DANAIDAE, SATYRIDAE, RAGADIDAE, ELYMNIADAE

BY

M. C. PIEPERS AND P. C. T. SNELLEN

WITH THE COLLABORATION OF H. FRUHSTORFER

WITH 8 COLOURED PLATES

THE HAGUE
MARTINUS NIJHOFF
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THE

RHOPALOCERA OF JAVA

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INTRODUCTION.

Whilst I was engaged in the preparation of this, the third volume of my monograph of the Rhopalocera of Java, my collaborator P. C. T. Snellen died. The systematic portion of this work, however, had already been completed by him, so that its continuation need not, therefore, be interrupted on that account. On the other hand I shall surely miss the aid of his extensive knowledge of the Malayan lepidoptera.

Before proceeding to a general discussion of the Rhopalocera, now to be considered, in the manner followed in the two previous volumes I deem it necessary to point out that for comparison I have been able to avail myself of the work of Prof. Dr. Seitz "*Die Gross-Schmetterlinge der Erde*" in which the Malayo-Australian Danaidae and Satyridae have already been dealt with by my collaborator H. Fruhstorfer. For although this book, intended chiefly for identification, differs totally in character from mine, this does not prevent it from being very useful for my work. I do not, indeed, agree in every respect with its contents, especially as regards the practice of basing a subspecies on every slight difference in colour or form of wing in butterflies of the same species and to apply to such forms distinct names. This method of procedure is at present much in vogue in the domain of entomology and since I do not follow this fashion kind critics have pretty clearly expressed the opinion that as I pay so little attention to local forms I do not, evidently, keep in touch with the prevalent attitude in this science. The matter, however, is this that this attitude I conceive to be a fashion or an expression of exaggerated speculation rather than a serious contribution to science. Where real local forms occur these do not escape my attention, but a slight difference of colour, even when it occurs in different localities, does not, in a scientific sense, merit the name of local form. It is a case of an opinion based on false premises which, in its practical expression, has been subjected to much exaggeration and has, consequently, degenerated into mere speculation. The attitude assumed in this connection is that the form, and especially the colour pattern of the butterflies, originate, chiefly if not entirely, through the influence of the environment and become modified also in connection with it. The nature of this influence — cold or heat, drought or moisture, light or food, or anything else — is in no way thoroughly investigated but is left to the fruitful source of the imagination. It is true much stress is laid, in this connection, on the results obtained from experiments in which pupae of European Rhopalocera have been subjected artificially to varying degrees of cold and heat, but conceived in a very superficial manner and interpreted without knowledge of the phenomenon of colour evolution, indeed without really grasping the evolutional nature of the morphological changes; these results, consequently, as I have already explained in detail else-where, are altogether wrongly understood; in reality the said erroneous opinion can find no support in them. Although all these factors may now and again exercise some influence on the form and colour of butterflies, as will be considered presently, by far the principal factor in this respect is their hereditary morphological evolution and, therefore, as regards the colour, the process of colour evolution. The numerous small differences in individuals of the same species only represent so many different stages in this evolution which, of course, in individuals living in isolated localities, may occur somewhat more strongly developed but without this being the actual result of the difference of locality. In an article by Krapotkin in the *Nineteenth Century* for September 1901, entitled *Recent Science*, I find it stated that from a quantity of land snails collected by Gulick on a mountainous island of the Sandwich Archipelago it was shown that each valley possesses a peculiar form of these mollusca with many varieties, and that according to the opinion of Hyatt, who investigated this collection, this proves conclusively that all these forms cannot possibly have been caused by the climate since this is the same in all these valleys. To attribute it to difference of locality is neither to be thought of. Between individuals of one species of one butterflies living together on the same island, several instances of which I have already indicated amongst the Pieridae of Java, such differences occur likewise; differences between the sexes are even very common, known as sexual dimorphism although in reality having no relation to difference in sex as such; on the other hand the same stage of evolution may be attained simultaneously by individuals living in different regions and give rise to the same forms. The expression "local form", therefore, in itself is not altogether correct and if it is desired to attach to this the scientific meaning of forms caused principally through local influences it is not applicable to the differences in question. To designate these as subspecies for that reason only cannot, therefore, be justified and the creation of all the special designations is, consequently, usually superfluous. In some cases where species whose different forms must of necessity be distinguished, as for instance with regard to the polymorphism in PAP. MEMNON L., a trinomial system may certainly be of use even for indicating forms which are not subspecies. But this is simply a question of practical utility; if interpreted generally, however, according to the present fashion — when, for instance, seperate names are assigned to the numerous forms of ZYGAENA and PARNASSIUS — it is made to appear as if a matter of scientific importance were involved whereas, in fact, only confusion is occasioned. There are already sufficient names.

For this reason I do not desire to keep in touch with this so-called prevalent attitude of entomology. Quite recently — in *Entom. Mitteilungen, I, 6* — Prof. C. EMERY, of Bologna, has protested against this pseudo-nomenclature which simply occasions confusion.

Although in working out the Rhopalocera of Java in connection with the systematic division followed by the late Mr. SNELLEN, the Danaidae, Satyridae, Ragadidae, and Elymniadae have been regarded as so many separate families, I would, however, in accordance with later views in this respect, include the latter two in the Satyridae, in so far as it concerns my general discussion in this introduction and, therefore, take into account only two groups, that of the Danaidae and that of the Satyridae. Both these belong to those Rhopalocera which BOISDUVAL assigned to the group *suspensi* and are, therefore, fairly distinct from his group *succincti*; this is especially manifest in the earlier stages, not only with regard to the pupae, to which these designations have reference, but also to the larvae. The larvae of the Malayo-Australian Danaidae at least — those of the African and American forms I am not sufficiently acquainted with — are characterized by the possession of shorter or longer fleshy processes, such as do not occur in the larvae of the Papilionidae and Pieridae or of the Hesperidae. It is true the most ancient forms of larvae in the genus PAPILIO, especially the ORNITHOPTERA, do possess fleshy processes but of a totally different character, being straight and rather stiff in appearance, and not in any way capable of voluntary movement as, to a certain extent, is the case in the larvae of Danaidae, evidently as a vestige of a former, much more mobile, condition. In the larvae of Satyridae spiny processes occur at the head and tail, while in those of Nymphalidae similar processes are found in various shapes on other parts, of the body but in the larvae of the families of *succincti* no trace of them can be observed. A close relationship between these two large groups, which, based simply on the venation of the wings, has been postulated some time or other, does not, therefore, actually exist.

As regards the group of Danaidae, this is of purely tropical origin; the few species which occur outside the tropics have, indeed, both in the old and the new world, spread to the north and the south but their home is, nevertheless, in the tropics; the tendency of spreading outside their centre of origin is, indeed, not at all rare in this group; one of the greatest migrators amongst the Rhopalocera — Danais, (or Anosia) Plexippus, L. — even belongs to it. The tropical origin at times manifests itself very stronghly in such colonisers. Danais Chrysippus, L. has spread, not only over Africa, and a part of Asia as well as over nearly the whole of the Malayo-Australian faunal region, but has also established itself in the extreme south of Europe, in Greece; but, whereas, in the tropics it occurs annually in several generations, in Greece it has only one and occurs there in the imago state only in August, i. e. the warmest season of the summer. In the tropics the Danaidae are, however, numerous in the Malayo-Australian as well as in the Ethiopian and the Neotropical regions; evidently, therefore, the Danaidae must have originated under a tropical climate in the southern hemisphere and must have spread east and west by means of former land connections; an adaptation to life in the northern and southern non-tropical districts, however, has occurred in only a few species. A very ancient separation has, presumably, led to the independent existence of the group now found over the whole of South America where, during a very long period, it has, evidently, developed independently to such an extent that at present it is scarcely considered to belong to the same family but has been raised to a separate group under the title of Neotropidae. Nevertheless, some features of the most ancient Danaidae appear to have been better preserved in this group than is the case with its allies in the old world, for in the Malay Archipelago some small butterflies occur possessing these same features and which for that reason have to be classed with the group Neotropidae although their home is situate in the region of the Danaidae proper. This can scarcely be explained otherwise than by regarding them as relics of the original form which have experienced little or no change and therefore agree to that extent with the group separated at a remote age and now restricted to South America, in which likewise some of the original features have been retained. In America, on the other hand, Danaidae are found in the genera Lycorea and Ituna, which must have arrived at a more recent period when the peculiar type of Danaidae had already become developed in the old world, by land connections then in existence, probably from Africa, and even some Danaidae belonging entirely to one of the Malayo-Australian forms. To the latter, for instance, belongs the great traveller Danais (Anosia) Plexippus L.

In the course of ages land connections have presumably existed repeatedly between South America and Africa and it is very remarkable, therefore, how the presence in America of butterflies of the Danaid type belonging to different groups indicates different periods of migration which becomes explicable only through the repeated existence of such land connections at different periods. The oldest of these connections existed presumably at that period when the continents of America, Africa and Indo-Australia, now terminating southwards in apices, were connected with the antarctic continent and with each other consequently, during a tropical climate, a fairly remote period, but during which the original Danaidae may well have been in existence. The two later connections may well be presumed to have existed between West Africa and South America. That the Danaidae have spread from the old world to America, and not *vice versa*, appears from the circumstance that not only the Neotropidae but likewise the others in America have acquired mostly the peculiar elongated American form of wings, so characteristic of the Heliconidae, but which the Danaidae of the old world do not possess, a phenomenon occurring also in butterflies of other orders, as for instance the Pieridae, Acraeidae, and Nymphalidae, and in such a manner that this process in these has not advanced to the same extent and some Pieridae are very clearly in a period of transition in this respect. This reveals, indeed, a process of change, gradually continuous and, consequently, where this has already been completed, initiated long ago which, therefore, must point likewise to the existence of an ancient land connection, although of a more recent date than that from which the Neotropidae resulted. But some species of Danaidae occurring also in America, as has already been stated, have all retained the form of wing of the old world, as for instance Danais (Anosia) Plexippus L. a fact which appears to indicate that they must have been subjected for a relatively short period to the influences, to be discussed more fully presently, which cause the form of wing in America to change. This can only be understood on the assumption of another later migration and, therefore, of a still later land connection in more recent times. For the existence of these land connections moreover, there is much probability on geological grounds.

A great tendency, or rather, adaptability for migrating evidently exists in this family. One species, Danais (Anosia) Plexippus L., already referred to, which, like Vanessa Cardui L. in Europe, migrates in large swarms, so-called, has, like the latter, spread over a large portion of the world. In a similar manner it is evidently carried off at times by air currents to which it can offer no resistance and thus travels occasionally eastwards across the whole width of the Atlantic Ocean to the western coasts of Europe and North Africa; it has thus even been observed once to arrive amongst the dunes of Holland across England and the North Sea. That these are no intentional migrations may be inferred from the fact that all these individuals perish and are unable to propagate the species since the food required by the larva does not exist in Europe. To the westward, however, across the Pacific Ocean, in regions producing the requisite food, it has spread in this manner to Australia and as far as China, while other species, such as Danais Chrysippus L., inhabit so extended an area, from Australia to Africa, Asia, and even South Europe, that in that case also it must be attributed to an abnormal distribution. Danais Limniace Cram. likewise occupies a very extensive area, from the east of the Malayo-Australian Archipelago as far as Africa, and the latter continent cannot be its home on account of its form which is entirely of the Malayo-Australian type; it must, therefore, have migrated thither. Over palaearctic western Asia and outside the tropical part of Australia some species of Danais have likewise spread.

A striking difference is also to be observed in this family with regard to the manner in which the process of colour evolution operates, especially the diffusion and recession of black, giving rise to definite groups each characterized by a special colour pattern. After the occurrence of the remotest severance, which gave rise to the separate existence of the Neotropidae, the Danaidae of the old world followed a course of development of their own in which, however, the process of colour mutation has moved on various lines, evidently under special influences entirely unknown to us, and has produced, in this manner, several groups. A portion of these (Lycorea Doubl., Itura Doubl.), as has been stated, arrived subsequently in South America, has adopted, the same as has occurred in the case of the Neotropidae, both the special "South American" form of wing and the manner in which the process of colour evolution operates there. In the Danaidae of the old world this process has moved on no less than three different lines. In the genus Amauris, found in Africa, a peculiar distribution of black occurs side by side with a fading of the original colour to a complete white, which must doubtless be ascribed to local influences since the same phenomenon occurs in African Rhopalocera of other families, giving rise to the alleged mimicry of species of Amauris, by female forms by Papilio Dardanus Brown. In the Indo-Australian region, presumably in the western part, in tracts between Madagascar and India, now covered by the Indian Ocean — in Madagascar and the groups of islands to the north some forms of Euploea are still to be found — two lines in the process of colour evolution have been produced, that which occurs in the genus Euploea and that which is to be observed in the genera Hestia, Ideopsis, and Danais. In Euploea the black has entirely fused with the original red in such a manner that the peculiar more or less dark red-brown, characterising this genus, has been produced; in some species, however, the red in this colour fusion has remained so predominant in some spots that much of the original pigment has distinctly been retained. In some species white dots make their appearance on this red-brown, in others they become more numerous and larger, increasing to large spots or even horizontal or vertical streaks; some portions of the wings, especially along the margins, even become completely white; this occurs most markedly in the individuals of species living in the Ké islands, whose members in other regions have not yet reached such a stage in the process of loss of pigment. Other Euploeas fade more gradually; thus E. Browni Godm. Salv., occurring in the east of New Ireland [New Mecklenburg], has practically become entirely white, while of the former brown colour only small patches remain on the under surface. The production of these white dots is evidently due to no other cause than that in the process of colour evolution certain of the scales, originally filled with red pigment, have reached a stage where the pigment, fading gradually at first, has totally disappeared and in this manner the scale, filled with air, produces the intense white colour, peculiar to such scales; the further this process continues and the more the number of scales filled with air increases, the larger and more numerous of course do the white spots become. Whereas in some butterflies, as the Pieridae, after the disappearance of the pigment the wing scales drop, sometimes causing a glassy appearance at those portions of the wings, this does not appear to be the case in other butterflies, where the scales, now devoid of pigment, become filled with air, producing the intense white colour much brighter than the pigmental white of the Pieridae, which occurs in many butterflies and especially in Danaidae.

It is very important in this connection to observe how these white dots increase to form larger spots and even white streaks, in which case, therefore, such spots do not arise from white streaks, as has been assumed in a well known theory to be a fixed rule; also that in the production of such streaks and spots in the species of some definite district a certain plan cannot be denied, which goes to prove that this is also governed by influences peculiar to the districts in question.

In the genera Hestia, Ideopsis, and Danais, however, this so universal fusion of the black with the original red pigment has not taken place. In these black entirely replaces the original colour in some parts, especially in the apex of the fore wings and is diffused only partially over the remainder of the surface of the wings, in some cases, as in D. CHRYSIPPUS L., to a very limited extent but much more in others, such as D. GENUTIA Cram., following espially the veins but leaving between them larger or smaller patches of the original colour in which the fading process in continued. In the latter species and some others it has become a bright orange and in others again it becomes lighter in shade, as, for instance, in the Javanese D. MELANIPPUS Cram., while in a form of this species occurring elsewhere, distinguished by the name HEGESIPPUS Cram., this orange has become entirely white in the hind wings.

In a great number of species, of which DANAIS JUVENTA Cram. may be taken as the best known example, the original colour has changed completely into white which re-appears everywhere in peculiar streaks and spots through the black, mostly faded to brown; reaching the same goal, in fact, by another road, as effected in EUPLOEAS by the increase of white. In some species remnants of the original red or its fading into yellow have been retained by different methods, such as D. TYTIA Gray and D. ASPASIA F., the latter also in IDEOPSIS CHLORIS Feld. where the black has again been diffused in another manner as is also the case in HESTIA, unless the colour pattern of HESTIA is to be regarded as consisting of the remnants of the much diffused black reduced for the greater part by the fading process, which is quite possible. The unusual size of the butterflies of this genus, indeed, justifies the assumption that a very ancient form has been preserved in them; they stand in the same relation to the other Danaidae as ORNITHOPTERA to the other PAPILIOS and as regards the last named it appears from the history of the development of the larvae, as will be indicated when discussing P. MEMNON L., that they have originated from more ancient forms agreeing with the present day ORNITHOPTERA. The exceptional size of the SATURNIAS also supports this view, the grounds for which, however, cannot for the present be discussed. Not only in mammals, birds, and reptiles giant forms have existed in former periods of which only a few relics have been preserved; in insects this was also the case and the large forms of Lepidoptera, now extant and constantly decreasing in size, must similarly be regarded as such relics. In D. CHRYSIPPUS L. a species in which the diffusion of black has been kept within narrow limits, the colour in several individuals living sometimes, but not invariably, in different districts, exhibits fading which now and again has become partially white and has thus produced the imaginary species DORIPPUS, ALCIPPUS, and ALCIPPOIDES.

How is it to explained that the process of colour evolution operates in such different ways?

In the first place it should be observed that however much variety may obtain in this respect, the phenomena occuring in connection with it are evidently governed by fixed rules.

Not only that in each of these groups the process of change is evidently in general of the same nature but this may also be observed in detail. Thus, for instance, all the different white streaks and lines in species such as D. Agleoides Felder and D. Similis Clerck bear the same character and this again recurs in those of the ♀ of Euploea Midamus L., a species in which the ♂ follows the direction of Euploeas while the ♀ follows principally that of the species of Danais just referred to. The slight differences occurring here are evidently only such deviations from a similar line of evolution which, in each distinct species, arise from their special morphological peculiarities which have to be taken into account in the course of the evolutionary process. I have indicated this clearly in my treatise "*Ueber das Horn der Sphingiden-Raupen*", which appeared in 1897 in volume XL of the *Tijdschrift voor Entomologie*, where I explained how the so-called horn of the caterpillar of the Sphingidae, originally a long moveable organ furnished with spines, has gradually become atrophied ultimately to disappear entirely.

A process, however, which has continued from the original Sphingidae through all the *genera* and *species* which have issued from them and doubtless, therefore, during several thousants of years until the present day, and which, as far as known, has hitherto only in one species caused this horn to disappear while the ontogenesis of the existing kinds of caterpillars shows how this process has ever continued slowly in them all and how, consequently, all kinds of forms of this organ, in various stages of atrophy, have arisen, all simply phenomena of the continuation of the same process, the morphological operation whereof must take into account the peculiarity, occuring correlatively, of each species. It is, therefore, neither accident nor chaos to which these differences, arising in the course of the process of colour evolution in Danaidae, must be attributed; they are governed by rules although their operation at times acquires so intricate a character that to unravel it, while not impossible, becomes extremely difficult.

The same may be observed, for instance, in the development of the white in the wings of several species of Euploea. One species, very common in Java, E. Leucostictos Gm., occurs also in many other islands of the Malay Archipelago where it has received various names as, for instance, E. Viola Butl. in Celebes. Another species of Java, E. Schlegelii Voll., is also found in Celebes where the name E. Gloriosa Butl. has been applied to it. Now both these forms of Celebes differ from their allies in Java — in the case of Viola especially at regards the ♀ — entirely in the same manner, i. e. in both the white spots are spread out into peculiar streaks (see Pl. XII, fig. 7*d*, Pl. XIII fig. 15*b*).

This peculiarity, however, is not confined to them since they agree in this respect with several other species peculiar to that island so that when they are compared with each other they all clearly exhibit a special Celebes facies to an expert Lepidopterologist. Similarly when the EUPLOEAS occurring in the Philippines are compared with the same species from other islands of the archipelago a special Philippine type can be recognised in them, in this case, however, rather on account of the size and increased number of the white or bluish-white spots especially in the apical portion of the fore-wings. The most notable example of this may be observed in the Ké islands. Three species of EUPLOEA occurring in Java under the names of E. LEUCOSTICTOS Gm., E. MAZARES Moore, and E. CLIMENA Cram. are met with in those islands in the forms called E. ASSIMILATA Felder, E. HOPFERI Felder, and E. EURYPON Hew, all differing from the Javanese forms in the same manner in having a very broad white margin round both wings, a feature which also occurs in some other islands, such as Banda, but neither in Ambon, Buru, nor New Guinea. As regards E. CLIMENA Cram., entirely brown specimens marked with some white dots (Pl. XI fig. 1*a*) and others with partly white hind-wings (Pl. XI fig. 1*b*) occur intermixed in Java, the specimens from Bawean agreeing with the former as do those from Ambon, (Pl. XI fig. 1*c*) while those from Flores, on the other hand, have the white on the hind-wings as a part of the Javanese; in this species, therefore, an evolutional diffusion of white exists which occurs in varying degrees but reaching its climax in the Ké and some other islands. In the Ké islands this is, indeed, the case with all these three species and, in addition, with butterflies of other genera. HYPOLIMNAS ANOMALA Wall (ANTIOPA Cram.) is a Nymphalid of wide distribution in the Malay Archipelago which has assumed the type of colouring of EUPLOEAS, differing in this respect from the other members of the genus to which its belongs, and thus, following in the same direction in the process of colour evolution, beginning to exhibit, in the same manner as EUPLOEAS, in different districts a larger or smaller number of white spots, especially on the under side of the hind-wings. In the islands referred to this species acquires, just like the said EUPLOEA species occurring there, a broad white margin round all four wings. Moreover in a species of DANAIS, D. SCHENKII Koch, from the same islands white makes its appearance in a striking manner; the large SATURNIA occuring there is also much more whitish than its allies in the other Malayan islands.

On taking these facts into consideration it cannot be doubted that they are all of the same nature and must, therefore, be attributed to a common origin.

It is difficult, therefore, to assume otherwise than the existence of local influences causing these changes of colour. When, however, one is familiar with the nature of the evolutionary changes which cause the modifications of form and colour, to which Lepidoptera are subject, it will be perceived that in reality the changes here referred to do not go beyond the acceleration, retardation, or direction in a certain channel of an evolutionary process of change already existing; they evidently agree, therefore, with those which are expressed in so different a manner in the process of extinction of the horn of the Sphingidae larvae, already alluded to, and are most probably, therefore, caused in like manner by the attendant special influences. These are in that case, however, unmistakably of a local character. Other phenomena exist which can likewise be only attributed to local influences. Butterflies of the same species in Celebes and from the Moluccas are frequently considerably larger than those of Java; in Flores, on the other hand, they are frequently smaller; why?

We know that adverse surroundings are able to modify in a wrong direction the hereditary course of development of a child. But although we clearly discern the existence of such influences we can only demonstrate a portion of them whereas others, whose presence is equally certain, are beyond our ken; these are usually classed together under the general term "antihygienic conditions". It is also known that such influences may be due to local causes and when their nature is known this may occasionally be demonstrated. To assume that the hereditary course of development of the forms and colours of butterflies also may be guided in another direction by influences proceeding from their environment, is consequently by no means startling. Only, in order to grasp this, it should be understood that these changes of form and colour are no accidental phenomena but the expression of hereditary courses of evolutionary development. Of this, however, lepidopterologists have as a rule no conception whatever.

When I protested very strongly just now against the present practice of attributing every little difference, especially in distribution of colour but also in form between butterflies of the same species occurring in different districts, in general to so-called local influences, without being able to adduce any evidence concerning their nature except fanciful statements about droughts or rainy seasons, it should not be assumed that I wish to doubt the existence of local influences as such. With so extremely superficial and unscientific an exaggeration I do not wish to associate myself; it is, moreover, not the only one of its kind which may be observed in the speculative treatment of the differences in colour in Lepidoptera, already alluded to. Some insular melanism, assumed indeed but certainly not existing, has had to do duty in this connection in turn with the greater dryness of Eastern Java as compared with the western portion of that island, an undoubted fact in itself but of no such importance as has been attributed to it in this manner. Such superficial treatment, however usual it may be, has, in my opinion, as little in common with serious science as have the many so-called historical novels of *Alexandre Dumas* with the actual history of France, although many people, without scientific education and decidedly without scientific critical faculty, consider it as such in good faith and judge by that criterion. It should not, however, be inferred from this that I absolutely deny that specific influences can bring about such changes. I certainly do not, for instance, deny that the greater or lesser degree of salinity of sea-water exercises influence on the morphology of fishes and other marine animals. Providing these influences are, however, apprehended in a scientific manner and are understood to be factors which, in the course of the natural evolutionary processes of form or colour, to which such species are normally subject, act as stimuli, causing some retardation or acceleration in them or conducting this course in a specific direction, and providing it be understood that this action on the individuals is mainly governed by their individual susceptibility which may vary in a high degree. For susceptibility is a quality, whose nature is indeed very little known to us, but whose existence cannot be denied. No stimulus, of whatever nature, can exercise influence unless the susceptibility for it is present; where this is not present originally it appears, nevertheless, that where the individual has been exposed to this stimulus for a period, this quality may even be generated. The requisite period again varies considerably in duration and may certainly in some cases be of very great length.

Many experiments have been conducted in which especially pupae of Lepidoptera have been exposed for periods of greater or lesser duration to varying degrees of heat or cold; the most extensive and important are those carried out by Dr. E. FISCHER (*Allgemeine Zeitschrift für Entomologie, VI n°. 20*) and latterly by Dr. HARRY FEDERLEY. It was observed that in consequence the imagines developed from these pupae exhibited differences in colour and sometimes in form from imagines developed under normal conditions, and owing to the existing ignorance, to be discussed further presently, with regard to the nature of the evolutionary changes to which Lepidoptera are subject and especially concerning the nature of colour evolution, these colour modifications were assumed to be due to the direct chemico-physical action of the said heat or cold. The usual superficial reasoning relying upon this would, therefore, attribute the production of colours in Lepidoptera — and even in animals generally — to such direct climatic influences and this erroneous conception has still many adherents. The fashion, alluded to, of referring each deviation in colour and form to such climatic influences and of basing thereupon species and subspecies is principally founded on this conception. With a better insight owing to the knowledge acquired concerning the phenomenon of colour evolution I have already in my treatise "*Die Farbenevolution (Phylogenie der Farben) bei den Pieriden*", published in 1898, pointed out that there can be no question here of direct special chemico-physical action but merely of a stimulus exercised by the abnormal state of the artificially produced condition in the course of the evolutionary process of change. But this made no impression on the prevalent ignorance and when subsequently Dr. FISCHER began to see that this influence did not act direct but had a retarding effect on the formation of the colours and consequently produced phylogenetically more ancient forms, his want of knowledge regarding the phenomenon of colour evolution confused him sothat he considered both his forms B obtained by moderate heat or cold, and his forms D produced by frost and great heat, as having been caused by retardation whereas a more intimate knowledge of this phenomenon admits only the former as recessive old forms produced by retardation while it indicates the forms D as prospective forms stimulated into development by acceleration. The fact, brought to light by subsequent investigation by Dr. E. FISCHER, that the same colour forms may be produced both by heat and cold, completely decided in this matter. For when such abnormal action only produces a disturbance in the course of normal existing processes of nature which, according to circumstances under which it operates, causes retardation or acceleration, the fact that in specific circumstances it may sometimes produce the one or the other cannot cause surprise. It cannot, however, be reconciled in any way with direct chemico-physical action. Other disturbing influences have gradually been shown to be equally capable of producing the same results. At the International Congress of Zoologists held at Bern in 1904, Dr. M. COUNTESS VON LINDEN stated that by withholding oxygen during the pupa stage, and doubtless, therefore, by a morbid disturbance, she produced the same changes in the colour of the imagines as had been obtained by Dr. E. FISCHER by frost and great heat. My own observations, to be referred to later, concerning the differences in colour and form which occur in the same species of butterflies and have been erroneously termed seasonal varieties, make it extremely probable that the origin of these differences must be sought in the more nourishing nature of the food which the caterpillars consume during the rainy season which, therefore, also acts as a stimulus promoting the development of such individuals whose susceptibilety enables them to respond to it. Finally, from the pedigree breeding, carried out at Batavia by Mr. JACOBSON in connection with an account of PAPILIO MEMNON L., also to be discussed presently, but already published in the *Tijdschrift voor Entomologie*, it appeared to me that the presumably somewhat abnormal condition produced in this animal by this nursing, however carefully conducted, had caused sometimes a noticeable retardation in its colour development and had thus produced a form, no longer existing in Java but still living normally elsewhere, being doubtless more ancient phylogenetically than its forms occurring in Java at the present day. Cold and heat, withholding oxygen, specially nourishing food, more or less scanty supplies, and, as we shall see also, abnormally strong illumination or darkness, therefore, may all act in a similar manner. The different evolutionary processes of change, including that of colour evolution may in their course be influenced by such stimuli and acquire a slower or more rapid development.

Nevertheless, as I have already stated, the prevalent ignorance retains this attitude and one finds repeatedly, especially in Germany, the influence of cold and heat — alleged to have been proved by these experiments with butterflies — adduced on all occasions. I have even met with it in the domain of ethnology. Prof. Dr. STANDFUSS regarded the change thus brought about in these butterflies as newly acquired characters; when he succeeded in inducing them to pair and in raising in this manner a second generation, corresponding in colour to the parents, he saw in this a proof of the heridity of the acquired characters! These butterflies, however, had simply, as regards their colour evolution, reverted to an older stage of development. Being at this stage they naturally produced — in like manner as their ancestors had done while at that stage — a progeny which corresponded to it. This contained indeed ample proof of the fact that they had by no means acquired new characters by the experiment but had simply reverted to an earlier stage of development.

The direction assumed by these processes must, therefore, also be governed by such stimuli, even though their nature is as yet unknown to us. That specific directions of this nature do exist, observation teaches us; the fact also emerges that where they occur they are not restricted to definite genera but make their appearance in animals otherwise different but living in the same district, sometimes, indeed, in whole genera, but also in a few species or even in one or other of the sexes of these. Where whole genera have assumed such a specific direction it sometimes appears, as is the case with the more ancient American Danaidae, that these are the very ones, if local influences are assumed to operate here, which have been exposed to them during the greatest period; where, however, only a few species or sexes have assumed a specific direction, this points unmistakably to a difference in susceptibility which has not yet been developed equally in all individuals. In those butterflies, where this occurs, as in the American DISMORPHIAS and the Malayo-Australian EUPLOEA MIDAMUS L. it is clearly a manifestation of transition from an older condition in this new direction.

These are the local influences, whose action manifests itself in accordance with the individual susceptibility, which must be kept in mind when there is question of the above mentioned accelerated development which produces the alleged seasonal varieties.

It is worthy of being noted here how little variation occurs in migratory butterflies distributed over a great part of the world, such as ANOSIA (DANAIS) PLEXIPPUS L., PYRAMEIS CARDUI L., or LYCAENA BOETICUS L.; would not this point to a very slight susceptibility to foreign influences in these species, thereby explaining how they can adapt themselves in this manner to different climates?

With regard to the peculiar elongated form of wing of the South American Rhopalocera, so characteristic of the family HELICONIDAE, which is confined to that part of the world, I have already alluded to the fact that this form of wing has been acquired not only by the NEOTROPIDAE, a form of Danaid established there for a very long period, but likewise by the progenitors, which must have arrived from Africa much later, of the present genera LYCOREA and ITUNA, and by several of the later arrivals amongst the ACRAEIDAE, PIERIDAE, and NYMPHALIDAE. By these last, however, by no means so generally, sothat some species of the Pierid genus DISMORPHIA are evidently still in a period of transition which is shown by the fact that in only one of the sexes this change of wing form has commenced. While the DANAIDAE which must certainly have reached America last, to which DANAIS (ANOSIA) PLEXIPPUS L. belongs, have retained their original form of wing entirely unchanged. Where this process of change of form occurs in this manner it can hardly be explained otherwise than that it is caused by the difference in individual susceptibility; that only during a long continued existence under specific uniform conditions this increases to such an extent that the form of wing in all the species becomes thus modified but with an existence of shorter duration does not thus increase in all the species and this modification is, consequently, produced only in certain species and sometimes even only in one of the sexes of such species, while with a still shorter existence it may not occur at all.

The peculiar modification in the form of wing alluded to must, therefore, be considered as the response to a stimulus, directing the evolution of the form of wing in a specific course. A stimulus whose character we may be unable to define as yet but which is evidently restricted to South America, although the region where its influence is felt is of very great extent.

With regard to the evolution of pigmental colours the same phenomenon may be observed in the old world. As we have already noted, in the African Danaid genus Amauris this follows the same course which characterizes the African Papilio Dardanus Brown. Still more striking is the arrangement of the pigments producing the peculiar colour of Euploeas. But while this character occurs in the whole of this specialized genus the same colouring appears in a few species of various genera of Rhopalocera, living in the same districts with them, in various degrees of resemblance, sometimes completely as in Euploea's, at other times in a lesser degree, or even in one sex only, as is the case with Dimorphias in South America, whereas in the others this course of the evolution of colours has not, or at least not yet, been followed. Hypolimnas Antilope Cram. (Anomala Wall.) in this respect has come to resemble most a Euploea. The colour is completely that of a Euploea; in the ♂ even a strong interference blue has been developed on the upper side of the fore-wings, as in Euploea Midamus L., but of a lighter shade, sothat the expert who, as happened to me, sees it on the wing in broad daylight, although not in the glare of the sun, immediately distinguishes both species in spite of all ideas of mimicry. The interference colours are governed by the form of the scales and the difference in this respect in two not allied butterflies will presumably remain constant, however much the pigmental colours may change. In addition white begins to make its appearance on the universal brown in these Hypolimnas, as in Euploeas; at first in the form of white dots and, in one island more and in another less, in white streaks along the inner margin of the hind-wings, just, therefore, where in Euploea Climena Cram. Sepulchralis Butl. the white is most developed, becoming diffused into a broad border surrounding all the wings, just as in this and even other species of Euploeas, in the Ké islands. In various species of Papilio, such as P. Paradoxa Zinck, P. Canopus Westw., and others the colour evolution has in general followed the same course as in Euploeas; in some species, such as P. Caunus Westw. and P. Agestor Gray, this has been carried so far, as regards the white, that they acquire a strong so-called mimetic resemblance in colour to certain species of Euploea. In the Zygaenidae, a family of Heterocera which appears to be specially susceptible to such influences, the same Euploea colour occurs in a few species, most so in Isbarta Midamia H-Sch. and Isbarta Militans Butl. Another species of Hypolimnas, H. Bolina has, indeed, not shown itself as susceptible to this influence as H. Antiopa Cram. but has not been able to escape it entirely; amongst the different forms of the ♀ of that species one occurs, Perimele Cram. in which the Euploea colour appears likewise. In the ♂ of a species of Elymnias, E. Undularis Drury the colour development of Euploea is also present, but in the ♀ that followed by the genus DANAIS; this therefore, points to a transition phenomenon as regards colour evolution the same as occurs with respect to wing form in the fore-mentioned DISMORPHIAS in South America, in which the one sex is already under the influence, directed in a definite course, but the susceptibllity to it has not yet developed in the other, which, consequently, retains the ancient form of wing unchanged. This case is analogous to that of EUPLOEA MIDAMUS L. whose ♂ is a typical EUPLOEA whereas the ♀ principally exhibits the colour adjustment obtaining in the genus DANAIS and, therefore, resembles D. AGLEOIDES Felder more than a EUPLOEA, pointing also to a state of transition on which hypothesis the EUPLOEA course must have been developed from the one peculiar to the genus DANAIS sothat the ♀ of E. MIDAMUS L. and ELYMNIAS UNDULARIS Drury have retained the old form which, according to the ontogenesis of the EUPLOEA larvae, appears, in fact, to have been the case.

The same occurs with the other course of colour evolution which, besides the one alluded to, has been followed by the Malayo-Australian Danaids and is most observable in the genus DANAIS. In addition to the genera HESTIA and IDEOPSIS it occurs also in the different species of PAPILIO living in the same districts, such as P. MACAREUS Godt., P. IDAEOIDES Hew. and others; likewise in Nymphalidae in species of the genus HESTINA Westw. and in Satyridae in species of the genus ZETHERA Felder and even in the family Zygaenidae already alluded to, *inter alia* in ISBARTA ASPASIA Sn. and CYCLOSIA PAPILIONARIS Drury. Such cases of uniformity in the process of colour evolution or so-called homochromatism are, moreover, known in different genera and families in South America. BATES has referred to it and BLANFORD discussed it in *Nature* of June 20th 1895 and indicated several very important instances of it at a meeting of the *Entomological Society of London* on May 5th 1897. Its cause, however, was unknown to them.

When we observe how the appearance of white, which in EUPLOEAS we know to be an expression of the course of the process of colour evolution, manifests itself in the island of Celebes in two species of EUPLOEA occurring there, but likewise in other Malayan islands, E. VIOLA Butl. and E. SCHLEGELII Voll. in a different manner from what obtains in those other districts, yet in both deviating therefrom in the same way and in complete agreement with what occurs in this respect in several other species of EUPLOEA indigenous in that island, while at the same time other species of that genus occurring in Celebes as well as elsewhere do not exhibit this special modification, but resemble their congeners in other islands, this can hardly be explained otherwise than by attributing it to some influence operating locally in Celebes, an influence which not only governs the course of colour evolution in the indigenous species but has operated in like manner on the two species arrived thither from other parts, without influencing others in which this susceptibility has not yet been developed.

On these grounds we must, therefore, admit the existence of such local influences operating on the evolutionary processes to which the Rhopalocera are subject although we may be unable as yet to indicate their nature. When, however, empty phrases or the forementioned erroneous conception fail to satisfy us, this conviction, as clearly follows from what has here been formulated, can only be based on the phenomena revealed by a study of the evolution both of the forms and of the colours of butterflies, a study which must, therefore, reveal the existence of the phenomenon of colour evolution also. It is, moreover, not the only fact in this connection which can only thereby be explained. In my monograph of the Pieridae of Java, on page 50, I explained in this way the presence of the red dots on the wings of the European Gonopteryx Rhamni L, which are doubtless well known but whose cause nobody has hitherto been able to indicate, and on pages 41 and 50 l. c. the equally known and equally mysterious 8 shaped metal-coloured spots on the hind-wings of some species of Colias. On page 35 I pointed out how clearly this phenomenon manifests itself in the various colour forms and the remarkable colour relics, connected with them, of the genus Hebomoia, such as the streak on the upper side of the fore-wings retained in the specimens of a species from the Philippines, Flores, Sumba, and in a lesser degree in those from Java and how completely it explains this but only in accordance with my conception of the problem. In many other places besides I have clearly indicated this process. What is the reason that this theory of mine of colour evolution, for which I have striven so many years, not with hollow phrases indeed, but with the adduction of large quantities of material in support thereof, has received so little credence? Can it be because, unlike so many present day biological theories which receive much support, it is not based on superficial reasoning and hollow propositions supposed to be confirmed subsequently by isolated observations insufficiently controlled but strongly biassed by preconceived notions, but is the result of the unprejudiced observation of a number of mutually corroborative facts? Because its examination requires a method in which those are not versed who have been brought up in the present day experimental methods — *i. e.* of investigating what has already *a priori* been assumed — but are not accustomed to explain logically by means of extended comparison facts obtained by unprejudiced observation? Perhaps so, for no attempt at thorough investigation of its value or at serious refutation of its propositions has ever been made. In his "*Experimentele entomologische Studien vom physikalisch-chemischen Standpunkt aus*" Prof. BACHMETJEW has indeed given an account of it but this has not led to any serious discussion. The Professor even apologises, as it were, for giving an account of it and when he calls my views "very original" this may possiby be understood to be a polite term for "absurd". For thus he regards them in his narrow-mindedness and thus, he supposes, correctly perhaps, that they will mostly appear to other biologists of supposed scientific standing. For their point of view, like his, is the physico-chemical one, in which they have been educated; outside this only soul-saving scientific dogma they deny all science, and my views based, not upon such pedantry, but upon independent observation are wholly outside that dogma and even reject it as such. Such an attitude is, to them, absurd and, therefore, unworthy of investigation. I will not deny that a certain amount of change in this attitude appears to be imminent for quite recently the following sentence in an English periodical drew my attention: "It is perhaps true that physiologists are on the whole less satisfied now than formerly with the adequacy of the physico-chemical explanation of vital activities".

My opinions encounter, moreover, much opposition through the inability, so general amongst biologist, of grasping the principle of evolutionary change, for the phenomenon of colour evolution is simply one of its manifestations. I have already stated previously that since DARWIN's time the word "evolution, is met everywhere but in spite of this the subject itself is as yet very little understood. And no wonder. When new opinions, no matter on what subject, whether religion, politics, science, or what not, make their appearance in the human mind they are the result of a higher mental development, acquired in this connection by certain persons and which, mostly favoured by special circumstances, have found recognition. But it does not follow from this that such a higher conception penetrates the mind of every one. This can only be effected after a shorter or longer interval when the general level of mental development has been raised so far that this higher conception can be indentified with it. Not until then can the mental processes move and work on these lines; and until then this higher conception, while openly acknowledged and taught, remains in reality, so to speak, unassimilated and incapable of being elaborated by such persons who constitute the large majority in every region of mental activity. Thus it will be seen, when Indian nations are subjected to an alien higher civilization, what is called the polish of European culture is produced in them — a superficial layer of imported forms, ideas, and conceptions — without governing actual thought and consequent action. Thus the mental attitude of the parvenu remains generally on the inferior level peculiar to his birth or former environment; hence the French proverb: "*Frottez le Russe, vous trouverez le Tartare*". No subsequent teachings of morality or religion alter the nature of him whose inherited inferior moral development unfits him for its reception; his natural egoism makes him the born criminal in the well-conditioned state; it depends only on the conditions of life in what manner this will find expression. In the domain of science the same may be observed; the disciples generally adopt the dicta of the master but they elaborate these from their own cultural level. The theory of evolution, similarly, is at the present day universally accepted scientifically which implies that every species must be considered as being, as a rule, in a condition of continuous evolutional change, but in spite of this the old view of immutability of species frequently overrides that of biologists. DARWIN as wel as LAMARCK, indeed, conceived living nature as being in a condition of constant evolutional change, interrupted now and again temporarily by some cessation in development, but the theory of mutation again assumes an unchanging condition as the rule, only now and again interrupted by so-called mutations, approaching thus in this respect the old view, just alluded to; but since the cause of their appearance remains completely hidden this theory strongly reminds us, in fact, of distinct creative acts in which the Creator alone is either disregarded or indicated by a note of interrogation. For this reason I can only consider this theory as a retrogression in the domain of the doctrine of evolution.

Now when I consider the detailed observations made by lepidopterologists on the frequently very slight modifications in colour and markings in many species and note how, purely on such differences, all kinds of species and subspecies have been based, I fancy I can see much of the old conception of the immutability of species in this method. For if they had grasped the biological principle of the evolutional mutability they would have understood that these numerous differences, each of little significance in itself and running into each other, can be nothing but so many expressions by wich the same evolutionary processes manifest themselves in proportion to the individuality of each, processes amongst which, in Lepidoptera, that of colour evolution especially comes to the front.

While the mutability of a species is, indeed, acknowledged it is yet considered to be a fixed entity; but that each individual, belonging to any species, independently plays its part in the universal evolution process is still very little understood.

The processes in question nevertheless operate in this manner. The power governing the processes of change, to which the species is subject, affects every individual, but in proportion to its conditions of life and to its susceptibility to this power which constantly varies in individuals. Hence each individual assumes an independent station in the course of these evolutionary processes and amongst the individuals, therefore, all stages may be encountered forming transitions to one another. Now in the same manner as the cinematograph, by the combination of a number of impressions of successive stages, reproduces a whole occurence in its natural sequence, the individual colour patterns indicate to the person, possessing sufficient lepidopterological knowledge to combine them, how this process of colour change, of which each pattern represents a specific stage, operates.

Colour evolution teaches us how to explain the origin of existing colour variety, somewhat in the same manner as embryology and comparative anatomy, from forms in various stages of development existing side by side; it teaches this, however, by observing the living forms and its study is thus identified with that of the nature of evolution in general in which so much remains to be elucidated, and is, therefore, of far-reaching importance.

Recently I read the following sentence, written by a naturalist: "The whole colour question of the plumage is one of evolution". With the colours of Lepidoptera it is the same. Nothing is further from the truth than the superstition so general amongst zoologists, against which I have already protested on page vi of the Introduction to my Monograph of the Java Pieridae, that the colour of animals is accidental, devoid of biological value and, therefore, not susceptible to evolutionary change. But all this and consequently the phenomenon of colour evolution is, of course, scarcely comprehensible to those to whom evolution is, as I stated, not much more than a term. Recourse is then had to unknown influences which, even if they be termed meteorological, differ little in reality from the supernatural with which the uncultured satisfies his lack of knowledge.

