia*-Group.

76. JUNONIA ORITHYIA, Linn. Kumaon generally, plains to 6,000 feet.

77. JUNONIA LEMONIAS, Linn. Kumaon, plains to 6,000 ft.

78. JUNONIA CENONE, Linn. Kumaon generally, taken up to 7,000 ft.

79. JUNONIA ATLITES, Joh. (*laomedia*). Ránibágh and the Tarai, 1,000—2,000 feet, scarce.

80. JUNONIA ALMANA, Linn. The dry-season form. I have no doubt that it is conspecific with *asterie*, Linn., the wet-season form. Both are found in the Sarju and Káli valleys, 2,000—4,000 feet, and in the Tarai. The prehensores are the same in both.

81. PRECIS IPHITA, Cram. Everywhere common, as high up as Kháti, 8,000 feet. The wet-season brood consists of very pale specimens; the autumn brood, appearing at the end of September, is much darker.

82. PSEUDERGOLIS VEDA, Koll. (*wedah*). Sarju, Káli, and Gori valleys, 2,000—5,500 feet.

83. ROHANA PARYSATIS, Westw. (*parisatis*). One male, seen at Jhulaghát, eastern border of Kumaon. The genus is allied to *Precis*.

#### *Apatura*-Group.

84. APATURA (or HYPOLIMNAS) BOLINA, Linn. Tarai, 1,000 feet. Specimens from the forests of the Káli valley (2,000—4,000 feet) approach *jacintha*, Drury.

85. APATURA (or HYPOLIMNAS) MISIPPUS, Linn. Almora, 6,000 feet, Lower Gori, 2,500 feet.

86. STIBOCHIONA NICÆA, Gray, (*nicea*). Sarju, Gori, and Káli valleys, 2—5,000 feet.

87. DICHORRHAGIA NESIMACHUS, Boisd. One female in bad condition, Káli valley, near Jhulaghát, Nepál. I am not certain as to the position of this genus, never having examined the egg.



## Subfamily EURIPINÆ.

88. *SEPHISA DICHROA*, Koll. Loharkhet, N. W. Kumaon, Askot, E. Kumaon. Much darker than Kulu or Simla specimens. The black discal band across the hindwing below is especially wide, so as wholly to enclose the whitish spot between the lower medians. The veins are also heavily marked with black. At Mari, in the extreme north-west of India, I found this species with the band on the hindwings below wholly obsolete, and the underside with a whitish, silky gloss.

89. *HESTINA NAMA*, Doub. Káli, Sarju, and Gori valleys, from 2,000 almost to 6,000 feet. The outer part of the hindwing above is somewhat darker than in Sikkim specimens, and the ground-colour more distinctly greenish.

90. *EURIPUS CONSIMILIS*, Westw. Jhulaghát, East Kumaon, two females only.

## Family EURYTELIDÆ, Westwood.

91. *ERGOLIS MERIONE*, Cram. Gori and Káli valleys, 2—4,000 ft.

92. *ERGOLIS ARIADNE*, Linn. Ránibágh and the Tarai, 1,000 feet.

## Family CHARAXIDÆ.

93. *CHARAXES FABIVS*, Fabr. Ránibágh at the foot of the hills.

94. *CHARAXES (EULEPIS) ATHAMAS*, Drury. Sarju, Káli, and Gori valleys, 2—4,000 feet.

95. *CHARAXES (EULEPIS) EUDAMIPPUS*, Doub. *Seen*, Jhulaghát on the Káli, no doubt as to the species.

96. *CHARAXES (HARIDRA) LUNAWARA*, Butler. Lower Káli, rare.

97. *CHARAXES (HARIDRA) HEMANA*, Butler. Kapkot on the Sarju, perhaps the western limit of the group. Also, Gori and Káli valleys. My specimens seem to correspond well enough with Mr. Butler's figure and description, but the markings are not very constant.

## Family NYMPHALIDÆ, Swainson.

98. *SYMPHÆDRA NAIS*, Forst. Haldwáni in the Tarai, 1,000 feet.

99. *EUTHALIA DOUBLEDAIL*, Gray. Naini Tál, Ránibágh, etc., 2,000—7,000 feet. Found chiefly in the rains.

100. *EUTHALIA APIADES*, Mén., (*appiades*). Lower Gori, Jhulaghát on the Káli, 2—3,000 feet, scarce.

101. *EUTHALIA GARUDA*, Moore. Káli valley, 2—3,000 feet, scarce.

102. *EUTHALIA LUBENTINA*, Cram. Káli valley at Baghrihát, 2,500 feet, scarce.



103. *NYMPHALIS* (or *LIMENITIS*) *DANAVA*, Moore. Gori valley at Garjiaghát, rare.

104. *MODUZA* *PROCRIS*, Cram. Káli valley, 2—4,000 feet, scarce.

105. *POTAMIS* (or *APATURA*) *NAMOUNA*, Doub. Loharkhet, and Kápkot on the upper Sarju, 4—5,000 feet, scarce.

106. *ATHYMA* *PERIUS*, Linn. (*leucothoë*). Kumaon generally, 1,000—6,000 feet. Unlike the other species of *Athyma* it prefers open meadows to forests.

107. *ATHYMA* *SELENOPHORA*, Koll. Kali and Gori valleys, 2—3,000 feet.

108. *ATHYMA* *CAMA*, Moore. Almora; Eastern Kumaon generally, 2—5,000 feet, common.

109. *ATHYMA* *ZEROCA*, Moore. Gori and Káli valleys, 2—3,000 feet, varies considerably in markings.

110. *ATHYMA* *OPALINA*, Koll. Upper Himalayan region, from Naini Tal, 6,000 feet, and Askot, 4,500 feet, up to Dwáli, nearly 10,000 feet.

