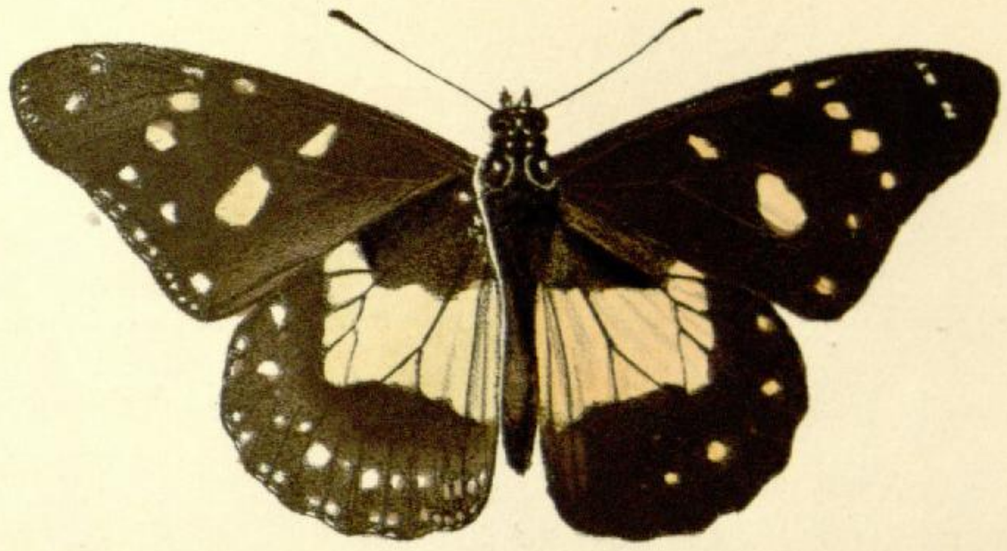

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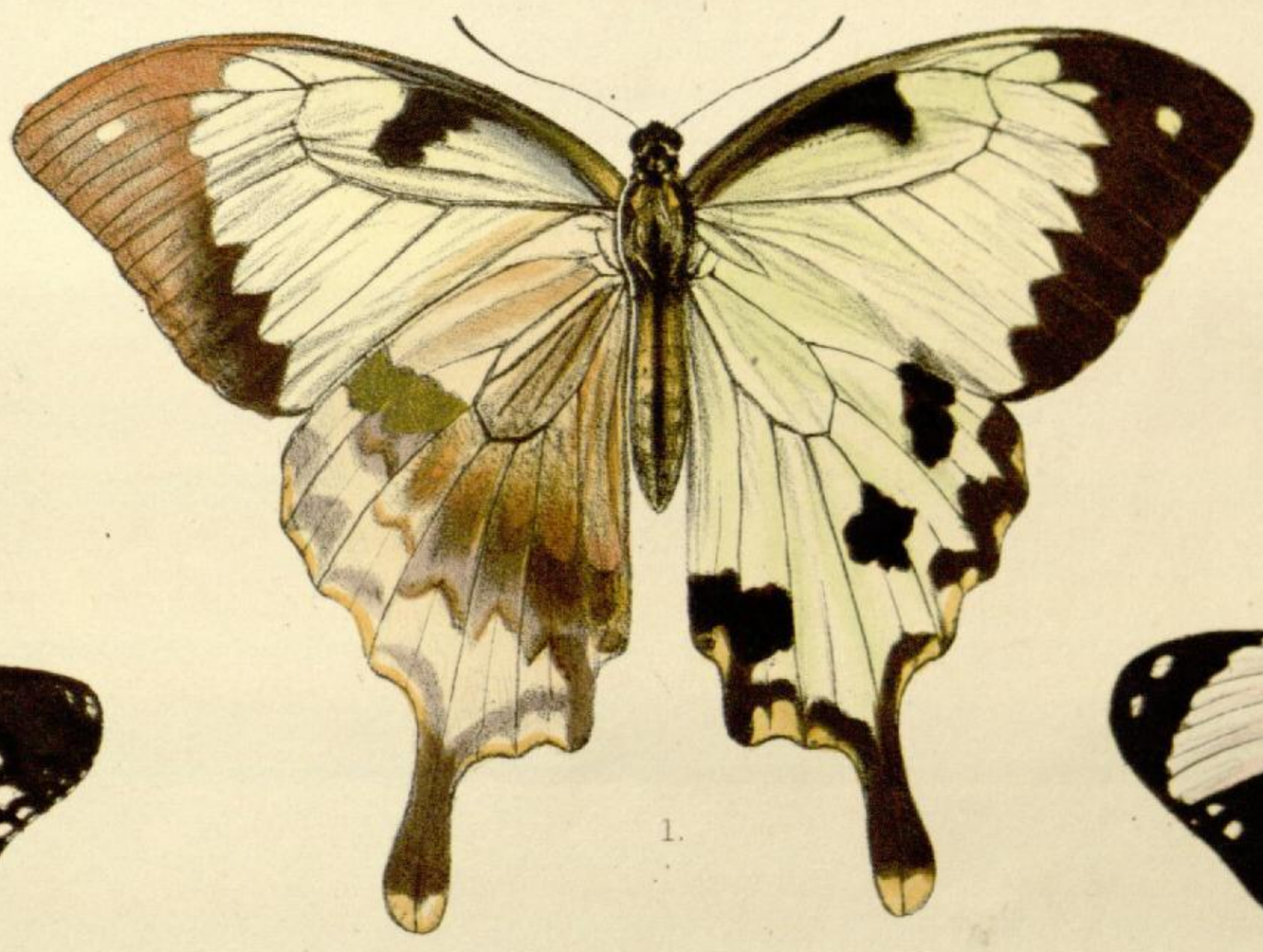