A great part, in this connection, is probably played by a certain pedantic shallowness, unfortunately, far from uncommon, which, however, assumes a decided scientific guise and as such may exercise much influence on the semi-learned. This manifests itself in the, to my mind unwarranted, weight attributed to the only objection, of any importance, raised against my theory of colour evolution. According to this theory, as I have summarily explained on page ix of the Introduction of my Monograph of the Java Pieridae, the original pigment was red, which gradually faded to white until the pigment disappeared in the scales, and during this process a black pigment, moreover, increased at first and then decreased. It is objected to this that the ontogenetic investigations conducted concerning the origin of the pigmental colours in the pupal stage, have established a sequence which does not accord with the one assumed by me and that in these red certainly does not occur as the original pigment. How does the matter really stand in this respect? When the haemolymph of the pupa, penetrated into the scales, has been transformed into a granular pigment it is of a uniform dull yellow or light drab colour. This can, in a certam sense, certainly be termed the oldest pigmental colour but only when this pigment, as MAYER [1]) expresses it, appears as "ornamentation", does it acquire, through chemical changes in the haemolymph itself, what he terms the mature colours which, therefore, arise from the action of chemical reagents; experiments have shown that in this manner, according to the reagents employed, red-orange or yellow can be produced. By the term "mature colours", therefore, is meant the colours which are visible in the imago after it has left the pupal envelop and it is only with these the theory of colour evolution is concerned; when, in discussing these I used the term original pigment, I referred to the pigment which, in the original forms of Rhopalocera, besides some black pigment, constituted the universal mature colour and which in the present forms has since been more or less modified by the process of colour evolution, but not what has been termed original pigment in the ontogenetic investigations which as such never appears as a mature colour and can only be classed with it after undergoing chemical change. In consequence of what I have just stated concerning these mature colours it is, therefore, quite possible that in the primary butterflies this colour should have been red to become gradually changed in later times into orange, yellow, and white, especially since the pigments of all these colours, in so far at least as this has been investigated, as in the Pieridae, do not differ chemically. These changes must, however, have proceeded very unequally in the different groups of scales which alone can explain the fact that several of these pigmental colours appear side by side on the wings of the same animal. This inequality of its expression in time and space is, moreover, as has been correctly observed years ago by WEISSMANN, a fixed character in all evolutionary processes and does not prevent these colour changes in any way, from being governed by one and the same principle or, as it is usually termed, by a fixed law. I always hesitate, however, to employ this so usual expression "law" in this connection, since I am only too well aware that non-lawyers

[1]) I follow here principally the two treatises by ALFRED GOLDBOROUGH MAYER, "*The development of the wing scales and their pigments in butterflies and moths*" and "*On the color and color-patterns of Moths and Butterflies*" (*Bulletin of the Museum of Comparative Zoology at Harvard College*, *xxix*, *n*°. *5*, *xxx*, *n*°. *4*). MAYER's term "ornamentation" is good in itself, providing it is not understood to imply that the process in question occurs for the sake of ornamentation.

and consequently as a rule also biologists are inclined to understand by this term something immutable, something which cannot be modified in its manifestations according to circumstances which is certainly not the case with these so-called laws any more than with human laws. Only the leading principle remains unchanged; the method of its execution, however, is regulated according to circumstances. That this process is not only possible but actually occurs in this manner is admitted by the theory of colour evolution on the grounds of the observations on which it is based. I will return to the subject presently.

The ontogenetic investigations concerning the origin of the pigmental colours in the wings during the pupal stage do not show this sequence. It is true that one colour appears earlier than another in that stage but that the evolutional sequence of the colours, as this occurs phylogenetically, should be reflected in it I do not consider at alle essential.

The method of tracing phylogenetic changes by means of ontogenetic investigations rests entirely on the so-called fundamental law of HAECKEL. The correctness of this law I certainly admit and it receives complete confirmation from my study on the horn of the larvae of Sphingidae. But this does not alter the fact that inemploying it in a scientific sense judgment should be exercised since a slavish pedantic conception of it can only lead to erroneous results which are of no value as scientific arguments. Vestiges or relics of all the processes occuring during the phylogenetic development of an animal species are not by any means traceable in the ontogenetic investigation of an existing form. That Lepidoptera like all other animals have developed from older forms cannot be doubted; this is, indeed, demonstrated by a study of the wing-venation and of the other evolutionary changes mentioned in the introduction to my monograph of the Java Pieridae. That the same is true also as regards their colours is proved irrefutably by the study of colour evolution and is evidenced, moreover, by the considerable difference in colour frequently exhibited by individuals of a species occurring in different, and often in the same, districts at different times or even contemporaneously, although they all have doubtless originated from the same primordial form. Prof. WEISSMANN admitted this years ago. In caterpillars, whose various stages of development marked off by their moults greatly facilitate the ontological investigation of the later periods of their development, it may actually be observed, as for instance in the larvae of the Sphingidae examined by me in his connection, that the colour gradually changes. The assertion, however, that in observing the first appearance of the colours in the wings during the pupal stage, in which they are developed, the phylogenetic sequence of the origin and changes of these colours may be traced does not by any means appear to me to rest on such a firm basis. As we have seen this sequence must have depended on the presence of chemical reagents varying in the course of ages through vital requirements unknown to us, whose action, moreover, each time affected, in an extremely unequal manner, only certain groups of scales.

Is there sufficient ground, therefore, for assuming that when an animal, in the course of attaining maturity, reaches the actual state of development acquired by the species all these chemical reagents and the vital influences which excited them will be repeated in the same order in its ontogenesis? It is true in the case of the colour of the Sphingidae larvae, just alluded to, the old colour occurs ontogenetically but apart from the fact that there is only question of a single colour change here, there is no comparison with the great difference in colour occuring in the pigments of the Rhopalocera; in the development of the imagines, moreover, no well-marked stages, as are caused in the larvae by the moults, are to be observed but the whole formation of the colour pattern is completed in a very short time, according Dr. VAN BEMMELEN within 36 hours before the emerging of the imago. In the course of the various observations made in this manner with reference to the origin of the colours in the wings I could find, indeed, nothing which points to a phylogenetic continuation of colour development.

As a matter of fact I can discover in the result of the investigations only indications concerning the manner in which the colours of the wings in certain butterflies in their present stage of development have arisen and nothing which points ontogenetically to an orderly change from the original to the existing colour, in the manner this must have occured phylogenetically. To the alleged negative result of these investigations in respect of the theory in question I can, therefore, attach little value. The physiological fact that the pigmental colour in the larvae of Lepidoptera can change gradually as an unmistakable manifestation of an evolutionary process has been definitely established as the result of my studies in connection with colour changes in the Sphingidae larvae. Of an adaptation, pure and simple, of the colour to the environment, as occurs sometimes in certain larvae and pupae and which, in the usual superficial manner, has in this case also been given as the explanation, there is certainly no question. Now when an extensive series of interdependent and therefore mutually corroborating observations, such as I have published, points to the same conclusion in the imagines of Lepidoptera in general, the admission of this fact is not to be made dependent on the question whether this can be established ontogenetically by experiment. Insistance on this condition simply reveals a pedantic narrowness of conception.

In reality these investigations have in this respect little value in themselves.

Not being acquainted, or only slightly so, with my observations concerning the colours in Rhopalocera and the manner in which they change in individuals, investigators have worked in this respect not only without reference to these observations but even with a total disregard of them; a different line of research, as well as a careful selection of material specially adapted for investigation would have been a great desideratum in this connection, but haphazard work has mostly been undertaken in this respect which, moreover, is strongly biassed for the greater part by false theories, such as those of mimicry and natural selection, or those of the German Professor Dr. EIMER, and endeavours above all to seek confirmation of the said theories. Where, for instance, the most accurate of these investigators, ALFRED GOLDSBOROUGH MAYER, actually pays much attention to the colour pattern of the mature imagines, he simply follows BATESON and his wholly unexplained fantastic principle of variability, but is unable to conceive these colour changes as being the expressions of evolutionary processes in a specific direction. I am unable, therefore, to attach much value in this respect to his investigations but I consider it of interest to draw attention to one or two points in them which prove clearly that his very accurate observations, although not, in my opinion, correctly interpreted, agree with my own as regards the process of colour evolution. In his chapter "*General summary of results believed to be new to science*" he says under (8) (*a*) "when in process of disappearance, bands of colour usually shrink away at one end". This agrees entirely with what I have noted when discussing the first commencement of the formation of the spurious eye spot in CYLLO LEDA L. And again under (12) "A record of the characteristic markings upon the wings of the Danaid and Acraeoid Heliconidae shows that, physiologically speaking, the colours red, rufous, yellow, and white are closely related and that black is quite distinct from these, being the least variable colour of all". This, surely, is just what, according to my observation, constitutes such a prominent fact in the theory of colour evolution.

I believe that with a view to the experimental ontogenetic investigations referred to, attention may be drawn to a phenomenon which in my opinion is too much neglected. It is true I do not attribute very great value to it but it will not be amiss to consider it. I refer to what occurs in the appearance of the mature colours. It is known especially in Coleoptera that after reaching the mature stage their colour still requires some time before being completely developed. Something similar I observed, as stated on page 62 of my Monograph of the Java Pieridae, in the larva of TERIAS HECABE L. Until the last moult the larvae of this butterfly and those of T. SARI Horsf. have the heads of the same colour as the body generally, *i. e.* green. But whereas in T. SARI

Horsf. the heads remain the same after this moult in T. HECABE L. they become black. Not suddenly, however, for I observed that after this moult had taken place the head of this larva was still green; at first it became gradually darker and not until after about an hour did it become black which thenceforth remained constant; probably, however, it is such a dark green that it appears black to the eye. In the larva of PAPILIO AGAMEMNON L. also I remember making a similar observation. The pupa of the Java ACRAEA TERPSICHORE Cram. has the ground colour of a beautiful milky white much marbled with black and ochre-yellow. A couple of days before the imago emerges this milky white changes into an intense rose and after the butterfly makes its appearance no trace of either milky white or rose is visible on its wings or on the pupa case. How is this to be explained? I have been unable to investigate it but it appears to me that changes occur here which have no connection with the phylogenetic development of colour. It leads incontestably to the assumption that a certain amount of influence of air or light is required for the maturing of the colour as it occurs in the perfect insect; it may, therefore, be doubted if such reaction really occurs in wings exposed artificially during the experiment and whether the mature colours may be traced back to the earlier stages rather than that they should originate in the present stage of development of the chrysalis. For this reason I consider this phenomenon deserving attention.

On the other hand there is a great deal which, in my opinion, confirms the propositions of the theory in question. The most important is undoubtedly the fact that it is becoming more and more manifest that the numerous colour phenomena observed in Lepidoptera can only be explained by means of it. This is especially striking with respect to the remarkable cases of colour dimorphism or polymorphism which cannot be reasonably explained otherwise although there is no lack of phraseology in this connection. Where such cases occur regularly side by side as in PAP. MEMNON L. they follow the rules of colour evolution; likewise where they make their appearance contemporaneously but in different districts, as in PAP. DARDANUS Brown; and again where they are restricted to specific periods by climatic influences, showing clearly which is the more and which the less developed form, the same occurs. Finally where by the action of retarding influences, of whatever nature, only a lower, and therefore older, stage of development than the present normal one is reached, this older stage agrees also with the doctrine of this theory. This alone enables us correctly to understand the different results obtained in experiments with heat and cold conducted in connection with the development of butterflies, which are for the most part wrongly interpreted. A comparative study as to what must be considered relics amongst the colour spots in Rhopalocera proves the existence of the evolutionary change of these in the clearest manner. Such a study, however, only becomes possible of course when one has learned te interpret these changes, not as the result of accidental climatic conditions or similar airy assumptions — the ignorant would call it the action of spirits — but as that of regular manifestations of natural evolution. In which connection one may with advantage ponder over the words of Prof. Dr. KLAATSCH when proceeding to the ontoological comparison of the Neanderthal Gorilla type with the Aurignac Orang type, (*Die Umschau, Sept. 3, 1910*), he states that any one who wishes to form an independent judgment on this subject cannot dispense with a thorough study of the skeleton of man and of anthropoid apes and that sceptical phraseology will not do service instead. This, in judging the colours in butterflies as in other matters, is in the majority of cases simply overlooked for the sake of convenience.

The study of colour evolution invariably indicates that red must have been the original pigmental colour, in the sense of mature colour as stated. But this is not all. MAYER in treating of the "*Quantitative Determination of Pigmental colors*" states "to have analysed the colors of many butterflies by means of the spectroscope and also by MAXWELL's discs", and that in this manner he has "determined that the vast majority of the colors found in Lepidoptera are impure; that is to say, they contain a large percentage of black and that the so-called "blacks" found in butterflies, are rarely jet-black but almost always only deep shades of brown". Thus, for instance, he found in the glaucous green of COLAENIS DIDO 29 % black and in addition 24 % vermilion, in the sepia-brown ground colour of CERCYONIS ALOPE 71 % black and 21.5 % vermilion; in the tawny rufous colour of wings of MECHANITIS POLYMNIA 46 % black, 40 % vermilion, 14 % lemon-yellow; and in the rufous red patch on the upper surface of the fore-wings of HELICONIUS MELPOMENE 27 % black, 66.5 % vermilion, 6.5 % lemon-yellow. In all these cases, therefore, the colours are mixtures of red and black of which red constitutes a very considerable portion and sometimes also yellow, all of which, therefore, completely accords with the theory of colour evolution of an original red colour with the gradual increase of black, and sometimes fading te yellow. Whence otherwise comes all this red and why is it thus mixed with black? This is supplemented by what MAYER further states about his *Spectrum analysis of colors of Lepidoptera*, which leads him to the conclusion that "in general the colors of the wing are not simple but compound; that is to say, they are made up of a mixture of several different colors" and in these red and yellow frequently occurred; it is worthy of note in this connection that he found that "the spectrum of the rufous ground color of the upper surface of the wings of Danais Plexippus consists of all the red and yellow of the spectrum and about 75 % of the green". Here we have to do, therefore, with a butterfly of the same genus Danais, with which we were concerned just now and which is also closely allied to the genus Euploea.

On the one side we have, therefore, a number of very careful observations which, on being correlated, completely elucidate and confirm each other, by means of which a number of biological phenomena are explained, hitherto not to be accounted for in any other way, and for whose interpretation all sorts of unproved and even incomprehensible influences have been invoked. On the other side we find some incomplete anatomical investigations, some technical dexterity in which certainly cannot be denied, but whose relevance in this connection is very doubtful and which were, moreover, accompanied by so little knowledge of what had already been proved by investigation and comparison in this field, that this must of necessity have exercised great influence on the interpretation of the results of these investigations. I believe the choice between these two cannot admit of much doubt.

I think the foregoing observations are sufficient to convince the unprejudiced that the theory of colour evolution rests on a firm basis and can in no way be considered as refuted. I will not further dilate on this; those desiring further information on this subject and as to what is to be observed in this connection in other animals may find additional particulars in the chapter "*Farbenevolution*" in the second section of my work "*Noch einmal Mimicry, Selektion, Darwinismus*" published in 1907. I would only here quote the following from the treatise published in 1904 by Dr. Arnold Jacobi "*Die Bedeutung der Farben im Thierreich*". "The first pigments" this savant states "to arise, in the gradual development of animals, appear to be those corresponding to the left side of the rainbow and admitting, therefore, only rays of very great wave-length and very little refrangibility and as a consequence red is the most common ground colour to which yellow is gradually and green sometimes also added. That red is the starting point of all colour development may be inferred from the fact that the actual perception of light in our eye is connected with a finely divided red substance, Rhodopsin, in the retina. Thus the primitive eye-spots in various Infusoria are red and in Turbelaria and Chaetopoda, living in great depths of water where light scarcely penetrates, as in the subterranean Aphides, the eyes are also red, although the pigment in the eyes of their allies exposed to light is dark.

Moreover, many animals whose stage of development has retained an ancient simple character are red, such as, for instance, some lobsters; even our common marine and fluviatile lobsters and crabs have a red body colour although this is hidden by a brown colour until the latter has been driven off chemically by means of boiling. In relation with the change in the pigment of the eye many aquatic animals which, when they occur at slight depth are colourless and translucent, become red when they reach greater depths and darkness. In a like manner many animals living in holes or inside plants exhibit this otherwise so striking colour, such as the orange-red larvae of CECIDOMYA, those of TRYPANUS COSSUS L. and of many microptera as well as certain Indian snakes (Uropeltidae).

Concerning the caterpillars of Danaidae little is to be noted. Those of the genus EUPLOEA appear to indicate that this genus has become specialised from the genus Danais. It has, indeed, been already noted that the colour development in EUPLOEA MIDAMUS L. ♀ greatly resembles the one which obtains in the genus DANAIS and that this makes it probable that this species remains in the condition — as may be met with in others — in which one sex has retained the older form, while the other has assumed the later one. The DANAIS form in this instance, therefore, must be the older one from which the EUPLOEA form has been developed. Amongst the little known EUPLOEA larvae, which, like those of the genus HESTIA differ more especially from DANAIS larvae in the long fleshy dorsal processes, occurs one, *i. e.* EUPLOEA MAZARES Moore, in which these processes are short and straight, corresponding, therefore, with those in the DANAIS larvae and having presumably remained in an older stage which is that of the genus DANAIS. In very young specimens of EUPLOEA larvae, furnished with the long processes, they are equally short and straight as in the DANAIS larvae. But considering that, in view of the small size of these larvae, in any case the processes are of necessity also very short it would appear somewhat risky to draw any conclusions from this fact.

As regards the pupae of Danaidae much remains which requires elucidation. Those of EUPLOEAS are conspicuous by their strong metallic lustre. Some, such as those of E. MIDAMUS L , completely resemble little clumps of polished gold or silver, in others this lustre is interrupted by patches or streaks of a dark or light brown or it is even more of a copper colour. At the fourth International Congress of Zoologists, held at Cambridge, Mr. EDMOND BORDAGE stated that in the Mauritius he had reared in the dark larvae of E. GOUDOTI Bsd., whose pupae normally resemble polished gold or silver, and obtained pupae having dark brown streaks and spots on this metallic lustre. These, therefore, agreed with the normal pupae of E. Leucostictos Gm. from Java. How is this to be accounted for? It can hardly be attributed to colour evolution since this metallic lustre is undoubtedly of a structural nature whereas colour evolution in only known in pigmental colours.

The pupae of some species of Danais also exhibit special phenomena. I have frequently bred those of Danais Chrysippus L. and of D. Genutia Cram. Of the former I obtained many pupae the majority of which were of milky white, some retaining this colour while others subsequently became rose or green. On the other hand I observed that of these pupae, reared in a clear glass cylinder, which were of a beautiful green a portion subsequently turned to a milky white while others under the same conditions remained green. The bred pupae of D. Genutia Cram. were all green at first; some remained of that colour but others subsequently became pale rose. None of these pupae contained parasites. Whether they were reared in dark boxes or in clear glass cylinders made no difference; one beautiful green chrysalis of Danais Juventa Cram., formed in a very dark box, agreed completely in colour with one found by me in a natural state. In all these pupae golden spots occur which appear as white immediately after pupation and in which the metallic lustre only becomes apparent later. How can these colour differences be explained? I believe in order to arrive at this attention must be paid in the first place to what is known concerning the colour phenomena occurring in the pupae of other butterflies and that, therefore, I must take into account all investigations on the subject, although these mostly have reference not to Danaidae, but to other Lepidoptera — Papilionidae, Pieridae, and even Heterocera. When some time back I discussed the rearing by Mr. Edw. Jacobson of imagines of Papilio Memnon L. I had also to concern myself with this question. My views in this connection have since been published in the *Tijdschrift voor Entomologie* liii, 1910. I will briefly repeat them here. According to Mr. Jacobson the pupae — about 400 in number reared by him at Batavia on its food plant had, almost without exception, assumed the colour of their immediate environment, those attached to the variegated greyish-brown branches of the citrus tree, on which the larva had been reared, were of the colour of bark with green spots while those fastened to leaves or green twigs were green. A few only had pupated against the white gauze surrounding the larvae on the citrus branches and these were of a dirty white without green spots. Mr. Jacobson expresses the opinion that these results in general agree with those obtained by Prof. Dr. J. Vosseler in breeding Papilio Demoleus L. in East Africa but do not correspond with my earlier observations in Java. During my stay in Java I did not indeed, conduct actual investigations in this field, the importance whereof had not attracted my attention at that time, but nevertheless I bred many larvae of Papilio Memnon L. and P. Polites L. for other purposes and my notes made at the time are of value also in this connection. From these it appears that in the pupae reared under varying conditions of light and darkness no influence of this could be perceived, some being green others brown with green spots. Of four pupae of P. Polites L. two, which had developed between dark green citrus leaves in cylinders of clear glass, were of a striking dark green but two, which had pupated in similar cylinders without leaves and whose environment was greyish, were bark-coloured. Both Jacobson and Vosseler obtained similar results with pupae reared completely in the dark and the latter expresses astonishment that in that case such pupae assume the colour of their immediate surrounding. Jacobson suspects that my negative results are due to the fact that my experiments, unlike his, had not been conducted in full daylight. My experiments, however, were certainly not conducted, like his, in the natural state even if under white gauze, although by no means in the dark but in cylinders of clear glass or in boxes covered with white gauze and in rooms of houses where, indeed, subdued daylight only is admitted in order to avert the great heat, but which are, nevertheless, as well lighted as an ordinary mid-european dwelling. Moreover, in complete darkness similar results are obtained as I have just mentioned. There is a great deal, therefore, still requiring elucidation. Before proceeding I would, however, draw attention to one or two points. So far as I can call to mind, and the illustrations in my possession of Memnon pupae confirm this, the green chrysalides of this species are very light, mostly yellowish green and by no means of the dark green of citrus leaves; I also have a recollection that the pupae designated with the rather indefinite term bark-coloured do not exactly conform to the colour of the ligneous parts of the citrus tree. We must not lose sight of this; in such matters we must beware of unconscious auto-suggestion.

A considerable number of observations and discussions on this subject have seen the light. Many of the more important of these were available to me; of a great many others, where this was not the case, I have been able to consult the ample and apposite quotations published by Prof. P. Bachmetjew in his "*Experimentelle entomologische Studien von physikalisch-chemischen Standpunkt aus*". In making use of these great circumspection must be exercised. Many of the experiments have been conducted in so superficial a manner or have reference only to certain animals or conditions that in this respect, where the difference in susceptibility — not only between species but even between individuals — leads to widely divergent, or even directly opposite results, little value can be attached to them. Not a few, even of the more important ones, are governed by the suggestion of mimicry which, like every suggestion, not unfrequently induces one to observe what is looked for sothat one cannot be too careful in this respect. Others again, some of them of great importance, are completely dominated by the preconceived notion that the colour manifestations must be explained by chromo-photographic action. The correctness of this idea, however, is also very doubtful and this should constantly be borne in mind. Without losing sight of this we will proceed to examine these observations.

The fact that where a caterpillar at a specific period of its existence, when it ceases feeding and prepares to pupate, is exposed to radiation from any definitely coloured environment — especially during the twenty hours preceding the last twelve hours before pupating — the colour of the resulting pupa frequently adapts itself to its surroundings, may at the outset be accepted as having been proved beyond dispute, especially by POULTON's investigations. It further appears, however, that much difference in this respects exists amongst the various kinds of caterpillars.

Of the older observations on this point, those made in 1876 by Mrs. BARBER are well known especially through DARWIN having drawn attention to them. According to this observer pupae of PAPILIO NIREUS L. reared against a twig of the citrus tree, on which the larva lives, were light green; between dark green leaves dark green; against dead twigs covered with pale yellowish-green leaves they resembled the latter; while they were yellowisch against the wooden frame of the case of the same colour. Red surroundings appeared to exercise no influence but on the other hand a pupa attached to the junction of purplish brown brick and wood composing the case was stated to have its back the colour of the bricks and the under surface that of the wood. The latter observation, however, was doubted by POULTON since it did not agree with his own experience; he justly refers to the fact that it is a common occurrence that the colours of pupae differ greatly in the dorsal and ventral regions and when it is borne in mind — what has, moreover, been proved in other instances — that Mrs. BARBER was a fanatical supporter of the then novel theory of mimicry, I consider it advisable not to attach too much weight to her observations. Mr. ROLAND TRIMEN subsequently conducted experiments, on the pupa of PAPILIO DEMOLEUS L. He found these pupae yellow, green, or reddish-brown, according to whether they were attached to bands of these colours fixed by him to the sides of the cage. A black surrounding caused them to become dark but light red and blue had no effect. Of more significance are the observations by POULTON who certainly is a strong and by no means unbiassed supporter of the said theory but whose experiments have been conducted on so large a scale and with so much accuracy that, even when we are unable otherwise to accept his conclusions, the facts observed by him merit every confidence. Six pupae of VANESSA IO L., which occur in two colours in nature — dark green and more rarely yellowisch-green — reared by him in a surrounding of yellowisch-green tissue paper were all of that colour. In the pupae of ARGYNNIS PAPHIA L. and VANESSA POLYCHLOROS L., according to WOOD and others the environment caused them to become darker or lighter but otherwise the colour was not affected. In PIERIS BRASSICAE L. and P. RAPAE L. the pupae become a beautiful smaragd-green from a yellow or orange surrounding but a black or white environment induced only darker or lighter shades; the former also resulted from every other surrounding except yellow or orange; blue has no influence on PIERIS pupae nor has orange on those of VANESSA. The most important results were obtained by POULTON in experiments on the pupae of VANESSA URTICAE L., which he was able to carry out on a large scale. The larvae which were the subject of these experiments were placed in green surroundings in the hope of producing green pupae which in this species do not occur in nature; but in vain, the pupae were only "somewhat darker than usual and this suggested a trial of black surroundings, from which the strongest effects were at once witnessed; the pupae were as a rule extremely dark with only the smallest trace, and often no trace at all, of the golden spots which are so conspicuous in the lighter forms. A not inconsiderable number, however, retained the normal light colour with golden dots. These results suggested the use of white surroundings. The colours of nearly 150 chrysalides obtained under such conditions, were very surprising. Not only was the black colouring matter as a rule absent, so that the pupae were light-coloured, but there was often an immense development of the golden spots, so that in many cases the whole surface of the pupae glittered with an apparent metallic lustre as if they were covered with gold-leaf". Sometimes the pupae were light pink in colour. Finally a golden surrounding was tried and the same effect secured as with white but with a great increase in the number of golden pupae. POULTON, moreover, observed that whereas an orange surrounding induces a dark smaragd-green in pupae of PIERIS, that colour does not influence VANESSA pupae and also that blue has no effect on PIERIS pupae.

Concerning the pupae of VANESSA IO L., Dr. KATHARINER (*Biologisches Centralblatt 1899*) has also published some observations in which, however, he considers the rare green form a variety and the lighter or darker brownish-grey form with a few metallic dots the normal one, while in my opinion the green is the original form, now rarely met with, and the other the one which has advanced further in the normal darkening process. According to his observations on a great number of pupae, those reared in broad daylight with light-coloured surroundings were of the green form and those in darker surroundings brownish-grey. In the green ones the usual metallic dots were present; he once found such a chrysalis in the natural state wich was entirely of a golden lustre and on this occasion quotes the opinion of C. Ed. Venus that this should be the result of an intense solar irradiation. The results mentioned, however, only concern the large majority of the pupae, on which he experimented; contrary results occurred also, although in a much smaller number and even when reared in complete darkness the green form occurred occasionally.

From larvae of Vanessa Cardui L. and V. Urticae L., which pupated in a temperature of 37° C. against white linen in full daylight, Standfuss obtained pupae of a more or less white general shade but others reared similarly in a temperature of 8°—23° C. assumed the usual brownish-grey hue.

Prof. Dr. J. Vosseler discusses in *Zeitschrift für Wissenschaftliche Insektenbiologie, Band iii, (1907), p. 204*, the pupae of Papilio Demoleus L., reared by him in quantity in East Africa. Although a whole-hearted supporter of the theory of mimicry and speculating on the subject to his heart's content, and like Kathariner and others retaining the likewise antiquated tenet — attributing the origin of the colours in pupae in relation to their environment to chromophotographic action — his observations on the matter are not devoid of importance. He states that the pupae of this species vary from very bright yellow, yellow, green, and bluish-green to bright and dark brown with green dots and invariably marked with the same dark band; the ventral side is brightest in colour and thus most strongly imitates the colour of the environment; the colours of bark and wood especially are imitated best, yet this imitation is never absolute but is invariably confined within certain limits.

Bordage also reared some pupae of Papilio Demoleus L. in the Mauritius which, according to him, are grey or yellowish-green, the dorsal side sometimes more reddish-brown, while the ventral side is yellowish-green. The colour of the environment where these pupae are formed, such as bark or leaves, appeared to have no influence on the colour of the pupae, neither did light or darkness, sothat under these conditions pupae of both colours occurred.

With reference to Acraea pupae from South Africa, Mr. Mansel Weale informs us that in his experience a light or dark environment would cause these to be lighter or darker in colour but that otherwise their colour did not change.

Finally some investigations have been instituted concerning the colour of the pupae of the South American Papilio Polydamas L. of which species it has been stated by Fritz Müller that they are dimorphic as regards colour and that both green and brown pupae occur. Also concerning the pupa of the European Papilio Machaon L., which is likewise dimorphic, produces green and brown pupae and similarly has not shown any symptoms of this susceptibility. Various investigators have experimented with it in this connection. I find it noted by a certain German observer that green as well as brownish-grey or plain grey pupae occur in this species, some of the first named having dark markings — all irrespective of the surrounding amid which pupation took place, with this qualification, that those reared in a dark case, although showing both the colours named, were in general somewhat darker. Cecil Floersheim, in an essay entitled "*Some notes on the earlier stages of Papilio Machaon, particularly with regard to the colour-dimorphism of its pupa*" occurring in *The Entomologist's Record and Journal of Variation, vol. xvii, (1905)*, came to a different conclusion. According to him the green pupae were formed almost exclusively between green leaves but a few (2 to 115) against dark-brown twigs near the soil, while on the other hand the brown ones occured mostly against these dark-brown twigs and a few against green leaves but not against the light green ones where the majority of the green pupae were found. Some fifteen, having pupated against wood painted white and being exposed to the full glare of the sun, were all brown and he, therefore, while admitting the influence of the green leaves, does not consider that bright light promotes this adaptation.

Many similar observations are mentioned in the work by Wilhelm Petersen "*Zur Frage der chromophotographie bei Schmetterlingspuppen (1890)*" which, however, are on the same lines as the others already referred to.

On quietly passing all these observations in review, ignoring for prudence sake the first mentioned in which a strong desire is manifested of seeing what the theory of mimicry suggests finding and provisionally also passing by the quasi-alchemic ones of Poulton — to which I shall refer later — it appears to me that they may all be summed up as establishing some amount of darkening as the result of a dark environment or at least an environment making that impression on the larva. This result being invariably in relation to the colour which obtains normally in the species, as well as to the susceptibility to the accompanying stimulus which always differs in each individual and to which is due the fact, so astonishing to most observers, that experiments conducted exactly in the same manner on various individuals not only differ somewhat but show directly opposite results. In this manner the considerable difference of temperature in the experiments related by Standfuss may possibly have occasioned difference in susceptibility.

In this connection there is, therefore, question only of a greater or lesser increase of black and this in relation to the susceptibility thereto, but this is simply identical with the chief element of colour change, which I term colour evolution, and which plays so important a role in imagines, which I first observed in the larvae of Sphingidae and subsequently also in other larvae, and to which, on page XXI of my introduction to the treatise of the Java Pieridae, I attributed the increase of black in PIERIS pupae. When we reflect that the pupae which have been dealt with actually occur in two colour forms: green, from yellowish to various darker shades, and grey, through various shades to almost black, and that these two forms occur side by side in different individuals of the same species, such as: PAPILIO MACHAON L., P. POLYDAMAS L., P. DEMOLEUS L., and P. MEMNON L., and thus produce a pupal dimorphism, the matter will admit of no doubt to any one acquainted with the phenomenon of colour evolution. Wherever such a dimorphism occurs it points to the existence of an evolutionary process of change in which a certain number of the members of such a species have advanced further than the others which possessed little susceptibility in this respect sothat two distinct forms, each exhibiting a different stage in this process, have been produced. Exactly the same process obtains in the case of the green Sphingidae larvae turning brown, which is dealt with in my article "*Ueber die Farbe und den Polymorphismus der Sphingiden Raupen*", and in which the course of the process can be distinctly observed owing to the separation of the various stages of development by the moults.

In this case there is not only a very great difference — doubtless representing many centuries of development — between the various species as regards the stage of this evolution attained, but even between the individuals of the same species there is a considerable disparity in this respect. The different shades in which colours occur in pupae of the same species also point in that direction, namely to a general darkening tendency which in different individuals, however, is more or less developed. But to those well acquainted with the phenomena of colour evolution this is by no means all. I distinctly remember, and JACOBSON also observes, that the dark brown-greyish pupae of PAP. MEMNON L. exhibit green dots; VOSSELER notes the same concerning the dark pupae of PAP. DEMOLEUS L. Whence these dots? They are relics or vestiges of the ancient green colour of the pupae which in certain spots have resisted the evolutionary darkening process; these are the same persistent spots to which I have already referred when discussing the Pieridae, as regards the process of colour evolution.

In so far as the colour of pupae is still subject to this process and susceptibility is present, its course may be accelerated by the influence of favourable conditions of life. Now it appears that at a certain period shortly before pupating a definite amount of illumination, in this case a darkened environment, may bring about this effect, but that, on the other hand, an unusually strong illumination or one caused by specific light rays corresponding to certain colours of the environment, may retard or interrupt this process.

How and why? To a large extent the answer is still "we know not". POULTON, in order to prove that the influence of colour, alluded to, on the pupa could not be the result of some response through the sense of sight on the part of the larva, covered the eyes of the latter with a certain varnish during the said period before pupation so as to blind the larva. It may be presumed that this was, indeed, superfluous; at that period when the skin — and with it that of the head — is nearly severed from the body and has probably but little connection with it, as is evidenced by the change of colour, it may be assumed that the optical function no longer operates by means of the eyes and that the pupal stage in this respect has already been assumed. Nevertheless, even if we do not know in what manner, it may be taken as very probable that the animal remains susceptible to influences of light, for we are here concerned with a class of animals endowed with extreme sensitiveness in this respect. Most of the Heterocera are unable to endure daylight and hide away from it, some even passing the day in an extremely somnolent state; on the other hand many swiftly fly towards any light in the darkness such as the strongly lighted white tropical dwellings. Some Rhopalocera also seek semi-dark spots in the dense forest while others again continually prefer the full glare of the sun, many species being evidently unable to dispense with it, sothat they cease to fly directly the sun disappears, even if only for a few moments, behind the clouds, although the temperature may remain unchanged. It cannot, therefore, appear strange that light, or the absence of it, should exercise a strong influence on such animals and especially at a particularly critical period of their life which would bring a particularly great susceptibility in its train. In many animals devoid of eyes this is, indeed, also the case.

Now if an environment conducing to a decrease of light promotes the natural development of the colour process in pupae, it stands to reason that the reverse condition should likewise exercise certain effects. Hereto, moreover, certain phenomena sometimes seem to appear which accord to such an extent with other facts, whose occurrence has been observed through the action of other abnormal influences on the pupae in the resulting imagines, that they also are by no means surprising.

Blue surroundings had no effect whatever on pupae of PIERIS BRASSICAE L., and P. RAPAE L., so that no susceptibility for this colour was present, black or white surroundings, or even those of any other colour except blue and the two colours to be referred to hereafter, resulted in the darkening of the pupae, *i. e.* an increase in black; yellow or orange surroundings, therefore radiating a very bright light, caused the pupa to become dark green however. In the latter some darkening, therefore, occurred also, but whence this green colour?

According to W. PETERSEN the colour of the pupa is due to the pigment in the cuticula and the hypodermis. Now the pigment in the latter is green in the larva and sometimes remains so in the pupa. If, however, an accumulation of pigment occurs in the cuticula this green colour becomes darker. Yellow or orange light, however, is said to prevent the formation of dark pigment in the cuticula, causing it to become translucent when the pupa would appear green owing to the pigment of that colour in the hypodermis. This may well be the case but those who do not judge from a chemico-physical point of view will be satisfied neither with this nor, therefore, with the chromo-photographic explanation. It will be asked what, then, is the cause of the appearance of dark pigment in the cuticula, as it appears to occur normally and is prevented abnormally by such a particular light? What natural process is disturbed in its normal course by this illumination? PETERSEN does not explain this; let us see, therefore, if we may not be able to trace it.

The pupa of P. BRASSICAE L. is described by the Dutch Entomologist SNELLEN as yellowish-green with black dots, that of P. RAPAE L., as yellowish-grey or brown with three yellow stripes, and that of P. NAPI L., closely allied to the latter, as dull green, finally that of P. DAPLIDICE L. as green. Green, therefore, appears to be the original colour of the PIERIS pupae, partly turning to yellow and in which, moreover, black commences to appear. The occurrence of green in the forementioned experiments, therefore, can be nothing but the reappearance of the colour peculiar to the pupae of P. BRASSICAE L. and P. RAPAE L. at an earlier stage of colour development, and is doubtless the return to an earlier colour form similar to that occasioned in the colour development in the imagines by the experiments with heat and cold on the pupae, referred to on page XII *supra*, the B. forms of Dr. E. FISCHER; the result of disturbance by abnormal influences in the natural process of colour development, in the one case caused by heat or cold, in the other by too bright a light.

We must here draw attention to a series of other experiments.

In order to find out whether the colour of the environment also influences the colour of the cocoons of Heterocera, POULTON made several trials. Thus he found that larvae of SATURNIA CARPINI H. (PAVONIA L.) formed very dark cocoons in dark surroudings but white ones in bright light; that ERIOGASTER LANESTRIS L. produced creamy white cocoons on white paper but dark-brown ones between leaves; that the cocoon of HALIAS PRASINANA L. is likewise brown normally but white in white surroundings, and that the same occurs in the case of the cocoons of LIPARIS AURIFLUA W. V. and RUMIA CRATAEGATA L. BATESON, however, in 1892 published in the *Transactions of the Entom. Society of London* the results of some experiments conducted by him in connection with the cocoon of ERIOGASTER LANESTRIS L. He obtained, indeed, the same results but he expressed the opinion that the cocoon was normally dark coloured and that the dark pigment is destroyed if during the formation of the cocoon the larva is placed in an abnormal condition through any disturbing factor, such as being removed from the food plant when nearly full-grown or by the presence of parasites.

Dr. HARRY FEDERLEY, in an article in the *Meddelanden af Societas pro Fauna et Flora Fennica, 1909—1910,* expressed yet another opinion; he also obtained similar results in his experiments but he thinks these are to be attributed, chiefly at least, not to the influence of the light but to that of the greater or lesser humidity; when the white cocoons, obtained in this manner, were sprinkled with water they acquired the brown colour one or two days after. It is difficult, however, in my opinion, to imagine that in the many experiments which have produced the said results the lack of humidity could invariably have played such a role without it being noted and I believe, therefore, that this observation must be considered as an independent phenomenon. BATESON'S interpretation could not, of course be reconciled with the opinion of POULTON, so strongly suggestive of the theory of mimicry, as regards the cause of this phenomenon. The latter, therefore, at once proceeded to contest it and those *Transactions* for the same year contain an account of new experiments on the same larva carried out by him, in which it was subjected during the formation of its cocoon to various disturbances without inducing it to become white. He thus considers to have sufficiently refuted the interpretation by BATESON.

It would appear to me, however, that POULTON may have been mistaken and that BATESON'S interpretation is really correct intuitively, if I may so call it, *i. e.* without quite understanding its real bearing, while POULTON has overlooked the principal disturbing factor in the case. Would not the presence of bright, or at least white, light occasion an important disturbance in such a heterocerous larva which in that conditions has continuously lived in daylight but whose organisation of vision now becomes so changed that in the imago stage it is only adapted for darkness and which, consequently, for its pupation intentionally seeks dark places or protects itself against daylight by means of a dark cocoon? I think this may be considered far from improbable and that in this manner all these cases of white cocoons obtained on white paper or in white boxes can easily be accounted for. That bodily functions — and this applies especially to secretions — are not exercised, or only partly so, under abnormal conditions is indeed no uncommon phenomenon; thus the secretion of dark pigments might well be impeded by the disturbance here referred to, either absolutely or to such an extent that the cocoon threads, originally white, might become coloured in which latter case insufficient moisture of this secretion might be the determining factor and FEDERLEY's experiment would, therefore, be to the point here. This would again be a case of disturbance in the natural course of development caused by white light, which would very well accord with the forementioned interpretation of the action of yellow and orange light on PIERIS pupae. This appears to me to receive equal confirmation from POULTON's experiments with the pupa of VANESSA URTICAE L. As we have seen by exposing these pupae to bright white light he obtained a few pink ones but by far the greater number were very light in colour with an extraordinary development of the golden spots, even causing a complete gilt appearance of some of the pupae; illumination with gilt surroundings, thus irradiating a bright yellow light, further increased the number of strongly gilt pupae. In this butterfly a very intense white or yellow light, however, appears to be required for this; simple white surroundings, such as white paper which influences the cocoons of Heterocera, appears to be insufficient; pupae of PIERIS species and of PAPILIO MACHAON L. placed against a white wall became darker, not light; pupae of PAP. MEMNON L. attached to white gauze assumed a dirty white. Similar surroundings, however, may, as we have seen, produce different effects in different species.

POULTON was particularly pleased with his quasi-alchemic discovery of the almost completely gilded pupae and, in the same manner in which phenomena of mimicry are so hotly chased, the appearance in nature of golden spots, such as occur in the pupa of VANESSA URTICAE L., for instance, is attributed with great ingenuity to a similar illumination or even where it may be observed on a much larger scale as in South America — or for instance in the Malayan EUPLOEAS — it is interpreted as a vestige of earlier conditions of similar illumination! But upon serious reflection there is no ground whatever for attributing these strong and wide-spread metallic lustres, such as occur for instance in the pupae of EUPLOEA and ATELLA, to such influence; moreover the same occurs in other life-stages of Lepidoptera. In the case of larvae, indeed, few instances are known, although I recollect referring on page 56 of the Monograph of the Java Pieridae to the steel-blue lustre of some caterpillars of CALLIDRYAS POMONA F.; in imagines, however, many examples are met with; the metallic spots on the lower surface in some species of ARGYNNIS and those on the upper surface of

PLUSIAS being the best known; reference may also be made to the strong metallic gloss in species of MORPHO and in several Lycaenidae. In the VANESSA pupae also it is doubtless simply a question of prismatic colour phenomena of whose nature we are still ignorant and which have no relation to the direct influence of light but which may be excited abnormally by abnormal disturbing influence of light in so far as the susceptibility for it exists, as in the pupa of VANESSA URTICAE L. Disturbance of the natural course of development, therefore, is the cause in this case. This reacts on the colour of the pupae in the presence of abnormal influence of light, in the same manner as may be witnessed with respect to the colour and form in imagines resulting from various influences, as indicated on page XIV *supra*. The occasional appearance of a pink colour under the same influences is doubtless to be interpreted in a similar manner.

The experiments in connection with influences of light have, therefore, produced much confusion in the science of lepidopterology; I hope to be able to shed some light on the subject. It should be observed that a knowledge of the phenomenon of colour evolution is closely associated with it.

Fortwith to explain all the phenomena to be observed in this connection would, indeed, be too great a task and more than could reasonably be expected. The explanation of some, however, appears not impossible.

The observations by BORDAGE indicate that in the normal condition EUPLOEA pupae are of a generally dark brown colour on which a strong metallic lustre has a tendency of spreading more and more. Of the different species, some are in a more advanced stage than others as regards this process. Now in the case of pupae normally produced in daylight, when this process takes place in the dark a disturbance is caused resulting in a decreased distribution of the metallic lustre.

The MEMNON pupae, like those of P. MACHAON L., P. PHILODAMAS L., and P. DEMOLEUS L., are dimorphic, *i. e.* light green and dark greyish or brownish, which is termed bark-coloured. A dark environment may cause the former to turn to dark green, as has been observed in the case of the two pupae of P. POLITES L.; moreover, with ordinary treatment or even when reared in dark boxes, green as well as greyish or brownish coloured pupae may be produced; very susceptible individuals only in that case acquire a dark colour. A particularly great susceptibility to this evolutionary change seems to occur in P. MEMNON L. the same as in P. MACHAON L., hence the slightest darkening of its environment, when pupation takes place against a branch or bark, is sufficient to cause them to become brown-grey, except as to the persistent green spot, alluded to as a vestige of the old colour. The others, not subjected to such surroundings, remain light green. A pronounced white environment, too, appears to have a disturbing effect; hence a few pupae formed against the white gauze turned a dirty white, *i. e.* somewhat darkened white without green spots. The phenomena noted by KATHARINER in the likewise dimorphic pupa of VANESSA IO L. are thus also explained.