111. *RAHINDA* *HORDONIA*, Stoll. Ránibágh, the Tarai, and the Rám-ganga, Káli, and Gori valleys, common, 1—4,000 feet.

112. *NEPTIS* *EMODES*, Moore. Common all over Kumaon from 2,000 to 7,000 feet.

113. *NEPTIS* *VARMONA*, Moore. Káli valley, Eastern Kumaon, also Haldwáni in the Tarai, 1—3,000 feet.

114. *NEPTIS* *NANDINA*, Moore. Loharkhet, N. W. Kumaon, 5,000 feet.

115. *NEPTIS* *VIKASI*, Horsf. Sarju valley at Kápkot, 4,000 feet, rare.

116. *NEPTIS* *SOMA*, Moore. Common in the Sarju, Gori, and Káli valleys, 2—4,000 feet.

117. *NEPTIS* *SUSRUTA*, Moore. Káli valley, 2—3,000 feet.

118. *NEPTIS* *MAHENDRA*, Moore. Common, extending from the Sarju and Káli valleys at 2,000 feet, up to over 9,000 feet near Dwáli, N. W. Kumaon, and at Budhi, N. E. Kumaon. My specimens differ from those in the Indian Museum in being darker red below with all the white markings smaller.

119. *NEPTIS* *AMBA*, Moore. Káli and Sarju valleys, 2—5,000 feet. Most of my specimens are much darker than the common *amba* of the N. W. Himalayas, and are by no means fixed in type, gradually changing to *cartica*, which is therefore in my opinion only a form of this species. The allied *carticoides*, however, seems distinct.

120. *NEPTIS* *ANANTA*, Moore. Rám-ganga valley, 2,500 feet, rare.



## Suborder RHOPALOCERA HETEROPODA.

## Family LYCÆNIDÆ, Stephens.

## Subfamily AMBLYPODINÆ.

121. PANCHALA GANESA, Moore. Naini Tál, Dhánkuri, 6—8,000 feet.

122. PANCHALA RAMA, Koll. Kumaon generally, 1,000—8,000 feet. Though it belongs to a tropical group, I found it flying in great numbers on the mountain near Rámgarh (7,500 feet) in December, when the ground was powdered with snow. The males and females of *rama* are very much alike. *Dodonæa*, which I have from Mari, seems to be a distinct species.

123. IRAOTA MÆCENAS, Fabr. One male, Jhulaghát, eastern border of Kumaon; an extremely variable species wherever I have found it.

I prefer to separate this group from the next by the structure of the prehensores, the clasps of *Deudorix* being very small and immovably fixed on each side of the intromittent organ, which is not retractile; while in *Amblypodia* they are free and tolerably well developed. As for the egg, I had examined that of some twenty species of the *Amblypodia* group, including several of the genera, and found it always covered with acute spines. But in all the females of *rama* examined by me, there were two easily-distinguished forms of egg present in about equal numbers, the one with the spines acute as in *Amblypodia*, the other with them truncate as in *Deudorix*.

## Subfamily DEUDORIGINÆ.

124. VIRACHOLA ISOCRATES, Fabr. Charma valley, Eastern Kumaon, 3,000 feet.

125. DEUDORIX EPIARBAS, Moore, (*epijarbas*). Kumaon generally, 2—6,000 feet.

126. BASPA MELAMPUS, Cram. Almora, Loharkhet, Káli valley, 2—6,000 feet.

127. HYSUDRA SELIRA, Moore. Almora, Pyura, 4—6,000 feet.

128. BIDASPA NISSA, Koll. Kumaon generally, 3—7,000 feet. My specimens rarely show any trace of the red spot above, and are of a richer metallic above and a deeper rufous below than Simla specimens. The genus seems very close to *Rapala*.

129. RAPALA SCHISTACEA, Moore. Lower Rámganga and Sarju, 2—4,000 feet. Distinguished by the beautiful blue of the hindwings and the basal part of the forewings, when seen in certain lights, especially from behind.



130. *RAPALA GRISEA*, Moore. Kápkot, Bágheswar, Kháti, 3—7,000 feet. This species, which has the transverse band below broader than in *schistacea*, and the wings dull steel-blue in all lights without the brilliant cyaneous reflections of that species, has been identified by Mr. de Nicéville as *orseis*, Hew. (from Sumatra), and so named by him in his lists of the butterflies of Sikkim, Calcutta, and the Andaman Islands.

An aberrant male and female from Jhulaghát on the western border of Nepál differ in the extreme width of the transverse band below, which is very dark, and on both wings of the male, and less perfectly in the hindwing of the female, is united with the dark discocellular band. I prefer not to separate this form from *grisea*, though it is perhaps distinct.

131. *CURETIS THETIS*, Drury, (*thetys*). Káli valley, not common. Except in the outline of the wings, which is that of the typical *thetis*, my Kumaon specimens do not differ from *bulis*. The red is confined to a rather small area of the forewing, indented from above, and not reaching the hind margin.

132. *CURETIS BULIS*, Doub. Sarju, Káli, and Gori valleys, 2—5,000 feet. Male as in the preceding form, the red of the forewing occupying most of the cell, but not extending above middle median on the disc, the hind margin widely black. Female with a large white medial area on the forewing indented at the end of the cell. Hindwing with a small lunular white patch on the disc, extending to the whitish costa. It thus seems to resemble *dentata*, Moore, in colouring, but the hindwing, like the forewing, is very strongly angled. My specimens vary remarkably in size. Though the prehensores are very complicated in this genus, I have not been able to detect the slightest difference between those of the two species (?) here called *bulis* and *thetis*.

133. *LOXURA ATYMNUS*, Cram. Ránibagh and the Tarai, 1,000 feet. Of the position of this as of the preceding genus, I am still uncertain.