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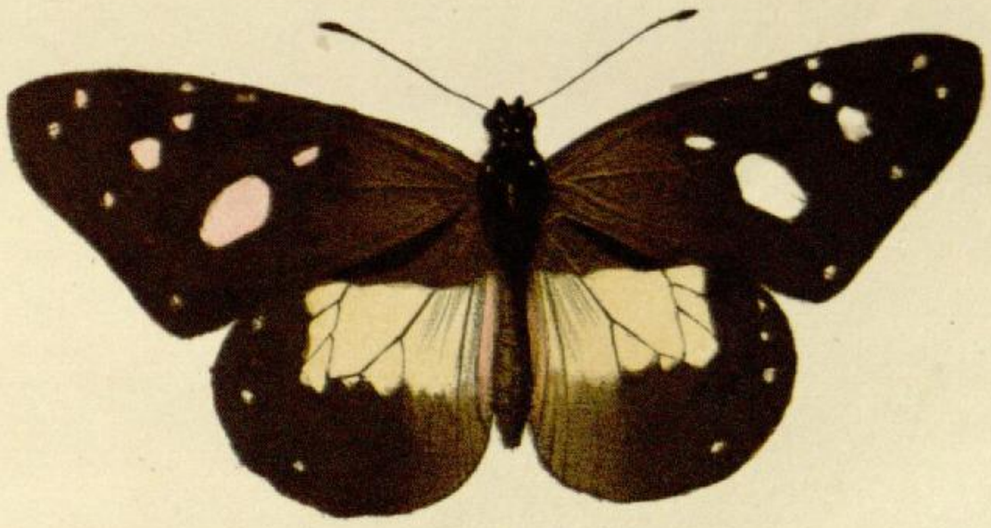

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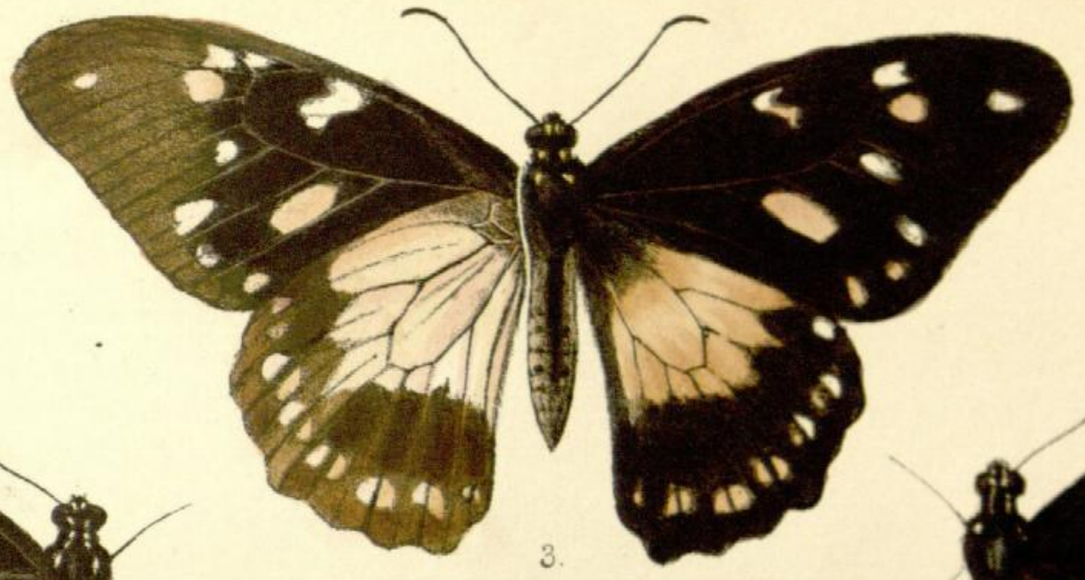
A. G. Butler, del. et lith. 1868.

Vincent Brooks, Day & Son, Imp.



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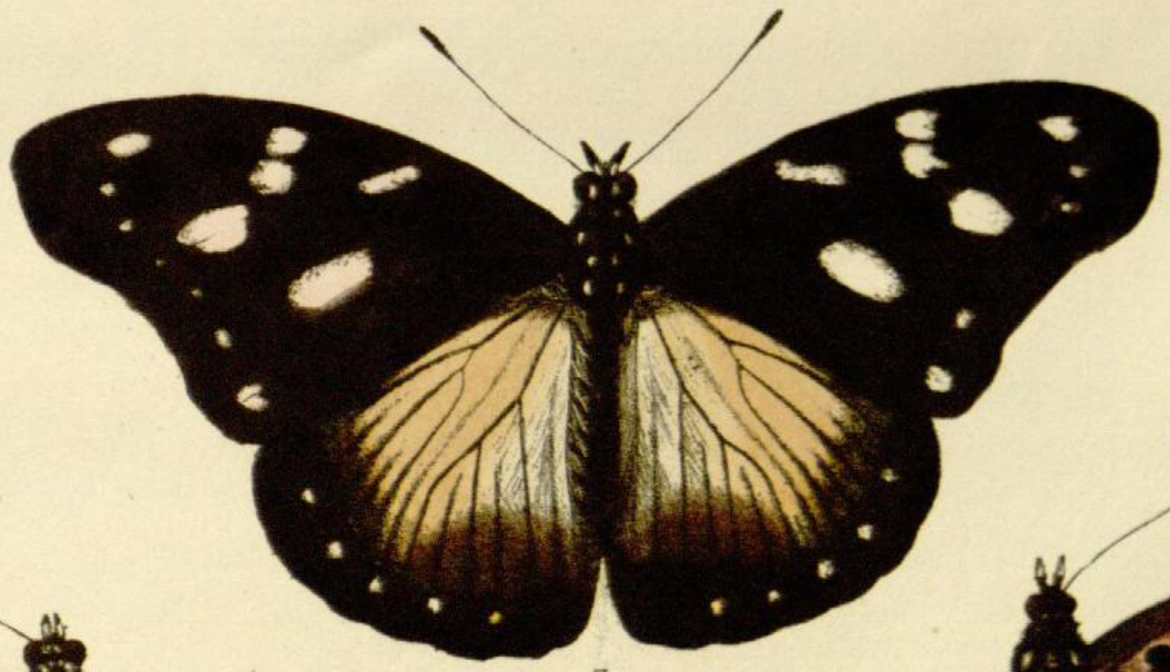