With regard to DANAIS pupae I am still groping in the dark. The fact mentioned by POULTON that white light induced the production of a few pink coloured pupae of VANESSA URTICAE L. is not without interest in this connection, since there appears to be but little difference between this and the more rosy colour of a portion of these dimorphic DANAIS pupae. BORDAGE obtained in this species faint rose, light green, more rarely yellowish-white and sometimes even red pupae; the latter were, probably, infested by parasites and invariably produced imperfectly developed imagines. He thinks that larvae which have pupated against brightly coloured or metallic-lustrous surfaces mostly produce green pupae and against dark coloured surfaces mostly white or rose-coloured ones. With weak illumination against black surfaces and still more in total darkness the rose-coloured and white pupae greatly increased in number. Subsequently he found that of a number of pupae placed in golden-lustrous surrounding during a day and night $^2/_3$ had become green and $^1/_3$ rose and white. This does not, however, shed much light on the subject and certainly does not account for the changes observed by me. My observations in this respect, however, were accidental and were not the result of experiments conducted intentionally with that object in view. In order to be able to form a sound judgment such experiments still require to be carried out. Many other investigations also are necessary in this field. We are only at the commencement of the enquiry. In spite of the many experiments conducted in this respect concerning the facts, or of their extent and accuracy, incontestably deserving every praise, such as those by POULTON for instance, I believe that, as regards the interpretation of these facts, in general not much of consequence has been contributed. POULTON and others, completely obsessed by the theory of mimicry, endeavour to explain the observed facts simply by mimicry fictions; even the chromo-photographic interpretation still counts too many adherents. For this reason I can attach but little value to the important study in connection with this subject contained in the work, already referred to, by WILHELM PETERSEN. This savant completely adopts this attitude, the phenomenon of colour evolution, and with it every attempt to interpret the colour phenomena on evolutional lines, being wholly foreign to him. The chromo-photographic theory proceeds from the physico-chemical point of view, which is simply based on a vague hypothesis by which the bearing of the phenomena of life can only be partly explained. While this theory may, in itself, not be so impossible, as Meldola and Poulton appear to think, it can only be applied in connection with the evolutionary changes to which the colour as much as the whole form of each animal is subject and which may differ considerably not only in the greater divisions but even in individuals. Where it does not take this into account I believe consequently that it cannot lead to the desired goal and that all investigations and observations conducted from this point of view lead *a priori* on the wrong track. Even resemblance of the colour of pupae to their environment, the conception of so-called bark-colour, must be studied with greater attention, since a great deal of superficial observation has been brought to bear on the subject; moreover, the same remarkable agreement observed in many larvae has to be studied more accurately and may prove ot great service for comparison in this connection. Nearly alle observations noted in this respect have taken place far too much under the suggestion of mimicry to allow of an unbiassed judgment being formed. It should, therefore, be borne in mind that this resemblance to the environment occurs, not only as regards colour, but equally as regards shape, as for instance in the case of the larvae of geometrae resembling twigs, which can hardly be attributed to the influence of light rays. Moreover, chemical and microscopic investigation is indispensable here. We know that the colours of imagines, except such white as is produced by the filling with air of the scales, are of a pigmental or structural nature. We know something about these pigments but our knowledge is still very incomplete, and as regards the occurrence of structural colours too we are as yet very ignorant. Without a doubt pigmental colours occur in caterpillars but others exist also even on a large scale, but what do we know of these? And as regards the pupal colours, observation leads us to suspect, indeed, something similar but concerning their structural colours too we know practically nothing. Our knowledge generally with regard to these colours in still extremely insignificant. I have already referred to this at the conclusion of the chapter on the influence of light in my work "*Noch einmal Mimicry, Selektion, Darwinismus*", published in 1907. A considerable amount of specific and accurate investigation is still needed in this respect. Only then shall we make further progress with the interpretation of the colour phenomena in the pupae of lepidoptera.

Even the urgent recommendation of further study in this field on these lines has its value; with this I propose, therefore, to terminate my reflections.

Now as regards the Satyridae, on proceeding to a general consideration of this family, two of the subjects, already referred to when treating of the Danaidae, come to the front, in respect of which clearer ideas are required than usually obtain in order to understand the phenomena which present themselves so prominently in the butterflies of this family. First, that of colour evolution which in this family plays so important a role and frequently produces colour phenomena which, without a knowledge of this process, are inexplicable. Secondly, the mistaken notion, already referred to, concerning the alleged seasonal varieties which, in judging the differences existing between butterflies of the same species in this family, has attained a truly fearful extent.

We will first consider colour evolution. There are surely few things which to every lepidopterologist, who is concerned with the study of the Indo-Australian fauna, appear equally striking as the great variation in colour and marking of the wings of Cyllo Leda L., especially on their under side. This is not, indeed, confined to this species, since in Kallima paralecta Horsf., for instance, the colour of the underside of the wings also offers much variety, but in the former it is much more pronounced and on account of the common occurrence of this butterfly this rivets the attention more. No other phenomenon which presents itself in connection with the subject, I venture to say, has been less capable of interpretation. Of course there has been no lack of phrases concerning the influence of the environment etc. in this connection but, although it is not impossible that this may exercise some influence, it is by no means certain that this is so; in any case this assumption does not really help us to an understanding and the theory of mimicry enables us least of all to explain the origin of so many differences. The fact that such resemblance in colour with its environment may sometimes afford a butterfly some protection against its enemies, in so far as these pursue them by sight only, may be taken for granted but it does not explain in what manner this arises. With the aid of the theory of colour evolution, however, this truly very intricate phenomenon may be elucidated, and, at least at present, exclusively by means of it, which consequently constitutes a very powerful argument for the correctness of this theory. The value of a theory can, indeed, be gauged only by what it enables us to elucidate.

When treating of this species in its proper place I will fully explain my meaning in this connection, but since this has a general bearing on the value of the theory in question I have thought it useful to refer to it here.

An explanation of many other phenomena, which are particularly conspicuous in the Satyridae, must also be looked for in the theory alluded to. Midway between the dark-coloured species of a genus so typical of this family, like Mycalesis, occur some whose wings show a fair amount of yellow and even orange; in Java, indeed, this is the case only in a couple of species but in others, not occurring in that island, it is found in a much greater degree. Whence this difference? Since we have already traced the course of the process of colour evolution in many other butterflies it is easily assumed that the original Satyridae were also red and that subsequently the red of these butterflies turned to orange and yellow in the usual course; that, moreover, at the same time a great increase of the black pigment occurred causing the colour of the wings of many species to become darker in varying degrees of intensity while in others, which in consequence of the inequality, invariably characterizing the appearance of evolutionary processes, not having advanced to the same extent, much yellow or orange has been retained, so that, therefore, these colours, where they are present, must be regarded as relics of an older condition and the butterflies in which they occur exhibit a less advanced stage in the evolutional extension of black. This is, indeed, in complete agreement with the theory of colour evolution and with what may be observed in this respect also in other butterflies. But here we find an instance where from a comparison with some closely allied butterflies the course of this process may be observed in a particularly striking manner. The orange spot near the apex on the upper side of the fore-wings in Cyllo Leda L. (Pl. XV fig. 30*c*), wich in some specimens, however, is larger and clearer than shown in the figure, is nothing but a vestige of a much greater amount of orange such as still occurs in many races or species of Cyllo (Pl. XV fig. 30*q*, *r*). In some this appears in the form of a fairly broad streak running transversely across the wing surface and it may be observed here how first in some individuals this streak is invaded and covered at its lower end by the black pigment, exactly in the manner as we have observed that it was correctly noted by Alfred Goldborough Mayer; it then (Pl. XV fig. 30*r*) encroaches on the remainder which becomes covered bit by bit until but little is left, as is frequently the case in Cyllo Leda L. (Pl. XV fig. 30*c*), which, moreover, also gradually becomes covered completely by the black pigment in the individuals of this species further advanced in the evolution (Pl. XV fig. 30*e*). If, in fact, the various stages, as they occur in these butterflies, were to be reproduced cinematographically in succession, a correct idea could be formed of the course taken by the process of colour evolution here being enacted. Of the various stages in this process instances have been retained in the various species, races, or individuals.

We have here a specially apposite illustration of the course adopted by the process of colour evolution which, like that of the "streak on the edge between the red which has remained there and the white which has become the general colour" in individuals of IPHIAS (HEBOMOIA) GLAUCIPPE Bsd., occurring in some regions, as referred to on page 35 of my treatise on the Java Pieridae, is particularly adapted to afford an insight into this process of change and the origin of the colour markings on the wings of Rhopalocera.

I have referred above to the broad transverse band which in many Rhopalocera devides the upper side of the fore-wings into two parts. Such bands occur, as I have already noted when treating of the Hesperidae, in many Rhopalocera, among Satyridae in NEORINA and especially in various species of DEBIS, sometimes in both sexes, at other times only in the ♀, this band having sometimes resolved itself into dots or stripes, the one and the other clearly indicating various stages in a process of development whose nature, however, is not clear. In the instance referred to of the butterflies of CYLLO it is, nevertheless, clear that we are concerned with a phenomenon of colour evolution and it is, therefore, probable that these bands in other Rhopalocera must be interpreted in the same way. How does this process operate, however, in this instance? Why is it that with the spreading of the black pigment in CYLLO butterflies just this band has remained intact so long? One would be inclined to assume that this spreading took place from both extremities towards the middle; such a spreading of the black pigment from the apex towards the base occurs indeed in the ♀ of THYCA BELISAMA Cram., but in HEBOMOIAS and other Pieridae the original colour, on the other hand, is clearly driven towards the apex. As a rule the band in question is white or at least of a very light colour and therefore indicates the occupation of a region where the original colour has remainnd exempt from the invasion of black and has gradually faded. But all this does not make it clear to me why this has occured in these instances.

For an explanation of the origin of the so-called eye-spots, a phenomenon also of frequent occurrence in Satyridae, a knowledge of colour evolution is likewise requisite; this phenomenon, and therefore everything related to it, may better be discussed in connection with the erroneous conceptions concerning the so-called seasonal varieties.

To this I will, therefore, now proceed. On pages XIV to XIX of the introduction to my treatise of the Pieridae of Java I have already declared myself to be opposed to the prevalent misconception concerning the dry and wet-seasonal forms; this is more especially conspicuous with reference to the Satyridae. Following in the footsteps of DE NICÉVILLE, MOORE in his *Lepidoptera indica* has adopted a number of well separated forms of the dry and the wet season and among these the Satyridae play an important role; others again have followed

Moore, Bingham being one of these, while Fruhstorfer goes still much further in this direction and thus bases on supposed seasonal varieties of Satyridae various subspecies. But I am convinced this rests entirely on a misconception even when there may be some substratum of truth. In the same introduction I have already referred to the fact that many observers have noted the so-called seasonal forms side by side at the same time in various districts; even de Nicéville, according to Moore, admitted that the dry and wet-season forms prevail during their respective seasons, but are by no means strictly confined to them, although at the same time he endeavoured to account for this by the circumstance that even during the dry season showers of rain occur occasionally and that the wet season is sometimes interrupted by periods of drought, a matter, however, not of so much significance that the fact in question, which, moreover, does not occur now and again only but happens constantly, is to be attributed to this. Nor does this in any way explain how both so-called forms are met with at the same time — by no means of rare occurrence — and is, evidently, based on the erroneous assumption that temporary meteorological influences are to be regarded as the determining cause. According to Fruhstorfer, Dr. Martin noted with reference to the Sumatra form of Ypthima Baldus (Morus Fruhst.) that no dry-season form exists of this but that, nevertheless, the ocelli on the under side of the hind-wings are sometimes strikingly smaller than usual. With respect to the Pieridae I have published in the work referred to, some important observations in connection with this subject together with my ideas concerning the origin of the differences here alluded to. My observations on the Java Satyridae fully confirm these ideas.

As will be further noted when treating the species separately, these alleged seasonal forms are by no means distinctly separated but run into each other through transitions and are, moreover, found frequently side by side. It cannot, indeed, be denied that as regards colour some greater development may be observed during the wet season in many individuals of the same species than is the case during the dry season. But seeing that this is by no means the case in all individuals, nor confined to the different seasons, it is impossible to assume the existence of such well marked dry and wet-season forms, as is done by the above-named entomologists. This difference is only manifested in the manner indicated by me on page XVIII of the introduction to my monograph of the Java Pieridae as regards Calledryas Pomona F.; in the Satyridae it may especially be traced by a study of the ocelli which are very characteristic in several genera. For this purpose, however, the origin of these ocelli must first be well understood and this is only made possible by the knowledge of the process of colour evolution.

The so-called eye-spots or ocelli occur in many butterflies. Before proceeding to discuss these I would caution my readers against the existence of what I will call pseudo-ocelli which being confused with the true eye-spots, causes some perplexity in explaining the origin of the latter since this does not accord with that of the former. Those designated as pseudo-ocelli by me are simply spots produced on the spreading of the black at the expense of the original colour, already partly faded, by the latter crowding in a more or less rounded form in which the imagination endeavours to trace a resemblance to an eye. To this may be referred the so-called eye, so conspicuous on account of a certain development of interference colours in that region, on the upper side of the fore-wings of the European Peacock butterfly (VANESSA IO L.) which owes its popular name to that resemblance; the genesis of this spot is demonstrated by the less developed forms, produced by breeding, of this butterfly, illustrated by the famous entomologist Prof. Dr. M. STANDFUSS in his *Handbuch der paläarktischen Gross-Schmetterlinge.* The same applies to the spot near the apex on the upper side of the fore-wings in CYLLO LEDA L , referred to above. For although these spots also owe their origin to the process of colour evolution their round shape is to a certain extent accidental and is by no means sharply defined; in this respect they differ at once from the sharply marked ocelli, generally round but sometimes oblong, composed of concentric colour rings, and which have originated in a different way although by the same process; moreover, they must not be confounded with what I call for that reason pseudo ones. The true ocelli occur in may Lepidoptera; some genera, such as PARNASSIUS, TENARIS, MORPHO, and BRASSOLIS, as well as, among Heterocera, SATURNIA, are specially characterized by them; in a smaller form, but otherwise of an identical nature, they are frequently met with, *inter alia,* in some genera of Satyridae, which leads me to discuss them here. DARWIN paid attention to the ocelli and initiated the confusion between the true and spurious ones. Discussing the ocellar markings on the feathers of certain birds in his work *The Descent of Man* in connection with his ideas concerning sexual selection, he considers them in relation to those of certain butterflies and especially to the spurious ones of CYLLO LEDA L. Whether these spots and the ocellar markings in birds are, however, as has been assumed, indeed identical in origin may, in my opinion, be considered very doubtful; the true ocelli in Lepidoptera have evidently nothing in common with these ocellar markings of the feathers in birds. W. BATESON, in his "*Materials for the Study of variation*", devoting a special and otherwise very important study to this subject, and being unacquainted with the process of colour evolution, entirely adopts the attitude of DARWIN in the matter.

The eye-spots, which I term true ocelli, are characterized, as has been stated, by various concentric colour rings and, as Bateson correctly observes, strongly suggesting the notion "that the whole series of rings may have been formed by some one central disturbance, somewhat as a series of concentric waves may be found by the splash of a stone thrown into a pool". Now the production of colour rings round an excisting centre is not entirely unknown in Lepidoptera. In my paper *Over de ontwikkeling van eenige Javaansche Papilionidenrupsen* published in 1888 in volume XXXI of the *Tijdschrift voor Entomologie* I showed, for instance, how in the caterpillars of Papilio Agamemnon L. and P. Eurypylus L. (Jason Esp.) a ring of coloured pigment is formed round the base of the spines on the third thoracical segment; a similar ring spot is also found in the larva of Pterogon Oenotherae Esp. round the horny last vestige of the horn peculiar to the caterpillars of Sphingidae. It appears, therefore, that where on the body surface a certain induration occurs interrupting or disturbing the normal distribution of the pigment a ring-shaped accumulation of the latter round the obstruction results. This, moreover, apparently occurs not only in caterpillars; the origin of the 8 shaped figure on the under side of the hind-wings in Callidryas Scylla L. and C. Pomona F. I considered, when treating of the Java Pieridae, could only be accounted for in this way, *i. e.* by assuming that in certain places of the wings small indurations — probably traceable anatomically — are formed, around which the pigment present begins to accumulate in ringshaped fashion. The same or something similar, it may be assumed, causes the production of the ocelli in the wings of butterflies and a knowledge of the process of colour evolution strongly supports this assumption. It is, indeed, by no means impossible that in some genera or species certain anatomical impediments against the normal distribution of the pigment, as this occurs under the stress of the process of colour evolution, operate in specific places on the surface of the wings, corresponding to the above mentioned indurations to that extent. The fact noted by Bateson that in Satyridae the ocelli occur invariably on one of the creases or fold marks of the wings between two nerures, *i. e.* just, therefore, where such a disturbance would take place, deserves consideration in this connection, as well as the observation by the same author that such ocelli on the upper and under sides of the wings, indeed, sometimes occur which completely coincide but that this is by no means always the case and consequently the assumed disturbance may possibly occur in one of the two sides of the wings only which, indeed, agrees entirely with the fact that the process of colour evolution pursues its course independently with regard to either of these surfaces. Some other explanation in this connection may, however, present itself, *i. e.* that to which I referred when dealing with the Java Pieridae where I applied the term "persistent" to these spots which I looked upon as being portions of the wing surface where the original colour had resisted the evolutional invasion of black much longer than in other parts, the cause whereof must probably be sought in some special condition of the tissues. However this may be, it is certainly reasonable to assume that when in the stress of the process of colour evolution the black pigment endeavours to spread over the original colour and encounters such a disturbance, induration, or persistent spot, this pigment will be distributed around it and an island will be formed of the original colour surrounded by black. We find in fact that the colour of this enclosed centre accords with this proposition as a rule, sometimes, however, circumstances may arise when this is not so clearly perceptible. In the ocelli of Parnassii the centre frequently exhibits for the greater part the original red colour, only just in part faded to white. In the various genera, however, in accordance with the same absence of uniformity, invariably to be witnessed in the course of an evolutionary process, the process in question has doubtless frequently taken a special course. Thus, for instance, it is remarkable how these ocelli on the hind-wings of Parnassii correspond in form and manner of disposition to the black spots on their fore-wings; the former are evidently just such spots as the latter in which, however, the black pigment has not been distributed to the same extent and where, consequently, in the formation of the ocelli the black pigment has not exercised as much stress as has been the case in other genera. In some Satyridae the course of this process can be clearly discerned. The accompanying illustration (Pl. XV fig. 30*b*) gives an enlargement of the ocellus, indicated on Pl. XV fig. 30*a* by number 5, on the under surface of the hind-wings of Cyllo Leda L. A clear white centre will there be observed round which a fairly wide ring of intense black has gathered while outside this again a narrower yellow ring has been formed. Now this centre is doubtless the vestige of the induration or persistent spot where the original colour was not — or at least not completely — covered by the black pigment, but where this has gradually faded to white in conformity with the rule of the process of colour evolution or has already been destroyed and replaced by scales simply filled with air which, in view of the intensity of this white, I do not consider improbable.

For this reason it not unfrequently happens, as Bateson observes, that the centres of ocelli are deficient in or destitute of scales. Around this centre the black pigment, which was checked in its even distribution, has become accumulated, thereby causing the production of a fairly broad ring of black much more intense than the black pigment occurring elsewhere in the colour of the wings in this species. This intensity clearly indicates that an accumulation of this pigment has taken place here and this accounts for the narrow yellow ring again surrounding this black. For the black pigment, which there as elsewhere in the wings, had first covered the original colour, has, under the said stress, thence pressed towards the centre, where consequently, it has increased most and has thus produced the intense black colour but at the same time it has retired from the place where it occurred first and in this manner has caused the original colour — now faded to yellow — which formerly it covered, to reappear as a narrow ring.

Conceived in this fashion the colour arrangement of this ocellus is easily understood without having recourse to chemical action to which Bateson draws attention. Providing, of course, one is acquainted with the phenomenon of colour evolution and has been taught to interpret the distribution of the black pigment over the original, or subsequently faded, pigmental colours in a manner, which in fact reminds us of the flowing forward of a liquid, as the expression of the stress of this evolution.

Since this is the case with this ocellus it seems reasonable, as regards other true ocelli, to explain the cause of their origin in a similar manner even though the course of the process of colour evolution in every species, or at least in every genus, may not be so clearly traceable and adventitions circumstances, such as the appearance of interference colours, may impede its investigation.

Other ocelli exist which must also be classed with the true ones but which, in part at least, have presumably originated in a different way. I refer to those occurring in many caterpillars of the Sphingidae, and which have played an important role in the fantastic theory of mimicry. As far as I have been able to find out they sometimes start from a colour spot on each segment, the remnants of the longitudinal lateral stripes occurring in earlier stages of development and which subsequently either disappear entirely or at least strongly diminish; these remnants appear to assume a round shape during the growth of the caterpillar and in this manner form large round ocelli on such articulations which increase inordinately in size. The course of this development, however, requires further and special investigation.

The ocelli, first referred to, are of great importance for a correct judgment on the question of the alleged seasonal forms. For it is asserted that these markings only occur in the wet season while in the dry-season forms of the same species they are absent, and that consequently the forms of the dry and the wet season can be distinguished by the absence or presence of the ocelli. It is true this assertion is based upon a certain amount of correct observation; but this has become the subject of much wild speculation so that in the end much misconception has arisen. Much stress has frequently been laid upon the excessive variability of the ocelli but in the interpretation of this phenomenon little progress has been made, because, as I have already pointed out, so little attention has been paid to the fact that every animal organism is subjected to continuous changes of form, appearing in a greater or lesser degree in various individuals, and that changes of colour come under this category, from which it follows that where in consequence of colour evolution special forms have been produced, as is the case in butterflies with ocelli, these changes are particalarly striking. Individual differences exist invariably; no two butterflies, any more than two men, being completely alike; some difference in colour or marking is, as a rule, to be noted also between two butterflies of one species. With regard to the forms created by the evolutional stress of a special process of change of form such individual differences must consequently occur. Its greater or lesser progress is always governed by the peculiar constitution of each individual whose origin is never identical with that of the other individuals and also by the very different individual susceptibility for this special stress of development. These must, therefore, of neccessity, reflect the fact whether the process of the evolution occurring here has more or less advanced in some individual and, therefore, the degree of its development. In one the ocelli will consequently be larger or more numerous than in another; in some they will exhibit a particular distribution while in others again they will be scarcely apparent or altogether absent. This is, in fact, what a study of the ocelli brings to light. In size they differ considerably in individuals of the same species. BATESON, on page 295 of his important work already quoted, figures four specimens of SATYRUS HYPERANTHUS L. all differing in the number and size of the ocelli; three of these he notes as having been taken on the same day in the same district in England, "so that here no question of seasonal or local difference is necessarily involved". Indeed, in view of the present tendency of basing so-called sub-species and even species purely on such differences, this observation may usefully be reiterated. Besides, how insignificant actually are these differences. The specimen marked n°. III is the only one of any importance because practically no ocelli are to be seen in it. This form occurs very little and is evidently one in which the colour development has been much retarded; it clearly corresponds in the present species, producing but a single generation in a year, to the form LEVANA in the VANESSA species yielding two generations each year. In CYLLO LEDA L. such specimens occur not infrequently and here it may be observed how they arise through retarded colour development and grade into one another with more advanced forms. As regards the other three, which are in a further advanced stage of development, there is only a slight difference in respect to the size of the ocelli; in the one which is most developed, marked IV, by the side of two fairly large occelli in the centre of each of the hind-wings a third appears, being confluent with one of the former. The latter phenomenon is one of evolutional change of form not of infrequent occurrence where the ocelli are strongly developed and often to be observed on the lower surface of Lycaenidae, which has been noted as such by Prof. Dr. COUVOISIER of Basle in his paper "*Ueber Zeichnungs-Aberrationen bei Lycaeniden*" (*Zeitschrift für Wissenschaftliche Insektenbiologie, 1907*). This confluence of ocelli may plainly be observed in many YPTHIMA species; in some specimens they may thus be seen as two ocelli joined side by side, being already united where they are in contact; in more advanced stages they are amalgamated into one ocellus which is still elongate in shape, however, while next this becomes more and more rounded in outline until finally a single large ocellus results. This does not, however, contain a single, but two nuclear points, the nuclei of the two original ocelli; which, therefore, demonstrate the fact of this confluence. Not always, however, is the presence of two white dots in such an ocellus due to this origin. In NEORINA CHRISNA Westw. a large ocellus may be observed on the apical portion of the fore-wings on the upper surface. This ocellus is of an intense black with yellow border and sometimes with a white nuclear dot in the centre of the black. Now two larger white dots invariably occur, not in the centre, but in the upper and lower part of the yellow border. Consequently they are certainly not nuclei. Moreover, they are not placed within the ocellus proper, but why such white scales should appear just in these places remains unsolved. The difference in the occurrence of these ocelli in butterflies of the genus MORPHO, quoted by BATESON, is also similar in character. The species of this genus mentioned by him are closely allied, and they are, therefore, subjected to the same evolutionary processes; in which connection sometimes a few more ocelli occur in one individual than in another.

These individual differences in size or number of ocelli occur also to a considerable extent in the Java Satyridae, such as MYCALESIS PERSEUS F.; this is most conspicuous in CYLLO LEDA L., so common in that island, and a careful study of this butterfly clearly demonstrates that in this case they are purely phases of colour development, and that of some unlimited or irregular so-called variability there can be no question. In CYLLO LEDA L. the lower surface exhibits on the fore-wings 4 and on the hind-wings 6 ocelli which I have indicated with numerals in the accompanying illustration. Of those on the fore-wings n^0. 3 is the largest and the others are mostly very small. On the hind-wings n^0. 5 is the largest, n^0. 7 and n^0. 9 being next in size and the remaining three considerably smaller; n^0. 10 is sometimes duplicated and n^0. 8 mostly placed further towards the outer margin than the others. Individual differences in this respect occur in Java only exceptionally; in races or closely allied species in the east of the Archipelago, in which the ocelli are invariably larger, greater differences in this respect are met with, although the character of these spots remains the same. The stage of development of these ocelli, however, is not identical in the several individuals, yet they are invariably in the same mutual relation, n⁰. 5 on the hind-wings being always the largest, n⁰. 9 coming next, etc. They thus occur in the same relation in various stages of development; at the most advanced stage such an ocellus has the appearance in miniature of the enlarged illustration given on Pl. XV fig. 30*b*, but in less advanced condition these colour rings are only partly distinguishable or not at all; at a still earlier stage they appear as yellowish dots or specks, and in proportion to the lower stage of development they decrease in size; the larger being reduced to specks while the smaller disappear entirely but all in the same mutual ratio; if only one yellow speck remains visible it is found at the spot where in case of complete development the largest of the ocelli — n⁰. 5 on the hind wings — occurs. The action of a regular process of colour mutation is clearly manifested here but there is no question of irregular changing caused by so-called variability.

In a species like Cyllo Leda L., where the degree of its colour development as well as that of its ocelli can thus so easily be observed and which at the same time occurs so generally in various districts and at various times, the question whether or not the existence of ocelli characterizes the wet-season variety, ought to be capable of being demonstrated.

Now from the examination of a great number of specimens, available for comparison, it is perfectly clear to me that such is not the case. It is true the best developed ocelli occur in the wet season while ocelli met with in the dry season are always less developed and mostly reduced to specks, wholly or partly, or they may also be wanting in part or even entirely. But transitions occur and, moreover, the rainy season in Java gradually passes into the dry season while, finally, butterflies with very slightly developed ocelli are by no means unfrequently met with in the middle of the wet season. It is, therefore, clear that the process of colour evolution, in the way this, too, decidedly manifests itself in the ocelli, operates in Cyllo Leda L. most strongly during the wet season, but presumably because, above all, the food is more nutritious at that time — since in the wet season the whole vegetation is much more robust and the larvae then met with have a much stronger appearance — and not by reason of any direct specific meteorological influence. In the course of this evolutionary process the individual susceptibility too undoubtedly plays an important part and its progress in relation thereto in certain individuals may at the height of the wet season be almost or entirely suspended. Notwithstanding the fact that, therefore, the wet season undoubtedly exercises some influence, if only indirectly, it is by no means clearly reflected in the appearance of the ocelli and the assumption of the existence of sharply defined seasonal varieties as the results is unwarranted since these do not, in Java at least, actually exist; which, moreover, completely accords with what I have ascertained in this respect in the case of the Pieridae. The study of the ocelli in other Satyridae, such as Mycalesis Perseus L. and species of Ypthima, leads to the same result.

The larvae of the Satyridae give occasion to some observations. In the genus Ypthima the same colour dimorphism of green and brown larvae appears to exist as was the subject of my careful investigations in the Sphingidae larvae in *Tijdschrift van Entomologie*, XL, and subsequently observed by Dietze (*Deutsche Entom. Zeitung, Iris*, XIV), in the larva of Tephrolystis Druentiata. As has been demonstrated by the study of the Sphingidae larvae, it can only be a question of a regular, and therefore not an accidental, but evolutional colour change, in short, of colour evolution. A striking fact, moreover, in connection with these larvae — at least in so far as they are known, since our knowledge in this respect is still very incomplete — is that whereas the heads of the European Satyrus larvae, according to the illustrations given, appear to be round, those in the genus Ypthima, while being round likewise, are provided with two small spiny processes, while in the genus Mycalesis the heads become bifurcate, and in the other Satyrid genera Cyllo, Debis, Orsitriaena, as well as in the genus Elymnias, probably belonging to that family also, the branches of these processes develop into true horns to which the processes on the posterior extremity correspond in formation, terminating as they do in a more or less developed bifurcation. The same is to be observed in a more advanced stage in the Nymphalidae amongst which in the genus Neptis the heads of the larvae are still more decidedly bilobed but in the other genera are invariably provided with projections or so-called horns of various shapes, while presumably in correlation with these various projections or spines are also produced on the back and sides. It appears to me that this affords strong confirmation of the suggestion that the family Nymphalidae has developed from that of Satyridae which deserves the more consideration from the fact that some systematists desire to place the genus Amathusia, considered to pertain to Nymphalidae, for other reasons among Satyridae and in this respect, therefore, a difference of opinion exists which is invariably the case where transition forms occur which clearly demonstrate that in fact no definite limits exist.

Concerning so-called mimicry phenomena, where these are supposed to occur in Danaidae or Satyridae, I will briefly refer to them without, however, deeply going into the subject, because, as I have already stated in the introduction to my monograph of the Java Pieridae, I do not consider it a subject for scientific discussion but merely a matter of belief against which reasoning is of no avail and which with its supporters will probably die a natural death. In 1910 an attempt was made again to bring the subject on the carpet and this was undoubtedly one of the principal reasons which led to an international entomological congress being held, all the principal supporters of this theory having turned up in a solid body. I was kindly invited to take part in the preliminary deliberations concerning this congress and I was also offered the chairmanship of the section in which the subject of mimicry would definitely come up for discussion, but while fully appreciating this courtesy I have thought it expedient not to accept the invitation. In the first place I have long since arrived at the conclusion that for the discussion of scientific subject congresses are altogether unsuitable. Differences of opinion on really scientific subjects can only be discussed with advantage by those who are acquainted with the pros and contras and who can adduce their arguments against a theory they feel bound to contest, in a detailed and thorough manner; but with verbal discussion this is impossible since the time for carefully weighing the adversary's contention is lacking, and the proper place for one-sided propositions undoubtedly is in scientific periodicals where they can be considered quietly and at leisure. Congresses are the product of our democratic age, a kind of popular assemblies where superficiality sits enthroned, but such discussion cannot be reconciled with the conception of serious knowledge. Thus the question of mimicry can only be solved by serious scientific investigation. In the second place I consider such investigation no longer required since this has already taken place. The propositions in connection with the subject have been refuted by numerous writers after an examination, as careful as it was comprehensive; against the facts on which the latter have based their opinion the supporters of the theory of mimicry have never adduced any serious arguments; the opponents of this doctrine are therefore entitled to consider them incapable of discussing this theory in a scientific manner and to look upon them as supporters, not of a scientifically formed doctrine, but of a creed, and against a creed no argument avails. Everything they continually bring forward is nothing but the repeated marshalling of new facts which under the dominance of their creed they represent as mimicry but without ever adducing anything of the nature of proof to support their explanation or to refute the contending interpretation of others. It could not, therefore, be reasonably expected that a discussion of the subject at that congress should lead to any other result and it is on that account that I did not desire to take part in it.

Although following the systematic arrangement of the late Snellen I have found it necessary somewhat to modify it in connection with certain points which I would further have discussed with him if he had lived. After consulting Mr. Fruhstorfer I have had to include the species Ypthima Jarbas de Nic., whose occurrence in Java was unknown to Snellen; moreover, after careful study of much more extensive material than was available to him I have excluded from the present work the two species Ypthima Nigricans Sn. and Cyllo Zithenius Herbst. The advice of Mr. Fruhstorfer and the inspection of his extensive collection have been of great service to me.

POSTSCRIPT.

The issue of the present volume has been considerably delayed. Although otherwise completed at the end of 1911, the printing of the plates has encountered many difficulties and consequently publication could only be effected in 1913. As a result, the report of the proceedings of the International Entomological Congres held in 1911 having reached me in the course of 1912, I was able to acquaint myself with its conclusions on the subject of mimicry, discussed by me at the end of the Introduction *vide* page LVI. This circumstance induces me here to add a few observations on the subject.

I there stated that for two reasons especially no useful purpose could be served by such discussions. First, because, as I have already stated repeatedly, the subject in question appears to me already to have been shelved in a scientific sense and will, therefore, probably die a natural death; so that the fact that a few adherents continue to support it needs no further consideration. Secondly, because experience has shown that on their part no scientific reasoning, no adduction of proof or fundamental refutation, is to be expected but only records of fresh observations which, having been explained from their one-sided point of view, are regarded as confirming their theory which, however, with a different interpretation is by no means the case, while they fail to refute the latter. The report of the Congress, in my opinion, completely confirms my attitude in this connection.

I stated at the time that the inception of the Congress had created in my mind a strong impression that the idea of energetically taking up the defence of the theory of mimicry had played an important role in it. And what actually took place? Messrs. Dixey, Poulton, Trimen, Jordan. Rothschild, and Marshall, being some of the oldest and keenest defenders of the theory of mimicry, attended the congress in Brussels; of these three spoke on the subject. To me this seemed to be a cruisade conceived with deliberation, a serious attempt to stifle once and for all the biological heresy which during the last few years had become more and more pronounced. Now what was the effect produced? What was it that the whole remainder of the entomological world, appearing at this congress in large numbers and acquainted with the fact that the theory of mimicry would intentionally be brought on the tapis, considered it worth while to adduce in support or against it? A single speaker, besides the three forementioned, addressed the Congress on the subject; one other speaker made a few unimportant observations in opposition to it. With all this ostentation this was all the result produced and I consider, therefore, I was justified in asserting that the theory of mimicry is moribund and that in the domain of science it has ceased to be of any account.

From the beginning the supporters of the theory of mimicry have continually adduced facts, sometimes isolated, sometimes in whole complexes, observed by the same person, which would, according to their interpretation, establish the existence of mimicry. Later and more accurate observation, however, has demonstrated the invalidity of this reasoning. Sometimes it was proved that the alleged observation had been of an extreme superficial nature or had been carried out under suggestion of the preconceived notion of mimicry. In other instances, whereas the observation itself was indeed accurate, it was found that its interpretation as mimicry originated from the same idea, and that this could quite well be explained in a different manner, but could not in itself demonstrate the existence of mimicry and was only then to be attributed to it if the postulates of this biological theory had, at the outset, themselves been proved, which, however, has never yet been done. In this manner the so-called facts of mimicry in South America of Bates, Fritz Müller, and others, those in Africa — especially concerning Papilio Dardanus Brown — and the numerous Indo-Australian instances, chiefly contributed by Wallace, have been brought forward. Further investigation, in which, chiefly as regards the two latter, I haven taken an active share, has refuted all this to such an extent that the value of the theory in question has greatly depreciated with the majority of serious biologists, if indeed it has not been completely demolished. In spite of this the supporters referred to, again present the self-same doctrine, not indeed accompanied by arguments absolutely essential to it but simply, as on former occasions, by an appeal to alleged facts.

Some of these are new and so far in themselves irrefutable. For this purpose their observations would first have to be controlled. Even though the *bona fides* of Dr. WIGGINS need not be questioned he is clearly what Mr. JORDAN terms E. HAASE, an ardent believer in mimicry, and that little reliance is to be placed upon observations made under this obsession is known in numerous instances. The accuracy of these observations requires to be controlled by other independent observers who are sceptical on the subject; not until then shall we be in a position to estimate their value. It may, however, even now be assumed that these facts, even though they be correctly observed, can assuredly be explained without having recourse to mimicry. In reality they exhibit no character other than that pertaining to many other facts observed elsewhere, which clearly proves that a similar mutual resemblance in identical circumstances may indeed occur through a similar line of development being influenced in the same manner, without there being any question, however, of mimicry. Resemblance does not constitute mimicry but resemblance considered under the suggestion of mimicry creates alleged instances thereof.

While once more discussing the subject of mimicry I propose here cursorily to subject the proceedings in this connection at the said Congress to a critical examination; more especially to demonstrate that on this occasion the requisite arguments were totally lacking.

On August 3rd 1910 Dr. DIXEY gave a lecture on "*Mimicry*". He does not, however, commence, as a basis of his observations, by pointing out the scientific necessity of acknowledging the existence of this alleged biological phenomenon, in other words by indicating the scientifically sound, or at least most credible, grounds on which this necessity is based.

To this he makes no allusion whatever, he simply assumes its existence *a priori* and attempts to extend the knowledge of this phenomenon by connecting with it various simple resemblances observed. He asserts, in fact, that the said resemblance are so numerous and exhibit such peculiarities that it will not do to attribute them merely to accident which, although nothing but a vague expression, certainly does not sound incredible but which can in no case imply that it can only be accounted for by the existence of mimicry; a great number of similar facts have indeed long since been explained in other ways. He next gives a detailed description of such cases of resemblance which, by the way, contain inaccuracies or assertions which have long since been refuted to which, however, no further reference can here be made. One is struck, however, in this connection with his want of knowledge as to what in this domain has been investigated, discussed, and refuted by many entomologists, other than English, which, naturally, entails a very limited judgment on the subject. He thus arrives at the following ten propositions, which I will quote here.

1. The cases of resemblance between distinct kinds of insects are very numerous — too numerous to be accidental.

2. These resemblances are to a very great extent independent of affinity. Some of the most striking are those between insects of different orders.

3. They are peculiarly liable to occur in insects of the female sex.

4. They are, speaking generally, found only between the inhabitants of the same region.

5. They may affect one phase of a seasonally dimorphic insect differently from the others.

6. No structure or detail of organisation is involved in these resemblances except in so far as a modification therein may assist in producing a superficial likeness in aspect or behaviour.

7. In the production of these resemblances the same effect is often brought about by different means.

8. Every transition exists between a likeness which is so remote as to be fairly disputable, and a resemblance which may even deceive a skilled observer.

9. In some cases there may be great disparity in point of numbers between the forms linked together by community of aspect. In other cases the numbers may be nearly equal.

10. The combinations of two or more forms resembling one another are in many cases not isolated, but are often connected with other combinations by a more or less complete series of gradations.

Dr. Dixey calls these facts, but it is clear that they are not facts in a scientific sense; they are purely propositions recapitulating what according to his notion appears to result from certain observations; propositions, whose accuracy is not only considerably to be discounted, but which, moreover, are of far too uncertain and subjective a character to allow scientific — *i. e.* logical — conclusions to be deduced from them. But this course is not adopted by Dr. Dixey. He simply proceeds to discuss the theory of geogrophical influences, the artist theory of Mr. Abbott H. Thayer, and the opinion that these resemblances are to be attributed to internal causes, winding up with the declaration that he associates himself with the opinion of Bates and Fritz Müller. But while his arguments against the artist theory contain a great deal of truth, this much cannot be said, as regards the remainder. His reasoning practically consist of *a priori* adducing the well known Darwinian theories of utility and natural selection, neither of which, however, is scientifically established; the old assertion that the fact of some butterflies being distasteful to birds constitutes an argument in favour of the theory of mimicry, he also considers as practically proved. Yet this has in reality been long since sufficiently refuted. In conclusion he declares the observations thus adduced to agree well with his "facts" quoted *supra* and he professes to demonstrate that they receive strong support from these "facts". We may, however, quite well leave out of account what Dr. DIXEY adduces in this connection since neither his "facts" nor the observations in question have any scientific value. This applies equally to the whole of his lecture, which is characterized as much by a lack of precise logical arrangement as by a complete absence of the requisite critical faculty. The theory of mimicry — like any speculative doctrine whatever — does not lend itself to demonstration by means of a mass of ill-digested observations. Now what cannot be proved adequately may at the utmost be acknowledged by science as hypothesis but even this must rest on a sound basis. When any phenomenon cannot be explained in any other manner a conjecture so soundly based and, therefore, very admissible may in this respect pass muster as hypothesis. As soon, however, as any other equally admissible solution presents itself such hypothesis falls to the ground.

On the same day Prof. E. B. POULTON gave an account of Dr. C. A. WIGGIN'S *Researches on Mimicry in the Forest Butterflies of Uganda* (1909). These observations have reference to the joint occurrence of some species or forms of the Acraeine Genus PLANEMA with butterflies belonging to other genera, which at the same places strongly resemble one another, from which fact various considerations concerning the existence of mimicry are deduced. But in all these cases it is assumed *a priori* that the butterflies in question represent models and mimics respectively; this should, however, be proved first for until this has been done these observations are without foundation. No attempt, however, is made to establish this proof. Only from a confused mental process the idea can arise that these resemblances, in themselves, however remarkable they may be, have of necessity been produced by mimetic action. From these alone this conclusion can never be drawn. Prof. POULTON, therefore, has likewise failed to adduce any proof of the theory of mimicry on this occasion.

Mr. J. K. JORDAN, also on the same day, discussed "*The systematics of certain Lepidoptera which resemble each other, and their bearing on general questions of evolution*".

This discourse was decidedly on a higher level than the preceding, and contained a great deal worthy of attention. As regards the theory of mimicry, however, it was greatly lacking in force as well as in logical argument. Instead of the latter he employed propositions devoid of scientific foundation — nothing but hollow phrases — therefore *a priori* reasoning, while he entirely omitted to make the requisite examination of the ways in which the opponents of the theory in question explain the phenomena which are indicated as mimicry and their refutation consequently was not attempted. Whether it be owing to inability or to prejudice, when no cognizance is taken thereof the treatment of the subject becomes of necessity so incomplete that no value can be attached to it. Mr. JORDAN professes to find a proof of the existence of mimicry in the circumstance that in several cases where the models belong to different species their mimics, on the other hand, are simply forms of one single species, these forms not possessing the characters of incipient species and their origin, therefore, being unexplainable otherwise than by natural selection on account of their mimetic protection. This reasoning, therefore, likewise proceeds *a priori* from the proposition that these butterflies are each others, models or mimics respectively and that their resemblance cannot be attributed to other causes. The correctness of this proposition should, however, be first established scientifically and its proof, therefore, produced. But this again is not attempted by Mr. JORDAN and his observations are, therefore, valueless. Mr. JORDAN looks for the force of his reasoning, to a great extent, in the Darwinian theory that every new variation occurs because of the utility which accompanies it and in that of natural selection. Conceived in so general and far-reaching a sense, however, these theories are not tenable.

Whosoever observes the phenomena of nature from an independent standpoint and without being influenced by prevalent theories is bound to arrive at the conclusion that a certain number of variations are useful to the creatures in which they occur, while others must be considered detrimental or at least in no wise to satisfy a specific want. It is by no means to be assumed, therefore, that new forms of necessity are referable to their utility. Resemblances may, consequently, very well occur without being of any advantage. The doctrine of natural selection does not possess the value either which the supporters of the theory of mimicry attach to it. This doctrine rests entirely on that of the struggle for existence, it is, in fact, a natural corollary of it but only in the original Darwinian sense, according to which the whole of animate nature was regarded as waging a fierce mutual contest which was supposed to lead to the sole survival of the fittest. Soon, however, the error of this conception concerning this so universal, exclusive, and fierce character of nature became manifest. DARWIN himself in his later years toned down his views in this respect and others have continued this process so that at present the expression "struggle for existence" is not meant to imply much more than a general term for the obstacles of all kinds with which every being has to contend in the course of its life, without invariably being of so fierce and aggressive a character. The doctrine of natural selection is not, however, based on the words "struggle for existence" but on their meaning and when, therefore, this no longer corresponds to the old drastic definition, this fierce, agressive character implied by it, can no longer be assigned to natural selection, nor the great influence originally attributed to it and assumed to play such an important role in the theory of mimicry. This assumption nevertheless retains currency in this theory although being devoid of scientific basis.

On the other hand Mr. JORDAN takes no account of the views I have published several years ago concerning colour evolution; besides the theory of mimicry he discusses, it is true, some different views as to the alleged mimetic phenomena but is silent on this subject, notwithstanding the fact that it is just this theory which affords quite a simple explanation of all the cases of resemblance which he considers so remarkable, although it must be admitted that his argument would certainly thereby be considerably weakened. In mimetic phenomena colours play the chief role, but as long as one only possesses confused ideas concerning their existence — as long as one does not grasp, for instance, that pigmental colours form a physiological unit governed by definite rules of development — one will be unable to form a clear judgment on these phenomena. A study of colour evolution alone enables us thoroughly to understand the nature and progress of evolutionary phenomena and will induce any one who reflects on the subject to come forth from among the great host of naturalists, whom I had in mind when I repeatedly stated that since DARWIN'S time one meets continually and everywhere the term "evolution", but that this is by no means the case with persons who possess some clear notion as to its nature. It is only through this study, moreover, that one becomes acquainted with its exceedingly uneven progress and that one thus acquires a much truer insight as to the nature of variation, which plays so important a role in present day biological problems. Thus the nature of dimorphism and polymorphism will be understood in quite a different sense than is mostly the case at present. A new factor has arisen in the scientific study of biological phenomena and amongst these that of mimicry; this factor has to be refuted or admitted but where it is simply ignored no claim to a scientific handling of the subject can be made.

While, therefore, fully admitting the justice of several observations and views of Mr. JORDAN and being, moreover, entirely on his side on some points, such as the rejection of the modern mutation theory, I am bound to declare that I am unable to attach any scientific value to his opinions on the subject of mimicry and that his lecture has by no means established the justness of this theory.