#### Subfamily THECLINÆ.

134. *CHERITRA ACTE*, Moore. Askot, 5,000 feet, Baghrihát, 2,500 feet, E. Kumaon, scarce.

135. *CHERITRA JAFRA*, Godt. Jhulaghát, Gori, and Káli valleys, 2—3,000 feet.

136. *SPINDASIS LOHITA*, Horsf., (*himalayanus*, Moore). Below Kápkot, 3,500 feet, scarce.

137. *SPINDASIS VULCANUS*, Fabr. Haldwáni at the foot of the hills, 1,000 feet.

138. *TAJURIA LONGINUS*, Fabr. Haldwáni at foot of hills, 1,000 ft., one male.



139. PRATAPA DEVA, Moore. Kápkot, 4,000 feet, a female. It resembles a specimen from Sikkim in the Indian Museum, being much darker than those from Kánara and the plains of Bengal, the blue on the forewing covering only the lower half of the base of the cell, paler blue from the hind margin to just above the middle median, broken by black veins, the margin broad and black. Hindwing bluish as in *deva*, but powdered with gray scales, and interrupted by black veins, and by a submarginal line of joined dark lunules, the costal border widely dark. Owing to my ignorance of the male, I am unwilling to describe the species as new.

140. REMELANA YAJNA, n. sp. Allied to *megisbia*, Hewitson. Black, the upper part of the *hindwing* glittering azure from the first subcostal to the radial, extending beyond into the cell (slightly), and almost to the costal and the upper median veins, but not approaching the apex or the costa. Anal lobe gray, touched with fulvous and bluish, a slender marginal bluish line on the lower part of the hindwing, cilia dark. *Below* rufous-brown, darker at apex. On the *hindwing* a slender transverse line of fulvous crosses the wing, almost straight to the lower median, bordered outwardly with slender lines of black and white, continued by similar lines at right angles with it from the lower median to the abdominal margin. On the *forewing* the line is chiefly white (the fulvous and black being obsolescent), slender, and sinuous, extending from the submedian almost to the costa. A broken submarginal darker line obscurely visible on both wings. Lower part of hindwing with a large area of gray extending to the upper median, bordered outwardly with white and black lines, part of abdominal margin white. Anal black spot partly bordered with fulvous and silvery lilac, a submarginal black-centred fulvous spot between the lower medians. Tails black, tipped with white, the outer more slender than the inner, and somewhat shorter. Antennæ black annulated with white, club black. Expanse  $1\frac{1}{3}$  inch.

Differs from *megisbia*, Hewitson, habitat unknown, in the ground colour of the underside, which is dull rufous-brown, that of Hewitson's species being orange (in his description) or orange-yellow (in his plate).

Two males, Garjiaghát and Baghrihát, on the Káli, 2,500—3,000 feet.

141. CHLIARIA KINA, Hewitson. Loharkhet, N. W. Kumaon, 5,000 feet. *Male*, *forewing* widely black over the apex, costa, and outer margin to the lower angle; a large whitish discal patch (greenish or bluish in different lights, just entering the cell and extending from the submedian to the upper median, and obscurely along the median basally and the submedian discally) set in the middle of an area of



bright blue, only visible in some lights, and extending to the hind margin and nearly to the costa. *Hindwing* bluish-gray over the outer disc from submedian to lower subcostal, and also on the abdominal margin basally, with three somewhat darker spots anally and subanally, of which that between the lower medians is rather distinct. Edge line black, fringe white, cell and the space between the subcostals blue in some lights as on the forewing. *Below*, whitish with a silky lustre, two dark transverse lines across end of cell of forewing, a dark discal transverse line in two parts, narrowed, and removed inwardly below the upper median. Two darker lines of joined lunules submarginally; edge line of both wings dark. *Hindwing*, a black spot near the costa basally, a double streak across end of cell, a dark transverse discal band broken into six pieces, that near the costa being nearly black, a submarginal line of streaks backed by a continuous irregular dark-gray line, a black spot surrounded with dark ochreous between the lower median branches, a smaller similar spot on the lobe.

*Female*, black, forewing with a whitish discal area most distinct between the median branches, but extending beyond, and entering the interno-median space as a pale band. Cilia white, especially at the lower angle. Disc of hindwing with a pale area cut by dark veins, a submarginal white line and an obscurely darker subanal spot near the margin. Both sexes have four tails, of which, unlike *othona*, the outer ones are much the shorter. My specimens agree with Sikkim males in Mr. de Nicéville's collection; the Sikkim female I have not seen. They are much darker than Mr. Hewitson's figures. My two males were both taken flying in a flock of the common *Cyaniris puspā*, from which I could not distinguish them till I caught them. If this is a case of mimicry, it is the first, I believe, yet observed in the *Lycænidae*.

142. *CHLIARIA OTHONA*, Hew. Lower Gori, E. Kumaon, 2,500 feet, Kápkot, N. W. Kumaon, 4,000 feet. Male beautifully glossed with dark blue on the forewing beyond the cell, seen only in certain lights. Female, the pale blue of the male, replaced by a pale gray area from the hindmargin of the forewing to the middle median. Hindwing with a similar area (without any trace of blue) extending nearly to the margin, where there is a dark subanal spot with fainter ones near it. Marginal black and white edge-lines as in male. *Below* like the male, marks somewhat paler, subanal black spot bordered narrowly with pale ochre, wings wider and more rounded than in the male.

143. *ILERDA ODA*, Hew. Naini Tal, 6,000—7,000 feet.

144. *ILERDA BRAHMA*, Moore. Naini Tal, Lohárkhet, 5—7,000 feet.

145. *ILERDA SENA*, Koll. Kumaon generally, extending up to



Budhi in Byáns (9,000 feet), and down to 3,000 feet. It frequents drier and more open ground than the other species.