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A.G.Butler, del. et lith. 1868.

Vincent Brooks, Day & Son, Imp.

X. *On some remarkable Mimetic Analogies among African Butterflies.*

By Roland Trimen, *Mem. Ent. Soc. Lond.*

(Plates XLII. & XLIII.)

Read March 5th, 1868.

* * * * * "C'est une chose bien remarquable que de voir la nature créer à côté les uns des autres *l'Euplœa Niavius*, le *Diadema dubia*, et le *Papilio Westermanni*, trois Lépidoptères qui se ressemblent presque complétement par le port, le dessin, et la couleur, quoique appartenant à des genres fort éloignés et de tribus différentes."—Boisduval, *Species Général des Lépidoptères*, pp. 372, 373.

From the year 1836, when Dr. Boisduval published these remarks, a period of twenty-five years elapsed without any light being thrown upon the meaning of those remarkable resemblances among the *Rhopalocera* which are familiar to every lepidopterist, which have been noted by entomologists in publications both prior and subsequent to the date of the 'Species Général,' and to one of the most striking of which the above quotation refers. The extraordinary fact, that in all parts of the world species of Butterflies occurred which, aberrant from the normal *facies* of their immediate allies, most closely resembled other species of wholly different structure, awakened no comment beyond the admission that it was curious, unless it were some vague suggestion as to "recurrent types" in nature, which left the subject as completely mysterious as before. Entomologists, no less than naturalists generally, appeared content with a child-like wonder at this and kindred facts, and let them pass as things inscrutable. That this neglect of inquiry was due in great measure to the absence of reliable observations upon the living insects in their native haunts, cannot be doubted; but it may be questioned if, with all the data now accumulated by various explorers, those whose energies were necessarily, and in many cases exclusively, concentrated upon the arduous work of the systematist would have been enabled to elucidate the subject. It remained for one of those adventurous lovers of nature whose zeal for discovery leads them to years of tropical wanderings, to indicate, from his own assiduous observations, and in the light of that comprehensive theory of organic nature which we owe to Mr. Darwin, the rational explanation of these phenomena. That this explanation is absolutely conclusive, or not susceptible of future modification, it would be premature to assert; but it is indisputably the only advance yet made towards the solution of the difficulty, and so reasonable a demonstration as to commend itself to every thoughtful observer. I need scarcely say that I refer to the well-known treatise by Mr. Bates on the *Heliconidæ* of the Amazons Valley (published in the twenty-third volume of the 'Transactions of the Linnean Society'), in which the principle of natural selection is most ably applied in elucidation of the origin and development of those "mimicries" of which many are now so astonishingly exact. The

view propounded by Mr. Bates has met with the weighty support of Mr. Wallace, who, in his interesting paper on Malayan *Papilionidæ**, has called attention to an analogous series of phenomena presented in India and the great Eastern Archipelago, and can only account for them on the same theory.

My object in the present paper is to give some account of the most striking cases of mimetic analogy which have been found to exist among the Butterflies of Africa, more especially regarding those occurring at the southern extremity of the continent, a region in which I have had the advantage of several years' personal research.

In the first place, it is eminently worthy of remark that the Butterflies which are the subjects of imitation by others, belong to the same families both in the Old World and the New. The *Danaidæ* and *Acræidæ*, throughout the warmer parts of the earth, are unquestionably the special groups that furnish the models after which more or less perfect copies have been elaborated. This being an acknowledged fact, we are naturally led to inquire why it should be so—what advantage is to be gained by closely resembling the members of those families. Is there anything connected with those groups tending to show that they possess advantages above others of their Order? Do they appear, from their numbers and habits of life, to be dominant races?