On August 4th Mr. W. SCHAUS addressed the Congress, the title of his discourse being "*A quoi sert le Mimétisme?*" The speaker mentioned a great number of lepidopterological observations made, in his capacity of field naturalist, during a long stay in South and Central America, in connection with the various assertions which have been made on the subject of mimicry; observations with reference to the alleged facts — to which great weight is usually attached in this respect — so much at variance that their connection has completely dissipated his former belief in the value of so-called protective colours. His communication on the subject was indeed of great importance. Primarily because we do not meet here with such loose, isolated — and mostly, therefore, as inaccurate as incomplete — observations which are so frequently made by mere amateurs or zoological globe trotters possessed of but very little sound lepidopterological knowledge, but with a deliberate exposé, the result of observation during many years with a thorough knowledge of the butterflies to which it has reference, which on that account deserves much consideration, but also because these observations tally in so remarkable a manner, even to minute details, with those carried out by myself and others in like manner with reference to the Indo-Australian fauna, which have for the most part already been published; observations which from a believer in the theory of mimicry have turned me into an antagonist. Such agreement of opinion on this subject, evolved quite independently, having reference to a different tropical fauna, and based on similar knowledge and experience, is surely of no little value.

The statement, *inter alia,* by Mr. SCHAUS, that on several occasions he had witnessed butterflies with so-called protective colours being attacked nothwithstanding by enemies, Prof. Dr. SEITZ met by the observation that in order to contest the theory of mimicry it is not sufficient to prove that a protective colouring does not protect against all enemies but that it must be shown that this would not avail against a single enemy and he quotes some instances where, according to him, this is supposed to be the case. Prof. SEITZ thus completely departs from the canons of proper scientic discussion. The burden of proof would lie upon any one asserting that a specific colour affords protection, even if only against certain enemies, and it is only when this has been demonstrated that the antagonist of this theory should show the fallacy of the said proof. But this has hitherto never been attempted, nor does Prof. SEITZ attempts this as regards the cases cited by him; because resemblance exists protection, according to him, must be assumed. The facts observed by Mr. SCHAUS, however, prove the invalidity of this assumption, and the statement by Prof. SEITZ in opposition to them is therefore, of no value.

Mr. ROLAND TRIMEN expressed astonishment that it is possible to deny the existence of mimicry in view of such instances as are provided by *Papilio Dardanus* Brown. This naturalist appears to be unaware that these supposed instances have been refuted by me long since. With regard to the statement by Mr. SCHAUS, that only in exceptional cases has he observed birds attacking butterflies, he does not consider it improbable that birds prey on butterflies mostly in the early morning before the latter are on the wing and that for that reason this is not frequently observed. He further makes a couple of observations in which simply on account of resemblance the existence of mimicry is again *a priori* assumed.

The Hon. W. ROTHSCHILD mentioned a couple of cases of resemblance which in his opinion could only be explained by mimicry.

Prof. POULTON was unable to agree with either M. ABBOTT H. THAYER or Mr. SCHAUS in their interpretation of the subject of mimicry since a number of authenticated observations had convinced him of the contrary.

Dr. DIXEY stated his opinion that observations such as those of Mr. SCHAUS are not irreconcilable with the theory of BATES and FRITZ MÜLLER.

Mr. MARSHALL finally quoted several instances in which birds had been observed to prey on butterflies. He appears to forget, however, that if this indeed possessed the significance attributed to it on behalf of the theory of mimicry, it would not happen in a few instances only but would be of universal occurrence and this, in view of all the statements that have been advanced against this assertion, is evidently not the case.

The latest on this subject which has come to my knowledge is a communication by A. M. BANTA in an article entitled: "*The distastefulness of* ANOSIA PLEXIPPUS" and published in *Nature* of May 9th 1912. It is to the following effect: "For a number of years trained experts of the United States Department of Agriculture have been engaged in determining the food of native birds by examination of the contents of thousands of bird's stomachs collected in all sections of the country and in all seasons of the year. The bearing of these findings upon the question of butterflies as food for birds has recently been summed up by one of these experts as follows: "Four records of birds eating butterflies are all that are afforded by the records of the examination of more than 40000 stomachs in the Biological Survey".

Further discussion did not take place because the time had arrived for the members of the Congress to pay a visit to the Brussels Museum of Natural History, which was in fact far more useful, for the discussion called forth by the discourse of Mr. Schaus was really of little account.

To sum up, only an unfavourable judgment can be pronounced in general with regard to the views brought forward at the Congress in defence of the biological superstition which is called mimicry. This cruisade has evidently miscarried completely. Doubtless its ardent believers will still uphold this theory. At the second International Entomological Congress held at Oxford they have returned to the charge in the same manner. It will doubtless long continue to supply the need for zoological romance in popular periodicals but by the serious, scientific entomologist it can no longer be acknowledged.

M. C. Piepers.

DANAIDAE.

Genus EUPLOEA F.

Euploeas are slowly hovering, not high-flying, butterflies settling on flowers and seeking mostly shady places, some, such as E. Leucostictos Gmel., frequently entering dwellings. They are met with, moreover, both in the plains and in the mountains, being found even at an altitude of 2000 M.; some species occur everywhere while others are restricted to definite areas, which may probably depend on the presence of the food plant. Among Euploeas also some specimens are considerably smaller than others. According to Moore they belong in Ceylon to the migratory butterflies. An observation made in December 1885 by Mr. T. Ottolander — already communicated by me some time ago — is to the effect that in the province of Besouki, Eastern Java, he witnessed the migrating of Euploea Leucostictos Gmel. on several days between 8 and 12 o'clock in the forenoon when the sun shone but no high wind prevailed. Mr. G. A. Schouten likewise noticed the migrating of two species of Euploea at the same period near the lake Ranau, in the province of Palembang, in Sumatra. I have never myself observed the migrating of Euploeas in Java, although, at the places in that island where I resided, Euploea leucostictos Gmel. was very common; nor have I received any confirmation of the fact from any other observers and I do not deny that to my mind this renders the accuracy of these observations somewhat doubtful. May it not have been that these Euploeas simply happened to be particularly numerous at these spots without, however, all flying in the same direction, a process characteristic of the phenomenon usually indicated by the term "migration"?

The ♂, on being taken in the hand, protrudes its genitalia in the form of long yellow processes. I have never noticed them, however, to emit by this means the strong scent which Dr. Fritz Müller states to have observed in

Brazilian Danaidae. According to FRUHSTORFER all EUPLOEAS emit a strong smell, sometimes resembling the scent of flowers but frequently very repulsive, the latter being the case especially in E. MIDAMUS L. LONGSTAFF, however, took two ♂ and four ♀ of this species at Hongkong, of which only one ♀ had such a powerful acetylene-like odour as to be clearly perceptible when in the net. Except in a couple of instances where evidently these butterflies had recently been feeding on excrements and clearly carried the smell with them, I have never been able to notice that they emitted any particular smell, not even the species just referred to, although I have certainly handled hundreds of it; I can scarcely believe, therefore, that they should be protected against the attacks of birds by an unpleasant smell or taste. DE NICÉVILLE, it is true, makes this assertion, but this entomologist always labours strongly under the suggestion of mimicry and observations in relation to their obsessions by such persons are not much to be trusted. When treating of the Hesperidae, we have already seen an instance of this in the case of the larva of HIDARI TRAVA Moore. But such insects, having only a very attenuated body together with large inconvenient wings, can hardly be a favourite food with insectivorous birds. Moreover, on two occasions I have seen EUPLOEA RAFFLESI Moore being caught and eaten by a bird (EDOLIUS). The tenacity of life in these butterflies is very striking, since it is next to impossible to kill them, like other Rhopalocera, by compressing the thorax; they certainly remain motionless a short time but soon recover completely. On the other hand a drop of chloroform applied to the side of the thorax kills thems at once. On my arrival at Batavia on the morning of January 18th 1863, after a sea voyage of three months, I went to the *Hôtel des Indes* where a room, communicating with the garden, was placed at my disposal. Here I observed my first Malayan butterfly flying round a shrub and, naturally, I could not resist the temptation of catching it with the aid of my hat; it was a EUPLOEA MIDAMUS L. ♀. I squeezed the thorax of the insect until it was motionless and, as I thought, dead and fixed it with an ordinary pin, for want of better, to a piece of board which I found on the spot, provisionally placing the board on the top of a wardrobe. This happened about 11 o'clock in the morning, shortly after which I left my room to take luncheon and upon returning afterwards I noticed the board still in the same place but both butterfly and pin had disappeared. I concluded that a native servant had thrown away the insect. The next morning, however, about 10 o'clock I observed a similar butterfly flying round the same shrub; I caught it and it proved to be the identical one, the pin still through its body. With pin and all the creature had managed to detach itself from the board, had passed the night in this state and then flew about as if nothing had happened!

When twelve years later, during a temporary return to Europe, I gave a lecture at a meeting of the Nederl. Entom. Vereeniging on some of my experiences in connection with Malayan insects, a translation of which appeared in the Entomologist for November 1877, I was afraid to communicate this fact. It appeared to me so incredible that I feared I should not believed and that, in consequence, the reliability of my other communications might be doubted. It was not until later, when I came across similar instances of the tenacity of life in EUPLOEAS in MOORE's *Lepidoptera of Ceylon*, communicated by Dr. THWAITES, that I ventured to publish my own experiences in this connection. It has also happened to me subsequently that I received from the mountains a tin of butterflies in papers which had been lying between large quantities of naphtaline powder, certainly not less than five days; while examining them a EUPLOEA suddenly, on the paper being opened, flew out and escaped at once through the window. This insect certainly had also had its thorax squeezed several days previously and yet it well managed to survive its imprisonment in the paper in the naphtaline-saturated atmosphere.

On page 5 of the *Trans. Entom. Soc. London 1905* Mr. JOHN C. W. KERSHAW states that while in China he observed a specimen of EPEIRA MACULATA which had captured a EUPLOEA AMYMONE Gdt. and had attackned the under side of the abdomen and a part of the thorax, but upon releasing the butterfly from its toils and placing it upon his hand it suddenly flew off and settled on a high tree.

TRIMEN observed analogous cases with reference to specimens of DANAIS and ACRAEA which upon being released from the pin, on which his native hunters had stuck them, flew away as if nothing unusual had occurred.

In the case of two species I have repeatedly observed a yellowish-white egg deposited on the under surface of a leaf. I noticed the ♀ placing herself near the margin on the upper side of the leaf and thereupon curve the abdomen round the edge and press it against the underside.

The larvae are provided with several pairs of appendages, whose number, dimensions, and mode of attachment, vary in the different species. In the majority of species, whose larvae are known, these processes in the full-grown larva are long and four in number but in that of E. MAZARES Moore they are short, straight, and only three in number, thus agreeing with the processes in the genus DANAIS. This rather points to the larvae of EUPLOEA originating from those of the genus DANAIS, especially since the young larvae of the former genus all have these processes short and straight and those of E. MAZARES Moore have, therefore, not kept pace in this evolutional change in that respect, although the imago has assumed the new form, a fact which, moreover, occurs in other cases. In the genus PAPILIO many instances of this will be observed, giving rise to transition forms which distinctly indicate the course followed in this development. According to WOOD MASON the first pair of these processes is movable; I have observed this in only one species although I have reared large numbers of these caterpillars, sothat this faculty appears to be in a state of retrogression, being now found only in a few species or even in certain individuals only. MOORE in his *Lepidoptera Indica* states that the larvae occur on ASCLEPIADACEAE but I have found them on various plants.

The pupae are simply attached by their caudal extremity; they are of stout build, without projections, being rounded in outline, frequently with a bright metallic lustre. The observation by MOORE, concerning the pupae of NYMPHALIDAE, that the narrowness of the ventral side of the abdomen clearly indicates that they are descended from a butterfly whose pupae were attached by means of a girdle thread, applies equally to these pupae. The decrease in the faculty of spinning, as this manifests itself in the pupae of the section *Suspensi* of BOISDUVAL in comparison with those of his section *succincti*, is indeed, as I have already stated, evidence of more advanced evolution in this respect, indicating, therefore, that those forms in which it occurs must be of later development than the others.

1. CLIMENA Cram. (Pl. XI, fig. *1a, 1b, 1c, 1d*).

CRAMER, *IV, p.* 207, *pl.* 389, *E, F,* (1782)	Papilio Climena.
BUTLER, *Proc. Zool. Soc. London,* 1866, *p.* 282, *fig.* 2 ♂.	Euploea Sepulchralis.
FELDER, *Novara Lep., p.* 335, (1864—1867). . . .	„ Zinckenii.
SNELLEN, *Tijdschr. v. Ent.,* 34, *p.* 231 (1891) . . .	„ Sepulchralis.
FRUHSTORFER (SEITZ, *Grossschm. d. Erde*), *p.* 226, *pl.* 86*c* (1910).	„ Climena.

The Javanese specimens belong to the form SEPULCHRALIS Butl. (ZINCKENII Felder).

FRUHSTORFER distinguishes the specimens from E. Java as a separate form, under the name of FERISSA, from those of W. Java, which he calls SEPULCHRALIS. Without justification, however, for, as is shown by the accompanying illustration (*pl. XI, fig. 1a, 1b*), the increase in white occurs likewise in some specimens from C. Java; it is, in fact, nothing but a manifestation, asserting itself earlier or later in the various individuals, of the fading process of colour-evolution. How uneven the course of this process is may be observed from the fact that whereas all specimens from Bawean known to me do not exhibit this increase of white, my specimes from Flores, on the other hand, resemble those of Java which do show it.

W. J. Batavia (3—14); Buitenzorg (265); Dèpok (95).

C. J. Touban (2) on the north coast; Magelang (500); prov. Madioun; prov. Tegal (*Lucassen*).

E. J. Kediri (64); Banyoupoutih (45) in the prov. Probolingo; Semarou mountains (800); Ardjouno mountains (*Hekmeijer*).

SNELLEN has noted with respect to this species:

"The Javanese specimens differ from the type from the Moluccas only in being smaller (Expanse of wings 55—62 mm. against 75—78 mm.). In some specimens white occurs in addition on the hind wings; MACLEARI Butler from Christmas Island and EURYPON Hew. from the Kéy Islands are probably also forms of CLIMENA Cram".

I am unable to confirm FRUHSTORFER's statement that this butterfly is common at Batavia; I never found it very common there, on the contrary, it appeared to me much more common at Touban and at Kediri than in W. Java.

2. MALAYICA Butl. (Pl. XI, fig. *2a*, *2b*).

MOORE, *Cat. Lep. E. J. C.*, I, *p.* 132 (1857) . .	Euploea Ochsenheimeri.
BUTLER, *Journ. Linn Soc. London*, 14, *p.* 297 (1878).	„ Malayica.
SNELLEN, *Midden Sumatra, Lep.*, *p.* 12, *pl.* 2, *fig.* 12 ♂, (1882)	„ Ochsenheimeri.
DISTANT, *Rhop. Mal.*, *p.* 22, *tab.* 2, *fig.* 7, ♂ (1882—1886)	„ Malayica.
FRUHSTORFER (SEITZ, *Grossschm. d. Erde*), *p.* 231, *pl.* 80*b*, (1910)	„ „

SNELLEN notes the following:

"It is not the species to which LUCAS applies the name OCHSENHEIMERI".

For this reason MOORE's name, OCHSENHEIMERI, although being the oldest and his description agreeing well with the Javanese specimens, cannot be accepted. FRUHSTORFER, assigns to the latter the local name HYPANIS.

W. J. Gedeh mountains (1000); Tjampea (160).

C. J.?

E. J.?

I received the larva from Tjampea. Its back is velvety-black, except at the first thoracic segment which, like the sides andundersurface is of a dark orange colour. On the black of each of the body rings occurs a wide milky-white transverse band attenuated at either end; this band on the second thoracic segment is narrower. The head, the thoracic legs, and lower part of the pro-legs are black. A pair of long black appendages project on the back from the second and third thoracic, and from the second and penultimate abdominal segments, the first pair being the longest. I noticed the caterpillar moved the two foremost of the processes independently, but not to such an extent as to bend them.

It feeds voraciously on the leaves of a species of APOCYNACEAE, a wild climbing plant, evidently related to the food plant of E. RAFFLESI Moore. It pupated on the 1st September, the colour of the chrysalis being a mixture of brown and black with a golden and silver lustre, while the imago emerged on the 10th September.

3. DEHEERI Doherty.

DOHERTY, *Journ. Asiat. Soc. Bengal,* 60, *p.* 163 (1891) . Euploea Deheeri.
PAGENSTECHER, *Jahrb. Nass. Ver. Naturk.* 51, *p.* 188 (1898). „ „
FRUHSTORFER, (SEITZ, *Grossschm. d. Erde*), *p.* 231 (1910). „ „

FRUHSTORFER applies the local name LAMOS to the Javanese specimens. The species, discovered originally in Sumbawa, is recorded by FRUHSTORFER from E. Java, the specimens captured by him there, and which are in his collection, being the only ones known from that island. They differ but slightly from the specimens taken in Lombok. He has found it impossible to have an illustration made of it.

SNELLEN notes here:

"This species, with an expanse of wings of 62—66 mm., has about the form of wing of E. MALAYICA Butl. but is much smaller, the median area of the wing, especially on the under side, is distinctly darker while the light dots, a transverse row of which in front of the posterior margin of the hind-wings is twice suddenly interrupted, are purplish-white in colour. In the larger MALAYICA the same transverse row of dots is curved round above, then straight, while the colour is rather somewhat yellowish-white. The fore-wings, moreover, are sometimes a little darker towards the external margin, but not in the median area. In the ♀ the inner margin of the fore-wings is quite straight but it does not differ from the ♂ either in colour or marking. On the under side of the hind-wings may be observed behind the dark median area an ill-defined, curved, lighter transverse band. According to Dr. PAGENSTECHER's notes the species appears to vary somewhat. It belongs to the section ADIGAMA Moore, together with MALAYICA Butl. It is doubtful whether the ♀ described by DE NICÉVILLE (Journ. Asiat. Soc. Bengal, 66, p. 674, 1897) belongs to the present species".

4. CRAMERI Luc. (Pl. XI, fig. 3*a*, 3*b*).

LUCAS, *Revue et Mag. Zool.*, 1853, *p.* 318.	Euploea	Crameri.
FELDER, *Wien. Entom. Monatschr.*, IV, *p.* 398 (1860) . .	„	Bremeri.
DISTANT, *Rhop. Mal.*, *p.* 23, *tab.* 2, *fig.* 4, ♂ (1882—1886).	„	„
MOORE, *Proc. Zool. Soc. London*, 1883, *p.* 267, *pl.* 29, *fig.* 5.	Tronga	„
„ *Lep. Ind.*, I, *p.* 76, *pl.* 19, *fig.* 1, 1*a*—*d* (1890) .	„	„
FRUHSTORFER, *Berl. Ent. Zeitschr.*, 43, *p.* 187 (1898) . .	„	Crameri.
„ , (SEITZ, *Grossschm. d. Erde*), *p.* 229, *pl.* 82*b*, 86*d* (1910)	Euploea	„

SNELLEN has noted the following in connection with the present species:

"The typical form of E. CRAMERI Luc. does not occur in the Philippine Islands but in Borneo, from which island MOORE described it. It differs from the Javanese form in being larger (80—82 mm. against 70—77 mm.) and in being of a somewhat darker colour. The white spots on the fore-wings, moreover, are almost limited to the apex, being also larger".

These notes do not agree with the description by FRUHSTORFER quoted *supra*, who appears to know Javanese specimens only from the Tengger mountains in East Java which he designates by the name TENGGERENSIS.

W. J. Soukapoura, in the prov. Prayangan; vicinity of Tjiletou or Sand Bay on the south coast.

C. J. Babakan, prov. Banjoemas, on the sea coast. (*Jacobson*).

E. J. Tengger mountains (*Fruhstorfer*).

5. MIDAMUS L. (Pl. XI, fig. 4*a*, 4*b*, 4*c*, 4*d*, 4*e*).

LINNAEUS, *Mus. Lud. Ulr.*, *p.* 251 (1764)	Papilio	Midamus.
SULZER, *Abgek. Gesch. d. Ins.*, *p.* 144, *pl.* 16, *fig.* 4, 5, ♂ ♀ (1776)	„	„
CRAMER, II, *p.* 45, *pl.* 127, *C. D.* (♂) (1779) . . .	„	Mulciber.
„ III, *p.* 132, *pl.* 266, *C.* (♂) (1782). . . .	„	Basilissa.
FABRICIUS, *Ent. Syst. III*, 1, *p.* 40 ♀ (1793). . . .	„	Claudia.
HORSFIELD, *Cat. Lep. E. I. C.*, *pl.* 3, *fig.* 10, 10*a* (1828).	Euploea	Midamus.
MOORE, *Id. I*, *p.* 133, *pl.* 4, *fig.* 10, 10*a* (1857). . .	„	„
AURIVILLIUS, *Rec. Crit.*, *p.* 61 (1882)	„	„

DISTANT, *Rhop. Mal.*, *p.* 24, *tab.* 2, *fig.* 8, 9 ♂ ♀ (1882—1886)	Euploea Midamus.
STAUDINGER, *Exot. Schmett.*, *p.* 51, *pl.* 25, ♂ ♀ (1884—1888)	„ „
MOORE, *Lep. Ind.*, *I*, *p.* 100, *pl.* 35, *fig.* 1, 1*a*, 1*b* (1890).	Trepsichrois Midamus.
FRUHSTORFER, (SEITZ, *Grossschm. d. Erde*), *p.* 249, *pl.* 85*a* (1910)	Euploea Mulciber.

FRUHSTORFER separates the specimens from Java under the name of BASILISSA.

SNELLEN has noted regarding this species:

"Although LINNAEUS, in some of his later works, confused the present species with another EUPLOEA (SUPERBA Herbst), it appears to be beyond doubt, (*vide* AURIVILLIUS, Rec. Crit. l. c.), that in the older work concerning the Mus. Ludw. Ulr. a single species was described for which the Swedish Professor cites MULCIBER Cram. as the typical figure. The Javanese specimens clearly differ, at least as regards the ♂, from those of the South Asiatic Continent, Malacca, and Sumatra (MULCIBER Distant). They are somewhat larger, the blue of the fore-wings is more purplish, their light spots are smaller, and the median area contains less white. Tho white marking of the ♀, moreover, is somewhat finer. MIDAMUS is a widely distributed species of which the following are probably local forms: DIOCLETIA Hbn. from the Philippines, VERHUELLI Moore from Nias, MINDANAENSIS Semper from Mindanao, and GELDERI Sn. (DONGO Doherty), from Flores.

W. J. Batavia (3—14); Buitenzorg (275); vicinity of the Tjiletou or Sand Bay and the Pelabouan Ratou or Wynkoops Bay on the south coast (150); Dèpok (95); Patjet (1114); Sindanglaya (1074); Salak mountains (780); prov. Prayangan (1500).

C. J. Semarang and Touban on the north coast; Jokjokarta (113); prov. Tegal; Magelang (500); Bodjonegoro (258); Nousa Kambangan (Jacobson); prov. Madioun.

E. J. Sourabaya on the east coast, Banyoupoutih (45) in the prov. Probolingo; prov. Madoura; Banyouwangy.

One of the commonest butterflies of Java, occurring everywhere, in the lowest-lying districts as well as in the higher mountains and likewise met with in many other islands of the Malay Archipelago with but slight variation.

A striking difference in colour exists in the two sexes, viz., that whereas the ♂ entirely exhibits the EUPLOEA type, in the ♀ the process of colour evolu-evolution, especially as regards the hind-wings, has evidently largely followed the direction as it occurs in many species of the genus DANAIS, such as

D. Agleoides Felder for instance, so that the ♀ much more resembles the species of Danais than the ♂. I have already discussed these different directions of the process in the Introduction. Supporters of the theory of mimicry, who maintain that the ♂ of this species emits such a repulsive odour, being consequently unpalatable to birds and that on account of the protection resulting therefrom other butterflies have mimicked them, ought to explain why the ♀ of the same species has not availed itself of this protection but has on the contrary mimicked other butterflies, even though generally these also are stated to be unpalatable. Moreover, the beautiful dark blue structural colour, occurring on the upper side of the fore-wings in the ♂ — and the shade of which in the specimens from Java differs from that in the Bornean ones — recurs, although in a much less pronounced fashion, in the ♀ and rather points to a similarity of the scales in both sexes, since it is not improbable that these structural colours depend on the external character of the scales. These ♀ vary, 1°. in respect of the darkness of the ground colour; 2°. as regards the greater or lesser intensity of the blue sheen just referred to, which may even be entirely wanting; 3°. in the greater or lesser distinctness of the white stripes of the hind-wings, which frequently are interrupted here and there, sometimes narrower and at other times again wider. All these differences, however, may occur indifferently in specimens of East or West Javanese origin, and by no means constitute distinct races or forms, as Fruhstorfer assumes, being simply individual variations governed by their special development in the process of colour evolution in each case. The unpleasant smell attributed to this species has also been already dealt with in the Introduction.

The oviposition in this species has been observed by me and I succeeded in rearing the caterpillars from the egg; they eat voraciously and their development is very rapid. During the rainy season at least, when their food may be presumed to be the most nourishing, the time between leaving the egg and the appearance of the imago would probably, in free nature, not exeed a month. The larvae are found especially on the Waringin (Urostigma Benjaminea Miq.) and other species of Urostigma but also on other plants. As has been recorded from Ceylon by Moore in the case of the indigenous E. Asela, the present species is also frequently found in Java on the Nerium Oleander L., an ornamental plant much grown in that island. The coloration of the young larvae does not differ, as such, considerably from the full grown ones but while being practically of the same type in all a fairly large amount of individual variation exists, especially as regards the markings which at one time may be white and at others again yellow or orange, while the black pigment also appears to be much more prominent in some specimens than in others; alle these differences evidently indicating the various stages in the process of colour evolution. The colour pattern is, consequently, difficult to describe and it will be more satisfactory, therefore, to refer to the illustrations. The head is invariably black or reddish brown, peculiarly marked with white or yellow lines. From each of the second and third thoracic and the second and penultimate abdominal segments a pair of fairly long processes extend from the back, those of the second abdominal segment being more curved forward than the others. In not quite full-grown individuals these processes are entirely black but in the adults they are more or less dark red with black extremities. The handsome pupae have the appearance of burnished gold or silver with some brown streaks. When the larva has just recently moulted the pupa is flesh-coloured on which, however, the metallic lustre soon appears.

The figures of the larva and pupa given by Horsfield are very inaccurate and those by Moore, being copied from Horsfield, are no better; my own illustrations are much better, although, having been executed in Java by persons without any knowledge of the anatomical structure of caterpillars, little attention has been paid to the division of the segments and, consequently, the attachment of the third pair of processes is, apparently, not very accurate. As regards the chrysalis, my illustration is of value only in connection with the form since the metallic lustre cannot be reproduced.

6. Mazares Moore. (Pl. XI, fig. 5*a*, 5*b*).

Moore, *Cat. Lep. M. E. I. C., I., p.* 127 (1857) . . .	Euploea	Mazares.
Felder, *Novara, Lep., p.* 317, *pl.* 40, *fig.* 5, 6 (1864—1867).	„	Ledereri.
Distant, *Rhop. Mal., p.* 26, *tab.* 2, *fig.* 10 (1882—1886)	„	„
Snellen, *Tijdschr. v. Ent.*, 34, *p.* 232 (1891)	„	Mazares.
Fruhstorfer, (Seitz, *Grossschm. d. Erde*), *p.* 252, *pl.* 83*d* (1910)	„	„

Snellen notes the following concerning this species:

"It is possible that this species, so well described by Moore, is the Papilio Tulliolus of Fabricius (*Ent. Syst.*, III, 1, p. 41, 173), but the description, translated by Godart in *Encycl. Meth.*, IX, p. 181, 1819, is quite insufficient. E. Hopferi Felder, from the Ké Islands is probably a form of Mazares".

W. J. Batavia (3—14); Dèpok (95); Tjampea (160); neighbourhood of the Pelabouan Ratou or Wijnkoops Bay and of the Tjiletou or Sand Bay on the south coast (+ 150).

C. J. Prov. Madioun; Touban (4) on the north coast.

E. J. Banyoupoutih (45) in the prov. Probolingo; Willis mountains in the prov. Kediri.

This butterfly appears to be common everywhere in the lower lying districts but less so in the mountains. The shade of the brown of the upper side is darker in some specimens than in others. Individual differences occur in the white spots on the upper side of the fore-wings as regards size and number as well as with respect to the development of some structural blue on these.

At Batavia the larva is found on a climbing plant known locally as Serout oyot (Cephalotrophis javanica Bl.). Its general colour is brown or dark violet, sometimes a little lighter and reddish, with many transverse faint white and numerous wider black lines; along the ventral margin occurs a yellowish-white stripe. The ventral side is dark in colour, the legs are black; the head is shining black or brown marked with white lines. The very young larva is evenly shining, partly yellow-brown, partly blackish grey, with a red head. The most striking feature of the larva consists in its dorsal processes which resemble those occurring in the species of Danais much more than those noted by me in any other species of Euploea, being, as is the case with the former, straight and short, not curved. Only three pairs are present, on the second and third thoracic and the penultimate, but not on the second, abdominal segment. Of these three pairs, agreeing in colour with the back, the foremost is longest and the second shortest; in the very young larva the second pair has not yet made is appearance.

Before pupating the larvae turn a greenish grey; the pupae are at first yellow but on the second day they begin to resemble burnished gold or silver. In the case of two larvae which pupated on 11th December the imagines emerged on the 19th of the same month, while one which commenced this process on 4 February and another on 22 March, completed their metamorphosis on 12 February and 29 March respectively.

7. Eleusina Cram. (Pl. XI, fig. 6).

Cramer, *III, p.* 132, *pl.* 266 *D* (1782)	Papilio Eleusina.
Hübner, *Samml. Exot. Schm., II, pl.* 3, *fig.* 3, 4 ? (1806—1827)	„ „
Godart, *Enc. Méth., IX, p.* 177 (1819—1823)	Danais „
Fruhstorfer, (Seitz, *Grossschm. d. Erde*), *p.* 262 (1910) .	Euploea „

Snellen has the following notes about the present species:

"Godart not only changes the name of this species without cause but he confuses it with E. Mazares Moore, for he states that the purplish-white longitudinal stripe above the inner margin of the fore-wings is frequently wanting in the ♂ at least, which is incorrect. Cramer's figure is not good but recognizable".

W. J. Tegal (*Lucassen*).

C. J. Touban (4) on the north coast.

E. J. Mount Ardjouno (*Hekmeyer*); Malang (443) in the prov. Pasourouan.

According to Fruhstorfer this butterfly is common in Java, but I have only rarely found it.

8. Leucostictos Gmel. Pl. XII, fig. 7*a*, 7*b*, 7*c*, 7*d*, 7*e*).

Gmelin, *Syst. Nat., I*, 5, *p.* 2289, *No.* 889 (1788—1791).	Papilio Leucostictos.
Godart, *Enc. Meth., IX*, *p.* 177, *No.* 2 (1819—1823).	Danais Eunice.
Lucas, *Lep. Exot., pl.* 45, *fig.* 1 (1835)	Euploea „
„ *Rev. Zool.*, 1853, *p.* 313.	„ Dehaanii
Distant, *Rhop. Mal., p.* 26, *tab.* 13, *fig.* 6, 7 (1882—1886).	„ Vestigiata.
Moore, *Proc. Zool. Soc. London*, 1883, *p.* 301 . . .	Salphinx Dehaanii.
Fruhstorfer, (Seitz, *Grossschm. d. Erde*), *S.* 262 (1910).	Euploea Leucostictos.

Snellen has noted in this case:

"In addition to those cited *supra*, the following probably pertain to the present species: Viola Butl. from Celebes, Assimilata Felder from the Ké Islands, Kadu Eschholtz from the Marianne and Philippine Archipelagoes, Depuiseti Oberthür from Sangir and the Talaut Islands, Nemertes Hbn. from the Moluccas, Nepos Röber from Goram, Perdita Butl. from New Guinea, and Polymela Godm. and Salvin from the Solomon Islands".

W. J. Batavia (3—14); Dèpok (95); Tjampea (160); Buitenzorg (275); mount Karang in the prov. Bantam; Salak mountains (780); mountains of the prov. Prayangan; vicinity of Pelabouan Ratou or Wijnkoops Bay and of the Tjiletou or Sand Bay on the south coast (± 150).

C. J. Magelang (500); Jokjokarta (113); prov. Madioun.

E. J. Sourabaya on the east coast; prov. Besouki; Semarou mountains (740); Tengger mountains (1200) (*Jacobson*).

This butterfly, of which Fruhstorfer distinguishes the forms Debarbata, Bioculata, Radiata, and Abrupta, is very common; less so, however, in the mountains proper than in the somewhat lower lying country. Mr. Ottolander, however, asserts having observed the species in December 1885 migrating at an altitude of 1000 Meters in the province of Besouki in East Java.

Individual differences occur in the present species; the colour of the upper side, even of the hind-wings, being darker in some specimens than in others; in the size and number of the white spots on the upper side of the fore-wings there is also some difference. The structural blue in that region is not equally developed in all ♂, while in the ♀ only traces of it, at the most, are present and frequently it is entirely wanting. In spite of this I have failed to establish local differences between the numerous specimens I have been able to compare.

The caterpillar lives on *Serout* (Streblus asper Lour), *Waringin* (Ficus benjaminea L.), *Ampelos kebo* (Ficus ampelos Burm.), *Gegareman* (Ficus heterophylla L.), *Roukem besar* (Flacourtia Rukam Z. and M.). It is black, the head shining. On the back occur about ten white transverse streaks, the outermost single, but the others mostly double or even treble; they are so wide sometimes that nearly the whole back becomes white. At times they are continued at the sides as single vertical white lines which do not always coincide with the dorsal streaks or may be entirely wanting. A blood-red spot occurs at the sides of the third thoracic and the six foremost abdominal segments. Four pairs of black dorsal processes, about equal in length, are found on the second and third thoracic and the second and penultimate abdominal segments; these processes are mostly curved forward a little.

The pupa is yellow with brown streaks at first but on the second day it becomes like burnished silver or copper with grey and brown streaks radiating from the caudal extremity. From a pupa of December 1st the perfect insect developed on December 9th while one of April 6 and one of April 14 emerged on the 14th and 24th of April respectively.

9. Phoebus Butl. (Pl. XII, (fig. 8).

Butler, *Proc. Zool. Soc. London*, 1866, *p.* 270 . . .	Euploea	Phoebus.
Felder, *Novara*, *Lep.*, *p.* 315 ♀ (1864—1867). . . .	„	Castelnaui.
Distant, *Rhop. Mal.*, *p.* 24, *tab.* 2, *fig.* 6 ♀ (1882—1886).	„	„
Moore, *Lep. Ind.*, *I*, *p.* 109, *pl.* 38, *fig.* 1, 1*a* (1890) .	„	Phoebus.
Fruhstorfer, (Seitz, *Grossschm. d. Erde*), *p.* 259, *pl.* 80*b* (1910)	„	Corus.

Fruhstorfer indicates the Java specimens under the name of Pavettae.

Snellen notes the following in connection with the present species:

"Phoebus is probably only a local form of E. Phoenareta Schaller, *Naturf.* 21, *p.* 177, *pl.* 5, *fig.* 1, 2 ♂ (Midamus Cram. III, *p.* 131, *pl.* 266 *A*, *B*) from the Moluccas but I have seen no transition forms".

W. J. In the southern part of the prov. Prayangan, in the division of Soukapoura and in the neighbourhood of the Tjiletou or Sand Bay on the south coast (± 150).

C. J. ?

E. J. Semarou mountains (740).

As I have never found this butterfly in the northern half of Java, nor have I ever received it from there, while, on the other hand, I obtained several from the southern half, I am inclined to think that it is restricted to that part of the island, including East Java in its range. FRUHSTORFER also found it on the south coast of West Java.

10. RADAMANTHUS F. (Pl. XII, fig. 9*a*, 9*b*).

FABRICIUS, *Ent. Syst., III*, 1, *p.* 42 ♂ (1793). . .	Papilio Radamanthus.
„ „ „ „ 1, *p.* 40 ♀ „ . .	„ Diocletianus.
GODART, *Enc. Meth., p.* 180, *No.* 13 (1819—1823).	Danais Alcidice.
HÜBNER, *Samml. Exot. Schm., II, pl.* 8 ♂ (1806—1822).	Trepsichrois Thoosa.
DISTANT, *Rhop. Mal., p.* 28, *tab.* 4, *fig.* 4, 5, ♂ ♀ (1882—1886).	Euploea Diocletianus.
STAUDINGER, *Exot. Schm., p.* 53, *pl.* 26 ♂ (1884—1888).	„ Rhadamanthus.
SNELLEN, *Tijdschr. v. Ent.*, 42, *p.* 101 (1899) . .	„ „
FRUHSTORFER, (SEITZ, *Grossschm. d. Erde*), *p.* 271, *pl.* 81*c* (1910)	„ Diocletianus.

FRUHSTORFER distinguishes the Java specimens under the local name of ALCIDICE.

SNELLEN has noted in reference to this species:

"The Javanese specimens belong to the form ALCIDICE Godart or THOOSA Hbn., with only three or four white streaks, shorter than those in the type, near the inner margin of the hind-wings".

W. J. Dèpok (95); Tjampea (160); Sindanglaya (1074); Tjibougel (± 1000); vicinity of Pelabouan Ratou or Wijnkoops Bay (± 150).

C. J. ?

E. J. ?

I have never observed this butterfly at Batavia but it is common at Dèpok and many other places. The ♂ appear to be commoner than the ♀, although the latter are not rare. The fading to white in this species takes place in a peculiar manner which likewise appears to occur in PAPILIO CAUNUS Westw.

and in a ♀ form of EURIPUS HALLITHERSES Dbd., for which reason these are supposed to mimick the present species. This PAPILIO does not, however, appear to occur in Java; the only record of a specimen taken in that island is of ancient date and, like many such old records, not entirely reliable. In the present species the structural blue is strongly developed in the ♂ but little or not at all in the ♀, while the brown in the ♀ is much lighter than the dark shade of that colour in the ♂.

The larva is unknown to me. The pupa was once found by me at Tjampea; it very much resembled that of E. LEUCOSTICTOS Gmel.

11. EYNDHOVII Felder. (Pl. XII, fig. 10).

FELDER, *Novara Lep.*, *p.* 338 (1864—1867) . . . . Euploea Eyndhovii.
SNELLEN, *Tijdschr. v. Ent.*, 35, *pl.* 1 (1892) . . . . „ Alcathoe.
FRUHSTORFER, (SEITZ, *Grossschm. d. Erde*, *p.* 237 (1910). „ „

FRUHSTORFER distinguishes the forms ALCATHOE and GEYERI from Java.

SNELLEN has noted in this connection:

"FELDER's description is good, but of the blue sheen on the fore-wings no trace is to be seen in the specimens in our collection. The description in the *Novara* has been drawn up from old specimens from the collections of EYNDHOVEN and VAN DER CAPELLEN".

W. J. Batavia (3—14); Buitenzorg (275); Tjibodas (1410); Patjet (1114); Tjibougel (± 1000).

C. J. ?

E. J. Banyouwangy, Semarou mountains (740).

12. HUEBNERI Moore. (Pl. XII, fig. 11).

HÜBNER, *Samml. Exot. Schm.*, *II*, *pl.* 9, *fig.* 1, 2 (1820—1821). Salpinx Eleusina.
MOORE, *Cat. Lep.*, *M. E. I. C.*, *I.*, *p.* 128 (1857) . . Euploea Hübneri.
BUTLER, *Proc. Zool. Soc. London*, 1866, *p.* 273 . . . . „ Janus.
FELDER, *Novara*, *Lep.*, *p.* 315 (1864—1867). . . . . „ Moorei.
MOORE, *Proc. Zool. Soc. London*, 1883, *p.* 280 . . . . Chastia Haworthi.
FRUHSTORFER, (SEITZ, *Grossschm. d. Erde*), *p.* 237 (1910). Euploea „

SNELLEN has the following notes about the species:

"MOORE considers (*Proc. Zool. Soc. London*, 1883) this species co-specific with EUPLOEA HAWORTHII Lucas (*Revue Zool.*, 1853, *p.* 317), but the description is cursory and doubtful; it mentions no dull longitudinal streak on the fore-wings, gives the expanse too great — 80 mm. instead of 65—70 mm. — and states that the spots of the inner row along the inner margin of the hind-wings are oblong. This reminds of a ♀ of E. MENETRIESII Felder".

W. J. Batavia (3—14); Dèpok (95); prov. Prayangan (1500).

C. J. Magelang (500); Touban on the north coast.

E. J. Malang (443); Tengger mountains (500—700) (FRUHSTORFER).

This butterfly is not, as FRUHSTORFER thinks, rare at Batavia, but is very common there.

13. MENETRIESII Felder. (Pl. XII, fig. 12).

FELDER, *Wien, Ent. Monatschr., IV, p.* 398 (1860) . .	Euploea Menetriesii.
BUTLER, *Trans. Linn. Soc. London,* 2nd *Ser. I, p.* 535, *pl.* 69, *fig.* 9 (1879)	„ Pinwilli.
DISTANT, *Rhop. Mal., p.* 35, *tab.* 3, *fig.* 9, 10 (1882—1886).	„ „
SNELLEN, *Tijdschr. v. Ent.,* 33, *p.* 284 (1890) . . .	„ Alcathoe.
FRUHSTORFER, (SEITZ, *Grossschm. d. Erde*), *p.* 238, *pl.* 86*a* (1910)	„ Deione.

FRUHSTORFER separates the Java specimens as the local form WALLENGRENI.

SNELLEN notes here the following:

"The Javanese specimens of this species differ from the type from Malacca and Sumatra in being somewhat smaller and having darker fore-wings, the former appearing also to be devoid of the white marking. ALCATHOE Sn. is not GODART's species".

W. J. Dèpok (95); Buitenzorg (265); Mountains in the prov. Prayangan.

C. J. Prov. Rembang.

E. J. Prov. Kediri; Prov. Banyouwangy.

14. RAFFLESI Moore. (Pl. XII, fig. 13*a*, 13*b*, 13*c*).

MOORE, *Proc. Zool. Soc. London,* 1883, *p.* 314	Isamia Rafflesi.
FRUHSTORFER, (SEITZ, *Grossschm. d. Erde*), *p.* 268, *pl.* 84*a* (1910) . . . . , ...	Euploea Aegyptus.

FRUHSTORFER definitely calls the Java form "RAFFLESI".

SNELLEN notes with references to this species:

"Perhaps LUCAS when describing E. OCHSENHEIMERI (*Revue Zool.,* 1853, *p.* 315) had the present species before him but his description, like most of the older descriptions of EUPLOEAS without figures, is practically useless, whereas MOORE's may be considered good ".

W. J. Batavia (3—14); Tjampea (160); Buitenzorg (275); Gadok (± 550); vicinity of the Pelabouan Ratou or Wijnkoops Bay (± 150).

C. J. Touban (6) on the north coast; prov. Madioun.

E. J. Without precise indication of habitat; Malang (500—600) (*Fruhstorfer*).

The species is very common in West Java. In the ♂ the colour of the upper side of the fore-wings is much darker than in the ♀ but does not exhibit any iridescent blue. The white of the upper side increases more strongly in the ♀ than in the ♂, in some ♀ this increase is particularly striking.

The egg is yellowish white and strongly oval; it is attached with the apex to the under side of a young leaf and therefore hangs perpendicularly. The larva occurs repeatedly on *Kembang pita* (STROPHANTUS DICHROTOMUS Bl.) a cultivated ornamental plant. It is smooth and shining, orange in colour, sometimes approaching green. The head, the posterior extremity, the stigmata, the lower extremity of the legs, and the four pairs of processes, except their lower portion, are black. These processes occur on the first and third thoracic and the second and penultimate abdominal segments; the anterior pair is the longest, the third shortest; they are all somewhat curled in a forward direction. These processes much resemble those ocurring in the flowers of the plant on which the larva feeds. A splendid instance of mimicry for a superficial observer; for in this manner the larva has adapted itself to its environment! Unfortunately, however, other EUPLOEA larvae, living on different plants, have similar processes. The caterpillars are much pestered by Ichneumonidae and Tachiinae. The pupae are yellow at first but on the second day they begin to resemble burnished silver or copper, with some ochreous-yellow streaks radiating from the caudal extremity and provided anteriorly with some black dots. A pupa of September 8 changed into the imago on September 15 and one of December 15 emerged on December 23. Once I found a pupa on *Ampela*s (FICUS AMPELAS Burm.).

15. GAMELIA Hübn. (Pl. XIII, fig. 14*a*, 14*b*).

HÜBNER, *Samml. Exot. Schm., II, pl.* 10 (1806—1827) . Salpinx Gamelia.
CHAPMAN, *Ent. Monthly Mag., IX, p.* 263 ♀ (1873). . . Euploea Lorraini.
ZINCKEN, *Nova Acta Ac. Nat. Car., XV, p.* 186, *pl.* 16,
fig. 18, 19 (1881) . . . . „ Faberi.

Moore, *Proc. Zool. Soc. London*, 1883, *p.* 317	Anodara Gamelia.
Fruhstorfer, (Seitz, *Grossschm. d. Erde*), *p.* 268 (1910) .	Euploea „

The following has been noted respecting the species by Snellen:

"E. Lorraini Chapman, is simply a cursory description of the ♀. The illustrations by Hübner and Zincken ars good. Gamelia is hitherto known from Java only".

W. J. Mount Salak, Megamendoung, Gedeh and other mountains in the prov. Prayangan.

C. J. ?

E. J. ?

A mountain butterfly common above 1000 meters altitude in the mountains of West Java.