146. *ILERDA TAMU*(?), Koll. Upper Sarju, Pindari, and Káli valleys, 5—9,000 feet, scarce.

147. *ILERDA CORUSCANS*, Moore. Same localities. This species is shining greenish-blue well beyond the cell, and to the hind margin of the forewing, and over the disc of the hindwing. The preceding species is merely powdered with the same colour, which does not extend on the forewing beyond the cell or to the hind-margin, and is nearly obsolete on the hindwing. As in other *Ilerda*, these species are easily distinguished by their prehensores, the clasp of *coruscans*, seen from the side, being truncate and apparently unarmed, while in *tamu*(?) it is very broad and rounded at the end, with a line of strong, bent hooks. The uncus of *tamu* seen from the side is shorter than in *coruscans*, and its branches are more bent. I name the preceding species with great doubt, being unable to distinguish between *tamu*, *androcles*, *moorei*, and *langii*. It is so difficult to describe, and so impossible to figure the colouring of an *Ilerda*, that I think it will be very hard for the student to separate the four species mentioned, except by examination of the prehensores, which ought to be figured.

148. *ILERDA EPICLES*, Godt. Eastern Kumaon, in the Káli valley, 2—4,000 feet, at Askot (5,000 feet) and the Dhoaj Mountain (6,000 feet). This genus is very close to *Chrysophanus*, the prehensores being generically the same, though each species has its characteristic form.

149. *CHRYSOPHANUS TIMEUS*, Cram. (*timeus*). Naini Tál, 6—7,000 feet, above Garbyan, and at Kálápáni, N. E. Kumaon, 11—15,000 feet. Comparing the prehensores of my specimens with those figured by Dr. White, I should suppose the species distinct from the European *phlæas* (*phlœax*?).

150. *CHRYSOPHANUS PAVANA*, Kollar. Kumaon generally, 4,500—13,000, local.

151. *SURENDRA QUERCETORUM*, Moore. Bágheswar, Lower Rám-ganga, Gori, and Káli valleys, 2—4,000 feet. The egg clearly shows that the genus is near *Thecla* and remote from *Amblypodia*.

152. *THECLA* (or *ZEPHYRUS*) *BIRUPA*, Moore. Outer Himalayas, Pyura and Rámgarh, 4,000—7,000 feet.

153. *THECLA SYLA*, Koll. Dhánkuri, 9—11,000 feet, N. W. Kumaon.

154. *THECLA ICANA*, Moore. Dhánkuri, 9—11,000 feet, N. W. Kumaon, also in Chaudáns in N. E. Kumaon.

155. *THECLA MANDARA*, n. sp. Allied to *icana*, but whereas that species is metallic over the disc of the hindwing and most of the



forewing, interrupted by black veins, and appears green in some lights and violet in others, this species is only touched with obscure violet close to the base of the forewing: the disc has a faint lustre, as if greasy. *Below* more rufous than *icana*; the transverse discal line extends to the lower median, slightly bent inwards at its lower end; the discal band of the hindwing is straight, the submarginal band rounded: both are tinged with reddish. A blurred, obsolescent ocellus of black and reddish anally and subanally. Outer margin of the forewing strongly convex, sinuous, outer margin of hindwing not scalloped, abdominal marginal not excavated, but straight or slightly convex. The prehensores, though generally resembling those of *icana*, are quite distinct. Both are distinguished from *syla* and *birupa* by the uncus seen from the side being divided horizontally. In *icana* the upper lobe is slender, bent downwards, and projects beyond the lower. In this species the upper lobe is straight, and shorter than the long and massive lower lobe. The clasp (which in both species tapers obliquely upwards) here ends in a blunt, almost vertical point, while in *icana* it ends in a sharp horizontal beak. The uncus in *birupa* and *syla* is very different, being broad and entire, when viewed from the side.

There is an allied species undescribed in the Indian Museum, collected by Mr. de Nicéville in the Jalauri Pass, N. W. Himálayas. It is distinctly violet above in all lights and has a silver-white line across the hindwing below.

#### Subfamily GERYDINÆ.

156. ALLOTINUS MULTISTRIGATUS, de Nicéville. Two females, Askot, 5,000 feet, E. Kumaon. I also found it common at Dimagiri and Barakhal in the Chittagong Hill Tracts, and on Sirtai Mountain in the Lushai country. I wrote a description of it last September, but on my return to Calcutta found that Mr. de Nicéville had anticipated me, giving it the name of *Gerydus multistrigatus*. It is not, however, a *Gerydus*, the tarsi being cylindrical, the first joint nearly twice as long as all the others combined. The egg is extremely flat, strongly bicarinate at the side, more than three times as wide as high, with the sculpturing all but obliterated above. The third subcostal branch is given off opposite the end of the cell, for which reason I put it in the genus *Allotinus*. Of the other Indian species of the *Gerydinæ*, *drumila* is very much like *multistrigatus*; it likewise has the legs cylindrical, but the third subcostal is emitted a little beyond the end of the cell. It has been found in Sikkim, Cachar, and the Lushai country. *Paragerydus horsfieldii*, and another allied species entirely black above, occur abundantly in Arakan and the Chittagong Hill Tracts, north of which they



have not yet been observed. The egg is not quite so flat as in *multistrigatus*, and there is no trace of carination: it is beautifully reticulate above. *Hamada*, Druce, described from Japan, is found in Sikkim, Cachar, and the Chittagong Hill Tracts; it is very unlike any other member of this group, if indeed it belongs to it at all. From the structure of the prehensores I should rather place it among the *Lycæninæ*. The legs are short and thick, the wings broad and rounded, the third subcostal originates before the end of the cell. I did not succeed in examining its egg. Another species of this subfamily I found abundantly in the Chittagong Hill Tracts. Sikkim specimens of it have been identified by Mr. Moore with *boisduvalii* from Java. It is the only true *Gerydus* yet known from India. All the *Gerydinæ* which I have examined are distinguished by the extraordinarily flattened egg, and by the curious structure of the prehensores, the clasps being very long, broad, thin and plate-like, somewhat resembling the "valves" of the *Papilionidæ*. It is my impression that the egg of *Catapœcilma* (*Catapœcilma*, Butler) *elegans*, Druce, is intermediate in character between those of the *Deudorix* and *Gerydus* groups.