These inquiries can unhesitatingly be answered in the affirmative. The slow flight, the conspicuous colours, the complete disregard of concealment, no less than the great abundance of individuals, are characteristics indicating unmistakably that these Butterflies are favoured races, enjoying advantages and immunities above their fellows. I believe that Mr. Bates (*loc. cit.* p. 510) has correctly suggested the principal causes of the evident security of these insects, viz. their emitting an unpleasant odour, and being probably distasteful to insectivorous animals. The peculiar smell noticed by Mr. Bates in the Heliconide *Danaidæ* is also possessed by the *Euplœæ* of the Eastern Archipelago, as Mr. Wallace has recorded; and I am enabled to add similar evidence as regards the African species of *Danais* and *Acræa*†. Judging from the case of *Acræa Horta*, a widely-distributed African species, which I have reared in considerable numbers from the young larvæ, this disagreeable smell is not peculiar to the imago condition, but attends the insect throughout its life, even the pupæ emitting it. On pressing the thorax of a *Danais*, a *Euplœa*, or an *Acræa*, however lightly, a clear yellow liquid, similar to that secreted by the Ladybird beetles, almost always exudes from that part of the body; and in some species of the two former genera a pair of bright-yellow fascicled appendages are protruded from the extremity of the abdomen‡. The peculiar scent appears chiefly to reside in this liquid, being remarkedly stronger with each effusion. Most of the species of *Danais* and *Acræa* feign death very readily; and they possess another means of defence which, as far as I am aware, has not hitherto been recorded, viz. the remarkable elasticity of their entire structure. No pressure of the thorax, short of absolute crushing of the tissues, suffices to kill or even paralyze these Butterflies; and the collector who treats

* Trans. Linn. Soc. vol. xxv.

† The Mauritian *Euplœa Euphone* also gives out a strong odour when handled.

‡ Mr. Bates mentions that species of the genera *Lycorea* and *Ituna* (Heliconide *Danaidæ*) possess similar exsertile organs.

them as he would species of other families, soon finds his collecting-box alive with its struggling occupants. So flexible are the wings, that the insect generally succeeds in withdrawing them from crossed fences of pins which form a complete barrier to any motion on the part of ordinary Butterflies; and however bent and distorted the wings may become in such exertions, I have never known a fracture of nervures or membrane to result, the organs resuming their natural position even after having been bent double for some hours. While entomologizing in Natal, my Kafir collector used often to bring me numerous examples of the commonest species in his box, and when engaged in the necessary work of rejection, I constantly found the limp-winged *Danaidæ* and *Acræidæ*, as soon as they were released from the transfixing-pin, fly off with perfect ease and apparent *nonchalance*.

It is not difficult to perceive how important, as a reserve means of defence, this unusual elasticity of structure may prove. That birds, and other eaters of insects, may occasionally capture a Butterfly of these malodorous tribes before discovering its distasteful character is not an unreasonable supposition, especially in seasons when an exceptional scarcity of some favourite food may prevail. In such a case it may be safely stated that the chances are very greatly in favour of a *Danais* or an *Acræa* escaping, if not wholly unhurt, yet without serious injury, after rough treatment that would have proved fatal to a harder but less elastic animal*.

More extended observation is necessary to prove by positive evidence that persecution of the *Danaidæ* and *Acræidæ* has almost wholly ceased, although, negatively, the witness borne by their abundance is very strongly in favour of this view. Some check upon their inordinate increase must, of course, exist; and this is probably to be found in the Ichneumon flies attached to the various species, the females of which are not likely to be deterred by any odour from depositing their ova in the larvæ. Mr. Bates has recorded that the Heliconide *Danaidæ*†, when at rest on leaves, did not "appear to be molested by lizards or predaceous flies of the family *Asilidæ*, which were very often seen pouncing on Butterflies of other families." A well-known naturalist has quoted (in the Westminster and Foreign Quarterly Review for July 1867, Article 1) an observation by Mr. Belt, that a pair of Puff-birds, watched by him in Brazil, during half-an-hour caught and brought to their nest various butterflies to feed their young, but entirely avoided the slow-flying *Heliconidæ*, which were about the spot in great numbers‡. I

* This elasticity of structure is not confined to the Butterflies in question, being a character of many Moths, and markedly of some belonging to the families *Agaristidæ* and *Zygænidæ*. It is remarkable that the three South-African Moths in which I have found this peculiarity most developed, viz. *Pais decora*, *Eusemia euphemia*, and *Glaucopis formosa*—all have a strong and offensive odour, emit drops of white or yellow fluid, and are slow-flying, brightly coloured, and abundant species.

† The term used by Mr. Bates is "Danaoid *Heliconidæ*": but as it is clear that that author agrees with Dr. Felder in recognizing all the so-called *Heliconidæ* except *Heliconius* and *Eueides* as forming a part of the family *Danaidæ*, I have ventured to transpose the words in order the more distinctly to express this relationship.

‡ It is not uncommon to hear doubt expressed as to whether birds even feed on butterflies at all; and thus the case just mentioned is of importance. I have noticed a Swallow chasing a *Pieris Brassicæ* in England; and I never knew it to be disputed that the Goatsuckers eat the nocturnal Lepidoptera. But when one reflects on the host of insectivorous birds in all (and especially in tropical) countries, it would be marvellous indeed if they neglected the large supply of food afforded by the generally defenceless race of Butterflies.