16. Gloriosa Butl. (Pl. XIII, fig. 15*a*, 15*b*).

Butler, *Proc. Zool. Soc. London*, 1866, *p.* 293, *pl.* 29, *fig.* 4 ♀	Euploea Gloriosa.
Snellen van Vollenhoven, *Tijdschr. v. Ent.*, 9, *pl.* 209, *pl.* 10, *fig.* 1 ♂ (1806).	„ Superba.
Felder, *Novara, Lep.*, *p.* 327, *pl.* 41, *fig.* 5 ♂ (1864—1867)	„ Schlegelii.
Moore, *Proc. Zool. Soc. London*, 1883, *p.* 321 . .	Sticteuploea Lacordairei.
Fruhstorfer, (Seitz, *Grossschm. d. Erde*), *p.* 246 (1910)	Euploea „

Fruhstorfer is of opinion that among the Java specimens the forms Defigurata and Magniplaga may be distinguished.

Snellen notes here as follows:

"The first description and illustration of this species are, probably, those of Snellen van Vollenhoven, but the name Superba was already applied to a previously described species of Euploea, *i. e.* E. Superba Herbst from China. The Javanese specimens do not agree with the type from Celebes, to which Schlegelii Felder also pertains, but constitute the smaller and less marked form Lacordairei Moore. Perhaps the species had already previously been described as Danais Dufresnei from the Philippines by Godart (*Enc. Méth.*, *IX*, *p.* 815, 1819—1823) but this description is very superficial and might equally apply to other species. Gloriosa ♂ is easily distinguished amongst the Javanese Euploeas by the two faintly shining, longitudinal streaks in cell 1*b* of the fore-wings, the dark blue lustre of their second half, and the purplish blue spots along the posterior margin ".

W. J. Neighbourhood of the Pelabouan Ratou or Wijnkoops Bay (± 150).

C. J. Touban (4) on the north coast.

E. J. Berbek (13) in the prov. Kediri; Tengger mountains (2000) (*Fruhstorfer*).

Genus HESTIA Hübn., Dbd., and Hew.

The Hestias are likewise slowly hovering butterflies but they do not fly as low as most Euploeas; they frequent wooded country but only where the sunlight is able to penetrate. According to Moore one of the species from British India is migratory; this is not the case with the Javanese ones, whereof the only species which is not actually rare does not, moreover, occur in great numbers.

1. Belia Westw.

According to Fruhstorfer butterflies of the genus Hestia are called by the Javanese *koupou kertas, i. e.* paper butterflies. He must mean that these butterflies are so designated in Java, for *koupou kertas*, or rather *koupou koupou kartas*, is not Javanese but Malay; I have never heard the term.

According to the observation of Captain H. Macpherson, communicated by Moore, with reference to the Indian species called Hestia Malabarica by him, the egg is " deposited singly on the under surface of a leaf and is white, oval, about $^1/_{16}$ inch long by $^1/_{32}$ broad, attached to the leaf by one of the small ends and marked with about twenty-two longitudinal rows of hexagonal indentations ". They are said to hatch after 6 or 7 days. The young larva is stated to remain mostly on the under side of the leaf, eating small holes into it and only subsequently proceeding to eat the leaf from the margin inwards. They are said to be full-grown in from 20 to 25 days. According to one of the figures, given by Moore of this caterpillar, it is evidently closely allied to that of H. Lynceus Drury.

Westwood, *Cab. Or. Entom., p.* 75, *pl.* 37, *fig.* 2 (1848)	Hestia Belia.
Snellen van Vollenhoven, *Tijdschr. v. Ent., III, p.* 43, *pl.* 3 (1860)	Idea Hypermnestra var. Jasonia.

Butler, *Trans. Linn. Soc. London*, 2 *Ser.*, *I*, *p.* 536, *pl.* 69, *fig.* 6 (1879)	Hestia Linteata.
Distant, *Rhop. Mal.*, *p.* 7, *tab.* 1, *fig.* 1 (1882—1886).	„ „
Fruhstorfer, (Seitz, *Grossschm. d. Erde*), *p.* 221, *pl.* 74*c* (1910)	„ Hypermnestra.

W. J. Tjampea (160); Gounoung Pantjar, a mountain in the division of Buitenzorg; vicinity of the Tjiletou or Sand Bay on the south coast; vicinity of the Pelabouan Ratou or Wijnkoops Bay on the south coast (± 150) (*Fruhstorfer*).

C. J. ?

E. J. ?

The species appears restricted to West Java, but is not so rare as Fruhstorfer thinks; it exhibits many individual differences. Fruhstorfer indicates particularly the Javanese specimens under the name of Belia.

2. Lynceus Drury. (Pl. XIII, fig. 16*a*, 16*b*),

Drury, *Ill. Exot. Ent.*, *pl.* 7, *fig.* 1 (1773) . . .	Papilio Lynceus.
Stoll, *Suppl. Cram.*, *p.* 180, *pl.* 42, *fig.* 1 (1790) .	„ Idea.
Godart, *Enc. Meth.*, *IX*, *p.* 195, *No.* 2 (1819—1823).	Idea Lyncea.
Doubleday, *Gen. Diurn. Lep.*, *pl.* 13, *fig.* 1 (1847).	Hestia Idea.
Moore, *Proc. Zool. Soc. London*, 1883, *p.* 218 . .	„ Stolli.
„ „ „ „ „ „ „ „ . .	„ Reinwardti.
„ „ „ „ „ „ „ „ . .	„ Logani.
„ „ „ „ „ „ „ „ . .	„ Donovani.
„ „ „ „ „ „ „ 219 . .	„ Druryi.
Distant, *Rhop. Mal.*, *p.* 6, 405, *tab.* 1, *fig.* 2 (1882—1886)	„ Lynceus.
Fruhstorfer, (Seitz, *Grossschm. d. Erde*), *p.* 220 (1910).	„ „ Stolli.
„ „ „ „ „ „ „ „ .	„ Logani Mevaria.

W. J. Buitenzorg (265); Tjampea (160); Manondjaya; vicinity of Pelabouan Ratou or Wijnkoops Bay (± 150).

C. J. ?

E. J. Banyoupoutih (45) in the prov. Probolingo.

Fruhstorfer distinguishes two species: H. Lynceus Drury, Stolli Moore, and H. Logani Moore, Mevaria, Fruhst., the former of which is said to be rare in Java and the latter extremely common. Snellen considers the two simply synonymous. The apparent distinction which Fruhstorfer thinks he is able to point out between the two is not to be traced upon investigation; there appear to be simply darker or lighter individuals. The alleged difference in form of the genitalia I am at present unable to admit either. Herr Fruhstorfer had the kindness to hand me photographie illustrations of the genitalia of his two species Stolli and Logani, that of the former, however, having been prepared not from a Javanese specimen but from one from Sumatra. Dr. Henri de Graaf, a specialist in this kind of researches, has investigated, microscopically 25 specimens from my collection, both light and dark coloured, and he did not find a single one amongst them whose genitalia agreed with the figure given of those of Stolli, on the contrary they all agreed with those given of Logani, and although considerable individual differences were observed in this respect it was only as regards the form of the valvae and valvulae and not to such an extent in connection with the structure of the principal organs that the existence of more than one species could be inferred from it. For this reason I am of opinion that for the present, at least as regards Java, all these forms must be referred to a single species. I have nowhere met this species so abundantly as Fruhstorfer has recorded it to be.

The larva has been observed at Tjampea on a plant which has not been identified (probably a Gymnema). It is of the Euploea type, entirely jet-black with milky-white transverse dorsal bands on the three thoracic segments and on the third, fourth, fifth, and penultimate abdominal segments. At the sides of the second and seventh abdominal segments a handsome red spot occurs, which sometimes is diffused almost into a transverse band.

Four pairs of long black processes are found on the second and third thoracic and the second and penultimate abdominal segments, the two foremost pairs curved forward, the two hindmost somewhat curved backward. The very handsome pupa, of a golden hue marbled with black, brown, and white, is not of the Euploea type. From a pupa of February 27th the imago appeared on March 12th. The illustration of the larva has been made from a not quite full-grown individual and is somewhat stiff. The larva grows larger.

3. Leuconoe Erichs.

Erichson, *Nova Acta Acad. Nat. Cur., XVI, p.* 283 (1834)	Idea	Leuconoe.
Doubl. and Hew., *Gen. D. L., pl.* 13, *fig.* 2 (1847).	Hestia	„
Distant, *Rhop. Mal., p.* 406, *tab.* 39, *fig.* 3 (1882—1886).	„	„
Snellen, *Notes Leyden Mus.*, 17, *p.* 119 (1895) . .	„	var. Natunensis.
„ *Tijdschr. v. Ent. XXXIX, p.* 43 (1896) . .	„	Leuconoe.

FRUHSTORFER, *Ent. Nachr.*, 22, *p.* 65 (1896) . . . . Hestia Leuconoe.
„ *Berl. Ent. Zeitschr.*, 42, *p.* 321 (1897) . . „ „
SNELLEN, *Tijdschr. v. Ent.*, *XLV*, *p.* 75 (1902) . . . . „ „
FRUHSTORFER, *Iris*, *XVI*, *p.* 60 (1903). . . . . „ „
„ (SEITZ, *Grossschm. d. Erde*), *p.* 222, *pl.* 74*a* (1910) . . , ... „ „

The only specimen, said to have been found in the province of Japara, in the north of Java, is in the collection of Dr. PAGENSTECHER at Wiesbaden. From the figure published by FRUHSTORFER, who distinguishes this form under the name JAVANA, it pertains, according to SNELLEN, to the form described by him as NATUNENSIS.

Perhaps it has been found in the Karimon Djawa islands situate to the north of the province of Japara and belonging to Java. A specimen, in my collection, from the Kangean islands, lying east of Java, also belongs to the present form.

Genus IDEOPSIS Horsf. and Moore.

1. GAURA Horsf. (Pl. XIII, fig. 17*a*, 17*b*, 17*c*, 17*d*).

HORSFIELD, *Cat. Lep. M. E. I. C.*, *pl.* 6, *fig.* 1 (1828). . Idea Gaura.
BOISDUVAL, *Spec. Gen.*, *I*, *pl.* 11, *fig.* 11 (1836) . . . . „ „
HORSFIELD AND MOORE, *Cat. Lep. M. E. I. C.* I., *p.* 133 (1857). Ideopsis „
FRUHSTORFER, (SEITZ, *Grossschm. d. Erde*), *p.* 216, *pl.* 16*a* (1910) . . . . „ „

W. J. Gounoung Pantjar, a mountain in the division Buitenzorg; in the vicinity of the Pelabouan Ratou or Wijnkoops bay (± 150) on the south coast.

C. J. Noesa Kambangan (*Jacobson*).

E. J. Semarou mountains (140); prov. Besouki; Blitar; Tengger mountains (1200) (*Jacobson*).

This species flies amongst the underwood after the manner of the members of the genus DANAIS but a little higher, about a man's height or more. The only specimen obtained by me during the many years I have hunted in the north of Java is the caterpillar taken on Gounoung Pantjar, at an altitude of certainly not less than 300 metres; in the south, especially in the Tengger mountains in E. J., at an altitude of 1200 metres, it appears to be fairly common.

Lighter or darker specimens occur in both sexes without any apparent connection as to habitat or time of appearance; the black on the upper side is not so much diffused in all ♀ as in the specimen figured. The larva taken at the place just mentioned was found living on a climbing plant which has been identified as MELODINUS LAEVIGATUS Bl. It is intermediate between the EUPLOEA and the DANAIS type, velvety black with a milky white transverse band on each segment. It has only two pairs of processes, also black but red at the base. The anterior pair, projecting from the second thoracic segment, is considerably longer than the posterior pair which is situate on the penultimate segment. The head is shining and furnished with two sharp points. The pupa is of the DANAIS type, whitish green with a black caudal hook and several round black dots. A row of 8 such dots occurs at the boundary of the thorax and abdomen, the others being distributed in 6 pairs on the thorax.

Genus DANAIS Latr. [1])

FRUHSTORFER (SEITZ, *Grossschm d. Erde*, *Danaidae*, *p.* 193) states that DANAIS (ANOSIA) PLEXIPPUS L., ARCHIPPUS F., ERIPPUS (Cram.), of American origin is said to have spread even to Java. The same statement has been made by various English and American authors; the first to assert this appears to be KIRBY. It is, however, probably based on a misconception, due, most likely, to the fact that D. GENUTIA Cram. has been referred by some entomologists to D. PLEXIPPUS L. The true D. PLEXIPPUS L., as has already been mentioned in the introduction, has spread from America westwards over the Pacific islands but from Australia only northwards apparently and subsequently again eastwards. For specimens are known from new Guinea, the Moluccas, the Talaut islands, North Celebes and Southern China, but I have never seen any from one of the islands in the sea of Java anymore than from Java, South Borneo, South Sumatra nor from South Celebes, although I have myself during five years collected butterflies in that region, and such a large insect — so conspicuous by its colouring — which, moreover, occurs in the districts near the coasts, could not have escaped attention.

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[1]) In the Leyden Museum is a specimen of DANAIS ISMARE Cram. which is said to have been forwarded from Java by the late REINWARDT. Since no other specimen of this species, to my knowledge, from Java exists and in view of the unreliable character of many of the old labels in this museum, I do not propose, for the present, to include the species in the Java fauna. FRUHSTORFER, (SEITZ, *Grossschm. d. Erde*) also mentions a form of D. AFFINIS F., called KASIRENSIS by him, as doubtful for Java, a couple of specimens of which he states to have seen whose origin, however, he doubts. I do not, therefore, propose to include this species either in the fauna of Java for the present.

These insects fly amongst the underwood mostly close to the ground; many belong to the commonest Rhopalocera of Java. Considerable individual difference occurs in the size of the white and brown spots and streaks in the same species. The larvae are furnished with processes similar to those occurring in the genus EUPLOEA but they are shorter and less numerous. The anterior pair of these processes is movable, according to WOOD MASON; I have, in fact, observed this in a couple of species; if, however, we take into account the great number of DANIAS larvae I have reared it must be assumed that this is of rare occurrence, as has already been stated with respect to EUPLOEAS. The colouring of the pupae has already been dealt with in the introduction. According to MOORE some of the species, amongst these D. GENUTIA Cram., very common in Java, and D. CHRYSIPPUS L. in British India, belong to the migratory butterflies, but this is not the case in Java.

1. ALBATA Zinck. (Pl. XIII, fig. 18).

ZINCKEN, *Nova Acta Ac. Nat. Cur., XV, p.* 181, *pl.* 16, *fig.* 16 (1831)	Euploea Albata.
MOORE, *Proc. Zool. Soc. London,* 1883, *p.* 248	Mangalisa „
FRUHSTORFER, (SEITZ, *Grossschm. d. Erde*), *p.* 209 (1910).	Danais „

W. J. Megamendoung, Gedeh, Wajang mountains; (1000—2000).
C. J. Oungaran (700—1000) (*Jacobson*).
E. J. Tosari (1777); Tengger mountains (1200) (*Jacobson*); prov. Besouky.

A mountain species, very common everywhere in the upper mountains above 1000 metres altitude, where it may frequently be observed flying swiftly close to the ground in the dark forest. FRUHSTORFER found this butterfly on Mount Gedeh as high up as 2600 metres and distinguishes the E. J. specimens as GILVA from those of W. J.

2. MELANEUS Cram. (Pl. XIII, fig. 19).

CRAMER, *I, p.* 48, *pl.* 30 *D* (1779)	Papilio Melaneus.
ZINCKEN, *Nova Acta Ac. Nat. Cur., XV, p.* 179 (1831) .	Euploea Melanea.
FELDER, *Novara, Lep., p.* 349 (1867)	Danais Larissa.
DISTANT, *Rhop. Mal., p.* 14 (1882—1886).	„ Melaneus.
MOORE, *Proc. Zool. Soc. London,* 1883, *p.* 250	Caduga „
„ *Lep. Ind., I, p.* 60, *pl.* 14, *fig.* 2, 2*a*—*b* ♂ ♀ (1890).	„ „
FRUHSTORFER, (SEITZ, *Grossschm. d. Erde*), *p.* 210, *pl.* 78*c* (1910)	Danais „

The Javanese specimens, according to SNELLEN belong to the form LARISSA Felder. A still smaller difference in colour evolution originated the form PSEUDOMELANEUS Moore. Under the latter designation FRUHSTORFER specially indicates the Java form.

W. J. Gedeh and other mountains in the prov. Prayangan (1400—1600).

C. J. ?

E. J. ?

A mountain species, not very common.

3. AGLEA Cram. (Pl. XIII, fig. 20*a*, 20*b*).

CRAMER, *IV, p.* 173, *pl.* 377 *E* (1782)	Papilio Aglea.
DISTANT, *Rhop. Mal., p.* 14, 408, *tab.* 1, *fig.* 6 (1880—1886).	Danais Melaneus.
MOORE, *Proc. Zool. Soc. London,* 1883, *p.* 251	Caduga Banksii.
„ *Lep. Ind., I, p.* 55, *pl.* 13, *fig.* 1*a—d* (1890). .	Parantica Aglea.

According to MOORE the figure by CRAMER represents the form from the south of British India. The accompanying illustration has been prepared from a Javanese specimen.

W. J. Meester Cornelis (25); Dèpok (95); Tjampea (160); Buitenzorg (265); Gedeh mountains (1082); vicinity of the Tjiletou or Wijnkoops Bay (± 150).

C. J. Prov. Madioun.

E. J. Semarou montains (750).

I did not meet with this species in the vicinity of Batavia but at a slightly higher altitude at Meester Cornelis.

The egg is fairly large, white, strongly ribbed longitudinally. The larva was found on *hanyouwang* (MARSDENIA TINCTORIA R. Br.) at Tjampea. MOORE gives an asclepiad, TYLOPHORA CARNOSA, as its food plant in British India and CALOTROPIS in Ceylon; it is of the DANAIS type and shows marbling of milky white spots with reticulation of faint lilac lines. On the last three segments, however, the spots are yellow and in the full-grown larvae a subdorsal row of yellow spots occurs in addition, except on the 1st and 2nd thoracic segments. A yellow dot invariably occurs on either side of the 1st thoracic segment. The back is at times of almost a chalky white beneath which a black ground is scarcely discernable; in young larvae, on the other hand, the back is less white and the general colouring, therefore, darker. Two pairs of processes are present, the anterior pair, on the 2nd thoracic segment, being much longer than the posterior pair which is situate on the penultimate segment; the former are black at the extremity, white or pearly grey on the outer side and black or dark lilac on the inner side. The head is black with milky-white spots, while on each of the pro-legs and on the anal segment occurs a black dot. The larvae not only nibble the edges of leaves but make holes in them, first nibbling through the prominent veins on the under side and proceeding thence to eat away.

The pupa is similar in form to that of the related species, being likewise green with some white spots on the back of the thorax which subsequently become partly of a golden lustre. In addition there is a row of black dots at the boundary of thorax and abdomen, each in turn surrounded by a white ring and all arranged on a dull grey band which is mostly of a golden lustre. The figures of larva and pupa by MOORE do not quite agree with mine. My descriptions have invariably been taken from the living animal.

4. ASPASIA F. (Pl. XIII, fig. 21*a*, 21*b*, 21*c*).

FABRICIUS, *Mant. Ins.*, *II*, *p.* 15 (1787)	Papilio Aspasia.
ZINCKEN, *Nova Acta Ac. Nat. Cur.*, *XV*, *p.* 184, *pl.* 16, *fig.* 17 (1831)	Euploea Philomela.
BUTLER, *Proc. Zool. Soc. London*, 1866, *pl.* 4, *fig.* 5 . .	Danais Crocea.
DISTANT, *Rhop. Mal.*, *p.* 13, *tab.* 1, *fig.* 7 (1882—1886).	„ Aspasia.
MOORE, *Lep. Ind.*, *I.*, *p.* 53, *pl.* 12, *fig.* 1*a*, *b* (1890) .	Bahora Crocea.
AURIVILLIUS, *Ent. Tidskr.* 1897, *p.* 144	Danais Aspasia.
FRUHSTORFER, (SEITZ, *Grossschm. d. Erde*), *p.* 205, *pl.* 76*e* (1910)	„ „

FRUHSTORFER indicates the Javanese specimens under the name of PHILOMELA.

SNELLEN noted with reference to this species that, indeed, it differs slightly from D. CLEONA Cram (IV, *p.* 173, *pl.* 377 *F* 1782) from the Moluccas, being somewhat smaller and somewhat longer-winged while the markings are partly greyish white and the streak in the discoidal cell of the fore-wings is never entirely interrupted at the middle, but that, nevertheless, it must probably be looked upon as a form of that species without this being confirmed, however, by sufficient transition forms.

W. J. Dèpok (95); Buitenzorg (265); Tjampea (160); Salak mountains (780); Tjibougel (+ 1000); Mount Karang in the prov. Bantam.

C. J. Tegal (*Lucassen*); Magelang (500); Semarang (25) (*Jacobson*); Gounoung Sawou in the prov. Jokjokarta (*Jacobson*).

E. J. Prov. Kediri; Tengger mountains (1200) (*Jacobson*).

I never encountered this butterfly in the vicinity of Batavia. At Dèpok and elsewhere, for instance in the Tengger mountains, it is very common. The larva feeds on a climber which I was told is called *kelambennan*, probably a species of Gymnema. It is entirely of the DANAIS type. The ground colour is velvety black while the head is also black. The markings consist of numerous white streaks and dots, and a subdorsal row of round spots, one on each segment, those on the median segments being yellow while those on the outer, especially the posterior ones, are orange. In addition an oblong orange spot occurs on either side of the last segment. The larva is provided with two pairs of processes, the anterior pair being fairly long but the posterior short; these processes are black except the median part of the anterior pair which is whitish grey. The anterior processes can to some extent be moved voluntarily. The pupa is also of the DANAIS type, light green with black caudal hook having a couple of black dots in close proximity; at the boundary between thorax and abdomen is a row of 10 black dots and parallel with it a similar row of 8 dots on the abdomen; all these dots are placed within milky-white rings. The abdomen further has a pair of milky-white dots. A pupa of 30 November produced the imago on 8 December.

5. AGLEOIDES Felder. (Pl. XIII, fig. *22a*, *22b*, *22c*).

FELDER, *Wien. Ent. Monatschr.*, *IV*, *p.* 398 (1860) . .	Danais Agleoides.
BUTLER, *Cat. Lep. Fabr.*, *p.* 7, *pl.* 1, *fig.* 2 (1870) . .	„ Eryx.
DISTANT, *Rhop. Mal.*, *p.* 15, *tab.* 1, *fig.* 5 (1882—1886).	„ Agleoides.
STAUDINGER, *Exot. Schm.*, *p.* 49, *pl.* 23 (1884—1888) .	„ Eryx.
MOORE, *Lep. Ind.*, *I*, *p.* 58, *pl.* 14, *fig.* *1a—b* (1890) .	Parantica Agleoides.

Concerning this species SNELLEN noted that it differs from D. SIMILIS Clerck only by having the light longitudinal lines in the discoidal cell of the fore-wings uninterupted in both sexes and by the ♂ possessing a sexual black spot on the under side of the hind-wings which is not the case in the ♂ of D. SIMILIS Clerck.

W. J. Batavia (3—14); Buitenzorg (265); Tjampea (160); Soukapoura.

C. J. ?

E. J. Jember (98), in the prov. Besouky; Banyoupoutih (45), in the prov. Probolingo.

The larva which occurs on the same climber as the preceding species and on *mengkoudou outan* (LASIANTHUS FIRMUS Miq.), is entirely of the DANAIS type, resembling the larvae of the other species, with a dark ground colour and numerous fairly large yellowish-white spots. The pupa is also of the DANAIS type, of a handsome light green with black caudal hook; a golden band, containing a row of round black spots, occurs on the boundary between thorax and abdomen. A few silvery spots in addition on the thorax some of which contain a black dot. A pupa of 2 March gave the imago on 11 March.

6. SIMILIS Clerck. (Pl. XIV, fig. *23a*, *23b*, *23c*).

CLERCK, *Icones, Ins., I, pl.* 16, *fig.* 3 (1759)	Papilio Similis.
LINNAEUS, *Mus. Lud. Ulr., p.* 299 *pars* (1764). . . .	„ „
CRAMER, *I, p.* 92, *pl.* 59, *F* (1779)	„ Aventina.
BUTLER, *Ent. Monthly Mag., X, p.* 164 (1874). . . .	Danais Vulgaris.
DISTANT, *Rhop. Mal., p.* 10, *tab.* 1, *fig.* 8 (1882—1886).	Radena „
AURIVILLIUS, *Recensio Critica, p.* 99, *No.* 117*a* (1882). .	Papilio Similis.
MOORE, *Proc. Zool. Soc. London*, 1883, *p.* 223, *pl.* 31, *fig.* 4	Radena Persimilis.
MOORE, *Lep. Ind., I, p.* 27, *pl.* 5, *fig.* 1, 1*a* (1890) . .	„ Vulgaris.
FRUHSTORFER, (SEITZ, *Grossschm. d. Erde*), *p.* 211, *pl.* 78*b* (1910).	Danais Similis.

SNELLEN noted that LINNAEUS and some subsequent authors confused several allied species with SIMILIS, which caused Butler to apply the name VULGARIS to the present species. AVENTINA Cram. is a poor illustration while DISTANT's figure of VULGARIS also leaves much to be desired.

W. J. Batavia (3—14); Dèpok (95); Tjampea (160), vicinity of the Pelabouan Ratou or Wijnkoops Bay (± 150).

C. T. Magelang (500).

E. J. ? At an altitude of 300—500 metres (FRUHSTORFER).

The present species, the Java specimens of which are differentiated by FRUHSTORFER as VULGAROIDES, is also very common in the low-lying districts.

The larva, which is found on a climber (GYMNEMA *sp.*), is of the DANAIS type and on a very intense black ground colour, has numerous small white round or rhomboid dots which in young larvae, however, are yellow and not placed on the dorsal part, or only a small number of them, being, consequently, distributed in two groups. Head black. Two pairs of black processes, dark orange at the base. The larva can move the anterior processes voluntarily and independently of each other. The pupa resembles that of the preceding species to such an extent that I was unable to discriminate between them. The spots which in some specimens have a golden lustre are silvery in others.

7. JUVENTA Cram. (Pl. XIV, fig. 24*a*, 24*b*, 24*c*).

CRAMER, *II*, *p.* 149, *pl.* 188 *B* (1779)	Papilio Juventa.
HORSFIELD, *Cat. Lep.*, *M. E. I. C.*, *pl.* 3, *fig.* 7, 7*a* (1828).	Euploea „
MOORE, *Ibid.*, 1, *p.* 122, *pl.* 4, *fig.* 4, 4*a* (1857). . .	Danais „
SNELLEN, *Tijdschr. v. Ent.*, *XXI*, *p.* 6 (1877), *XXXIX*, *p.* 44 (1896)	„ „
DISTANT, *Rhop. Mal.*, *p.* 407, *tab.* 39, *fig.* 4 (1882—1886).	Radena „
MOORE, *Proc. Zool. Soc. London*, 1883, *p.* 224, *pl.* 39, *fig.* 1	„ Exprompta.
FRUHSTORFER, (SEITZ, *Grossschm. d. Erde*), *p.* 212, *pl.* 78*b* (1910)	Danais Juventa.

As regards sexual characters this species agrees with D. SIMILIS; the form of wings also is nearly the same, the hind-wings, however, being more rounded. For $^2/_3$ they are light in colour with dark veins, while in SIMILIS they are dark with light longitudinal streaks. CRAMER'S figure is of too deep a blue, while DISTANT'S is fairly good.

W. J. Batavia (3—14); Dèpok (95); Buitenzorg (265); Tjampea (160); vicinity of Pelabouan Ratou or Wijnkoops Bay on the south coast (± 150); Soukapoura, in the south of the prov. Prayangan.

C. J. Jokjokarta (113); prov. Semarang (300) (*Jacobson*); Nousa Kambangan (*Jacobson*).

E. J. Banyoupoutih (45) in the prov. Probolingo; Kediri (64); Jember (98) in the prov. Besouky; in the prov. Banyouwangy and in the prov. Madoura.

This species is extremely common at Batavia and elsewhere in the lower lying districts of Java. I even found it on the coral islet Edam, situate one hour's distance north of Batavia. The larva occurs on *tjabe djawa* (PIPER LONGUM L.); *melati tongkeng* (PERGULARIA ODORATISSIMA Sm.); on *kelambennan* (GYMNEMA *sp.?*); on a climber known as *bebankean* and on a plant called *serawan oyot*. It is dark red-brown in colour covered with numerous milky-white dots and transverse streaks. The head is a glossy black. From the back of the second thoracic segment issues a longer and from that of the penultimate abdominal segment a shorter pair of filiform processes, the anterior pair being somewhat bent forward. These processes are black except at the base where they are orange coloured. Sometimes several larvae are met with on the same plant.

The pupa is of a vegetable green with a black caudal hook; a row of black dots occurs on the dorsal boundary between thorax and abdomen and a few similar dots are distributed over the back. Those which pupated in a dark box were of an equally clear green as those found in the open. They are much pestered by ichneumons. From a pupa of 4 April the imago emerged on the 12th of the same month.

Horsfield's figure of the larva is poor, that of the pupa a little better. As to Semper's figures that of the larva, although likewise scarcely accurate, is better than that of the pupa.

8. Limniace Cram. (Pl. XV, fig. 25*a*, 25*b*, 25*c*).

Cramer, *I*, *p.* 92, *pl.* 59, *D. E.* (1779). . . . . Papilio Limniace.
„ *IV*, *p.* 172, *pl.* 377, *C. D.* (1782) . . . „ Melissa.
Hübner, *Samml. Exot. Schm.*, *I*, *pl.* 19, ♂ (1806—1827). Limnas Limniace.
Horsfield, *Cat. Lep.*, *M. E. I. C.*, *pl.* 3, *fig.* 6 (1828) . . . . Euploea „
Moore. *Ibid.*, 1, *p.* 121, *pl.* 4, *fig.* 3, 3*a* (1857) . . Danais „
Distant, *Rhop. Mal.*, *p.* 16, *tab.* 1, *fig.* 9 (1882—1886). „ Septentrionis.
Staudinger, *Exot. Schm.*, *p.* 49, *pl.* 24, ♂ (1884—1888) „ Limniace.
Moore, *Lep. Ind.*, *I*, *p.* 30, *pl.* 6, *fig.* 1, 1*a* (1890). Tirumala „
Stichel, *Berl. Ent. Zeitschr.*, 1899, *Sitz. Ber.* 17 *Mai.* Danais „
Fruhstorfer, „ „ „ 1899, *p.* 115 . . . „ „
Martin, *Iris*, 1910, *p.* 21 . . . . . Tirumala Limniace, var. Makassara.
„ „ 1910, *p.* 23 . . . . . „ Melissa, var. Govana.
Fruhstorfer, (Seitz, *Grossschm. d. Erde*), *p.* 202 (1910) . . . . Danais Melissa.

Snellen has noted that of the present species the type as well as the forms Septentrionis and Melissa occur in Java. The Javanese specimens of the typical form have been christened Myrsillos by Fruhstorfer.

W. J. Batavia (4—14); Tjampea (160); Mount Karang in the prov. Bantam; mountains in the prov. Prayangan.

C. J. Touban (4) and Semarang (6) on the north coast; prov. Tegal; prov. Madioun; Jokjokarta (113).

E. J. Prov. Kediri; prov. Besouky; prov. Banyouwangy.

The forms of this species have been dealt with extensively by Fruhstorfer in *Berliner Entom. Zeitschr.*, 1899 and by Dr. L. Martin in *Deutsche Ent. Zeitschr. Iris*, 1910, where they have based several species and subspecies on these various forms; the latter attributes them to climatic influences. I suspect that here again we have simply to deal with phenomena of colour evolution; the specially pronounced spreading of the white, which plays the chief role here, being doubtless nothing else. In the next species and amongst EUPLOEAS this peculiar development of the white, although in the latter genus it manifests itself in a somewhat different manner, arises from the same cause. The material in my possession has not been labelled with sufficient care, as regards locality and period of capture, to enable a definite judgment to be formed in this connection. Two types, one darker and larger (SEPTENTRIONIS) and one exhibiting more white (MELISSA) are clearly separable in Java. At Batavia, where I collected during an extensive period, I found, both in the wet and the dry season, exclusively butterflies of the MELISSA type, a specially large and fine specimen even in August, therefore at the height of the dry season; in the Preanger mountains, however, I invariably took specimens of the SEPTENTRIONIS form. At the same time I also possess a specimen of the MELISSA form from Tjampea (160) and one supposed to have been captured on Mount Karang, prov. Bantam, together with one from Touban which evidently forms a transition to the other type. Moreover, the MELISSA specimens are not constant as regards the white streaks and spots and frequently show transitions to SEPTENTRIONIS; the white lines in specimens of the latter are very unequal in width, the white in this form being of a bluish shade.

From Banyouwangy I received a specimen of the form SEPTENTRIONIS, most probably not taken in the mountains, and from Besouky, also from the low lying districts, a specimen which, according to SNELLEN, mostly agrees with the form described by BUTLER from the Samoa Islands under the name of OBSCURATA. From Jokjokarta and from Semarang, on the north coast, of C. J., I possess specimens which, without a doubt, belong to the form MELISSA and agree with it in size but which at the same time are much darker than others from W. J. and in this respect, therefore, again approach SEPTENTRIONIS.

Of the earlier stages nothing is known to me personally. MARTIN observed oviposition of SEPTENTRIONIS. A single egg was deposited on each leaf and affixed by the truncated end, in a similar manner as was observed by me in the case of EUPLOEA MIDAMUS L. and E. RAFFLESI Moore and recorded by MACPHERSON of a species of HESTIA. The egg was hatched on the third day while the larva 8 or 9 days after turned into a pupa of a shining green with golden spots and a gold band at the boundary of thorax and abdomen. On the eighth day the imago emerged.

MOORE gives the life history of the larva and pupa as it was observed on the continent of India by Dr. FORSAYETH. According to him the larva lives on ASCLEPIAS, CALOTROPIS, and HOYA. To judge from his figure it strongly resembles that of D. CHRYSIPPUS but the median pair of processes is absent; the pupa also appears to be of the same type as in that species but is larger.

9. MELANIPPUS Cram. (Pl. XIV, fig. 27*a*, 27*b*).

CRAMER, *II, p.* 44, *pl.* 127, *A. B.* (1779).	Papilio Melanippus.
„ *II, p.* 128, *pl.* 180, *A.* (1779)	„ Hegesippus.
DISTANT, *Rhop. Mal., p.* 19, *tab.* 2, *fig.* 1 (1882—1886).	Danais Melanippus var. Hegesippus.
STAUDINGER, *Exot. Schm., p.* 49, *pl.* 25 ♂ (1884—1888).	Danais Hegesippus.
MOORE, *Lep. Ind., I, p.* 49, *pl.* 11, *fig.* 1, 1*a*, 1*b* (1890).	Salatura „
FRUHSTORFER, (SEITZ, *Grossschm. der Erde*), *p.* 196, *pl.* 77*c* (1910) . . . . , ...	„ Melanippus.

SNELLEN noted that in the present species cell 1*a* in the fore-wings is entirely blackish brown on the upper side, whereas in D. GENUTIA it invariably shows a brownish yellow longitudinal band.

The form HEGESIPPUS Cram., which exhibits on the hinds wings a strong diffusion of white, does not occur in Java, although in some of the specimens of the type, found there, the under side of the hind-wings has a decided tendency to become white.

The amount of black on the upper side and that of whitish on the under side of the hind-wings varies in individuals without any inter-relation, however, and without this variation, apparently, depending on the period at which they are captured. It is simply a manifestation of the irregularity in the process of colour evolution.

D. MELANIPPUS Cram. is evidently closely related in form to D. GENUTIA Cram., although the larvae distinctly differ; it is a species which has advanced further in the process of colour evolution than the latter, hence the general colouring on the upper side is of a much lighter orange than is the case as a rule in GENUTIA, a few specimens excepted, and hence also on the hind-wings much more white occurs which becomes especially diffused in the form HEGESIPPUS.

In other species of DANAIS, not occurring in Java, the original colour has remained a much more intense red. Thus the entire evolutional fading process from red to white is clearly demonstrated by a comparison of many species of the genus.

W. J. Batavia (3—14) confined to the lowest districts, in the Pademangan Wood and even on the coral islet Edam, situate at an hour's distance north of Batavia; Buitenzorg (265); Tjampea (160) and in the mountains in the prov. Prayangan (± 1000—1700).

C. J. ?

E. J. ?

The larva is found on *kelambennan* (GYMNEMA *sp.*) and *outjous ajam* (TYLOPHORA CISSOIDES Bl.) and differs from most of the Javanese DANAIS larvae in having, not two, but like D. Chrysippus, three pairs of processes which are filiform, entirely black, and placed on the 2nd thoracic and the 2nd and penultimate abdominal segments; these processes are fairly short, the anterior pair being the longest whereas the two other pairs are very short. The markings of the larva consists of pearly grey, transverse lines and spots with a sub-dorsal row of a golden yellow; it much resembles the larva of D. GENUTIA but the ground colour is darker. The head is black. The pupa has the same shape as in that species, and is green at first becoming subsequently of a light rose colour with a few golden spots and a line of black, white, and silver mixed, at the boundary of thorax and abdomen.

10. ARTENICE Cram. (Pl. XIV, fig. 26).

CRAMER, *IV*, *p.* 168, *pl.* 375, *C. D.* (1782)	Papilio Artenice.
HÜBNER, *Samml. Exot. Schm.*, *II*, *pl.* 16, *fig.* 1—4 (1806—1824)	Euploea Chionippe.
ESCHHOLTZ *in* KOTZEBUE'S *Reise*, *III*, *p.* 209, *pl.* 7, *fig.* 12*a*, *b* (1821) , ...	Idea Abigar.
DISTANT, *Rhop. Mal.*, *p.* 409, *tab.* 42, *fig.* 11 (1882—1886).	Danais Abigar.
SNELLEN, *Tijdschr. v. Ent.*, *XXXIII*, *p.* 269 (1890); *XXXIX*, *p.* 44 (1896)	„ „
FRUHSTORFER, (SEITZ, *Grossschm. d. Erde*), *p.* 200 (1900).	„ Affinis.

In the case of ARTENICE, SNELLEN also noted that cell 1*a* of the fore-wings is entirely dark on the upper side, but that the under side of the hind-wings differs considerably both from MELANIPPUS and GENUTIA.

Besides the type figured by CRAMER specimens occur in Java either without white in the median portion of the upper side of the hind-wings or having that region strongly suffused with white, the latter being the form ABIGAR Eschh. The under side of the hind-wings, moreover, contains more white in some specimens than in others, this difference, to judge from my specimens, being more accentuated in the ♂ than in the ♀. The name ARTENICE is specially applied by FRUHSTORFER to the Java form.

W. J. Batavia (3—14); in the lower districts near Pademangan Wood this butterfly is common, but from the higher regions I have received but a single specimen.

C. J. The species was described by CRAMER from Semarang.

E. J. ?

11. Genutia Cram. (Pl. XIV, fig. 28*a*, 28*b*, 28*c*, 28*d*).

Cramer, *III, p.* 23, *pl.* 206, *C. D.* (1782)	Papilio Genutia.
Hübner, *Samml. Exot. Schm., I, pl.* 21, *fig.* 1, 2 (1806—1827)	Limnas „
Horsfield *and* Moore, *Cat. Lep. M. E. I. C., I, p.* 124, *pl.* 4, *fig.* 6, 6*a* (1857)	Danais Plexippus.
Distant, *Rhop. Mal., p.* 18, 408, *tab.* 2, *fig.* 2, 3 (1882—1886)	„ Genutia.
Moore, *Proc. Zool. Soc. London*, 1883, *p.* 240 . . .	Salatura Intensa.
„ „ „ „ „ „ *p.* 242 . . .	„ Sumatrana.
„ *Lep. Ind., I., p.* 45, *pl.* 10, *fig.* 1, 1*a*—*c* (1890).	„ Genutia.
Fruhstorfer, (Seitz, *Grossschm. d. Erde*), *p.* 194, *pl.* 77*c* (1910)	Danais Plexippus.

Fruhstorfer applies the name Intensa Moore to the Java form. According to Snellen, however, the latter, which is relatively small and dark, is indeed the common form in Java but Moore's Sumatrana also occurs there in which the colour of the hind-wings is suffused with white. Evidently, therefore, the same manifestation of colour evolution occurring in so many of the Danaidae.

W. J. Batavia (3—14); Buitenzorg (275); Sindanglaya (1074); mount Salak (780); Gedeh mountains (1425).

C. J. Semarang (10); Srondol in the prov. Semarang (300) (*Jacobson*); Magelang (500); prov. Madioun; Jokjokarta (113).

E. J. Kediri (64); Jember (98) in the prov. Besouky; Semarou mountains (750); Tengger mountains (1200) (*Jacobson*); prov. Banyouwangy; prov. Madoura.

One of the commonest butterflies in Java, being met with everywhere. In the *Transactions Ent. Soc. London*, 1905, *p.* 92, I find a statement by G. B. Longstaff to the effect that one evening in December, while at Hourou in British India, he noticed eight of these butterflies suspended close together from one of the huge leaf-stalks of a palm, evidently for the purpose of thus passing the night in company and that about twenty of them were found in close proximity to each other. Such a gregarious habit I have never observed either in this or any other species of Danaidae. I find a similar statement, however, with reference to the American D. (Anosia) Plexippus L.

According to Fruhstorfer the odoriferous scales in the present species emit the smell of carrion to an extraordinary degree. At times, however, it is said not to exhale any odour. I have handled hundreds of these butterflies without ever noticing anything of the sort, and I suspect that this observation is based on an individual which at the time of capture had just been feeding on carrion. I once caught a specimen of EUPLOEA MIDAMUS L. which, evidently for the same reason, smelt strongly of human faeces; but I have never noticed this in other specimens of this species.

The butterfly deposits the minute, round, milky-white eggs each separately on the under side of a leaf, as has been observed in a few other Danaidae; I have, however, found as many as four on the same leaf. The larvae feed on the leaves of *ousous ajam* (TYLOPHORA CISSOIDES Bl.); *melati tongkeng* (PERGULARIA ODORATISSIMA Sm.); *kelambennan* (GYMNEMA *sp.*) and also on an ornamental plant (Ravisteinia Pulchella) frequently met with at Batavia. Many larvae are found on the same plant; a shrub in my garden at Batavia was constantly covered with them and mostly stripped bare, in spite of my frequently killing great numbers; I constantly observed butterflies settle on it in order to deposit their eggs; they manifestly appear to perceive the presence of this plant from a distance, although the scent emitted by this flowerless and almost leafless shrub can only be a faint one.

The larvae are mostly light in colour; the ground colour of the back and sides is black on which occur numerous pearly-grey spots and transverse lines, and in addition on each segment, except the first thoracic, two golden-yellow spots, those on the median segments being largest, while the others decrease in size towards the head and the tail. A yellow band, interrupted by black lines, forms the boundary between the sides and the black under surface. The head is black with a light grey dot enclosed within rings of the same colour which are open at the base. There are two pairs of processes, the anterior pair on the second thoracic segment being longer and more filiform than the posterior pair, which issues from the penultimate segment; alle the processes are light red near the base the remainder being dark red, almost black. I have noticed the caterpillar voluntarily moving the posterior but not the anterior pair.

A dark form, which, however, is not so common, has the back dark purple or brown with faint black transverse lines and a golden yellow subdorsal dot on each segment. At the boundary between the sides and the faint green under surface is a broad white and yellow band in which the black stigmata are situate. The processes are black but the anterior pair at the base is of the same colour as the back. An immature larva, which completely agreed with the immature larva of D. CHRYSIPPUS L., changed into this dark form.

The pupae, which completely agree with those of the species just mentioned, are light green at first with a double band, half white and half black, at the boundary of thorax and abdomen; subsequently, however, it turns to a light rose and the white of the band changes into a row of golden dots or pearls. Whether the surroundings during pupating are light or dark exercises no influence upon the colour of the pupa. The caudal hook is black and close to it four black spots are to be observed. A chrysalis of 21 February produced the imago on March 1 while from pupae of 23 February the perfect insects emerged on March 2 and 3. The description given of the larva of this species by MOORE does not agree with mine and has reference to a caterpillar with 3 pairs of processes, like that of D. MELANIPPUS Cram. The same applies to the figure given by HORSFIELD, also based on a specimen from British India and this fact makes it appear probable that the Javanese GENUTIA is not identical with that from British India.