#### Subfamily PORITINÆ.

157. *PORITIA HEWITSONI*, Moore. A male and a female, Káli valley at Garjiaghát.

#### Subfamily LYCÆNINÆ.

158. *EVERES DIPORA*, Moore. Everywhere from 1,000 to 10,000 feet. The red area on the hindwing below is variable. The female is dark brown above. The male is indistinguishable from *parrhasius*.

159. *TARUCUS THEOPHRASTUS*, Fabr. Haldwáni at the foot of the hills.

160. *TARUCUS VENOSUS*, Moore. Bágheswar, Sarju valley, common; also in the Káli valley, 2,000—4,000 feet.

161. ———? *PLINIUS*, Fabr. Jhulaghát, Káli valley, 2,000 feet. The structure of the costal and sub-costal veins of the forewing shows that this species does not belong to Mr. Moore's genus *Tarucus*. It is perhaps allied to the next group.

162. *AZANUS UBALDUS*, Cram. Ránibágh and Haldwáni at the foot of the hills, Jhulaghát in the Káli valley, 2,000 feet.

163. *AZANUS GAMRA*, Lederer, (*crameri*, Moore). Haldwáni, scarce.

164. *POLYOMMATUS BÆTICUS*, Linn. Kumaon generally, up to Budhi, 9,000 feet.

165. *LAMPIDES ÆLIANUS*, Fabr. Ránibágh, at the foot of the hills; Sarju and Káli valleys, 2—4,000 feet, scarce.



166. *CHILADES LAIUS*, Cramer, (*varunana*, Moore). Haldwáni at the foot of the hills.

167. *CHILADES PUTLI*, Koll. Everywhere up to 7,000 feet.

168. *CASTALIUS ROSIMON*, Fabr. Jhulaghát, 2,000 feet.

169. *CATOCORYSOPS STRABO*, Fabr. Lower Gori valley, also at Ránibágh, 1—3,000 feet.

170. *CATOCORYSOPS CNEIUS*, Fabr. (*cnejus*). Kumaon generally up to 10,000 feet (Dhánkuri).

171. *CATOCORYSOPS PANDAVA*, Horsf. Ránibágh, Sarju valley, 1—4,000 feet.

172. *NACADUBA DANA*, de Nicéville. Kumaon and the plains, up to 5,000 feet, not so common as *ardates*. It is quite different from the tailless *ardates* of Orissa, the hindwing being broad and truncate.

173. *NACADUBA CÆLESTIS*, de Nicéville. One male, Jhulaghát, 2,000 feet.

174. *NACADUBA ARDATES*, Moore. Kumaon generally up to 5,000 feet, common. The tailless form, which in Orissa and the Eastern and Western Gháts is almost as common as the tailed, apparently does not occur in Kumaon.

An aberrant male, Ránibágh. The transverse discal band of the underside is extremely broad on both wings, united with the discocellular streak. This aberration occurs in many *Lycænidae*. I have a remarkable example of it in a specimen of *Nacaduba prominens* from Bassein, Burma, and in one or two specimens of *Zizera maha* and *Z. sangra*, in which the discal spots are all very elongate below. Similar though much rarer variations occurs in the *Argynnis* and *Cynthia* groups of the *Apaturidae*, of which I have an example in an *Atella*. One or two species have been based on these curious monstrosities.

175. *ZIZERA PYGMÆA*, Snellen. Ránibágh, 1,000 feet.

176. *ZIZERA SANGRA*, Moore. Ránibágh, Jhulaghát, 1,000—2,000 feet.

177. *ZIZERA MAHA*, Koll. Kumaon generally from the plains up to 9,000 feet.

178. *ZIZERA KARSANDRA*, Moore. Ránibágh, Bágheswar, 1,000—4,000 feet.

179. *LYCÆNA ARIANA*, Moore. Naini Tál, 4,000—8,000 feet.

180. *LYCÆNA ASTRARCHE*, Bgstr. (*nazira*, Moore). Naini Tál, Dhánkuri, 6,000—10,000 feet.

181. *CYANIRIS CÆLESTINA*, Koll. Naini Tál, Jágheswar, 6—8,000 feet.

182. *CYANIRIS HUEGELII*, Moore. All Kumaon as low as Bágheswar 3,500 feet, as high as Garbyán, 12,000 feet.



183. *CYANIRIS DILECTUS*, Moore. Kháti, N. W. Kumaon, 7,000 feet, Toli and Garjiaghát, East Kumaon, 2—3,000 feet scarce. My specimens are very small.

184. *CYANIRIS ALBOCÆRULEUS*, Moore. Kháti, N. W. Kumaon, 7,000 feet, rare.

185. *CYANIRIS VARDHANA*, Moore. Jágheswar, 7,500 feet, rare.

186. *CYANIRIS MARGINATA*, de Nicéville. Dhánkuri, Kháti, 7—10,000 feet. *Female*. Both wings chiefly black, *forewing* with the white area larger and clearer than in the male, extending from the lower median to the lower radial, and into the end of the cell, where it is indented from above. Extreme base of *forewing* from cell to hind margin dull greenish-blue. Hindwing with a subapical white patch over three spaces, a black spot between the upper median and the radial, sometimes a streak across the end of the cell, a line of obscure whitish submarginal lunules. Part of the disc between the white area and the abdominal margin dull bluish. Below like the male.