have published ('Rhopalocera Africæ Australis,' pt. ii. p. 335) an interesting note by Mr. J. H. Bowker on the manner in which *Junonia Œnone*, one of the *Nymphalidæ*, is systematically hunted down by a small Kaffrarian lizard. This *Junonia* is a particularly wary, active insect, and must give its pursuers infinitely more trouble to capture than would the slow, inert, grass-loving *Acrææ* of the same district; yet the lizards leave the latter unmolested. On more than one occasion, I have seen the larger Dragonflies catch Butterflies, both in England and Natal. *Pieridæ* were the victims in both countries; but in Natal the ubiquitous *Acrææ* were certainly passed by, and the more active insects selected. In the colony in question, several species of *Acacia* secrete a viscid fluid; and the spaces on the branches where this freshly exudes from the bark are a great resort of insects of all Orders, which assemble to imbibe the liquid. The larger *Mantidæ* take advantage of these gatherings to secure a plentiful and easy living; and one of them is usually to be seen among or close to the group of butterflies, beetles, wasps, ants, and flies attracted to the feast. As long as there is anything left to drink, there is no lack of visitors, and the *Mantis* fattens on numerous victims. The wings rejected by the devourer, who seems to prefer butterflies to other insects, in a short time rather conspicuously sprinkle the ground or herbage under one of these feeding-places; and in a few instances, where I chanced upon accessible spots, I searched among the *disjecta membra* for remains of *Danais* or *Acræa*, but in vain. It is necessary to observe that I cannot recollect having distinguished Butterflies of either of those genera at such drinking-stations; but the exudations were often situated at a height that precluded the certain distinction of any but very large insects, and there is apparently no reason why the fluid so universally appreciated should fail to attract those butterflies.

I think that the facts already placed on record, to the more important of which I have referred, may fairly be urged in support of the position that the *Danaidæ* and *Acræidæ* are exempted or protected in a very great degree from the attacks of those enemies to which the diurnal Lepidoptera generally, in their adult state, are constantly exposed. There are many instances of Butterflies, of various families, whose great abundance indicates that they have, by some means, attained immunity from persecution, or risen superior to adverse circumstances; but, as groups, the *Danaidæ* and *Acræidæ*, wherever they occur, are unquestionably preeminent in individuals, if not in species, and must take rank as the most perfectly adapted of all their Order to the existing conditions of life.

It is not surprising to find that those families of Butterflies which hold the first place in the battle of life display a structure which has led Mr. Bates to assign to them a position, in a "natural system" of classification, at the head of the order Lepidoptera*. The atrophy of the fore legs is a special character of the Rhopalocera as a group, which most widely distinguishes them from the Heterocera and from other Orders of insects; and this has been tacitly recognized by the universal consent with which entomologists have assigned the lowest place among Butterflies to the *Hesperiidæ*, a family which shows its affinity to the Moths by the fully developed fore legs, as well as by other cha-

* See Trans. Linn. Soc. vol. xxiii., and Journal of Entomology, December 1861, and No. X. 1864.

racters of importance. The splendid family *Papilionidæ*, by mere force of the size, number, and beauty of its members, has so long held the place of honour in English and in most continental classifications, that many lepidopterists are loth to supplant it by a comparatively insignificant-looking group; but, regarding the question structurally, there can be no doubt that an arrangement which interposed between the only families with fully developed fore legs (viz. the *Papilionidæ* and *Pieridæ* at one end of the series, and the *Hesperiidæ* at the other) all the groups that more or less widely differed in the character of those very organs was artificial and unnatural. On the other hand, Mr. Wallace (*loc. cit.* p. 2) has questioned the propriety of claiming a high position for any group on the ground of extreme imperfection of any of its organs. Taken apart from other considerations, this at first sight appears a valid objection; but it must be borne in mind, as suggested by Mr. Bates, that the Lepidopterous type among Articulata, like that of the Bird among Vertebrata, is preeminently aerial, and, consequently, that a diminution of the ambulatory organs, instead of being a sign of inferiority, may very possibly indicate a higher (because more thoroughly aerial) form. Mr. Wallace further contends for the first rank being accorded to the *Papilionidæ*, on account of the perfect insects possessing the peculiar and constant character of an apparently 4-branched median nervure, and a "spur"* on the anterior tibiæ, and the larvæ having an extrusible Y-shaped tentacle. The appendage to the anterior tibiæ is admitted by Mr. Wallace to be a character of some *Hesperiidæ*; and not having been found in other Butterflies, it may fairly be regarded, in conjunction with the full development of the first pair of legs, as a sign of affinity, however distant, between the two families. The apparent fourth branch of the median nervure is not an *additional* nervule, but actually the lower radial ("second discoidal nervule" of Doubleday) unusually placed in relation to the third branch of the nervure, and thus can hardly be regarded as in any way significant of superior development†. Nor can the Y-shaped tentacle of the larva be insisted

* This is more strictly a small foliated expansion or appendage.

† More remarkable points in the neuration of the *Papilionidæ* are the following, viz.:—1st, the short, transverse, *interno-median* nervule, uniting the median and submedian nervures of the fore wings, and closing a small basal cell; 2ndly, the well-marked *internal* nervure of the same wings, which has an independent course, and terminates on the inner margin; and, 3rdly, the distinct prediscoidal cell of the hind wings, formed by the junction of the branched precostal nervure with the costal. *Papilio* (including *Ornithoptera*) appears constantly to present these characters, with some variation in the size of the prediscoidal cell of the hind wings; the Australian *Eurycus* also possesses them all, and has the prediscoidal cell unusully large; in *Sericinus*, *Teinopalpus*, and *Leptocircus* appear the internal nervure (but *not* the interno-median nervule) of the fore wings and a much-narrowed prediscoidal cell: *Parnassius* and *Thais* present only the internal nervure of the fore wings; and in the aberrant *Doritis* I can trace none of the three characters. In other families we find the transverse *interno-median* nervule in several of the *Morphidæ*, though not so completely developed; the *internal* nervure is present in the *Danaidæ*, but, instead of having an independent course, is intimately connected with the submedian nervure, and ends by anastomosing with it; while the prediscoidal cell of the hind wings has hitherto been employed as the distinguishing feature of the curious *Brassolidæ*, in which it is formed in precisely the same manner as in the *Papilionidæ*.