12. CHRYSIPPUS L. (Pl. IV, fig. 29*a*, 29*b*, 29*c*, 29*d*, 29*e*, 29*f*).

LINNAEUS, *Syst. Nat., Ed. X, p.* 471, *No.* 81 (1758). .	Papilio	Chrysippus.
CRAMER, *II, p.* 32, *pl.* 118, *B. C.* (1779)	„	„
STOLL, *Suppl. of Cramer, p.* 132, *pl.* 28, *fig.* 3 (1790) .	„	Petilia.
HÜBNER, *Samml. Eur. Schm., pl.* 133, *fig.* 673, 679 (1816)	„	Chrysippus.
HÜBNER, *Samml. Exot. Schm. I.*	Limnas	„
HORSFIELD, *Cat. Lep., M. E. I. C., pl.* 3, *fig.* 9, 9*a* (1828).	Euploea	„
HORSFIELD *and* MOORE, *Ibid., I, p.* 126, *pl.* 4, *fig.* 7, 7*a* (1885)	Danais	„
DISTANT, *Rhop. Mal., p.* 20, 408, *tab.* 1, *fig.* 10, *tab.* 40, *fig.* 13 (1882—1886)	„	„
MOORE, *Proc. Zool Soc. London,* 1883, *p.* 238	Limnas	Bataviana.
„ *Lep. Ind., I, p.* 36, *pl.* 8, *fig.* 1, 1*a*—*e* (1890).	„	Chrysippus.
FRUHSTORFER, (SEITZ, *Grossschm. d. Erde*), *p.* 193 (1910).	Danais	„

The specimens from Java belong to the dark form BATAVIANA Moore; the shade of the principal colour varies, however, some ♂ especially being considerably lighter in hue, although not so light as the typical form which occurs elsewhere. The process of fading to yellow and white in this species generally manifests itself strongly over its very extensive range and thus produces all manner of so-called varieties, which, however, have partly been obtained also by breeding from typical parents. Thus, for instance, the forms ALCIPPUS and ALCIPPOIDES, which do not occur in Java, have been distinguished. The form PETILIA Stoll, from the east of the Archipelago and North Australia, is also of a light ground colour. In a consignment, which I received once from Tegal and which otherwise contained only common Javanese butterflies, amongst them the form of D. CHRYSIPPUS L. common in that island, I found also a fresh specimen of the form PETILIA, agreeing in every respect with those from North Australia, but which was said to have been captured by Mr. VAN BRUGGEN on the northern slope of Mount Selamat, at an altitude between 170 and 1000 metres. Considering, however, that this is the only specimen from Java known to me and that, moreover, the species most probably is a traveller, I would deem it advisable for the present not to draw any conclusions from this fact.

The dark form of Java differs very markedly in the shade of its colour from HYPOLIMNAS MISIPPUS L., which, it is alleged, mimics this DANAIS. Moreover, the flight of the latter, which flies low down over grassy plains, and of a tree frequenting species like this HYPOLIMNAS, is by no means the same and for this reason they do not occur together except accidentally.

W. J. Batavia (3—14); Buitenzorg (275); Bidara Tjina (28); Megamendoung mountains (1480); Soukapoura in the south of the prov. Prayangan.

C. J. Prov. Tegal; Magelang (500); Jokjokarta (113).

E. J. Kediri (64); prov. Madoura.

According to MOORE this butterfly is extremely common on the continent of India; Mr. AITKEN, quoted by him, states "with the exception, perhaps, of TERIAS HECABE, the commonest and most ubiquitous butterfly on the Bombay Side of India. Up to a level of 7000 feet it may be found anywhere in the Indian Empire".

This is not so in Java; in the mountains this butterfly occurs indeed but by no means frequently; on the plains of the low lying country it is, indeed, nowhere rare but very common only in some districts and never equally common as in British India.

According to MOORE the egg is cream coloured, sugar-loaf shaped and deposited singly on the under surface of the leaf. In the caterpillar when hatched the tentacula are barely visible; but in the full-grown one the tentacula are long and movable *ad libitum* by the caterpillar. The latter fact I have never observed in the numerous specimens reared by me. According to my notes the larva, which I also found in July at the height of the dry season, lives son a plant designated at Batavia as *rembéga* and *bidoura* (CALOTROPIS GIGANTEA Ait.), belonging to the ASCLEPIADEAE. Species of ASCLEPIAS are also indicated as its food plant by SEMPER in the Philippines, by TRIMEN in South Africa, and by

HOFFMANN in Greece, while MOORE mentions ASCLEPIAS CURASSAVICA for British India. The caterpillar is pearly grey on the back with many transverse black lines varying in width, between which on each segment occur two oblong, sometimes coherent, golden-yellow spots. Along the sides it has a golden-yellow band across which the foresaid lines partly extend; a black band divides the sides from the light grey under-surface. On the pearly-grey head may be observed black markings resembling those of the caterpillar of EUPLOEA MIDAMUS L. Three pairs of processes occur on the back, *i. e.* on the 2nd thoracic and on the 2nd and penultimate abdominal segments; they are filiform, the anterior longest and the middle pair shortest; they are black and, except the anterior pair, somewhat reddish at the base. In the immature larvae the yellow on the back has not yet formed distinct spots but appears as narrow transverse lines.

The larvae grow very rapidly and change into pupae which very much resemble those of D. GENUTIA Cram. The general colour of many is at first milky white and becomes subsequently a beautiful green which again fades at times when the pupae become white. Other pupae are light rose. At the boundary between thorax and abdomen a double line may be observed which is black on the side of the thorax but on the side of the abdomen consists of numerous golden dots placed side by side. On the thorax and the wing-cases some additional golden dots are found. The caudal hook is black.

As this butterfly inhabits a very extensive area there are many figures of its earlier stages. Those of TRIMEN (South Africa) are very good, and the description he gives of the larva agrees very well with the Java caterpillar. Of the South European form the larva and pupa have been described and figured by HÜBNER and by Prof. Dr. E. HOFMANN; HÜBNER's description and figures agree well with the Javanese except that all the processes of the caterpillar appear to be longer than those of the Java specimens. HOFMANN, in his description, mentions only two pairs of processes but he figures three pairs of equal length. He also mentions flesh-coloured and green pupae but his figure of the pupa is very poor. The figures of SEMPER (Philippines) and of HORSFIELD (Java) are very unsatisfactory; nor are those given by MOORE of the Ceylon caterpillars and chrysalides beautiful whereas those of the larva from British India, while not being accurate either, are somewhat better. The illustrations of the larva and pupae which I now offer are much more successful.

SATYRIDAE.

The Java SATYRIDAE are butterflies which, with a few exceptions, do not seek strong sunshine but rather frequent shady places and fly also when the sky is overcast; some species are actually met with in those parts of the mountains which are mostly enveloped in clouds and are consequently very foggy and damp. Some are on the wing during morning and evening twilight, but in day time only when disturbed and since the latter is the case with many other species it is very probable that these also are twilight butterflies. Of the larvae we have but a very incomplete knowledge, but they appear to live principally on graminaceous plants.

Genus CYLLO Bsd., Herr. Sch.

1. LEDA L. (Pl. XV, fig. 30*a*—30*r*).

LINNAEUS, *Syst. Nat., Ed. XII, I,* 2, *p.* 773, *No.* 151 (1767) . . . . Papilio Leda.
DRURY, *Ill. Ent., I, pl.* 15, *fig.* 5, 6 (1773) . . . . „ „
CRAMER, *I, p.* 40, *pl.* 26, *A. B.* (1779) . . . . . „ Ismene.
„ *III,* „ 5, *pl.* 196, *C; IV, p.* 8, *pl.* 292, *A.* (1779, 1782) . . . . „ Leda.
„ *IV,* „ 8, *pl.* 291, *F.* (1782) . . . . . . „ Mycena.
„ *IV,* „ 8, *pl.* 292, *B.* (1782) . . . . . . „ Phedima.
„ *IV,* „ 8, *pl.* 292, *C.* (1782) . . . . . . „ Arcensia.
HÜBNER, *Samml. Exot. Schm. I* (1816—1817) . . . . Oreas Leda.
HORSFIELD, *Cat. Lep., M. E. I. C., pl.* 8, *fig.* 9 (1828). Hipparchia Leda.
DISTANT, *Rhop. Mal., p.* 41, *tab.* 4, *fig.* 10 (1882—1886). Melanitis „
„ „ „ *p.* 42, *tab.* 4, *fig.* 9, 11, 12, (1882—1886) . . . . „ Ismene.

Moore, *Lep. Ind., II, p.* 118, *pl.* 122, 123 (1894) . .	Melanitis	Ismene.
Kobus, *Tijdschr. v. Ent.*, 39, *p.* 129, *pl.* 6 (1896) . .	Cyllo	Leda.
Bingham, *Fauna Brit. India, I, p.* 158 (1905)	Melanitis	Ismene.
Fruhstorfer, (Seitz, *Grossschm. d. Erde*), *p.* 362 (1911).	„	Leda.

This species is extremely common in Java, where the food of the caterpillar is met with everywhere. It is, therefore, unnecessary to enumerate specific habitats. Moreover, it has a very wide distribution, over the whole Indo-Australian region as well as elsewhere, to the north as far as north China and Japan, to Australia in the south, eastward on many of the South Sea islands, and westward in tropical Africa. The butterfly during morning and evening twilights flies low near the ground, in the day time only upon being disturbed when it settles again at a short distance on the ground or on some object. The peculiar coloration of the under side of the wings, which varies considerably in individuals, makes it difficult to distinguish it from its environment, which, of course, is considered mimicry although this theory fails to explain how such great differences in colouring and marking originate. The butterfly is frequently met with in dwellings, where, after the habit of many Heterocera it seeks to evade strong daylight. Distant mentions that it greedily sucks the sweet liquid tapped from palm trees, known as palm wine; in Java this is also the case.

In certain individuals, which have been considered a distinct species under the name of C. Ismene, a remnant of the original universal red colour is to be observed in the bright orange on the upper side of the fore-wings near the apex; frequently this has even faded to yellow or is covered in great part, if not entirely, by black. The unequal course of the process of colour evolution, according to the individuals, explains this difference, which manifests itself still more strongly on the under side of the wings where it causes the great variation in colouring and marking already alluded to; this variation has been attributed to difference in sex or in time of occurrence by authors unacquainted with this process, some even considering these differences of specific value. De Nicéville and Moore have in this manner created several species; Bingham has, it is true, reduced the number somewhat but not sufficiently. This is, indeed, unavoidable when one is unacquainted with the process of colour evolution. For even if it be admitted that existing animal and vegetable forms are not immutable but may vary through climatic or similar influences and, therefore, especially in proportion as they inhabit different regions, the fact that a species, apart from such influences, should be able to become modified, so to speak of its own accord, appears incomprehensible. Unless it should be conceived as an extraordinary, inexplicable fact — a so-caled mutation — instead of the result of a normal process of natural evolution. In that case one is at a loss how to treat these numerous forms except to differentiate them as numerous species or at least as races, which, however, are by no means well defined but graduating into each other constitute but a confused entity. It is only through grasping the principle referred to that it becomes possible to understand these varied forms. It is true that in the case of a species exhibiting such an amount of variation, like CYLLO LEDA L., this is by no means an easy task; I believe, nevertheless, to have succeeded in this.

By a comparison of more than 150 specimens from Java, aided by that of about 70 from other regions I have convinced myself that the CYLLO butterflies, occurring in Java, with the exception of a small number, forming a distinct species — CYLLO SUYUDANA Moore — all belong to the species CYLLO LEDA L. Neither do I attach any value to the subspecies, which FRUHSTORFER recognizes. With regard to the majority of species specially figured from British India by MOORE, I must also doubt their independent existence; considering, however, that these do not occur in Java I have been unable to study them and, consequently, I am unable to form a definite judgment in this respect.

Two courses of evolutionary modification are to be observed with regard to this species in Java. One being the decrease in size of the wings which I have explained in my paper "*Ueber die sogenannten Schwänze der Lepidopteren*". (*Deutsche Entomologische Zeitschrift Iris* 1903), and to which I hope to refer again when dealing with the Papilionidae. The continuous operation of this process manifests itself here principally in the gradual disappearance of the projecting points, the vestiges of a former greater expanse of the wings. In many individuals of CYLLO LEDA L. such appendages are still fairly evident (pl. XV, fig. 30 *o*, *p*, *q*), but in others, especially in the fore-wings, they become considerably smaller. Entomologists, who are insufficiently acquainted with this evolutionary process, are constrained to base distinct species on these different forms of wing; in this manner ELYMNIAS CAUDATA Butl., for instance, although nothing but an old form of E. UNDULARIS Drury, is looked upon as a separate species. These appendages, however, are nothing but such wing vestiges which in many PAPILIOS have remained in the form of the so-called tails, sometimes even — as in the ACHATES form of PAPILIO MEMNON L. — only in an old ♀ form; an instance which clearly proves that of specific difference there can be no question here. Thus these appendages are still strongly in evidence in ♀ specimens of CYLLO LEDA L. having made little evolutional progress in this respect and still exhibiting, therefore, an old form, which, moreover, like the old ACHATES form of PAPILIO MEMNON L., have also sometimes remained somewhat larger, thereby leading principally to the creation of the so-called species Cyllo Zithenius Herbst, while others again have regarded it merely ♀ of Cyllo Suyudana Moore. The other process, that of colour evolution, manifests itself at first in the fading of the original red pigment to orange and yellow, after which this pigment — whether or not first fading to white, of which there is no evidence — appears to be broken up but in such a manner that the scales, which contained the pigment, or some of them, become filled with air and thus acquire an intense white colour. Side by side with this, as usual, the black pigment at first strongly suffuses itself over the original colour, covering it completely or nearly so but subsequently decreases again sothat either the black investment becomes lighter in colour or the original colour — meanwhile having faded to yellow — reappears, even though still suffused with some black. The upper and the under sides of the wings independently pursue their course in this process so that any specific pattern of marking on the under surface goes side by side, now with one then with another pattern on the upper surface. Thus the following combinations may be met with:

upper side, A (Pl. XV, fig. 30*c*) under side, A′, E, D, F, H, G, I, K′ (Pl. V, fig. 30 *d, i, h, k, l, m, n, p*).

„ „ B (Pl. XV, „ 30*e*) „ „ C′, E, D, F, H (Pl. V, fig. 30 *g, i, h, k, l*).

„ „ C (Pl. XV, „ 30*f*) „ „ C′ F, H, K′ (Pl. V, fig. 30 *g, k, l, p*.

It is only in the very pale specimens, mostly ♀, figured on pl. XV, fig. 30 *f, g*, that some connection appears to exist, at least as regards the general tint, between the upper and under sides which, however, simply indicates an equally advanced stage in the process of colour evolution. In most cases that is to say, since there are also specimens with such an upper side, but whose under side have nothing in common with the latter.

Now first as regards the upper side, it is covered by the black pigments, either completely or with the exception of a small portion near the apex, to such an extent that of the original red colour nothing remains or only a spot faded to orange or yellow, while subsequently this black colour again has commenced to recede and in many specimens in this manner has become a light grey. This process is met with especially, but not exclusively, in ♀ (Pl. XV, fig. 30*f*), since I possess also ♂ in which it occurs, the former, therefore, having reached apparently a more advanced stage than the majority of the latter. The reddish, orange, or yellow spot referred to, which in its turn is margined by intense black containing two clear white dots, varies considerably as to size and shade in individuals, according as to whether the process of diffusion of the black pigment has advanced more or less. In specimens where the black is still on the increase this spot is most pronounced during the dry season when in general the development has less advanced than in individuals living in the rainy season, hence the form Ismene was believed to be a dry season type. It is, however, invariably of small size; such large yellow spots as figured by Moore for many of his alleged species from British India and which also occur in races of Cyllo in the west of the Malay Archipelago, are not met with in Java; only in some ♀ from E. J. (Pl. XV, fig. 30*q*) the orange shade is likewise fairly diffused. These are, however, very useful for understanding the existence and history of this spots in Cyllo Leda L., by means of comparison with them, as has been done in the introduction. We have here, evidently, to do with what in the introduction to my monograph of the Java Pieridae I have termed obstinate spots, in which the original colour — whether red or, at a more advanced stage, orange or yellow — is retained for a long period before being covered by the black pigment. The intense black by its side must, as has been explained in the introduction with reference to the true ocelli, apparently be looked upon as an accretion of this black pigment at the place where the said obstinate spot caused an obstruction to its even diffusion in the manner this has taken place in the remainder of the wing surface. The clear white dots occurring in the spot referred to must have originated in the same way as has been indicated in the introduction in the case of the true ocelli. At times similar white dots occur elsewhere on the upper side and it may happen that these are not clear white but yellow, in which case the scales are still filled with some faded and, therefore, yellow pigment. To utilize such white dots as specific characters simply signalizes a complete want of grasp of the process of colour evolution.

The course of this process on the under side is much more intricate. Here also the original red is covered by the black pigment and the latter has subsequently decreased step by step, but in so uneven a measure that it occurs in all manners of blends with the remnants of the original colour, in which the latter — although sometimes already faded to yellow — is still distinctly discernable. Two vertical, parallel, curved stripes on the under side of the fore-wings are first of all to be regarded as vestiges of the former general darkening process, the inner one being continued on the hind-wings, while both occur in various stages of fading and diminution, being wider at one time (Pl. XV, fig. 30 *h*, *m*) and narrower at another (Pl. XV, fig. 30 *k*, *l*, *n*); sometimes they are very dark (Pl. XV, fig. 30 *h*, *m*) but not unfrequently the original red is distinctly recognizable, more so than is shown in the illustration (Pl. XV, fig. 30 *n, p*). These stripes may even disappear entirely or nearly so, although in that case more or less isolated spots of black pigment remain (Pl. XV, fig. 30*d*) in a similar manner as is the case in Pieridae with the brown spots, produced by the same process, on the under side in species of Callidryas and Terias. (*Pieridae, Pl. III, fig. 6i, 6l, 5b, and Pl. IV, fig. 3e*). Frequently the diminution of black at that spot proceeds more evenly giving rise to the kind of marking termed "*Rieselung*" by German Entomologists, where the black pigment has been retained in so finely divided a condition reminding one of the minute drops of water of a drizzle, a form of marking which is also met with in many other butterflies, for instance on the under side of the hind-wings in Iphias (Hebomoia) Glaucippe Bsd.

If next the black pigment continues to diminish, the original colour no longer covered and faded to yellow, now reappears, (Pl. XV, fig. 10*g*), so that the individuals which are far advanced in this evolutionary process exhibit yellow on the under side now blended with but little black, and in these the upper side is faded to a light grey. (Pl. XV, fig. 10*f*).

The ocelli, which have been fully dealt with in the introduction, especially deserve attention in this connection. Those most highly developed are found in individuals whose under side has reached an advanced stage of "drizzling", for the most part where the original colour universally reappears as yellow. (Pl. XV, fig. 10*g*). As a matter of fact all these forms of Cyllo Leda L. can only be regarded as the same expression of excessive inequality in the individual manifestion of the evolutionary processes of form and colour which give rise to the polymorphism in many other butterflies but which in C. Leda L. presents a greater amount of confusion. Thus, for instance, the origin of the projecting appendages on the wings already referred to, and at one time more pronounced than at others, is the same as that of the so-called tails in the Achates form of Pap. Memnon L. Three circumstances co-operate to make this less manifest in this case:

1⁰. That in C. Leda L. the colour of the upper surface and that of the under surface of the wings in each individual continues its evolutional modification without, apparently, any inter-relation; in the cases of polymorphism, as in Pap. Memnon L. or Callidryas Pomona L., this holds good likewise but by no means so universally, since in most cases a definite pattern on the upper side corresponds to a definite pattern on the under side.

2⁰ That, although in the two species mentioned, for instance, there can be no question of sexual polymorphism and this difference of form has nothing to do with sex itself, this difference, nevertheless, manifests itself in the sexes of these butterflies in various stages of development and thereby facilitates the appreciation of these evolutional modifications; whereas in C. LEDA L. no difference in this respect manifests itself.

3^{0}. That the difference in colouring in C. LEDA L. arises almost entirely from a greater or lesser diffusion of the black pigment, frequently in a finely divided condition over a less clear ground colour, making it more difficult to distinguish a definite colour pattern than is the case with the polymorphic species, referred to, with their lighter and more distinct colours.

The fact that this solution of the CYLLO problem simply carries us back to the same evolutionary processes which manifest themselves in other butterflies, undoubtedly presents a strong presumption in favour of its correctness; that, moreover, only an acquaintance with these processes and especially with the theory of colour evolution can lead to such solution is also incontestably a strong argument on behalf of its accuracy.

I imagine that the foregoing observations will enable the reader to appreciate my conviction that the numerous species of CYLLO invented by MOORE, de NICÉVILLE and others, each provided in addition with a dry-and wet-season form, do not in reality exist and simply indicate various stages of development in one and the same species. Together with Cramer's species PHEDAMA, MYCENA, and ARCENSIA, which simply represent colour forms of LEDA, I am constrained to reject MOORE'S and BINGHAM'S MELANITIS BELA, under which the latter, moreover, includes MOORE'S species M. VARAHA, M. GOKALA, and M. FAMBRA; likewise FRUHSTORFER'S subspecies SIMESSA, LACRIMA, and ISMENIDES. Even CYLLO ZITHENIUS Herbst, mentioned by FRUHSTORFER under the forms GNOPHODES Btlr. and GRUESCENS from Java, is simply based on wrongly understood specimens of C. LEDA L. For a long time I have been in doubt concerning the form K (Pl. XV, fig. 30*o*) of which I have received from the mountains of W. J. numerous specimens differing slightly *inter se* and invariably exhibiting the same under side K′ (Pl. XV, fig. 30*p*). Seeing, however, that the marking of this under side agrees completely with that of many indubitable LEDA ♀ and that transition forms occur besides, I was unable to separate this form either from CYLLO LEDA L. CYLLO SUYUDANA Moore alone, which is not the same as PHEDIMA Cr. with which FRUHSTORFER confuses it, I recognize as a distinct species since no transitions between this and C. LEDA L. have come to my knowledge, although both are very closely allied in their colour development. The larger specimens from the Moluccas, however, I cannot regard otherwise than as a race of the same species, a view which I am prepared to modify only if, on examination of the generative organs, specific differences are shown to exist.

Of the different forms of this butterfly occurring in Java I have figured the most divergent; it should, however, be borne in mind that illustrations are never perfect, and that especially the various shades of colour can scarcely be reproduced with accuracy.

As regards the larvae I possess about 25 descriptions noted by me at different times, which I have compared with descriptions by MOORE, DE NICÉVILLE, BINGHAM, and RAINBOW, as well as with the figures contained in the works of these authors and of HORSFIELD and KOBUS and finally with those prepared under my supervision in Java. From this it is evident that of this species two larvae are rarely alike. They are long, slender, fusiform in build, the terminal segment is armed with two divergent setose processes; the head prominent and armed with two erect obtuse setose processes, like little horns. The body appears rugose and covered with short microscopic white hairs which give the appearance of minute white dots on the surface of the body. The colour is green, sometimes lighter, sometimes darker, on which occasionally the line of the vas dorsalis is visible dorsally while along the back and sides occur some, occasionally dark, but mostly yellow or white lines, the principal one of which runs along the ventral boundary and is more or less raised. All these lines, however, are sometimes only partly visible or even not at all. The ventral side is dark green covered with fairly long, stiff hairs. The bristles on the terminal processes are as a rule of the colour of the body but sometimes they are brownish; the horns are reddish brown, of a more or less dark shade, sometimes very light brown; this colour, in most cases, is continued form the horns along the head in the shape of two bands, uniting below the head. In addition a milky white band runs along the outer side of the horns, being also continued on the head and running side by side with the brown band. It varies, however, exceedingly, sometimes running only along the head or only along the horns while frequently it is reduced everywhere or here and there to a narrow line. It may at times, too, be yellow instead of white. On one occasion I found some black marking on the front of the head. In young larvae as a rule the horns, and sometimes the head, are black, which colour is retained until the last moult; occasionally the horns were pale rose coloured and the milky-white band was already present.

Sometimes the caterpillars occur gregariously, for instance, on *padi* (ORYZA SATIVA L.) and *tebou* (SACCHARUM OFFICINARUM L.) but they are also frequently found solitary on various kinds of grasses, BAMBUSA, palm leaves and even on *tapak liman* (ELEPHANTOPUS SCABER L.). They are voracious and change into light green chrysalides with some faint white stripes on the wing cases, without any processes, and attached to leaves or grass haulms, frequently in numbers close together. From pupae of 27 April and 20 May the imagines emerged on 6 and 28 May.

MOORE's figures of the imago are good but those of KOBUS poor. None of the figures of the larva referred to appears to me a good likeness, nor are those prepared for me. On the other hand I am able to reproduce here (Pl. XV, fig. 31*c*), a very successful figure of the larva of CYLLO SUYUDANA Moore which is, indeed, larger than any specimen of C. LEDA L. I have ever seen in Java but in which, otherwise, I can discover no characters differentiating it from that species; it is true the white lateral band along the ventral boundary is particularly distinct and evidently somewhat raised, but similar bands sometimes occur in the larva of C. LEDA L. Like that of the latter it is rugose but this is difficult of reproduction, which is clearly proved by KOBUS' figure.

2. SUYUDANA Moore. (Pl. XV, fig. *a*, *b*, *c*).

MOORE, *Cat. Lep., M. E. I. C.*, I., *p.* 224 (1857) . .	Melanitis	Suyudana.
„ *Lep. of Ceylon*, I, *p.* 15, *pl.* 9, *fig.* 2, *a*—*c* (1880).	„	Tambara.
DISTANT, *Rhop. Mal.*, *p.* 412, *tab.* 39, *fig.* 2 (1882—1886).	„	Suyudana.
„ „ „ *p.* 413, *pl.* 19, *fig.* 3 („).	„	Abdulla.
STAUDINGER, *Exot. Schm.*, *p.* 222, *pl.* 79 ♂ (1884—1888).	„	Suyudana.
FRUHSTORFER, (SEITZ, *Grossschm. d. Erde*), *p.* 364 (1911).	„	Phedima.

FRUHSTORFER confuses this species with PHEDIMA of CRAMER which represents a badly coloured ♀ of C. LEDA L.; his alleged seasonal forms, consequently, are of no value. I possess this butterfly from West, Central, and East Java, the majority of specimens being from the mountains, but one was captured in the prov. Semarang, very near the north coast, in low lying country, therefore. I have long been in doubt whether this species should not be considered a form of CYLLO LEDA L. A careful comparison of 19 specimens of the present species has, however, satisfied me that, even when closely allied to CYLLO LEDA L., it constitutes an independent type, although one specimen may be a little darker and another somewhat lighter on the upper side, while on the under side also they differ and the pointed appendage of the fore-wings is very pronounced in some individuals, whereas in others it is entirely wanting. Although the manner in which the evolutional modification of its under side is effected recurs in C. LEDA L. no transitions between these two species are met with. A careful examination of the genitalia of these butterflies conducted on my behalf by an expert on the subject, Dr. HENRI DE GRAAF of Leyden, revealed the fact that of these 19 specimens only 2 were ♀ and that the latter were only a trifle less dark than the ♂. The caterpillar found by me on *padi* (ORYZA SATIVA L.), although otherwise greatly resembling that of CYLLO LEDA L. and described with it *supra*, decidedly differed from it by its greater size. For these reasons I consider C. SUYUDANA Moore may be admitted as a distinct species.

Genus ERITES Westw. Herr. Sch. [1])

1. MADURA Horsf. (Pl. XIV, fig. 32).

HORSFIELD, *Cat. Lep. M. E. I. C.*, *pl.* 5, *fig.* 8, 8*a* (1828).	Hipparchia Madura.
WESTWOOD, *in* DOUBLEDAY *and* HEWITSON, *Gen. D. L.*, *p.* 392, footnoote (1847)	Erites Madura.
DE NICÉVILLE, *Journ. Asiat. Soc. Bengal*, LXII, *p.* 3 (1893)	„ Medura.
FRUHSTORFER, (SEITZ, *Grossschm. der Erde*), *p.* 302 . .	„ „

W. J. Buitenzorg (265); Gedeh mountains, in the south of the prov. Prayangan near Pelabouan Ratou or Wijnkoops Bay and Tjiletou or Sand bay (± 150).

C. J. ?

E. J. Prov. Besouky; Semarou mountains (740); Malang (440) (*Fruhst.*).

The flight of this butterfly is close to the ground, agreeing completely with that of the genus YPTHIMA. According to FRUHSTORFER it is very common in the south ot Java especially in E. Java, but I have never seen a specimen from the northern districts of that island. The ocelli on the upper side of the hind-wings do not occur as regularly as shown in the illustration nor are they all invariably of the same size.

2. OCHREANA Semp. (Pl. XIV, fig. 33).

SEMPER, *Schmett. d. Phil.*, *p.* 326, *No.* 497 (1886—1892)	Erites Ochreana.
STAUDINGER, *Iris*, II, *p.* 38 (1889)	„ Madura var. Ochreana.

[1]) In the Leyden Museum is a specimen of E. ELEGANS Butl., labelled Java, without any further indication. As no other specimen from Java is known to me and old labels in that Museum are not always reliable, I am unable, at present, to accept it as a member of the Javanese Fauna.

DE NICÉVILLE, *Journ. As. Soc. Bengal*, LXII, *p.* 5 (1893)	Erites Ochreana.
MOORE, *Lep. Ind.*, II, *p.* 113, *pl.* 121, *fig.* 1*a*—*b* (1883)	„ Argentina.
BINGHAM, *Fauna of Brit. India*, I, *p.* 153 (1905).	„ „
FRUHSTORFER, (SEITZ, *Grossschm. d. Erde*), *p.* 303, *pl.* 93 (1911)	„ Fruhstorferi.

I only possess a single specimen captured in the southern part of W. Java near Pelabouan Ratou or Wynkoops Bay (± 150). Mr. FRUHSTORFER obtained it at the same place as well as in the mountains along the south coast of E. Java.

Genus YPTIMA Hb. Westw.

Small butterflies which fly close to the ground and whose larvae, as far as known, occur on kinds of grass. They are partial to sunshine but they are on the wing also when the sky is overcast. Characteristic in them is the great apical ocellus on the fore-wings in which generally two blue dots may be observed, being the nuclei of the two ocelli whose coalescence has given rise to the larger eye-like blotches. In some specimens the two, although already connected, are still clearly distinguishable but where their coalescence is further advanced the large ocellus acquires consequently an oblong shape and the greater the size of the butterfly, and with it the apical eye-like blotch, the rounder does the latter become. In the ♂ it is usually smaller than in the ♀.

1. JARBA de Nicév. (Pl. XIV, fig. 34).

FRUHSTORFER, (SEITZ, *Grossschm. d. Erde*), *p.* 287, *pl.* 99*d*, *f.* Ypthima Jarba.

FRUHSTORFER distinguishes two forms of the present species: GANGAMELA from E. J. and EUPEITHES from W. J. The former, however, I met with in both sexes in W. J. and of the latter I received a ♂ from that entomologist. I am unable to find any difference of importance between the two. FRUHSTORFER figures a particularly large ♀ of EUPEITHES, not larger, however, than ♀ specimens of Y. PANDOCUS Moore, which occurs in W. J.

2. Huebneri Kirby. (Pl. XVI, fig. 35).

Hübner, *Zuträge*, I, *p.* 17, *fig.* 83, 84 (1818). . . .	Ypthima	Philomela.
Kirby, *Cat. Diurn. Lep.*, *p.* 95, *N°.* 18 (1871) . . .	„	Hübneri.
Distant, *Rhop. Mal.*, *p.* 57, *tab.* 7, *fig.* 5 (1882—1886).	„	„
Moore, *Lep. Ind.*, II, *p.* 77, *pl.* 111, *fig.* 1, 1*a*—*h* (1893).	„	„
Elwes *and* Edwards, *Trans. Ent. Soc. London*, 1893, *p.* 9, *pl.* 1, *fig.* 5	„	„
Bingham, *Fauna Brit. India*, I, *p.* 142 (1905). . . .	„	„
Fruhstorfer, (Seitz, *Grossschm. d. Erde*), *p.* 287, *pl.* 99*c* (1911).	„	Philomela.

W. J. Batavia (3—14); Meester Cornelis (25); Dèpok (95); Buitenzorg (275); Patjet (1114) (*Jacobson*).

C. J. Semarang (6); prov. Jokjokarta (*Jacobson*); Salatiga (580); (*Jacobson*).

E. J. Jember, prov. Besouky (98).

The present species is common everywhere in the low lying country; I also received specimens, however, from the mountains. Moore and Bingham, following de Nicéville, recognize definite forms of the dry and wet season. I am unable to accept the view of these entomologists. I possess many specimens captured both at the height of the wet and in the middle of the dry season and can find only individual differences between these. Some specimens are somewhat darker in colour on the upper side than others, but these occur as much in the dry as in the wet season. The under side also in some is more whitish than in others, a feature which appears to manifest itself especially in ♀. There is much difference in the size of the ocelli, both as regards the large apical eye-like blotch and that on the under side of the hind-wings; some of the ocelli at times are in contact while at others they are separate.

In nine specimes caught at Semarang in August and the beginning of September — therefore at the height of the dry season — the ocelli on the under side of the hind-wings differ, indeed, somewhat in size but are otherwise quite similar to those in specimens taken in the middle of the rainy season. I also possess specimens captured in March — therefore in the wet season — in which these ocelli are less developed than in the others.

The caterpillar feeds on *roumpout pahit* (Paspalum conjugatum Berg). It is hairless and dark ochre-yellow, somewhat darker at the sides and with a faint dark dorsal line. That green individuals occur, as figured by de Nicéville and Moore is, however, possible. The chrysalis is green and, according to de Nicéville, sometimes also brown. From a pupa of 29 June the perfect insect appeared on 10 July.

3. Argillosa Snell. (Pl. XVI, fig. 36*a*, 36*b*).

Snellen, *Tijdschr. v. Ent.*, XXXV, *p.* 133 (1892). . .	Ypthima Argillosa.
Fruhstorfer, (Seitz, *Grossschm. d. Erde*), *p.* 290 (1911).	„ „

W. J. One specimen, without precise indication of its habitat.
C. J. Touban (2), on the north coast; Dander (30).
E. J. ?

4. Baldus F. (Pl. XVI, fig. 37*a*, 37*b*, 38*a*, 38*b*, 38*c*, 38*d*).

Fabricius, *Syst. Ent.*, *Append.*, *p.* 829, (1775) . . .	Papilio Baldus.
Donovan, *Ins. of India*, *pl.* 36, *fig.* 2 (1800—1803) .	„ „
Distant, *Rhop. Mal.*, *p.* 57, *tab.* 5 (1882—1886) . .	Ypthima Neuboldi.
„ „ „ *p.* 56, 419, *tab.* 6, *fig.* 9 (1882—1886)	„ Methora.
Waterhouse, *Aid*, *pl.* 179, *fig.* 3 (1886—1890) . .	„ Horsfieldii.
Snellen, *Tijdschr. v. Ent.*, XXXIII, *p.* 286 (1890). .	„ Baldus.
Moore, *Lep. Ind.*, II, *p.* 58, *pl.* 106, *fig.* 1, 1*a*—*i* (1890).	Thymipa „
Elwes *and* Edwards, *Trans. Ent. Soc. London*, 1893, *p.* 28, *pl.* 1, *fig.* 21, 22 . .	Ypthima Leuca.
„ „ „ „ „ „ „ „ „ „ *p.* 25, *pl.* 1, *fig.* 1, 1*a* 11	„ Horsfieldii.
Bingham, *Fauna Brit. India*, I, *p.* 134 (1905) . . .	„ Baldus.
Fruhstorfer, (Seitz, *Grossschm. der Erde*), *p.* 289, *pl.* 99*d* (1911).	„ „

W. J. Batavia (3—14); Dèpok (95); Buitenzorg (265); vicinity of Pelabouan or Wijnkoops Bay (± 150).

C. J. Semarang (6); prov. Jokjokarta (*Jacobson*); Gounoung Kidoul (*Jacobson*).

E. J. Jember, prov. Besouky (98).

Fruhstorfer recognizes two races of this species which he designates Baldus F. and Horsfieldi Moore and which, in fact, are quite distinct. Of the latter I possess many specimens from the low-lying country of W. Java, where it is very common and likewise from Buitenzorg, also some from the prov. Jokjokarta in C. Java and a single one from Jember, E. Java. Of the other form I have eleven specimens of both sexes taken at the height of the dry season at Tjandi, the upper town of Semarang, and one in February — in the middle of the rainy season, therefore — on the Gounoung Kidoul, prov. Jokjakarta, so that I am unable to admit the separate wet-season race MARSHALLI Butl. of FRUHSTORFER, at least as far as Java is concerved. Neither can BALDUS and HORSFIELDI be regarded as distinct species, since a specimen, taken by me at the height of the rainy season in the province of Jokjokarta, is clearly intermediate to a certain extent between the two, the upper side as well as the pronounced ocelli on the under side agreeing entirely with those in BALDUS, while, on the other hand, the strong white powdering of the under side clearly accords with that of HORSFIELDI.

The larva feeds on *roumpout pahit* (PASPALUM CONJUGATUM Berg) and on the grass known as *gryntyngan* (CYNODON DACTYLON Pers.). The young caterpillar is greenish, but subsequently turns to a faint loam colour or yellowish white, almost colourless. It has a dark dorsal line and a light band along the ventral boundary, sometimes with more or less longitudinal lines on the head which, however, are much more distinct in some specimens than in others. The tail part terminates in two projections which, like the body, are closely invested with very short black or white hairs which can only be seen distinctly with a strong lens. The head is round but with two short projections. The chrysalis is suspended from a grass stem. A pupa of 3rd February produced the imago on the 11th of the same month while from one of 25th March the perfect insect emerged on 3rd April. The figures given by Moore of the caterpillar and chrysalis are very indistinct.

5. FASCIATA Hew. (Pl. XVI, fig. 39).

HEWITSON, *Trans. Ent. Soc. of London, Ser.* 3, 2, *p.* 287 (1864).	Ypthima Fasciata.
DISTANT, *Rhop. Mal., tab.* 420, *fig.* 122 (1882—1886). .	„ „
ELWES *and* EDWARDS, *Trans. Ent. Soc. of London*, 1893, *p.* 44.	„ „
FRUHSTOREER, (SEITZ, *Grossschm. d. Erde*), *p.* 287, *pl.* 99*g* (1911)	„ „

Only met with in the prov. Besouky in E. J.

6. PANDOCUS Moore. (Pl. XVI, fig. 40*a*, 40*b*, 40*c*, 40*d*, 40*e*, 40*f*).

MOORE, *Cat. Lep. M. E. I. C.*, I, *p.* 235, *No.* 506 (1857).	Ypthima Pandocus.
HEWITSON, *Trans. Ent. Soc. of London, Ser.* 3, 2, *p.* 290, *pl.* 18, *fig.* 12 (1864)	„ „
BUTLER, *Trans. Ent. Soc. of London*, 1879, *p.* 537 . .	„ Corticaria.

Distant, *Rhop. Mal.*, *p.* 55, *tab.* 6, *fig.* 8 (1882—1886). Ypthima Corticaria.
" " " *p.* 419 . . . . . Ypthima Pandocus var Corticaria.
Staudinger, *Iris*, II, *p.* 38 (1889) . . . . Ypthima Pandocus.
Elwes *and* Edwards, *Trans. Ent. Soc. of London*, 1893,
p. 22, *pl.* 2, *fig.* 38 . . . . " "
Fruhstorfer, (Seitz, *Grossschm. d. Erde*), *p.* 293, *pl.* 99/
(1911) . . . . " "

W. J. Buitenzorg (165); Salak mountains (780); Tjipanas (1114); Gedeh mountains (1480); mountain chain in the prov. Prayangan (± 1700); mountains in the prov. Bantam. Vicinity of the Pelabouan Ratou or Wijnkoops Bay on the south coast (± 150).

C. J. Salatiga (580) (*Jacobson*).

E. J. Semarou mountains (740); Tosari (1777); Tengger mountains (1200) (*Jacobson*); Blitar in the prov. Kediri; prov. Banyouwangy.

I possess many specimens of this species, not from the low lying country of northern Java but from the mountains, and likewise from the lower districts near Wijnkoops Bay on the south coast. They comprise light and dark coloured, large and small, with more or less pronounced ocelli, all having been caught either at the height of the dry or during the wet season, so that I find it impossible to trace in these differences in colour development any relation either the place or time of capture. Only the light coloured ♀ specimens from the Prayangan mountains appear to me to be the largest with the most strongly developed ocelli. I can, therefore, see nothing but individual differences of colour evolution in the various races of this species established by Fruhstorfer, any more than in the species Nigricans proposed by Snellen and Fruhstorfer. In the numerous specimens of the latter from E. and W. Java, in my possession, mostly taken during the dry but also in the wet season, I can only recognize smaller, less developed individuals of Pandocus; not a single definite feature characterizing either form can be traced since in large series they may, distinctly be seen to run into each other. Breeding may ultimately settle this matter.

This butterfly is very common in the mountains flying low near the ground amongst the underwood, even when there is no sun or during rain. Some ♀ attain an expanse of wing of 45 mm. The larva feeds on *allang allang* (Imperata arundinacea Cyrill), *bamboo* (Bambusa sp.), and *roumpout pahit* (Paspalum conjugatum Berg). The colour dimorphism, referred to in the introduction, is met with in these caterpillars, since there are loam- or brick-coloured as well as light green individuals. They exhibit a dark dorsal stripe and on either side some regular dark dots; a light line subdorsally and on the ventral boundary a raised very light dirty white band — in green individuals it is yellow — above which occur two dark longitudinal lines, al covered with very short stiff hairs. The body terminates posteriorly in two short projections and two very short projecting points occur on the head.

The pupa, which is beautifully marbled dark and light brown, is one of the suspensory kinds.

Genus NEORINA Westw.

1. CRISHNA Westw. (Pl. XVI, fig. 41).

WESTWOOD (*Doubl. and Hew. Gen. D. Lep., p.* 361) 1851. Cyllo Chrishna.
FRUHSTORFER, *Entom. Nachr.*, 14, *p.* 337 ♀ (1893). . . Neorina „
„ (SEITZ, *Grossschm. d. Erde*), *p.* 327, *pl.* 94*d* (1911). . . . . „ „

W. J. Vicinity of the Pelabouan Ratou or Wijnkoops Bay and Tjiletou or Sand Bay along the south coast (± 150).

C. J. ?

E. J. Semarou mountains (740) and Southern mountains (500).

This butterfly is evidently not rare at the localities enumerated; in the Southern mountains I found it at rest on the ground and making its way to hide amongst the tall *allang allang* grass, exactly in the manner as practised by CYLLO LEDA L., from which I concluded that, like the latter, it flies about the twilight. I never encountered it, however, in the vicinity of Batavia, Buitenzorg, Touban, Bodjonegoro, or Kediri, neither have I ever seen specimens captured in any other districts in Java but those named. On one occasion I found at Tjibodas in the mountains of the Prov. Prayangan (1410) on *rottan* (CALAMUS sp.) a caterpillar of the DEBIS type, but 6.5 c.m. in length and of proportionate bigness. It was light green; the head somewhat lighter in colour and having the appearance of being covered all over with white dots, caused by very short stiff white hairs. It had a dorsal and subdorsal yellow line, the latter having here and there a pale dot, while on the ventrae boundary occurred an indistinct yellowish supra-stigmatic and a very distinct brownish-yellow infra-stigmatic line. The head was furnished with two relatively short projections which were white spotted with brown on the anterior side and rather yellowish at the base. The hinder portion also terminated in two projections of moderate length. The stigmata were reddish brown. This caterpillar turned into a suspensory chrysalis of a dirty green sparsely spotted with brown, which, as regards the general form and the projections on the head, fairly agreed with a DEBIS pupa but exhibited two rows of subdorsal projecting, points on the abdomen. On leaving the mountains, I was obliged to take this pupa with me to Buitenzorg but, as frequently happens with pupae carried from the cooler humid mountain districts to low lying country, it died there. In view of the size of the caterpillar and its relationship with species of DEBIS, it can hardly have been anything but one of N. CHRISNA Westw.

Mr. FRUHSTORFER is of opinion that the specimens from E. J. and those from W. J. are distinct, and couples with this view some far-reaching speculations concerning former land connections. I only possess a single specimen from E. J. but I fail to discover the characters which he indicates as differentiating it from the W. J. specimens — of which I possess many. I am, therefore, constrained to doubt the justness of his arguments. Moreover, the same stage in the process of colour evolution may well have been reached by butterflies of one and the same species occurring in different regions, without basing theories as to the former existence of land connections on this single fact, uncorroborated by other evidence.

It appears to me very probable that NEORINA CRISHNA Westw. and its allies in other regions of the Malayo-Australian fauna are remnants of an ancient genus, formerly containing many types but now dying out and consequently represented by few forms. The great size of the present species, as compared with other closely allied Satyridae, may also have some bearing on the question. For instance, I possess as pecimen from the Wijnkoops Bay in W. J. with a broad white transverse band which is particularly large. The genus HESTIA probably owes its large size to the same cause and, amongst Papilios, ORNITHOPTERAS exhibit the same phenomenon. The close association between NEORINA and the tertiary genus NEORINOPSIS Butl., so aptly referred to in this connection by FRUHSTORFER, also points in the same direction.

Genus DEBIS Westw., Herr. Sch.

The species of DEBIS appear in general to be mountain butterflies. I have found only one species, D. EUROPA F., on a few occasious in low lying country. Dr. HAGEN has had a similar experience with respect to the species of this genus in Sumatra, but according to Dr. Martin, besides D. Europa F., D. Manthara Felder (Mekara Butl.) is said to occur also in low lying districts in Sumatra. The individuals from Java of species occurring also in British India frequently differ considerably from the latter in the shade of colour, at least in so far as can be judged from the figures given by Moore. The so-called seasonal differences, illustrated by Moore, I have been unable to discover in Java. I must, however, admit that since the majority of Debis species are fairly rare in Java no large series of these are available for comparison, except as regards D. Europa F. and D. Rohria F., but of these Moore also knows no seasonal varieties. To judge from Moore's figures two types of larvae appear to occur among the various species but I have met with only one of them in Java.

Fruhstorfer considers the species of Debis, except D. Rohria F., to be twilight butterflies; as a matter of fact they are never seen on the wing in day-time except when disturbed.