187. *CYANIRIS PUSPA*, Horsf. Kumaon generally, up to 7,000 feet, down to 2,000 feet. All these species except the first two, are easily distinguished both by their colouring and marking and by the shape of their prehensores.

188. *PITHECOPS ZALMORA*, Butler. Jhulaghát, Káli valley, 2,000 feet.

189. *PATHALIA MALAYA*, Horsf. (*albidisca*, Moore). Ránibágh, Bágheswar, Kápkot, Jhulaghát, Dhárchula, 1,000—5,000 feet. All my Kumaon specimens, as well as those taken by me in Burma and Chittagong, are tailed, while in Orissa, Ceylon, and the Eastern and Western Gháts, their place seems to be taken by a tailless form. Of this last, those from Ceylon and the Western Gháts are apparently *Megisba thwaitesii*, but those from Orissa and the Eastern Gháts seem to me identical with *malaya* except in the absence of the tail. The occurrence likewise of the tailless form of *Nacaduba ardates* in those districts is worthy of remark.

#### Family ERYCINIDÆ, Swainson.

##### Subfamily NEMEOBINÆ, Bates.

190. *DODONA DURGA*, Koll. Kumaon generally, 2,500 to 8,000 feet.

191. *DODONA EUGENES*, Bates. Naini Tál, 6—7,000 feet, Loharkhet, 5,000 feet, not common.

192. *ABISARA SUFFUSA*, Moore. Ránibágh 1,000 feet; also at Askot and in the Káli valley, 2,000—5,000 feet.

193. *ABISARA FYLLA*, Hew. Askot, the Dhoaj, Eastern Kumaon, 4—7,000 feet.

194. *ZEMEROS PHLEGYAS*, Cram. (*flegyas*). Askot and the lower Káli, Eastern Kumaon, 2—5,000 feet.



## Family LIBYTHEIDÆ, Westwood.

195. LIBYTHEA MYRRHA, Godt. Kumaon generally from the Tarai up to 4,000 feet.

196. LIBYTHEA LEPITA, Moore. Almora, Naini Tál, Kháti, Chaudáns, 5—8,000 feet. The prehensores are quite different from those of *myrrha*, from which species it seems perfectly distinct.

## Suborder RHOPALOCERA HEXAPODA, Constant Bar.

## Family PIERIDÆ, Duponchel.

197. TERIAS VENATA, Moore. Bágheswar, Askot, 3—5,000 feet. Felder describes a form of this species under the name of *santana* from Káladungi at the foot of the Kumaon Himalayas.

198. TERIAS DRONA, Horsf. Bágheswar, Almora, Naini Tál, 3—6,000 feet.

199. TERIAS HECABE, Linn. Everywhere up to 8,000 feet, occasionally higher. Many varieties, but none seem even locally constant.

200. TERIAS LÆTA, Boisd. Eastern Kumaon, Askot, Gori, and Káli valleys up to Dhárchula, 2—5,000 feet.

201. GANORIS (or MANCIPIUM) CANIDIA, Sparrm. Hills generally, 2,000—11,000 feet, from the Káli valley at Jhulaghát up to Garbyán in Byáns.

202. GANORIS AJAKA, Moore. Naini Tál, Dhánkuri, Kháti, Dwáli, 6,000—11,000 feet.

203. APORIA SORACTE, Moore, (*soracta*). Pindari valley, 9,000 feet, scarce.

204. SYNCHLOE CALLIDICE, Esp. Two males, Pindari Glacier, 12,000 feet.

205. BELENOIS MESENTINA, Cram. Ránibágh, 1,000 feet.

206. HUPHINA NERISSA, Fabr. Haldwáni at the foot of the hills.

207. DELIAS EUCHARIS, Drury. Almora, Ránibágh, 1—5,000 feet.

208. DELIAS BELLADONNA, Fabr. Sarju, Káli, and Gori valleys, 2—5,000 feet. If Mr. Butler's distinctions are to be followed, my specimens belong to *horsfieldii*, Gray, described from Nepál.

209. NEPHERONIA GÆA, Felder. Naini Tál, Bhim Tál, 2—6,000 feet.

210. CATOPSILIA CATILLA, Cram. Bágheswar, Tákula, Káli valley, 1—6,000 feet.

211. CATOPSILIA CROCALE, Cram. Bágheswar, Ránibágh, 1—4,000 feet.

212. CATOPSILIA PYRANTHE, Linn. Bágheswar, Káli valley up to Dhárchula, 2—4,000 feet.



213. CATOPSILIA GNOMA, Fabr. Haldwáni at the foot of the hills.

214. GONEPTERYX ZANEKA, Moore. Naini Tál, Lohughát, 6—8,000 feet.

215. GONEPTERYX RHAMNI, Linn. (*nepalensis*, Doub.) Kumaon generally, 3,000—8,000 feet. The Kumaon form does not seem to me distinct from the European. I did not find *carnipennis*, a species recently described by Mr. Butler from the Káli valley.

216. COLIAS FIELDII, Mén. Kumaon generally above 6,000 feet. One taken at Garjiaghát on the Gori, 2,500 feet, others as high as 16,500 feet, near Tárá, on the Chinese border.

217. COLIAS HYALE, Linn. Lohughát in Káli Kumaon, 7,000 feet.

218. IXIAS PIRENE, Linn. (*pyrene*). Káli valley, 2—3,000 feet.

219. IXIAS MARIANNE, Cram. Haldwáni at the foot of the hills.

#### Family PAPILIONIDÆ, Leach.

##### Subfamily PARNASSINÆ.

220. PARNASSIUS JACQUEMONTII, Boisd. Pála, Jhidikhár, and Tág-lakhár, Chinese Tibet, 13,000—16,000 feet.

221. PARNASSIUS HARDWICKII, Gray. Bireg Mountain and the Pindari valley, N. W. Kumaon, Byáns valley N. E. Kumaon, 10,000—15,000 feet.