The presence of additional cells, enclosed by anastomosing nervures, is a feature not rare among the Heterocera (*vide* the plates of neuration in Guenée's 'Noctuélites' and 'Phalénites'); and in some genera of Geometræ (*Oporabia*, *Ennomos*, &c.) a cell is found at the base of the hind wings, occupying exactly the same position as in the Butterflies mentioned.

on as indicating perfection of the Rhopalocerous type, when it is considered that the only known instances of an organ similar in structure and function in the rest of the Lepidoptera are found, not in Butterflies of any family, but in *Cerura*, a genus of Bombycide Moths. The organ of the Puss-Moth caterpillars is double, instead of forked, and occupies the opposite extremity of the body; but it is plainly homologous to that of the *Papilio* larvæ, and is protruded on occasion in precisely the same manner. Looking to the pupæ of the several families, we find, receding from those of the Heterocera in silken, earthen, or other cocoons, or buried in the ground, a gradual advance, corresponding with that towards a more aerial type of imago, to the freely suspended chrysalis of the tetrapod Rhopalocera. The pupæ of the *Hesperiidæ* are secured, like those of many moths, either in a slight cocoon or by several silken threads; those of the *Papilionidæ*, *Pieridæ*, and *Lycænidæ**, by the tail and by a single silken girdle; while, through the *Erycinidæ*, which present instances both of girt and freely suspended pupæ†, there is a gradation to the chrysalides of the true Nymphalide Butterflies, which hang, head downwards, by a caudal attachment only. The remarkable pupa of *Parnassius*, more heteroceroid (in its blunted form, bluish efflorescence, and numerous threads of support in a cocoon of leaves) than most of those known among the *Hesperiidæ*, seems to afford an additional indication of some connexion between the *Papilionidæ* and Moths. Another singular fact tends to strengthen the idea of a remote, but distinct relationship, viz. that the pupæ of *Ephyra*, a Geometrine genus, are not only suspended by the tail and a silken girth, in precisely the same position as those of the *Papilionidæ*, but closely resemble them in form, M. Guenée observing ('Phalénites,' ix. p. 402) that they can best be compared with the chrysalides of *Thais*‡. Similar, also, in their caudal attachment and silken girdle, but not so like the *Papilio* chrysalides in form, are the pupæ of the very curious Heterocerous group of *Pterophoridæ*, which stands alone in the structure of its wings, and has hitherto, by common consent, been placed last in the entire order Lepidoptera.

It thus appears that the *Papilionidæ* exhibit points of structure in common with some Heterocera in each stage of their growth; and these characters seem, in the aggregate, of sufficient importance to warrant our assigning to the family a position much nearer to the Moths than that which, until lately, has so generally been accorded to it.

Turning to the *Danaidæ* and *Acræidæ*, which have so much in common both in structure and habits, it is curious to find how the two families differ in their early states. The larvæ of the Old-World *Danaidæ* are smooth, but provided with several pairs of long fleshy filaments; and, from the case of *Mechanitis Polymnia* (mentioned by Mr. Bates, *loc. cit.* p. 496), the Heliconide *Danaidæ* also present a smooth larva, which, however, is furnished with tubercles instead of filaments. The *Acræidæ* (of Africa) are, in the larva-state, densely studded with stiff branched spines; and the true (or Acræoid) *Heli-*

* The larvæ of some *Lycænidæ* (e. g. *Thecla Quercus*, L.) are stated to bury themselves in the earth before assuming the pupal condition.

† See Mr. Bates's 'Catalogue of Erycinidæ,' in Journ. Linn. Soc., Zool. ix. p. 368.

‡ Plate 2 of M. Guenée's volume gives an interesting figure of the pupa of an *Ephyra* in its natural position. *Thais* is recorded as having the chrysalis enclosed in a slight web, which is not the case with *Ephyra*.

coniidæ of America are similar in this respect, both groups showing affinity to the *Nymphalidæ* as far as the caterpillars are concerned. The thick, blunt chrysalis of the Danaide Butterflies also differs widely from the elongate, slender, and subangulated pupa of *Acræa*.

The African continent is very poor in *Danaidæ*, only eight species, belonging to two genera*, being known to inhabit its vast area. Seven belong to the genus *Danais*; and these, with the exception of *D. Chrysippus*, form a section confined to Africa, Madagascar, and Mauritius, and distinguished by a peculiar coloration of conspicuous ochre-yellow or white bands and spots on a black ground. Three of the six species appear to be confined in their range to the western coast, between Sierra Leone and Angola; one, with an equal range in the west, extends to the Zambesi and Natal; while two seem to be limited to extra-tropical Southern Africa. It is most remarkable to find, in this very limited number of *Danaidæ*, that no less than four are accompanied throughout their range each by its closely-imitating *Diadema*, one of the four (*Danais echeria*) being further attended by three mimicking species of *Papilio*, and another by one *Papilio* that correctly copies it. *Danais Chrysippus*, as is well known, has a faithful imitator everywhere, except in Europe, in the ♀ *Diadema Bolina*, and, in the south of Africa, finds a second mimicker in a rare form of *Papilio*, apparently peculiar to that region.