1. Minerva F. (Pl. XVI, fig. 42*a*, 42*b*).

Fabricius, *Ent. Syst., p.* 493, *No.* 216 (1775)	Papilio	Minerva.
Cramer, II, *p.* 29, *pl.* 116, *D. E.* (1779)	„	Arcadia.
Distant, *Rhop. Mal., p.* 414, *tab.* 36, *fig.* 8 (1882—1886).	Lethe	Minerva.
Moore, *Lep. Ind.*, I, *p.* 237, *pl.* 77, *fig.* 1, 1*a*—*b* (1892).	Nemetis	„
Bingham, *Fauna Brit. India, vol.* 1, *p.* 90, *pl.* 11, *fig.* 14 ♀ (1905)	Lethe	„
Fruhstorfer, (Seitz, *Grossschm. d. Erde, p.* 318, *pl.* 98*a* (1911).	„	„

W. J. Buitenzorg (265); prov. Prayangan (500); vicinity of the Tjiletou or Sand Bay on the south coast (± 150).

C. J. Prov. Jokjokarta (*Jacobson*).

E. J. Banyouwangy and also without precise indication of habitat.

Common in the lower lying districts. (*Fruhst.*).

The accompanying figures of the present species are good, only in many ♀ the colour of the upper side is much more dull yellowish-grey than is shown in the illustration. The ♂ figured by Moore and described by Bingham does not agree with the Java specimens nor quite with those figured as from Java by Fruhstorfer.

The caterpillar feeds on bamboo leaves (Bambusa sp.). It is of slender build, with two long processes on the head, the hinder part of the body also terminating in two long projections, the latter being practically contiguous. In colour it is sometimes yellowish green with a double yellow dorsal line, between which sometimes are found a few yellow and red-brown dots and two yellow subdorsal lines which are continued on the lower part of the processes on the head, together with a yellow line on the ventral boundary. The remainder of the processes on the head is of a very light purple with black extremity, the apex being slightly yellowish. Over the whole of the body minute white or yellow dots may be observed which are the extremities of very small hairs. Some caterpillars, however, are of a dark ochreous yellow or stone colour with black markings; in these the processes of the head are also stone coloured with black extremity.

The pupa is without processes, sometimes of a handsome green at other times very faintly loam coloured. A pupa of 23rd April produced the imago on 3rd May.

2. Chandica Moore. (Pl. XVI, fig. 43*a*, 43*b*).

Moore, *Cat. Lep., M. E. I. C.*, I, *p.* 219, *No.* 455 (1857).	Debis Chandica.
„ *Lep. Ind.*, I, *p.* 247, *pl.* 79, *fig.* 2, 2*a*, *b* (1892) .	„ „
Bingham, *Fauna Brit. India*, I, *p.* 94 (1905)	Lethe „
Fruhstorfer, (Seitz, *Grossschm. d. Erde*), *p.* 320, *pl.* 98, *b* and *d* (1911)	„ „

W. J. Prov. Prayangan (± 1500).
C. J. ?
E. J. ?

The specimens from Java, of which good figures are now added, differ considerably, especially as regards the ♀, from Moore's figures as well as from those given by Fruhstorfer of Indian specimens.

3. Samio Dbd. (Pl. XVI, fig? 44).

Doubleday, *Gen. D. L.*, *p.* 360, *pl.* 61, *fig.* 3 (1851) . .	Debis Samio.
Felder, *Wien, Ent. Mon.* III, *p.* 400 (1859).	„ Purana.
Moore, *Lep. Ind.*, I, *p.* 242, *pl.* 78, *fig.* 2, 2*a* (1892) . .	„ Samio.
Fruhstorfer, (Seitz, *Grossschm. d. Erde*), *p.* 319 (1911). .	Lethe „

W. J. Prov. Prayangan (± 1500).
C. J. ?
E. J. ?

The present species appears to be known only from Java, where it is apparently not common. According to FRUHSTORFER the ♀, which is unknown to me, has also white transverse lines on the upper side of the fore-wings.

4. MANTHARA Feld. (Pl. XVI, fig. 45*a*, 45*b*, 45*c*, 45*d*).

FELDER, *Novara, Lep.*, *p.* 497, *No.* 861 (1867) . . . . Debis Manthara.
BUTLER, *Ann. Mag. Nat. Hist.*, *ser.* III, 20, *p.* 403, *pl.* 9, *fig.* 9 ♂ (1867). . . . . Lethe Mekara.
MOORE, *Lep. Ind.*, I, *p.* 244, *pl.* 79, *fig.* 1, 1*a*, *b* (1892) . Debis „
BINGHAM, *Fauna Brit. Ind.*, I *p.* 95 (1905). . . . . . Lethe „
FRUHSTORFER, (SEITZ, *Grossschm. d. Erde*), *p.* 320, *pl.* 98*e* (1911). . . . . „ Manthara.

W. J. Buitenzorg (265); Salak mountains (780); Megamendoung mountains (1480); prov. Prayangan (± 1500); vicinity of the Pelabouan Ratou or Wijnkoops Bay (± 150).
C. J. ?
E. J. Banyouwangy.

The orange colour on the upper side of the hind-wings of the ♂ is frequently faded to a dirty yellow and in some specimens the white transverse bands on the upper side of the fore-wings of the ♀ are very indistinct or may be entirely wanting.

From Java I possess two ♂ whose underside is much darker than in the other specimens and evidently differing from them. Otherwise the individuals from Java do not deviate much from the Indian specimens figured by MOORE.

The larva, which lives on young bamboo leaves, in appearance much resembles that of D. MINERVA F. It is grass-green in colour, covered with many white or yellowish dots, with a white band at the ventral margin and two or even four yellow dorsal lines between which, in the full-grown larva, yellow markings passing into brown, occur. The head is furnished with two long projections, yellow at the base, passing into rose and with a black apex. They are very dark in colour on the under side. The hinder portion of the body also terminates in two long granulated projections which lie closely appressed or with their apices crossed. On one occasion I found a loam-coloured caterpillar which, however, sickened and ultimately died. From a pupa of 23^{rd} April the imago emerged on May 4^{th}, one of 26^{th} April produced the perfect insect on May 5^{th}, while another of 5^{th} May completed is metamorphosis on the 12^{th} of the same month.

5. Darena Feld. (Pl. XVII, fig. 46*a*, 46*b*).

Felder, *Novara, Lep.*, *p.* 498, *No.* 862, *pl.* 68, *fig.* 4, 5 (1867) . . . . Debis Darena.
Staudinger, *Iris*, ix, *p.* 228 (1897). Lethe Darena var. Borneensis, Sumatrensis.
Fruhstorfer, (Seitz, *Grossschm. d. Erde*), *p.* 322, *pl.* 98*c* (1911) . . . . Lethe Darena.

W. J. Megamendoung, Wayang, and Gedeh mountains (1500).
C. J. ?
E. J. ?

6. Dyrta Feld. (Pl. XVII, fig. 47*a*, 47*b*).

Felder, *Novara, Lep.*, *p.* 497, *No.* 860 (1867) . . . . . Debis Dyrta.
Moore, *Lep. Ind.*, I, *p.* 259, *pl.* 82, *fig.* 3, 3*a*—*c* (1892). . Lethe „
Staudinger, *Exot. Schm.*, *p.* 221, *pl.* 78 ♂ (1884—1888) . „ „
Bingham, *Fauna Brit. India*, I, *p.* 80 (1905) . . . . . . „ Rohria.
Fruhstorfer, (Seitz, *Grossschm. d. Erde*), *p.* 316, *pl.* 97*b* (1911) . . . . „ Dyrta.

Bingham considers this species to be the Papilio Rohria of Fabricius, but Snellen thinks otherwise.

The ♂ from Java, now figured, differs considerably from the Indian specimens as figured by Moore as well as from the specimen from Lombok figured by Fruhstorfer.

W. J. ?
C. J. ?
E. J. Pouspa, Tengger mountains (630); Tengger Mountains (1200) (*Jacobson*).

Fruhstorfer also obtained this species only from E. J.

7. Europa F. (Pl. XVII, fig. 48*a*, 48*b*).

Fabricius, *Syst. Ent.*, *p.* 500, *No.* 247 (1775) . . . . . Papilio Europa.
Cramer, I, *p.* 125, *pl.* 79, *C D.* (1779) . . . . „ Beroe.
„ IV, *p.* 50, *pl.* 313, *E. F.* (1782) . . . . „ Arete.
Hübner, *Samml. Exot. Schm.* (1806—1827). . . . . . Oreas Europa.

DISTANT, *Rhop. Mal.*, *p.* 43, *tab.* 5, *fig.* 5, 6 (1882—1886). Lethe Europa.
STAUDINGER, *Exot. Schm.*, *p.* 221, *pl.* 78 (1884—1888) . . „ „
MOORE, *Lep. Ind.*, I, *p.* 254, *pl.* 82, *fig.* 1, 1*a* (1892) . . „ „
BINGHAM, *Fauna Brit. India*, I, *p.* 77 (1905) . . . . . . „ „
FRUHSTORFER, (SEITZ, *Grossschm. d. Erde*), *p.* 315, *pl.* 96*d* (1911) . . . . „ „

W. J. Batavia (14); mountains in the prov. Bantam; Sindanglaya (1074); Vicinity of the Pelabouan Ratou or Wijnkoops Bay and the Tjiletou or Sand Bay on the south coast (± 150).

C. J. Touban on the north coast (6); prov. Tegal; prov. Madioun.

E. J. Pouspa, Tengger mountains (630); Semarou mountains (740); prov. Kediri; Madoura.

The accompanying figures of this species also do not agree with those of MOORE especially as regards the ♀.

BINGHAM, on the authority of DAVIDSON and AITKEN, describes the caterpillar as green, paler beneath, fusiform; head with a single short erect horn; body suddenly attenuated from the 11th segment; the pupa is stated by the same author to be uniform pale green, stout, smooth, quite regular, except the head-case which is semi-detached, broad and angular, with two sharp points in front. Both larva and pupa appear to differ considerably, especially as regards the processes, from the species of the genus DEBIS observed by me, but they agree with the figure of LETHE DRYPETES Hew. given by MOORE.

8. ROHRIA F. (Pl. XVII, fig. 49).

FABRICIUS, *Mant. Ins.*, II, *p.* 45, *No.* 446 (1787) . . . . Papilio Rohria.
KOLLAR in VON HÜGEL'S *Kaschmir*, iv, 2, *p.* 448, *pl.* 16, *fig.* 3, 4 (1844) . . . . Satyrus Isana.
MOORE, *Lep. Ind.*, i, *p.* 264, *pl.* 84, *fig.* 2, 2*a*—*c* (1892) . Lethe Rohria.
BINGHAM, *Fauna Brit. India*, I, *p.* 80 (1905). Lethe Rohria race Nilgeriensis.
FRUHSTORFER, (SEITZ, *Grossschm. d. Erde*), *p.* 315, *pl.* 97*a* (1911) . . . . Lethe Rohria Godana.

W. J. Buitenzorg (265); Sindanglaya (1074); Tjibodas (1410); Mega Mendoung mountains (1480); mountains in the prov. Prayangan (1500); Salak mountains (780).

C. J. Oungaran, prov. Semarang (800) (*Jacobson*).

E. J. Tengger mountains (1000); Semarou mountains (740); Blitar.

As shown in the accompanying illustration the colour of Java individuals of this species is considerably darker on either side than that represented in the figures of Moore and Fruhstorfer.

The species, although a mountain butterfly, occurs lower, as appears from the above records, than Fruhstorfer thinks, for he states that it is never met with below 1200 metres altitude. I can see no difference between specimens from West and East Java, although Fruhstorfer distinguishes a dry season E. J. form which he calls Mangala.

Genus ORSOTRIAENA Wallengren.

1. Medus F. (Pl. XVII, fig. 50*a*, 50*b*).

Fabricius, *Syst. Ent.*, *p.* 488, *No.* 198 (1775) . . .	Papilio Medus.
Cramer, I, *p.* 816, *pl.* 11, *C. D.* (1779)	„ Hesione.
„ IV, *p.* 341, *pl.* 362, *C.* (1782)	„ Doris.
Wallengren, *Kongl. Vet. Akad. Forhandl.*, 15, *p.* 79 (1858)	Orsotriaena Hesione.
Distant, *Rhop. Mal.*, *p.* 49, *tab.* 4, *fig.* 8 (1882—1886).	Mycalesis Medus.
Staudinger, *Exot. Schm.*, *p.* 230, *pl.* 82, *fig.* 5 (1884—1888)	„ „
Moore, *Lep. Ind.*, I, *p.* 168, *fig.* 1, 1*a*, *b*, 2 (1892).	Orsotriaena „
Martin, *Iris*, viii, *p.* 239 (1895)	„ „
Bingham, *Fauna Brit. India*, I, *p.* 69, *fig.* 19 (1905).	„ Meda.
Fruhstorfer, (Seitz, *Grossschm. d. Erde*), *p.* 358, *pl.* 91*a* (1911).	„ Medus.

W. J. Batavia (3—14); Dèpok (95); Tjampea (160); Buitenzorg (265); Salak mountains (780); mountains in the provinces of Bantam and Prayangan (1500); vicinity of the Pelabouan Ratou or Wijnkoops Bay and the Tjiletou or Sand Bay on the south coast (± 150).

C. J. Prov. Semarang (300) (*Jacobson*; Magelang (500); prov. Jokjokarta (*Jacobson*).

E. J. Malang (443); Jember (98) in the prov. Besouky; Banyoupoutih (45) in the prov. Probolingo; Madoura.

This species is very common in Java; amongst the many specimens in my possession there are, as in the case with many species of Mycalesis, some which are dark on both sides and others which are light brown; generally the ♂ are, indeed, darker, but otherwise I am unable to detect any difference according to period of capture or habitat. Specimens either with large or with less developed ocelli are met with in both sexes; amongst these occur individuals with strongly developed ocelli taken at the height of the dry season and others with least developed ocelli caught in the wet season. Specimens such as Moore figures as the dry-season form I have never found in Java.

The caterpillar was repeatedly found on *allang-allang* (Imperata Arundinacea Cyrill.) and according to de Nicéville occurs on *padi* (Oryza sativa L.). Fruhstorfer informs us that Martin found the greenish-white globular eggs on the under side of leaves of various grass species; he also relates the whole life history of the caterpillar according to Martin's observations.

I found them to be of a type such as occurs in some Debis larvae, with long processes on the head and the hinder portion, the latter being sometimes closely appressed. Some are greyish-green with a dark dorsal line, a faint yellow subdorsal line and a clear white band at the ventral margin. With the aid of a lens it is seen to be covered with short black hairs. The head resembles ground glass and the horns are red, darker at the base and under a lens it is also observed to be covered with short stiff hairs. The posterior processes are faint rose. Another caterpillar was white with a raised white stripe on the ventral margin, the horns and posterior processes rose. Yet another caterpillar was entirely of a beautiful rose colour, including the horns and posterior processes, with the stripes already alluded to. This caterpillar had the head like ground glass but darker. The pupa is attached to a grass stem and is light brown with longitudinal dark brown stripes; the head terminates in two sharp points mostly closely appressed in the same manner as is the case with the posterior processes. According to Martin the imago emerged after nine days in the fore-noon.

The figures given by Moore of the larva and pupa of O. Mandata Moore from British India and Ceylon closely agree with mine of O. Medus F.

Genus MYCALESIS Hb.

As is the case in the genus Cyllo, in the present genus a universal darkening of colour appears to occur which subsequently again gradually diminishes. Vestiges of the original red are, in fact, present in some species. The general colour in several species as a reddish or brownish grey which in some individuals has become very dark, almost black; it cannot be stated definitely whether this difference is due to the increase of black or to the subsequent fading process. It is, however, clear that we have to deal here, not with the result of directly operating influences, but with an evolutional mutation process; in low lying districts as much as in mountainous regions, in the wet season as well as at the height of the dry season, light and dark coloured specimens are equally met with.

Specific distinctions, based purely on some difference in form of wing, as adopted by BINGHAM, I am unable to admit; CYLLO LEDA L., for instance, clearly teaches us that when a species is in a state of active evolutional change this manifests itself in the form of wing as much as in the colouring; for the same reason the form of wing in some species, such as DANAIS AGLEOIDES Felder, differs in the two sexes *i. e.* when they have reached different stages in the evolution of form. As regards the specific differences which BINGHAM and FRUHSTORFER infer from the secondary sexual characters in males, I am not inclined to attach much value to this either. Moreover, BINGHAM is himself still doubtful in this respect, while FRUHSTORFER observes that these characters are extremely variable in the genus DEBIS, even in the seasonal forms of the same species and the forms which he regards as subspecies.

The form or colour of such secondary characters cannot be considered of the same weight as attaches to the sexual organs proper. Much accurate investigation of ample material from different districts and especially much pedigree breeding are, indeed, required before the acceptance of specific differences on these grounds may be considered justifiable.

1. NALA Felder. (Pl. XVII, fig. 51*a*, 51*b*, 51*c*, 51*d*).

FELDER, *Wien, Ent. Mon.*, *p.* 403, *No.* 46 (1859) . . . Mycalesis Nala.
" *Novara, Lep.*, *p.* 500, *No.* 868, *pl.* 57, *fig.* 10 (1867). . . . . " Sudra.
FRUHSTORFER, (SEITZ, *Grossschm. d. Erde*), *pl.* 936*b* (1911). " "

W. J. Tjibodas (1410); Megamendoung mountains (1480); Salak mountains (780); mountains in the prov. Prayangan (1500); mount Tjerymay, prov. Cheribon.

C. J. Oungaran (800) (*Jacobson*); Magelang (500).

E. J. Tosari (1777); prov. Banyouwangy, Tengger mountains (1200) (*Jacobson*).

FELDER, who discovered the species, subsequently described a variety from

West Java specimens which merely differ in the dark ochreous yellow margin on the under side of the wings and which he called SUDRA. FRUHSTORFER, however, is of opinion that two species have been mixed up by FELDER and he distinguishes these as SUDRA and NALA, but bases them on alleged characters which in no wise accord with the differentiating characters given by FELDER and to which in any case the latter's names have unjustly been applied, giving rise to confusion. FRUHSTORFER includes in his SUDRA the form with the dark ochreous yellow on the under side, as well as the other form described by FELDER; he designates as NALA some ♂ individuals found by him particularly in E. J. which differ principally in having a black shining scent spot on the upper side of the fore-wings, while in addition several small faint ocelli occur on the under side in the margin of the fore-wings, whereas in SUDRA only two such ocelli are present which, however, are larger. Females in which several small faint ocelli also occur on the under side of the fore-wings, he regards as the other sex of this species. Such specimens do, indeed, occur and the difference in the ocelli appears to be fairly constant; this character is, nevertheless, not of great value. As regards the development of the ocelli in the margin of the under side of the wings, considerable individual difference exists in many species of MYCALESIS; and this is the case in the present one — I here add an illustration (Pl. XVII, fig. 50*b*) of a specimen from the Tengger mountains in E. J., in which these ocelli are considerably larger than usual — and in these circumstances I consider it too bold to assume specific distinction merely on account of such difference in the ocelli. The presence or absence of the forementioned scent spot is in quite another category and if this distinction were sufficiently confirmed I would not hesitate to admit specific difference on this ground. But this is not the case. Mr. FRUHSTORFER was good enough to let me have such a ♂ specimen and Mr. R. VAN EECKE, Assistant — principally concerned with Lepidoptera — at the Natural History Museum of Leiden, who is an expert microscopist besides, had the kindness to examine this black spot for me. He found, in fact, some scent scales distributed in these spots but they were likewise observed on the upper side of the forewings in the other NALA males which are without the black spot, so that the scent scales have actually no connection with the said black spot which, therefore, is not entitled to the term scent spot. It appears to consist principally of the ordinary, but very dark pigmented, scales, agreeing in this respect with similar black spots, as occur for instance in some specimens of C. LEDA L. (*cf.* pl. XV, fig. 30*o*), and these are simply relics of a former particularly intense development of the black pigment at the place where only after a long period this has spread over an obstinate spot.

M. Nala Felder is very common in damp forests of the higher mountain ranges of Java. A comparison of about 100 specimens, in my possession and in the Leiden Museum, not a single one of which shows the black spot referred to, has convinced me that in general the individuals of both sexes from E. J. — both of the dry and the wet season — as well as those from C. J., are darker in colour but I possess one, taken during the wet season in E. J., which is of a lighter colour. The specimens from W. J. are mostly of a brown shade, both in the dry and the wet season, the ♀ being lightest in colour. Nevertheless, I also possess several ♂, of the dry as well as the wet season, from W. J., whose upper side only is dark. Many specimens, but exclusively those from W. J. have the border on the under side of a beautiful dark ochreous yellow (Sudra), mostly of the wet season; of five specimens taken at Buitenzorg in July — in the dry season, therefore — this margin in only one is of that colour. In the ♀ especially this border on the under side is sometimes very white and generally various transitions occur between this white and the deepest ochreous yellow but, as already stated, only in W. J. Amongst these some ♀ are found (Pl. XVII, fig. 51*d*) in which the ocelli, especially on the under side of the fore-wings, have practically disappeared, agreeing, therefore, with those which, according to Fruhstorfer, are supposed to be ♀ of his Nala. The ochreous yellow in the border on the under side must probably be also looked upon as a relic of the original red colour; the brown in most specimens from E. J. still contains much red.

3. Moorei Felder. (Pl. XVII, fig. 52).

Felder, *Novara, Lep.*, *p.* 502, *No.* 870, *pl.* 67, *fig.* 9 (1867). Mycalesis Moorei.
Fruhstorfer, (Seitz, *Grossschm. d. Erde*), *p.* 349, *pl.* 92*b* (1911) . . . . " "

W. J. Tjampea (160); mountains in the district of Buitenzorg; Salak mountains (780); mountains in the prov. Bantam.
C. J. ?
E. J. Semarou mountains (740); Tengger mountains (1290) (*Jacobson*).

Like the two preceding, this butterfly is only met with in the forest of the higher mountain ranges where, however, it is less common than M. Nala Felder. The figure now given agrees with all the specimens in my possession. That occurring in Seitz, *Grossschm. d. Erde*, evidently represents a specimen with much reduced ocelli as they occur, according to Fruhstorfer, in the dry season. The two specimens I possess from the mountain range in the prov. Bantam, were, however, taken in September, therefore, at the height of the dry season.

4. Mineus L.

Linn., *Syst. Nat. Ed. XII*, I, 2 *p.* 768, *No.* 126 (1767).	Papilio	Mineus.
Butler, *Cat. Sat. Brit. Mus.*, *p.* 135, *pl.* 3, *fig.* 12 (1868).	Mycalesis	Judinella.
Moore, *Lep. of Ceylon*, I, *p.* 22, *pl.* 11, *fig.* 4, 4*a*, *b* (1880).	„	Mineus.
Distant, *Rhop. Mal.*, *p.* 50, *tab.* 4, *fig.* 13, 14, 7 (*var.*) (1882—1886) . . . . , .	„	„
Staud., *Exot. Schm.*, *p.* 230, *pl.* 82 (1884, 1888) . .	„	„
de Nicéville, *Journ. Asiat. Soc. of Bengal*, LV, *p.* 235, *pl.* 12, *fig.* 3 (1886)	„	„
Moore, *Lep. Ind.*, I, *p.* 183, *pl.* 60, *fig.* 1*a*—*f* (1892) .	Calysisma	„
Martin, *Iris*, VIII, *p.* 241 (1895).	„	„
Bingham, *Fauna of Brit. India*, I, *p.* 58, *fig.* 8, 9 (1905).	Mycalesis	„
Fruhstorfer, (Seitz, *Grossschm. d. Erde*), *p.* 343 . .	„	„

Of this kind, which in Java is almost entirely replaced by the next species, I received, however, a typical ♂ taken by Mrs. Lechner at ± 1000 metres in the province of Prayangan in W. J.

5. Horsfieldi Moore. (Pl. XVII, fig. 53*a*, 53*b*, 53*c*, 53*d*).

Moore, *Lep. Ind.*, I, *p.* 197, *pl.* 66, *fig.* 2, 2*a*—*c* (1892).	Calysisma	Horsfieldi.
Martin, *Iris*, VIII, *p.* 242 (1895)	Mycalesis (Cal.)	„
de Nicéville *and* Martin, *Journ. Asiat. Soc. Bengal*, 64, *p.* 379 (1895)	Mycalesis	„
Fruhstorfer, (Seitz, *Grossschm. d. Erde*), *p.* 345 . .	„	„

W. J. Batavia (3 14); Dèpok (95); Buitenzorg (275); mountains in the prov. Bantam; vicinity of the Pelabouan Ratou or Wijnkoops Bay on the south coast (± 150).

C. J. Semarang (6); Jokjokarta and Nousa Kambangan (*Jacobson*).

E. J. Semarou mountains (740); prov. Banyouwangy; mountains in the south of the prov. Passourouan (*Fruhstorfer*); Jember (98) in the prov. Besouky.

The numerous specimens collected by me in Java were erroneously indentified as MINEUS L. by SNELLEN, but after consulting Mr. FRUHSTORFER and his collection I am convinced that they must be referred to MOORE's later species HORSFIELDI. The clear white patch of specialized scales, duly observed by SNELLEN, but incorrectly termed ochreous yellow by MOORE, near the costa on the upper side of the hind-wings in the ♂, distinctly separates this species from MINEUS L. In MINEUS such a patch is indeed present but is covered by pencils of long hairs, while in HORSFIELDI also a similar patch occurs which, however, is larger and more distinct and is placed at some distance in front of these pencils of hairs. The figures given by MOORE are, however, poor and do not represent the species well; the seasonal forms figured by him are not to be traced, at least in Java. The ♂ are generally darker in colour than the ♀, but there are some lighter ones also. Difference in colour or size according to the dry or wet season is on the whole not to be observed but considerable difference in the stage of development of the ocelli on the under side does occur. Those most developed I find, the same as in M. PERSEUS F., in specimens captured in April near Wijnkoops Bay; moreover, these ocelli are generally better developed during the wet than in the dry season; I possess several specimens with specially small ocelli, all taken during the dry season. Amongst these even considerable difference in the degree of development exists but in those least developed the ocelli are never reduced to white dots, and I have individuals taken at the height of the dry season, both in the mountains and in the lowlands, whose ocelli are equally developed as is usually the case during the wet season. The individual unequal advance in colour development, already referred to under CYLLO LEDA L., therefore, exists here also, but a separation into seasonal races I am unable to recognize. On the upper side of the hind-wings of the ♀ sometimes one and sometimes two ocelli are visible or they may even be absent altogether.

I have observed the larva on *allang allang* (IMPERATA ARUNDINACEA Cyrill.) and on a bamboo like grass. Some larvae are dark green with a pale green lateral line, while in addition a dorsal and several dark and light longitudinal lines are to be seen. The body terminates in two short, spinous, faint red points. The head is reddish brown and furnished with two short stout points. Another larva was reddish-brown with a faint dark dorsal line and a lateral band, between which similar bands ran obliquely backwards; it was also strongly chagreened. Yet another larva, likewise strongly chagreened, was light greyish brown with a light line on the ventral margin and indistinct dark brown dorsal bands, and with faint marking, resembling a linked row of rhombs, at the sides.

The reddish brown larva before pupating turned to pale green. The pale green pupa has yellowish white stigmata and is devoid of processes. It was firmly attached by the tail to the box in which it was contained and, like the pupa of ORSOTRIAENA MEDUS F., is suspended horizontally. A pupa of April 22nd produced the imago on April 30th.

5. PERSEUS F. (Pl. XVII, fig. 54*a*, 54*b*, 54*c*).

FABRICIUS, *Syst. Ent., p.* 488, *No.* 199 (1775)	Papilio Perseus.
„ *Ent. Syst., Suppl. p.* 426 (1778).	„ Blasius.
DONOVAN, *Ins. New. Holland, pl.* 26, *fig.* 3 (1805) . .	„ Perseus.
HEWITSON, *Exot. Butterf.*, iv, *Mycal., fig.* 35 (1804) . .	Mycalesis Lalassis.
DISTANT, *Rhop. Mal., p.* 52, *tab.* 7, *fig.* 7 (1882—1886).	„ Blasius.
MOORE, *Lep. Ind.*, I, *p.* 174, *pl.* 59, *fig.* 1, 1*a*—*d*, *fig.* 2, 2*a*—*c* (1892).	Mycalesis Calysisma Perseus.
BINGHAM, *Fauna Brit. India*, I, *p.* 57 (1905) .	„ „
FRUHSTORFER, (SEITZ, *Grossschm. d. Erde*), *p.* 342 (1911).	„ „

W. J. Batavia (3—14); Dèpok (95); Tjampea (160); vicinity of the Pelabouan Ratou or Wijnkoops Bay on the south coast (± 150).

C. J. Semarang (6).

E. J. Pouspa (630); Jember, prov. Besouky (98).

The species differs particularly, as BINGHAM quite correctly observes, from its allies in Java — *i. e.* M. HORSFIELDI Moore — by the peculiar bending of three of the ocelli on the under side of the hind-wings. In the figure in SEITZ, *die Grossschm. d. Erde*, 92*a* this feature has been completely overlooked. In my figure I have indicated it (Pl. XVII, fig. 54*a*).

The species is very common in Java. As in the case of HORSFIELDI Moore, darker and lighter individuals occur, the ♂ being usually somewhat darker but this has no reference to the seasons. The same applies to the ocelli. Specimens with small ocelli occur, smaller in some than in others; these have been described by FABRICIUS as M. BLASIUS. In a specimen from Tjampea I find the ocelli most reduced, being partly resolved into white dots. I possess such specimens with small ocelli caught in may at Pouspa in E. J. and in August — therefore, in the middle of the dry season — at Semarang, but likewise some captured about the same time at Batavia and Semarang, with well developed ocelli, and a ♀ taken at Semarang in September where the stage of development is, so to speak, intermediate. The development of the ocelli I found most advanced, here as in HORSFIELDI, in specimens caught in April near Wijnkoops Bay.

I have also taken at Batavia on the same day in the rainy season two ♂, in one of which the eye-spot on the upper side of the fore-wings is very distinct while in the other no trace is to be seen of it. Some of my other specimens agree with the first and some with the second. As regards the row of ocelli on the under side of the fore-wings I found amongst 43 specimens many with only two, some with three or four, but only one with five ocelli as in the accompanying figure. The small lower eye-spot is mostly wanting. From this it will be seen to what extent the number of ocelli varies in the same species — which is also the case with the European species of SATYRUS — and that, consequently, there is no justification for basing forms or species on the number of these. The attendant circumstances in this and the preceding kind are doubtless indentical with those pointed out under CYLLO LEDA L.; the rainy season indeed greatly promotes this development but only in the individuals which have acquired susceptibility for it through evolution, while in the case where the stage of evolutional change has progressed very considerably this will manifest itself even in individuals making their appearance in the dry season. Definite wet-and dry-season forms or races do not, therefore occur. Much light is still required on the subject, not only as regards the genus MYCALESIS but in connection with DEBIS and YPTHIMA as well and we must await further observation and breeding. Although I have numerous specimens at my disposal, by far the great majority of them have been carefully labelled only as regards the habitat but not as to the time of capture; it was only during the latter part of my stay in Java the importance of these data became manifest to me.

On one occasion I bred the imago from a larva living on *allang allang* (IMPERATA ARUNDINACEA Cyrill).

6. JANARDANA Moore. (Pl. XVIII, fig. 55).

MOORE, *Cat. Lep. M. E. I. C.*, I, *p.* 234, *No.* 502 (1857).	Mycalesis Janardana.	
DISTANT, *Rhop. Mal.*, *p.* 54, *tab.* 5, *fig.* 2 (1882—1886).	„	„
FRUHSTORFER, (SEITZ, *Grossschm. d. Erde*), *p.* 341 (1911).	„	„

W. J. Batavia (3—14); mountains in the prov. Bantam; Dèpok (95); Buitenzorg (265); vicinity of the Tjiletou or Sand Bay on the south coast (± 150).

C. J. Nousa Kambangan (*Jacobson*).

E. J. Prov. Banyouwangy.

Of this species I possess many specimens from W. Java but none exhibiting great difference, and positively none of the little-ocellated form as it occurs in M. Perseus F. Both light and dark individuals are, however, met with in the present species in the dry as well as in the wet season.

This butterfly is very common at Batavia and elsewhere in W. J., and according to Fruhstorfer also in the mountains of E. J. The upper surface of the fore-wings of the ♂ is black for the greatest part but it is incorrect to call this a scent-spot for although some sent-scales are, indeed, to be found there, as in the ♂ of M. Nala Felder, by far the greatest part of the scales in the area referred to are simply ordinary scales coloured an intense black by a dark pigment. The ♀ are more yellowish brown but some resemble the ♂ in colour. Wet or dry season makes no difference in this respect. Even in ♀ taken at the height of the wet season black dots replace the two ocelli of the under side of the hind-wings. The form Sagittifera of Fruhstorfer is perhaps simply a somewhat unusually developed ♀. Fruhstorfer, on the authority of Dr. Martin, describes the caterpillar which is said much to resemble that of M. Mineus L., and to be produced from similar greenish white eggs deposited singly. The larva is supposed to be entirely nocturnal, during the day hiding itself deep in the stems of grass, feeding only at might and on being touched drops, feigning death. His description does not completely accord with mine. I found the larva on *roumpout benggala* (Paspalum mollicomum Kunth). It was of the same type as that of Ypthima Pandocus Moore, only slightly larger, brown marbled with dark grey or loam-coloured with a dark dorsal line and small blood-red spots; stigmata black. The two processes on the head and the posterior appendages as in Y. Pandocus. The pupa was of a uniform brown. The perfect insect emerged on March 4th from a pupa of February 23rd.

Martin notes that this butterfly emerges, not like its allies between 8 and 10 o'clock in the forenoon, but only between 2 and 3 o'clock in the afternoon, and does not begin to fly until twilight, so that he regards it as a twilight butterfly, which I consider very probable from the fact that, like other allied kinds, it is only seen on being disturbed by accident when it speedily settles down again.

7. Fusca Feld. (Pl. XVIII, fig. 56).

Felder, *Wien, Entom. Mon.*, iv, *p.* 401, *No.* 24 (1860).	Dasyomma Fuscum.
Hewitson, *Exot. Butterfl.*, iii, *Mycal. fig.* 26 (1862).	Mycalesis Diniche.
„ „ „ v, *Mycal., fig.* 61, 62 (1874).	„ Margites.
Distant, *Rhop. Mal., p.* 53, *tab.* 5, *fig.* 1 (1882—1886).	„ Fusca.

W. J. Tjampea (160); Buitenzorg (265); vicinity of the Pelabouan Ratou or Wijnkoops Bay and the Tjiletou or Sand Bay on the south coast (± 150).
C. J. ?
E. J. ?

Fourteen specimens of this species exhibit no difference except that the ♀ are much more strongly developed than the ♂.

8. OROATIS Hew. (Pl. XVIII, fig. 57).

HEWITSON, *Exot. Butterfl.*, III, *Mycal.*, *fig.* 38, 39 (1864). Mycalesis Oroatis.
DISTANT, *Entomologist*, 18, *p.* 259 (1885). . . . . . . „ Ustulata.
„ *Rhop. Mal.*, *p.* 418, *tab.* 41, *fig.* 16 (1882—1886). „ „

W. J. Mountains in the district of Buitenzorg and mountains in the prov. Prayangan.
C. J. ?
E. J. Mountains along the south coast. (*Fruhstorfer*).

RAGADIDAE.

These butterflies are now usually considered as belonging to the Satyridae.

Genus RAGADIA Westw., Hew. Sch.

1. Crisia Hb.

Hübner, *Zuträge*, III, *p.* 21, *fig.* 675, 676 (1825—1832). Euptychia Crisia.
Horsfield, *Cat. Lep. M. E. I. C.*, *pl.* 5, *fig.* 9, 9*a* (1828). Hippaichia Makuta.
Distant, *Rhop. Mal.*, *p.* 420, *tab.* 19, *fig.* 7 (1882—1886). Ragadia Crisia.
Fawcet, *Ann. Mag. Nat. Hist.*, *Ser.* 6, 20, *p.* 111 (1897). „ Simplex.
Fruhstorfer, (Seitz, *Grosschm. d. Erde*), *p.* 261, *pl.* 90*e* (1811). . . . . „ Crisia.

W. J. Mountains in the prov. Prayangan; vicinity of the Pelabouan Ratou or Wijnkoops Bay on the south coast (± 150). At the latter place also the form Simplex Fawcett.

C. J. Nousa Kambangan. (*Jacobson*).

E. J. ?

I have received many specimens but all exclusively from the localities mentioned, never from the northern parts of the island. Mr. Fruhstorfer also appears to possess it from South Java only. According to Martin this species is very common everywhere in Sumatra, even in the lowlands.

ELYMNIADAE.

Genus ELYMNIAS Hb. Herr. Sch.

The genus Elymnias, which is regarded as pertaining to the Satyridae by most entomologists, exhibits in its larvae a great resemblance to those of Cyllo not only as regards the slender build but particularly in respect of the peculiar horns on the head and the spiny processes at the hinder end of the body.

Of E. Undularis Drury and E. Lais F., with which I am best acquainted, the former loves sunshine and is, therefore, principally met with in gardens and other spots not densely covered with vegetation while the latter is to be found by preference in plantations of Cocos nucifera L. which does not generally occur in forests. It is, therefore, incorrect to call the members of this genus in general forest butterflies, as is done by Wallace for instance. All the larvae known in the genus likewise live on palm trees.

Whereas E. Undularis Drury, as has already been stated, seeks the sunshine I have only once observed E. Lais F. flying about in the evening twilight but otherwise, when disturbed, as frequently happens in the plantations referred to, I have always seen it settle immediately on a tree trunk, in exactly the same manner as Cyllo Leda L. It appears to me, therefore, that E. Lais F. is likewise one whose members only fly in the twilight; this may also be the case with other species of the genus. In the island of Saleyer I noticed the same habit in the species which there replaces E. Lais F. Dr. Martin, it is true, appears to have observed an individual of this species flying in broad daylight, being engaged in the act of ovipositing, but under stress of similar instinctive functions an insect may well deviate from its normal habits, just as when disturbed it seeks safety in flight. I am, therefore, unable to agree with Martin's assertion that Elymniads only fly in the full glare of the sun. On the other hand I consider his suggestion, that Elymnias is an ancient genus in process of dying out, more probable. It is, indeed, a fact that several species of the genus are by no means common, some being even very rare, while it is extremely doubtful that this should be due to the scarcity of the food plant.

The pupae, as far as they are known to me, have not the form of those of Cyllo Leda L., but rather resemble the chrysalides of some species of Debis, such as Debis manthara Felder.

The species of this genus furnish ample material for theorizing about mimicry. As a matter of fact they follow the various lines of colour evolution — as is the case with so many Malayo-Australian butterflies, and which, as has already been explained above, finds its strongest expression in the genera Euploea and Danais — and in such a manner that whereas one species follows on the lines of coloration in Euploeas others follow on those of Danaids. In some even, such as E. Undularis Drury, in a similar manner as occurs in Euploea Midamus L., *i. e.* the ♂ following on the lines of coloration in Euploas while the ♀ moves in the direction of Danais where, as for instance in D. Genutia Cram., a considerable amount of red has been retained. For, that it is a question here of colour evolution is clearly demonstrated from a comparison between the races E. Caudata Butl., in the ♂ of which much more of the ancient Danais colour has been retained than in that of E. Undularis Drury and E. Nigrescens Butl., both sexes of which have practically become entirely obfuscated. For, as Martin justly assumes, these forms are nothing but races, while climatic influences or the fantastic conception of insular melanism, any more than former land connections, have nothing to do with this phenomenon. It simply exhibits the various stages of transition as they arise from the uneven advance of the evolutionary darkening process. Al these cases of colour agreement are loosely accepted as instances of mimicry and the particulair species thus imitated are indicated without hesitation, although unprejudiced observation would clearly show that of such accurate copying there is never any question and moreover, on account of the somewhat concealing habit of most of the Elymnia imagines, this mimetic protection would be of little use to them.

1. Undularis Drury. (Pl. XVIII, fig. 58*a*, 58*b*).

Drury, *Ill. Exot. Ent.*, II, *pl.* 10, *fig.* 2 (1773) . Papilio Undularis.
Cramer, II, *p.* 141, *pl.* 189, *F. G.* (1779). . . „ Protogenia.
„ III, *p.* 110, *pl.* 256, *A. B.* (1782) . . „ Undularis.
Hübner, *Zuträge*, I, *p.* 12, *pl.* 37, 38 (1818) . . Elymnias Jynx.

HORSFIELD, *Cat. Lep. M. E. I. C.*, *pl.* 8, *fig.* 8*a*, *b* (1828)	Melanites	Undularis.
HORSFIELD *and* MOORE, *Ibid.*, I, *p.* 237, *pl.* 6, *fig.* 7, 7*a* (1857)	„	„
STAUDINGER, *Exot. Schm.*, *p.* 237, *pl.* 86 (1884—1888)	Elymnias	„
MOORE, *Lep. Ind.*, II, *p.* 145, *pl.* 133, *fig.* 1, 1*a*—*c* (1894)	„	Undularis.
BINGHAM, *Fauna Brit. India*, I, *p.* 171 (1905). .	„	„
FRUHSTORFER, *Iris*, XX, *p.* 174 (1907)	„	Hypermnestra.
„ (SEITZ, *Grossschm. d. Erde*), *p.* 374, *pl.* 87*a* (1911)	„	„

W. J. Batavia (3—14); Dèpok (95); Buitenzorg (265); Tjampea (160); vicinity of the Pelabouan Ratou or Wijnkoops Bay and the Tjiletou or Sand Bay (± 150) on the south coast.

C. J. Semarang (6); prov. Tegal; Touban on the north coast (6); Magelang (500).

E. J. Sourabaya (6); Banyoupoutih, prov. Probolingo (45); Madoura.

This is one of the commonest butterflies in Java; but not so abundant in the mountains as in the lowlands where the principal food of the larva, COCOS NUCIFERA L., is found in plenty. It is everywhere met with in gardens and the ♂ may at times be seen frolicking together in the sun so that any one, not acquainted with the striking difference in colour between the male and female, would doubtless conclude he was witnessing the preliminary play of the sexes before pairing. For this is no fighting but manifest play; I have, indeed, witnessed it on one occasion for half an hour before they separated and went their own way. BATES mentions the same fact with regard to ♂ of small Heliconidae. Once I noticed a ♂ of the present species diffusing a very unpleasant odour on being strongly compressed. In the introduction I have already dealt with the sexual colour dimorphism in this species and the interpretation of mimicry in connection with it.

The reddish brown band along the lower margin on the upper side of the hind-wings in the ♂, as well as the general orange colour and black on the upper side of the ♀, is darker in some individuals and lighter in others without seasonal differences being thereby indicated.

The caterpillar occurs on the leaves of *kelapa* (COCOS NUCIFFRA L.), of *pinang* (ARECA CATECHU L.), *arèn* (ARENGA SACCHARIFERA Lab.), *kiray* (METROXYLON SAGUS Rottb.), and other species of palms. Young individuals are green with black head, horns, and tail processes; in the full-grown larvae on the general pale green colour occurs a double golden-yellow dorsal line and in addition on either side tree similar longitudinal lines, the upper one being widest and dilating at several of the rings to yellow spots which in turn contain some orange, and sometimes even dark green, smaller spots. The colour varies somewhat in different individuals. The head is of a handsome pale brown or sometimes yellow and has two setose horns of the same colour, between which occur two vertical white or yellow stripes which curve downward, each behind either horn. The hinder portion of the body terminates in two long setose processes which may be either green, bright orange, or pale brown and which receive the forementioned wide longitudinal lines on either side of the double dorsal line. The larva does not, therefore, differ essentially from the Indian one figured by Moore and probably pertains to the same species. The pupa possesses the form, already alluded to, peculiar to the genus, and in colour resembles the larva in a remarkable manner. It is suspended so close against leaves that one would imagine it was attached by means a girdle thread. A chrysalis of March 12^{th} produced the butterfly on the 20^{th} of the same month. My figures are very successful and fairly agree with those of MOORE.

2. ESAKA Hew. (Pl. XVIII, fig. 64*a*, 64*b*).

HEWITSON, *Exot. Butterfl.*, III, *Melanitis*, *fig.* 5 (1863).	Melanitis Esaka.
MOORE, *Journ. Linn. Soc. of London*, XXI, *p.* 33, *pl.* 3, *fig.* 5 (1885)	Dyctis Andersonii.
FRUHSTORFER, *Ent. Nachr.*, XX, *p.* 21 (1894) . .	Elymnias Maheswara.
„ *Stett. Ent. Zeit.*, 1894, *p.* 124, *pl.* 4, *fig.* 7 ♀	„ „
MOORE, *Lep. Ind*, II, *p.* 169, *pl.* 143, *fig.* 2, 2*a* (1894).	Agrusia Andersonii.
BINGHAM, *Fauna Brit. India*, I, *p.* 179 (1905) . .	Elymnias Esaca.
FRUHSTORFER, *Iris*, XX, *p.* 248 (1907)	Mimadelias Maheswara.
„ (SEITZ, *Grossschm. d. Erde*), *p.* 392, *pl.* 90*b* (1911)	Elymnias „

W. J. Gedeh mountains (1250); mountains in the prov. Prayangan (± 1500).
C. J. ?
E. J. ?

My collection contains three ♂ of this species. A specimen identified by SNELLEN as VASUDEVA Moore is doubtless the ♀ of the present species, the MAHESWARA of FRUHSTORFER.