##### Subfamily PAPILIONINÆ, Swainson.

222. PAPILIO MACHAON, Linn. (variety *asiaticus*, Mén.). Common from 2,000 feet in the Sarju and Káli valleys up to 14,000 feet in Byáns and 12,500 feet in the Pindari valley.

223. PAPILIO (DALCHINA) CLOANTHUS, West. Kháti, Loharkhet, Lower Rámghanga, 2—7,000 feet.

224. PAPILIO (DALCHINA) SARPEDON, Linn. Sarju, Rámghanga, Gori, and Káli valleys 2—5,000 feet.

225. PAPILIO (ZETIDES) AXION?, Felder. One battered male, Askot, E. Kumaon, 5,000 feet.

226. PAPILIO (ZETIDES) AGAMEMNON, Linn. Lower Gori, 2,500 feet, scarce.

227. PAPILIO (SARBARIA) POLYCTOR, Boisd. Almora, Sarju, and Rámghanga valleys, 2—5,000 feet.

228. PAPILIO (ACHILLIDES) PARIS, Linn. Káli valley, 2—3,000 feet. The metallic area on the hindwing of all my specimens is blue rather than green.

229. PAPILIO (BYASA) PHILOXENUS, Gray. Pindari valley, 7,000 feet, scarce.



230. *PAPILIO* (*MENELAIDES*) *ARISTOLOCHIAE*, Fabr. Ránibágh and Haldwáni at the foot of the hills.

231. *PAPILIO* (*ORPHEIDES*) *ERITHONIUS*, Cram. Ránibagh, Bágheswar, 1—4,000 feet; generally replaced by *machaon* except in the Bhábar and the outer hills.

232. *PAPILIO* (*SAINIA*) *PROTENOR*, Cram. Kumaon generally, 2—6,000 feet, though never very common.

233. *PAPILIO* (*LAERTIAS*) *POLITES*, Linn. (*polytes*, or *pammon*). Kumaon generally, 1,000—6,000 feet, common.

234. *PAPILIO* (*CHILASA*) *DISSIMILIS*, Linn. Káli valley at Jhulaghat and Baghrihát, 2—3,000 feet, scarce.

235. *PAPILIO* (*CHILASA*) *PANOPE*, Linn. Káli valley at Jhulaghat, 2,000 feet, scarce.

236. *PAPILIO* (*CHARUS*) *HELENUS*, Linn. Káli valley, Dwálisera, 2,000 feet, scarce.

#### Family *HESPERIADÆ*, Leach.

##### Subfamily *HESPERINÆ*.

237. *HESPERIA* (or *PYRGUS*) *GALBA*, Fab. Bágheswar, Balwakot, Dhárchula, 2—4,000 feet.

238. *HESPERIA* *KASHMIRENSIS*, Moore. One male, Garbyán, N. E. Kumaon, 12,000 feet.

##### Subfamily *SUASTINÆ*.

239. *BADAMIA* *EXCLAMATIONIS*, Fabr. Near Bhim Tál, Outer Range, 3,000 feet.

240. *CHOASPES* *BENJAMINI*, Guér. Lower Sarju valley, 2,000 feet. I am not sure of the position of this genus and the preceding one.

241. *SUASTUS* *TOONA*, Moore. Lower Gori, 2,500 feet.

242. *SUASTUS* *ELTOLA*, Hew. Gori, Káli, and Sarju valleys, 2—5,000 feet, common and variable.

243. *SUASTUS* *GREMIUS*, Fabr. Askot, E. Kumaon, 5,000 feet.

244. *HYAROTIS* *ADRASTUS*, Cram. Lower Gori, 2,500 feet, Tákula, 5,000 feet, scarce.

245. *TAGIADES* *ATTICUS*, Fabr. (*menaka*, Moore). Sarju, Káli, Gori valleys, 2—4,000 feet.

246. *SARANGESA* *PURENDRA*, Moore. Naini Tál, 4,000 feet, Almora, 5,000 feet.

247. *SARANGESA* *DASAHARA*, Moore, Gori and Káli valleys, 2—4,000 feet.

248. *SATARUPA* *SAMBARA*, Moore. Bágheswar, Tákula, Lower Gori, 2—5,000 feet.



249. *ABARATHA SARAYA*, n. sp. One male, Bágheswar on the Sarju (the Sarayu or Saraya of the Sanskrit poets), 3,500 feet.

Agrees with Mr. Moore's description of the genus *Abaratha* except that the apex of the forewing is not acute but right-angled, that of the hindwing decidedly rounded. The outer margin of the hindwing is also more scalloped, and less irregularly angulate. *Above*, fuscous with the following tawny-ochreous marks: a line of streaks just within the margin; a line of square spots from the costa to the upper median branch, continued to the hind margin by a series of larger and more irregular blurs, removed further from the outer margin; a dull area just beyond the cell, from costa to the middle median; three large irregular spots occupying the middle of the cell, and the two spaces below between the submedian and the middle median. Also the following translucent spots; five apical ones, the upper three elongate and approximate; one at the end of the cell, almost bifid, with a dot on the costa above it; four on the disc from the submedian to the upper median, the second from above largest of all and adjoining that at the end of the cell. Also one in the cell near the base. All these are surrounded by blackish rings above and below. A blackish marginal line; cilia long, alternately black and whitish. *Hindwing* rusty ochreous, with a marginal dark line, and a discal, a cellular and a sub-marginal row of dusky spots, but no translucent ones. *Below* paler ochreous, without any rufous tinge, the translucent spots set in small blackish patches, a submarginal line of joined dusky spots, and a dark streak near the base from the submedian to the median veins. *Hindwing* with a black transverse streak at the end of the cell, a fainter one nearer the base of the cell, and a circle of large and conspicuous black spots, nine in all, round the disc, whereof two are between the costal and the subcostal, and two between the median and the submedian veins; whitish hairs at the extreme base. Body dull ferruginous above, whitish below. Female unknown.