The *Acræidæ* have their metropolis in Africa, about fifty species being known from all parts of the Continent. Six *Acrææ* are distinctly the objects of mimicry by certain *Nymphalidæ* and *Papilionidæ*†. Four of these are West African only; one extends, under a somewhat altered form, to South Africa; and the sixth appears peculiar to the latter region. The mimickers here, also, are constant attendants on the species imitated; and in three cases, where the sexes of the *Acrææ* are dissimilar, the sexes of the mimickers differ accordingly.

It is worthy of notice that the mimicking *Papiliones*, whether imitators of *Danaides* or *Acrææ*, are very frequently only the *females* of the species, to the exclusion of the males, which, in such cases, wear the normal aspect of their immediate congeners‡. Among the *Diademæ* and other *Nymphalidæ*, on the contrary, both sexes of the mimickers,

* *Euplœa Goudotii*, well known as a native of Bourbon, is included, on the authority of Sir Andrew Smith, who presented a specimen from "South Africa" to the British Museum.

† The magnificent *Papilio Antimachus*, Drury, of which but one specimen is known to science, is very Acræiform in habit, and is possibly an instance of special modification in imitation of some gigantic *Acræa* as yet unknown, or perhaps extinct. Drury's having "received" this *Papilio* from Sierra Leone is, unfortunately, no clue to its actual *habitat*, the principal sea-ports in many parts of the world usually getting the credit of all natural objects, from whatever distance inland, that are shipped from them to Europe. *Antimachus* has the aspect of a slow and heavy flier; and the observation by Smeathman, quoted by Professor Westwood (Arc. Entom. i. p. 146), did not originally apply to the great *Papilio*, but to *Charaxes Camulus*, Drury (= *C. Castor*, Fab.), as may be seen on reference to Drury's 3rd volume, pp. 15–23, and pl. xxx.). Donovan, in his 'Naturalist's Repository,' first misquoted the passage respecting the flight of the *Charaxes*.

‡ Among fifteen Indian and Malayan imitative *Papiliones* tabulated by Mr. Wallace (*loc. cit.* p. 20), seven are expressly mentioned as females. As regards the African species, *Papilio Ridleyanus* is an instance of both ♂ and ♀ wearing the aspect of an *Acræa*, and, in a less degree, the southern form of *Papilio Leonidas*, which is the least accurate of the four mimickers of *Danais Echeria*; but in this case the majority of the specimens that most resemble the *Danais* are females.

as a rule *, present, with equal exactness, the appearance of the butterflies imitated. It would almost appear from this that the Nymphalide imitators stood in need of a more complete protection than the mimicking *Papiliones*; and I find that, in general, they are comparatively fewer in individuals than the latter.

The following Table exhibits a view of the more striking cases of mimicry that have come under my notice, and also indicates the localities in which each model and its copies are known to occur together:—

Tabular View of the most remarkable Mimetic Analogies among African Rhopalocera, with the Localities in which the several Species concerned in each case are known to co-exist.

Danaidæ.	Nymphalidæ.	Papilionidæ.		
Danais Damocles Angola.	Diadema Damoclina, n. s. Angola.			
Danais Egialea Sierra Leone. Ashanti.	Diadema dubia. Sierra Leone. Ashanti.			
Danais Echeria		Papilio Merope ♀ (1st form *Cenea*, Stoll).	Papilio echerioides, ♀	
Type Knysna, Cape Colony. Bashee River, Kaffraria. Port Natal.		Type Knysna, Cape Colony. Bashee River, Kaffraria. Port Natal.	Var. Tsomo River, Kaffraria.	
Var. Knysna. Bashee River. Port Natal.	Diadema mima, n. s. Port Natal.	Var. Port Natal.	Type. Tsomo River. Natal.	Papilio Leonidas. Var. austr. (Brasidas, Felder). Bashee River. Port Natal.
Danais Niavius	Diadema Anthedon	Papilio Merope ♀ (2nd form *Hippocoon*, Fab.).		
Type Sierra Leone. Ashanti.	Type Sierra Leone. Ashanti.	Type. Sierra Leone. Ashanti.		
Var. austr. Port Natal.	Var. austr. Port Natal.	Var. austr. Port Natal.		
Danais Chrysippus	Diadema Bolina ♀	Papilio Merope ♀ (3rd form, *Trophonius*, Westwood).		
Type. Sierra Leone. Ashanti. St. Helena. Damara-land. Bechuana-land (Motito). Transvaal (Potchefstroom). Cape Town, Knysna, Plettenberg Bay } Cape Colony. Bashee River. Umquabaaba, D'Urban, Pietermaritzburg } Natal. St. Lucia Bay. Madagascar. Bourbon. Mauritius. Zambesi. Somauli-land.	Type. Sierra Leone. Ashanti. St. Helena. Damara-land. Bechuana-land (Motito). Transvaal (Potchefstroom). Cape Town, Knysna, Plettenberg Bay } Cape Colony. Bashee River. Umquabaaba, D'Urban, Pietermaritzburg. } Natal. St. Lucia Bay. Madagascar. Bourbon. Mauritius. Zambesi. Somauli-land.	Knysna. Plettenberg Bay. Bashee River.		
Var. *Alcippus*, Cr. Sierra Leone.	Var. Sierra Leone.			
Var. *Dorippus*, Klug. D'Urban, Natal.	Var. *Inaria*, Cr. D'Urban, Natal.			

* *Diadema Bolina* is a notable exception.

Table (continued).