3. Panthera F.

Fabricus, *Mant. Ins.*, III, *p.* 39, *No.* 40 (1787) . . .	Papilio Panthera.
Horsfield, *Cat. Lep. M. E. I. C.*, *pl.* 5, *fig.* 7, 7*c* (1828).	Melanitis Dusara.
Butler, *Ann. Mag. Nat. Hist.*, *Ser.* 3, 20, *p.* 404, *pl.* 9, *fig.* 10 (1867)	Elymnias Lutescens.
Distant, *Rhop. Mal.*, *p.* 62, *tab.* 6, *fig.* 4, 5 (1882—1886).	„ „
Moore, *Lep. Ind.*, II, *p.* 152, *pl.* 136, *fig.* 2, 2*a*—*b* (1894).	„ Mimus.
Fruhstorfer, *Iris*, XX, *p.* 216 (1907)	„ Panthera.
„ (Seitz, *Grossschm. d. Erde*), *p.* 371, *pl.* 88*b* (1911)	„ „

W. J. Tjampea (160); mount Pantjar, district Buitenzorg; mountains in the prov. Prayangan (1500).

C. J. ?

E. J. Prov. Passourouan.

This species is not rare at Tjampea but elsewhere, apparently, it is not at all common. In the lowlands I never met with it. The specimens in my possession from W. Java, especially those from Tjampea, belong to the form named Dusara by Fruhstorfer; the colour of the ♂ is not always equally dark brown, some approaching the ♀ in shade. A ♂ from the prov. Passourouan completely agrees with the latter but not with the form Dulcibella figured by him, which is unknown to me.

The larvae were repeatedly observed on *arèn outan* (Arenga Obtusifolia Mart.), *pinang rendeh* (Pinanga Kuhlii Bl.), and *kiray* Metroxylon Sagus Rottb.). I was unable to distinguish it from the larva of E. Undularis Drury. The same was the case with the pupae which, however, were particularly brightly coloured; I have notes of one chrysalis being ornamented on the beauiful green colour with longitudinal yellow lines mixed with handsome red, containing here and there oblong black spots. Dr. L. Martin, in the *Deutsche Entomologische National-Bibliothek* 1910, *No.* 12, gave a description of the larva and pupa bred by him at Sintang in West Borneo. From a spherical milky-white egg deposited on the leaf of a dwarf species of palm the caterpillar was hatched after four days, being yellowish white at first but which after feeding became yellowish green with black head, when is gradually changed into the full-grown larva whose description on the whole answers to that given by me of the larva of E. Undularis Drury, but in which besides the double dorsal line only a single lateral line on either side is said to occur and whose horns are said to be black and to terminate in three points. The pupa also has the same form as mine and a system of coloration practically conforming with that observed by me. Dr. MARTIN also specifically refers to the bright colour of the pupa and to the fact — likewise observed by me in the chrysalis of E. UNDULARIS Drury — that its ventral surface is firmly appressed to the leaf to which it is attached by the caudal extremity.

4. DARA Dist. (Pl. XVIII, fig. 59).

DISTANT, *Ann. Mag. Nat. Hist. Ser.* 5, 19, *p.* 50 (1884).	Elymnias Dara.
STAUDINGER, *Iris*, II, *p.* 39 (1889)	„ Albofasciata.
DE NICÉVILLE, *Journ. Bombay Soc. Nat. Hist.* V, *p.* 202, *pl. D, fig.* 4 (1890)	Dyctis Daedalion.
MOORE, *Lep. Ind.*, II, *p.* 154, *pl.* 137, *fig.* 2, 2*a* (1894).	Elymnias Daedalion.
BINGHAM, *Fauna Brit. India*, I, *p.* 178 (1905). . .	„ Dara.
FRUHSTORFER, *Iris*, XX, *p.* 214 (1907)	„ „
„ (SEITZ, *Grossschm. d. Erde*), *p.* 373, *pl.* 88*b* (1911)	„ „

W. J. Tjibougel (± 1000) in the prov. Prayangan; vicinity of the Pelabouan Ratou or Wijnkoops Bay (± 150).

C. J. ?

E. J. Banyouwangy (± 500).

FRUHSTORFER calls the figured form DIMINUTA and distinguishes somewhat larger forms from W. Java under the name of BENGENA.

From W. J. I only possess ♂ and from E. J. a single ♀. I was, therefore, unable to form a judgment, although I doubt this difference in size. These ♂ are however, much darker in colour than this ♀ and the white on the upper side of the former is tinted with beautiful violet.

5. CASIPHONE Hb. (Pl. XVIII, fig. 60*a*, 60*b*).

HÜBNER, *Samml. Exot. Schm.*, III (1806—1827). . .	Elymnias Casiphone.
DISTANT, *Rhop. Mal.*, *p.* 64, *Tab.* 6, *fig.* 10 (1882—1886).	„ „
FRUHSTORFER, *Iris*, XX, *p.* 207 (1907).	„ „
„ (SEITZ, *Grossschm. d. Erde*), *p.* 381, *pl.* 87*c* (1911)	„ „

W. J. Sindanglaya (1074); Gedeh mountains (1250); Salak mountains (780).

C. J. ?

E. J. Without precise indication of habitat.

At Tjampea I once found, attached to a MUSA leaf, a pupa, resembling that of E. UNDULARIS Drury, from which a butterfly belonging to the present species emerged. I am quite unable to agree with the observations concerning this species in the well-known work of SEITZ. The upper side of the ♂ has, it is true, a great resemblance to that in EUPLOEA MIDAMUS L., and the ♀ less so; nevertheless, the form and flight differ so much in the two species that they can scarcely be confused. Although in some ♂ the same metallic gloss occurs on the upper side of the fore-wings as in the EUPLOEA referred to, nothing of this is to be seen in several ♂ in my possession. I only possess a single ♂ from E. J. — a very good specimen by the way — and I can detect no difference between this and my W. J. specimens. The upper side of the fore-wings is equally dark as in the most glossy ♂ from W. J. and the blue metallic gloss, although not pronounced, is, nevertheless, distinctly in evidence. Consequently it does not quite agree with the figure given by FRUHSTORFER of his E. J. form ALUMNA.

6. LAIS Cram. (Pl. XVIII, fig. 61*a*, 61*b*, 61*c*, 61*d*, 61*e*, 62*a*, 62*l*).

CRAMER, II, *p.* 21, *pl.* 110 *A. B.* (1779)	Papilio Lais.
DISTANT, *Rhop. Mal.*, *p.* 62, *tab.* 9, *fig.* 2 (1882—1886).	Elymnias Lais.
STAUDINGER, *Exot. Schm.*, *p.* 237, *pl.* 86 ♂ (1884—1888).	„ „
HAGEN, *Jahrb. Nass. Ver. Naturk.*, XLIX, *p.* 184, *pl.* 4, *fig.* 6 (1896).	„ Baweana.
FRUHSTORFER, *Iris*, XX, *p.* 200 (1907)	„ Nesaea.
„ (SEITZ, *Grossschm. d. Erde*), *p.* 379, *pl.* 87*c*, *d* (1911)	„ „

W. J. Batavia (3—14); Buitenzorg (265); Tjibougel (± 1000); mountains in the prov. Prayangan; vicinity of the Pelabouan Ratou or Wijnkoops Bay on the south coast (± 150).

C. J. Prov. Tegal; prov. Rembang; Magelang (500).

E. J. Malang (443).

This butterfly is common in Java wherever the coco-nut palm grows, especially in plantations of that tree; it flies, as has already been noted above, in the twilight. My ♂ specimen from E. J. is not shot with bluish green on the upper side like the ♂ from W. J., especially from Batavia, but does not otherwise differ. FRUHSTORFER separates the E. J. specimens from those of W. J. as the form HERMIA. The form from the island of Bawean differs distinctly from the Java form in both sexes having the peculiar marking on the upper surface of the fore-wings mostly covered by reddish brown or rather in having retained the former obfuscation in that portion of the fore-wings. My specimens, however, from the mountains of the prov. Prayangan — not those from Wijnkoops Bay — show a decided increase of this brown, especially near the apex of the fore-wings, while the Leiden Museum possesses a ♀ from Malang in E. J. in which this feature is almost equally pronounced as in the Bawean individuals. This difference of colouring again is surely due, not to local influence, but to the unequal advance in the same process of colour evolution. For this reason I have considered it desirable to figure these different forms. The larva and pupa are of the same type as in E. UNDULARIS Drury and occur likewise on leaves of the *kelapa* (COCOS NUCIFERA L.) and *pinang* (ARECA CATECHU L.). The caterpillar attains a length of 6.5 centimetre, is green with eight golden-yellow longitudinal lines as in E. UNDULARIS Drury, but the subdorsal pair, which is similarly continued on the head and the tail spines, while it has been also united to a single stripe does not show the small spots peculiar to that species. The head terminates in two not very long, setose, horns which, together with the head, are pale flesh-coloured. The tail processes are long, spiny, and yellow. In the young larvae, however, the horns as well as the tail spines are black. The pupa has the same rigidity as that of the species just referred to, is of a delicate green with four streaks commencing from the tail end, consisting of non-amalgamated lines, partly handsome red, partly yellow; the process on the head is similarly coloured. The larva pupated against the wall of the bottle in which it had been reared, but it had previously covered that portion to which its ventral side was attached with a fine web.

7. KAMARA Moore. (Pl. XVIII, fig. 62).

MOORE, *Cat. Lep. M. E. I. C.*, I, *p.* 239, *No.* 516 (1857) . . . . Elymnias Kamara.
DE NICÉVILLE, *Journ. Bombay Soc. Nat. Hist.*, X, *p.* 19, *pl.* R, *fig.* 9, 10, 11 (1895) . . . . „ Erinyes.
FRUHSTORFER, (SEITZ, *Grossschm. d. Erde*), *p.* 382, *pl.* 87*c* (1911) . . . . „ Kamara.

W. J. Buitenzorg (265); Sindanglaya (1074); Prayangan mountains.
C. J. ?
E. J. Near Lake Klakah (230) in the prov. Probolingo.

8. Ceryx Bsd. (Pl. XVIII, fig. 63).

Boisduval, *Spec. Gén.*, I, *pl.* 9, *fig.* 38 (1836). . . . . Melanitis Ceryx.
Fruhstorfer, *Iris*, XX, *p.* 212 (1907) . . . . Elymnias „
„ (Seitz, *Grossschm. d. Erde*), *p.* 383 (1911) . „ „

W. J. Tjibodas (1410); mountains in the prov. Prayangan.
C. J. ?
E. J. ?

Fruhstorfer also only knows this species from the mountains of W. J., where, however, it is not rare, the type and the dark form called Hesionia by him, occuring together. In the colour of the sexes I can see no noteworthy difference. According to Hagen this species is also a mountains butterfly in Sumatra.

9. Künstieri Honr.

Fruhstorfer, *Ent. Nachr.*, XX, *No.* 3, *p.* 43 (1894) . Elymnias Gauroides.
„ *Berl. Ent. Zeitschr.*, XXXIX, *p.* 243, *pl.* 18, *fig.* 4 (1894) . . . . „ „
Fruhstorfer, (Seitz, *Grossschm. d. Erde*), *p.* 384 (1911). „ Künstieri.

Mr. Fruhstorfer captured a ♀ of this species at Tjisewou in the prov. Prayangan at an altitude of about 700 Metres. This is the only specimen known from Java.

INDEX

OF

Java DANAIDAE, SATYRIDAE, RAGADIDAE and ELYMNIADAE.

EXPLANATION OF PLATE XI.

Fig. 1. EUPLOEA CLIMENA, Cram. form SEPULCHRALIS Butl. ♀. *a* (Batavia); *b* id. ♂ (C. Java); *c* ♂ (Amboyna); *d* form EURYPON Hew. ♀ (Ké islands).

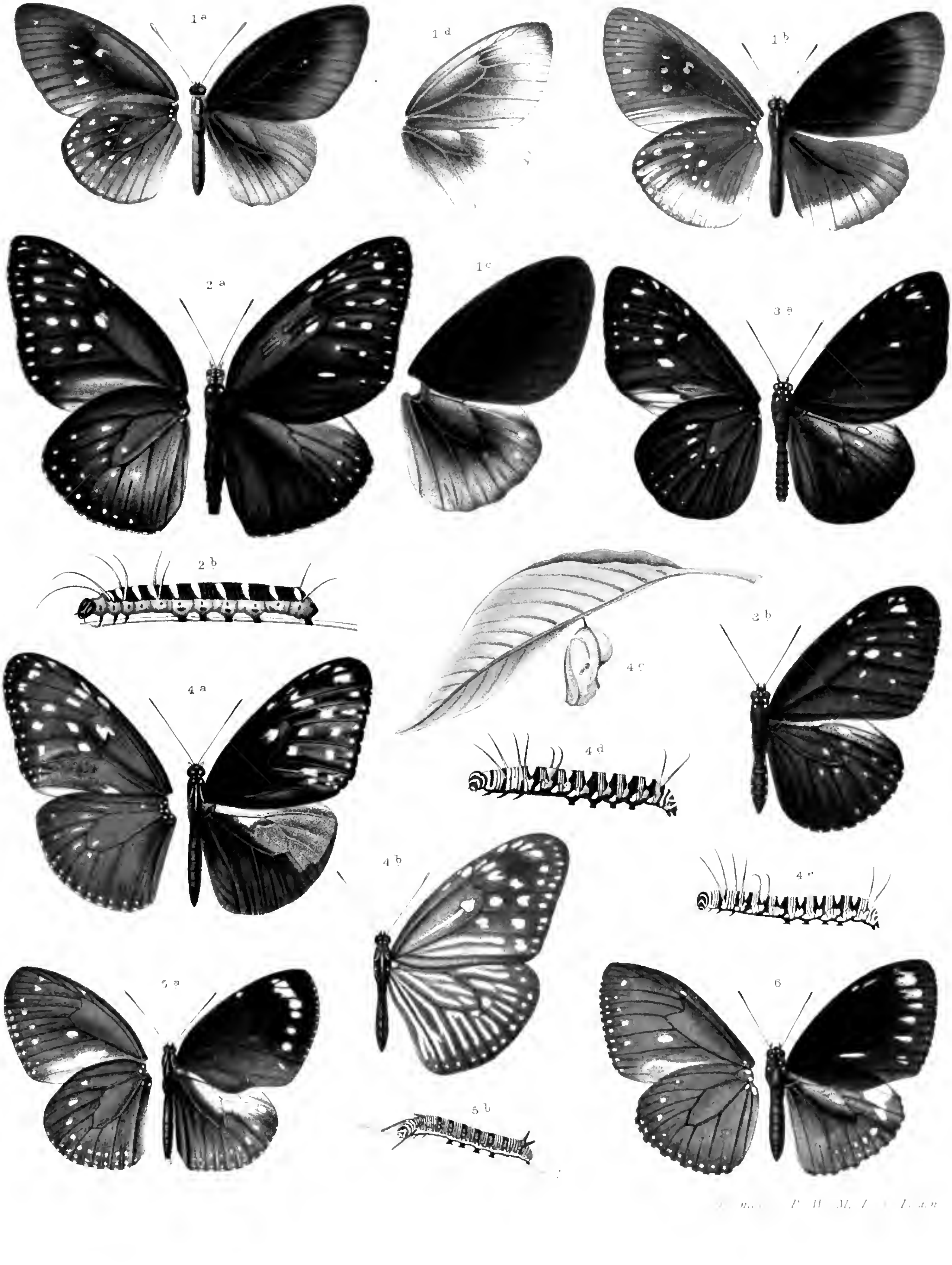
„ 2. EUPLOEA MALAYICA Butl. *a* imago ♂; *b* larva.

„ 3. EUPLOEA CRAMERI Luc. *a* ♂; *b* ♀.

„ 4. EUPLOEA MIDAMUS L. form BASILISSA Cram. *a* imago ♂; *b* id ♀; *c* pupa; (only the form of the pupa is sufficient; its strong metallic lustre does not show in the illustration); *d*, *e* caterpillars.

„ 5. EUPLOEA MAZARES Moore. *a* imago ♂; *b* larva.

„ 6. EUPLOEA ELEUSINA Cram. ♂.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1b
2a
1c
3a
2b
4c
3b
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4b
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EXPLANATION OF PLATE XII.

Fig. 7. EUPLOEA LEUCOSTICTOS Gmel. *a* imago ♂; *b* id. form NEMESTHES Hb. (Saparoua); *c* id. form ASSIMILATA Felder (Ké islands); *d* id. ♀ form VIOLA Butl. (Celebes), *e* larva.

„ 8. EUPLOEA PHOEBUS Butl. ♂.

„ 9. EUPLOEA RADAMANTHUS F. form ALCIDICE. *a* ♂; *b* ♀.

„ 10. EUPLOEA EIJNDHOVII Felder. ♂.

„ 11. EUPLOEA HÜBNERI Moore. ♂.

„ 12. EUPLOEA MENETRIESII Felder ♂ form WALLENGRENI. Fruhst. ♂.

„ 13. EUPLOEA RAFFLESI Moore. *a* imago ♂; *b* id. ♀; *c* larva.

EXPLANATION OF PLATE XIII.

Fig. 14. Euploea Gamelia Hb. *a* ♂ (on the lower part of the upper side of the fore-wings occurs a dull-lustrous spot while the lower part of the under side of the fore-wings as well as the fore part of the upper side of the hind-wings are also dull-lustrous; this is not shown in the figures); *b* ♀.

„ 15. Euploea Gloriosa Butl. *a* form Lacordairei Moore ♂ (Java); *b* form Schlegelii Felder ♀. (Celebes).

„ 16. Hestia Lynceus Drury. *a* larva (an immature specimen); *b* pupa.

„ 17. Ideopsis Gaura Horsf. *a* imago ♂; *b* id. ♀; *c* larva (immature); *d* pupa.

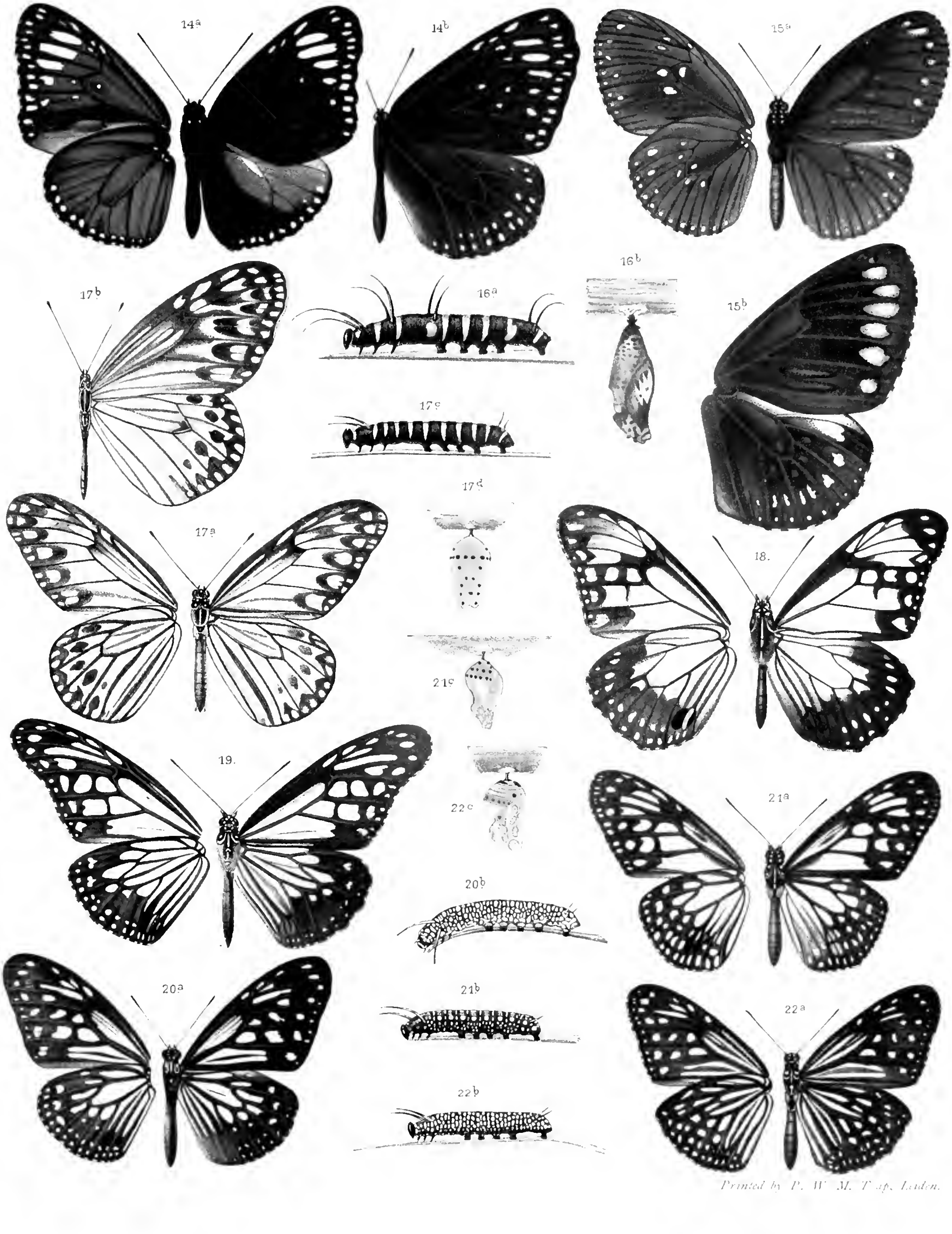
„ 18. Danais Albata Zinck ♂.

„ 19. Danais Melaneus Cram., form Larisca Felder ♂.

„ 20. Danais Aglea Cram. *a* imago ♂; *b* larva.

„ 21. Danais Aspasia F. *a* imago ♂; *b* larva; *c* pupa. (The pupa is not occurately reproduced).

„ 22. Danais Agleoides Felder. *a* imago ♂; *b* larva; *c* pupa. (The figura of the pupa is not very accurate).



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EXPLANATION OF PLATE XIV.

Fig. 23. DANAIS SIMILIS L. *a* imago; *b* larva; *c* pupa.

„ 24. DANAIS JUVENTA Cram. *a* imago ♂; *b* larva; *c* pupa.

„ 25. DANAIS LIMNIACE Cram. *a* form MELISSA Cram. (The figure while reproducing the general impress is nevertheless not very accurate); *b* form SEPTENTRIONIS Dist.; *c* form OBSCURATA Butl.

„ 26. DANAIS ARTENICE Cram. ♂.

„ 27. DANAIS MELANIPPUS Cram. *a* imago ♂; *b* larva.

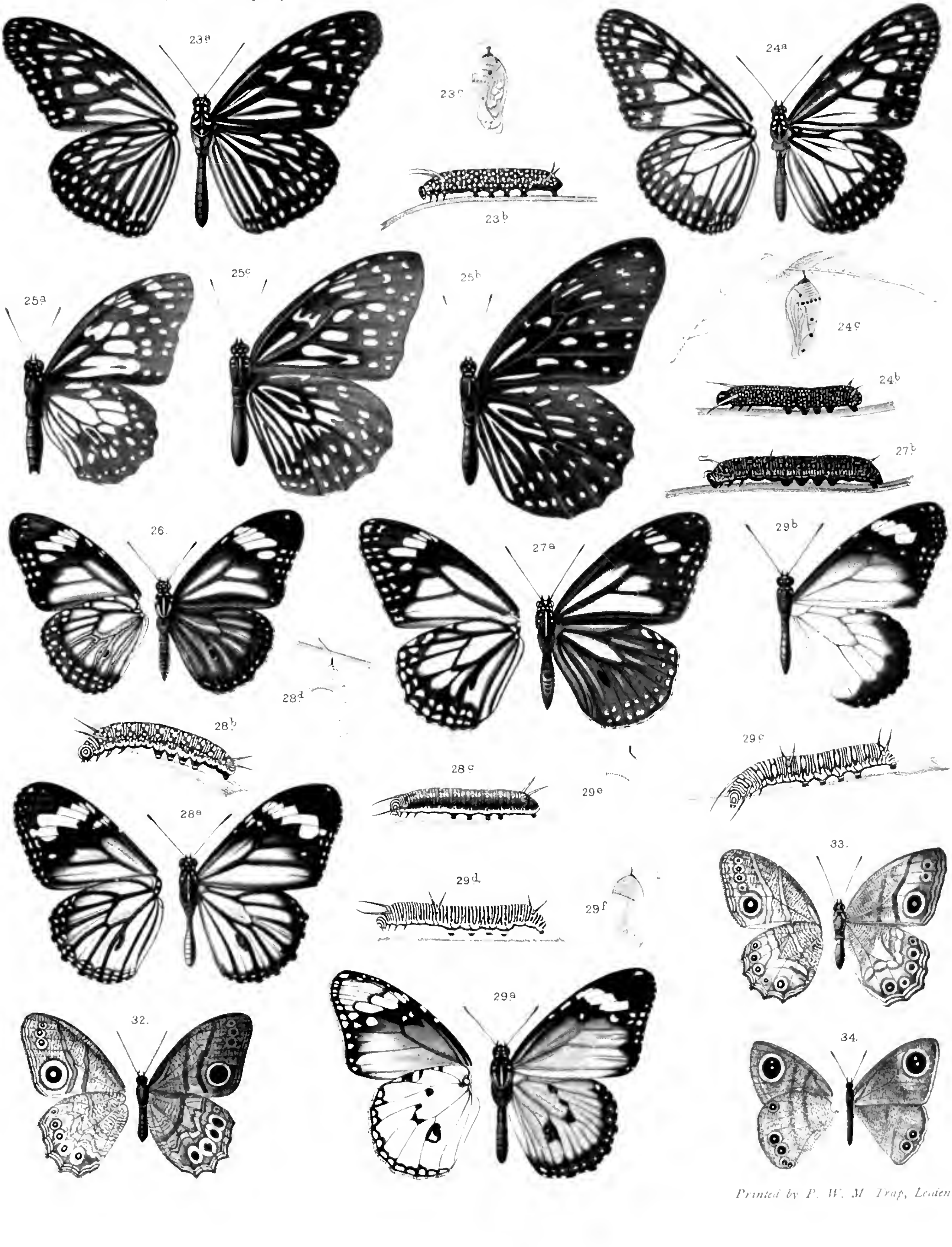
„ 28. DANAIS GENUTIA Cram. *a* imago ♂; *b* larva; *c* larva (dark form); *d* pupa.

„ 29. DANAIS CHRYSIPPUS L. *a* imago ♂; *b* id. form PETILIA Stoll (Tegal, C. J.); *c* larva; *d* id. immature; *e, f* pupae.

„ 32. ERITES MADURA Horsf. ♂.

„ 33. ERITES OCHREANA Semp. ♀.

„ 34. YPTHIMA JARBA de Nic. form GANGAMALA Fruhst. ♀.



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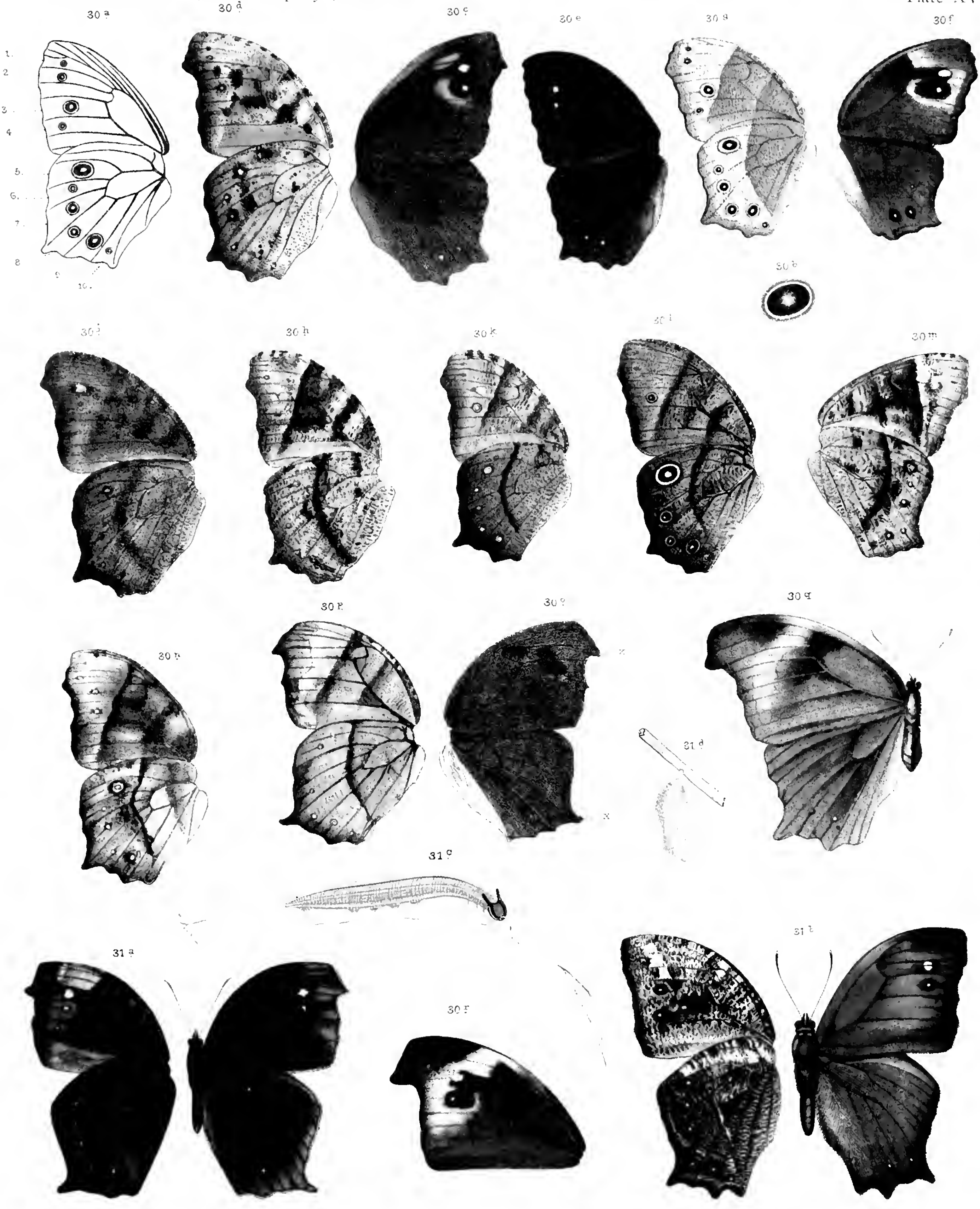
EXPLANATION OF PLATE XV.

Fig. 30. CYLLO LEDA L. *a* Representation of the ocelli on the underside; *b* ocellus magnified; *c* upperside form A; *d* underside form A′; *e* upperside form B; *f* upperside form C (to dark in colour); *g* underside form C (to dark in colour); *h* underside form D; *i* underside form E; *k* underside form F; *l* underside form H; *m* underside form G; *n* underside form I; *o* upperside form K; *p* underside form K′; *q* upperside of a specimen from E. J.; *r* CYLLO CONSTANTIA Cram. (Moluccas), to demonstrate how the black is gradually diffused over the original colour.

„ 31. CYLLO SUYUDANA Moore. *a* ♂; *b* id.; *c* larva; *d* pupa.



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EXPLANATION OF PLATE XVI.

Fig. 35. YPTHIMA HÜBNERI Kirby.

„ 36. YPTHIMA ARGILLOSA Snell. *a* ♂; *b* ♀.

„ 37. YPTHIMA BALDUS F. *a* ♂; *b* ♀.

„ 38. YPTHIMA BALDUS F. form HORSFIELDI Moore. *a* imago ♂; *b* id ♀. The colour is much too light and does not differ much from that of the ♂; it is suffused with a yellow brown sheen; *c* larva; *d* pupa.

„ 39. YPTHIMA FASCIATA Hew. ♀.

„ 40. YPTHIMA PANDOCUS Moore. *a* imago ♂. (The colour is too dark); *b* id. ♀; *c* id. form NIGRICANS Snell. ♂; *d*, *e* larvae; *f* pupa.

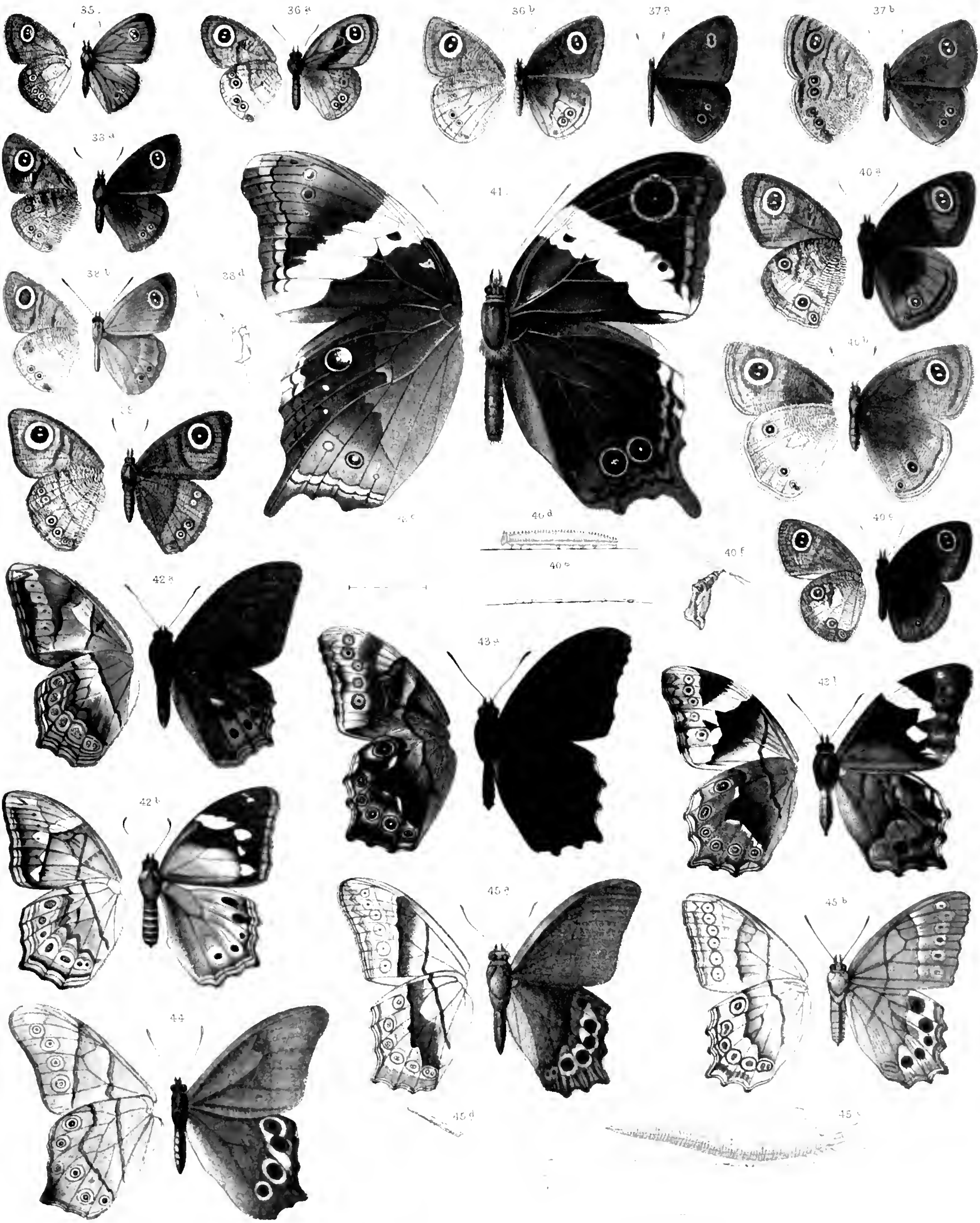
„ 41. NEORINA CRISHNA Westw. ♂.

„ 42. DEBIS MINERVA F. *a* ♂; *b* ♀.

„ 43. DEBIS CHANDICA Moore. *a* ♂; *b* ♀.

„ 44. DEBIS SAMIO Dbd. ♂.

„ 45. DEBIS MANTHARA Felder. *a* imago ♂; *b* id. ♀; *c* larva; *d* pupa.



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EXPLANATION OF PLATE XVII.

Fig. 46. Debis Darena Felder. *a* ♂; *b* ♀.

„ 47. Debis Dyrta Felder. *a* ♂; *b* ♀.

„ 48. Debis Europa F. *a* ♂; *b* ♀.

„ 49. Debis Rohria F.

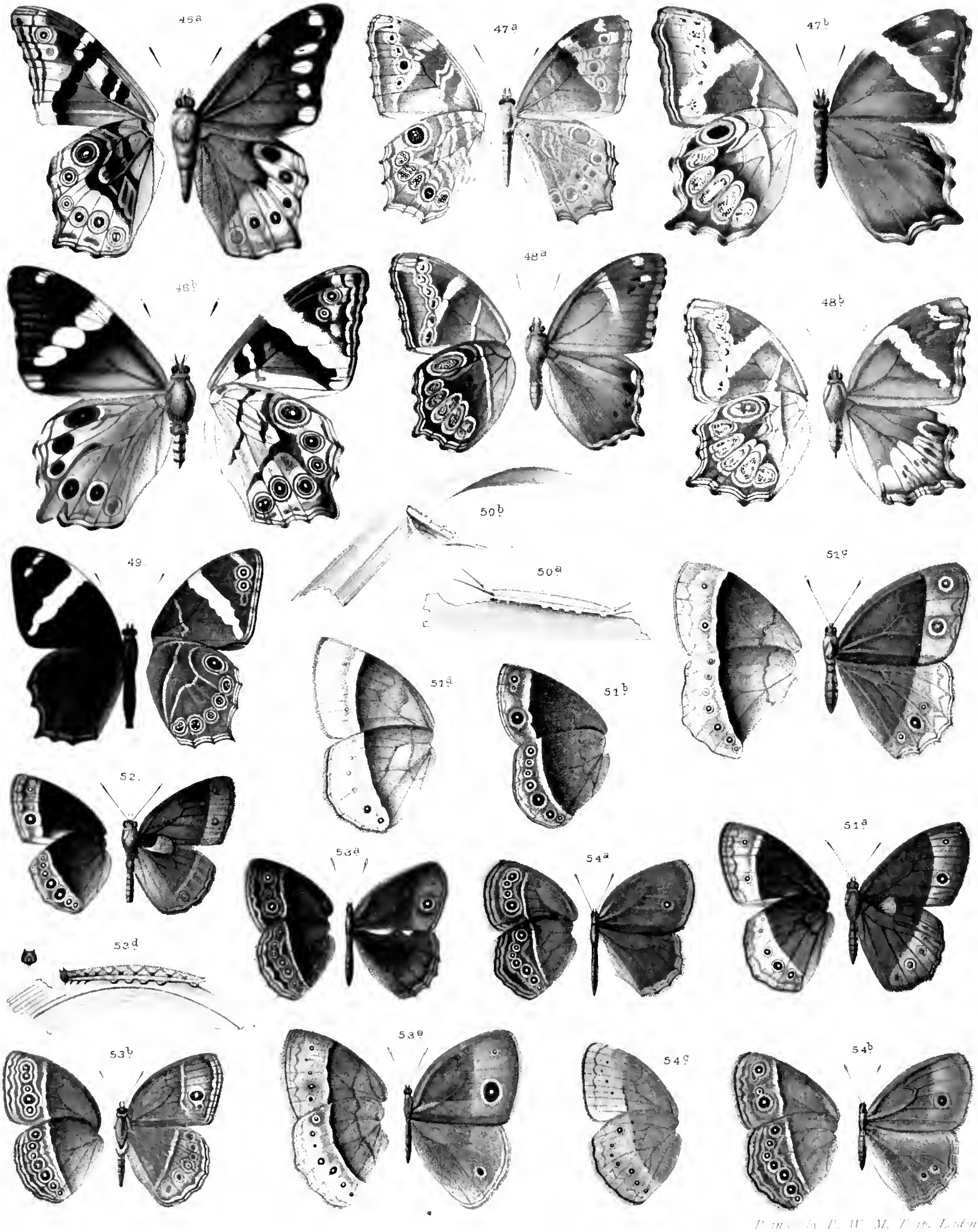
„ 50. Orsotriaena Medus F. *a* larva; *b* pupa.

„ 51. Mycalesis Nala Felder. *a* ♂; *b* id. with large ocelli; *c* id. ♀; id.; *d* id. form Sudra Felder.

„ 52. Mycalesis Moorei Felder. ♂.

„ 53. Mycalesis Horsfieldi Moore. *a* imago ♂; *b* id. ♀; *c* id. specimen with small ocelli; *d* larva.

„ 54. Mycalesis Perseus F. *a* ♂; *b* ♀; *c* specimen with small ocelli.



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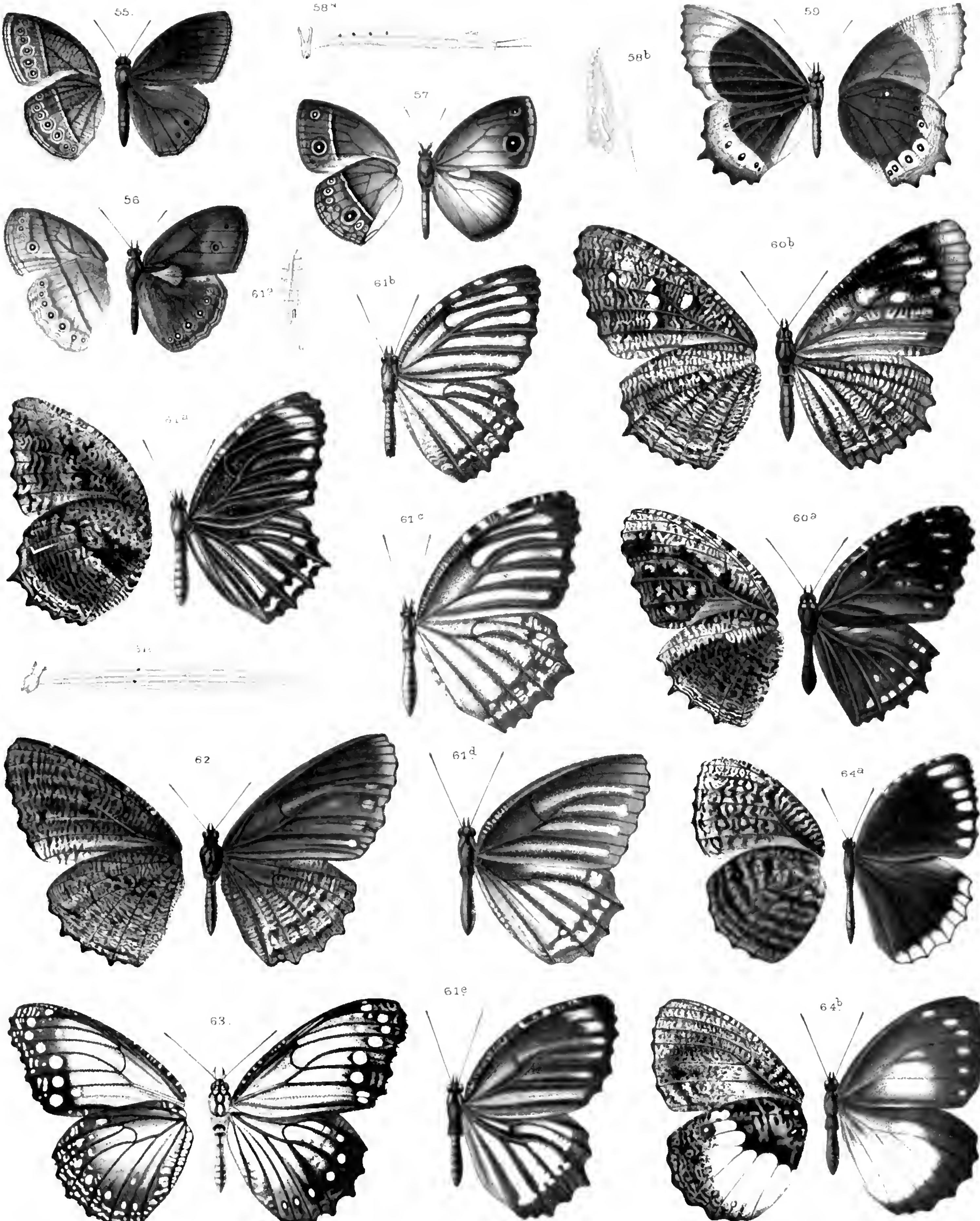
EXPLANATION OF PLATE XVIII.

Fig. 55. Mycalesis Janardana Moore. ♂.
„ 56. Mycalesis Fusca Felder ♂.
„ 57. Mycalesis Oroatis Hew. ♂.
„ 58. Elymnias Undularis F. *a* larva; *b* pupa.
„ 59. Elymnias Dara Distant. ♂. (The centre of the ocelli on the hind-wings is darker).
„ 60. Elymnias Casiphone Hb. *a* ♂; *b* ♀.
„ 61. Elymnias Lais Cram. *a* imago ♂ (Batavia); *b* ♀ (Batavia); *c* ♀ (Prayangan); *d* ♀ Ambarawa. (C. J.); *e* (marked also *c* in error) ♀ (island Bawean); *f* larva; *g* pupa.
„ 62. Elymnias Kamara Moore. ♀.
„ 63. Elymnias Ceryx Bsd. ♂.
„ 64. Elymnias Esaka Hew. *a* ♂; *b* ♀.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