Differs from *ransonnetii*, Felder, its nearest ally, in the absence of all white on the disc below. In colouring it is somewhat intermediate between *ransonnetii* and the curious *Abaratha agama* of Sikkim, which seems to mimic *Argynnis issæa*.

250. *ANTIGONUS ANGULATUS*, Feld. Lower Sarju valley, 2—3,000 feet.

251. *HALPE SEPARATA*, Moore. Kháti and Dwáli, Pindari valley, 7—9,000 feet. The female differs from the male in the larger size and squarer shape of the apical and cellular translucent spots. In the male the outer discal spot is sometimes wanting.

252. *ISOTEINON MASURIENSIS*, Moore. Lohárkhet, N. W. Kumaon, 7,000 feet.



253. ISOTEINON SATWA, de Nicéville. Jhulaghát, Káli valley, rare.

254. COLADENIA DAN, Fab. (*fatih*, Koll.). Gori and Káli valleys, 2—5,000 feet.

255. COLADENIA DHANADA, Moore. Káli valley 2—5,000 feet. I am neither sure that these two species belong to the same genus, nor that either of them (or the two species of *Isoteinon* above named) should be placed in this subfamily, which includes many of the larger Indian *Hesperiadæ*, and especially those of the *Ismene* group.

#### Subfamily BAORINÆ.

##### *Cyclopides* Group.

256. CYCLOPIDES SUBVITTATUS, Moore. Sarju valley 3—6,000 feet, Kali 2,500 feet.

257. ? PLESIONEURA SUMITRA, Moore. Pindari valley, 7—9,000 feet, Chaudáns, 7,000 feet.

258. ? PLESIONEURA PULOMAYA, Moore. Pindari valley, 7—9,000 feet. I have taken specimens transitional between this species and the last, and think it probable that the two are not specifically distinct.

259. ? PLESIONEURA LEUCOCERA, Koll. Sarju and Káli valleys, 2—5,000 feet. Some of my specimens seem somewhat transitional to *munda*, Moore, from the North West Himalayas, the spots of the hindwing being evanescent. My females have the antennæ entirely dark.

##### *Baoris* Group. (*Astyci*, Huebner, apud Scudder.)

260. PLESIONEURA CURVIFASCIA, Felder, (*alysos*, Moore). Bágheswar, 3,500 feet.

261. UDASPES FOLUS, Cram. Sarju and Káli valleys, 2—4,000 feet.

262. PARNARA ASSAMENSIS, Wood-Mason and de Nicéville. Gori and Káli valleys, 2—4,000 feet.

263. PARNARA BADA, Moore. Bágheswar, 3,500 feet.

264. CHAPRA KARSANA, Moore. Loháarkhet, 5,000 feet.

265. CHAPRA MATHIAS, Moore. River-valleys 2,000—4,000 feet.

266. CHAPRA PROMINENS, Moore. Lower Rámanga, 2,500 feet.

267. THANAOS STIGMATA, Moore. Bágheswar, Balwakot, 2—4,000 feet. Varies considerably.

268. TARACTROCERA SAGARA, Moore. Bágheswar, Dhárchula, common, 2—4,000 feet.

269. TELICOTA BAMBUSÆ, Moore. Káli and Gori valleys, 2—4,000 feet.

270. PADRAONA DARA, Moore. River valleys, 1—4,000 feet, common.

271. PADRAONA MÆSOIDES, Butler. Ditto. Differs from the preceding chiefly in the rich, dark tawny-ochreous colour of the underside, *dara*



being greenish-yellow set with dark scales. The markings are almost exactly alike. The prehensores are singularly different: Seen from above, the uncus of *dara* is gradually acuminate, that of *mæsoïdes* abruptly truncate and slightly bilobed; seen from the side the uncus of *dara* is slender, tapering and pointed at the tip, that of *mæsoïdes*, which is surmounted by a prominent tuft of hairs, is blunt and rounded at the tip; the clasp of *dara* is much more slender than in *mæsoïdes*, and its terminal hook much more produced and bent.

The prehensores of the *Hesperiadæ* are by no means so constant as those of other butterflies, and are lacking in *generic* characteristics. Nevertheless, their study seems to me absolutely necessary to any clear understanding of the species.

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VI.—*On a second Species of Uredine affecting Abies smithiana, Forbes.*

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[Received Jan. 8th;—Read Feb. 3rd, 1886.]

(With Plates IV. & V.)

The Himalayan spruce-fir (*Abies smithiana*, Forbes) harbours yet another uredine. This tree, as I have already mentioned in a former paper,\* is not common in Simla, though very common at slightly higher elevations a few miles beyond the station. A few, however, do occur in the station, and on three of them this second species of uredine was found. Two of these grow in the garden of a house towards the western side of the station, and were most probably planted there for ornamental purposes, whilst the third grows in an open, though preserved, forest on "Jakko," a peak towards its eastern end about two miles as the crow flies from the first mentioned locality. I noticed the parasite for the first time early in July when it was in all cases fully mature.

The abnormal appearances caused by the growth of this fungus differ very widely from those already described as characteristic of infection by the first described species. The whole tree is generally besprinkled with the fungus, and it is then conspicuous by the amount of yellow discoloration occasioned. In this affection also the youngest shoots only are attacked, not one of the needles of the preceding year's growth being involved. A marked difference, however, in

\* *Supra*, p. 1.