Acræidæ.	Nymphalidæ.	Eurytelidæ.	Papilionidæ.	
Acræa Gea ♂ and ♀	Panopea Hirce ♂ and ♀	Melanitis Phegea	Papilio Cynorta ♀	
Sierra Leone.	Type.	Var. ♀ (*Bammakoo*, Westw.)	(*P. Boisduvallianus*,	
Ashanti.	Ashanti.	Ashanti.	Westw.)	
Calabar.	Calabar.		Sierra Leone.	
Acræa Euryta	Panopea Hirce	Melanitis Phegea.	Ashanti.	
Var. ♀	Var. ♀.		Calabar.	
Calabar.	Calabar.			
Var. ♀	Var. ♀.			
Congo.	Congo.			
Var. ♀	.....	♀♂.		
Congo.				
Var. ♀	.....	♀.		
Acræa Aganice ♂	Panopea Tarquinia, ♂.			
Port Natal.	Port Natal.	Calabar.		
Acræa Lycoa.....	Panopea Lucretia.			
Sierra Leone.	Sierra Leone.			
Calabar.	Calabar.			
Acræa Zetes ♂ and ♀	Panopea Boisduvalii.			
Type	Type.			
Ashanti.	Ashanti.			
Calabar.	Calabar.			
Var. austr.	Var. austr.			
Port Natal.	Port Natal.			
Acræa Egina ♂ and ♀	.....	.....	Papilio Ridleyanus ♂	
			and ♀.	
Congo.			Congo.	

In order to give a clear idea of the nature of these cases of mimicry, it is necessary to consider them separately. I will therefore describe them *seriatim* as concisely as possible, only premising that, as regards Tropical Africa, so little is on record respecting the range of individual species or their variation, to say nothing of habits and stations, that it is at present impossible to treat satisfactorily of the instances occurring in that immense tract of country.

1. Danais Damocles, Fab.

Danais Damocles, Ent. Syst. iii. 1. p. 41. no. 121; Palisot de Beauvois, Ins. Afr. et Am. Lep. t. 6. figg. 3 *a*, 3 *b*.

This species is rather widely spread in tropical Western Africa, examples having been received from Sierra Leone, Ashanti, the Gaboon, and Angola (in about 8° S. lat.). It is nearly related to *D. Egialea*, Cram., but is larger, and may be recognized by the broader central white band of the fore wings (which extends below the first median nervule), by the more irregular subapical white bar of the same wings, and by the smaller and whiter basal space in the hind wings. The Gaboon examples form a variety in which the pale basal patch in the hind wings is either reduced to a small spot or altogether absent. In Angola this *Danais* is accompanied by a *Diadema* (which also inhabits Congo) that very closely imitates it, differing from *Diadema dubia*, its nearest ally*, precisely as *Danais Damocles* differs from its congener *Egialea*. The two species

* I propose for this butterfly the name of

Diadema Damoclina, n. sp.

Exp. 3 in.–3 in. 5 lin. Closely allied to *D. dubia*, Pal. de Beauv. *Fore wing*: central white bar much broader,

of *Danais* appear to exist side by side at Sierra Leone and in Ashanti; and it is probable that the mimickers of *Damocles* will eventually be found in those localities from which *Diadema dubia* has already been brought.

2. Danais Egialea, Cram.

Danais Egialea, Pap. Exot. pl. 192. fig. D.

This *Danais* has apparently a less extensive range than *D. Damocles*, inhabiting Sierra Leone, Cape Palmas, and Ashanti. It is most exactly copied by *Diadema dubia*, Pal. de Beauv., the only noticeable difference being that the *Diadema* has three or four additional dots near the hind margin of the hind wings. There are specimens of this *Diadema* in the British Museum, from Sierra Leone and Ashanti; and in Mr. Hewitson's collection, from Calabar. Palisot de Beauvois records it as a native of Oware and Benin, the latter district being situated between Ashanti and Calabar.

3. Danais Echeria, Stoll. (Tab. XLII. figg. 3, 7.)

Danais Echeria, Suppl. Cramer, Pap. Exot. t. 29. figg. 1, 1 *a*.
—— *Vaillantiana*, Godt. Enc. Méth. ix. p. 183. no. 25.

D. Echeria is a widely-spread and abundant butterfly throughout the wooded parts of South Africa, where it takes the place of its tropical ally, *D. Egialea*. Like the latter, it has an exact imitation in a *Diadema*, which, though nearly allied to *D. dubia*, appears to be distinct*. But *Echeria* has no less than three other imitators in the genus *Papilio*, the two more accurate mimickers—*P. echerioides*, Trimen, ♀, and *P. Merope*, Cram., ♀ (= *Cenea*, Stoll)—being females of very dissimilar males, and the third a variety of *P. Leonidas*, Fab., which seems only to occur in South Africa beyond the tropic, and in which the pale markings are almost or wholly devoid of the green or greenish colouring of the type-form, and several of the lesser spots generally wanting. All these mimicking species are much rarer than the *Danais*—especially the *Diadema*, of which I met with only two examples in Natal, and have seen but five others in collections. *Papilio eche-*

continuous, not interrupted on median nervure; subapical bar interrupted, narrower, more macular. *Hind wing*: whitish basal space reduced to a small ovate marking, occupying discoidal cell (and extending beyond and above it), well defined, instead of gradually fading into the ground-colour; the submarginal white spots much smaller, some of them occasionally wanting; ground-colour darker than in *D. dubia*. Underside.—As in *D. dubia*, but with the white bars differing in the same manner as on the upperside.

Hab. Angola.

In the collection of the British Museum.

* I append a diagnosis of this species:—

Diadema mima, n. sp. (Tab. XLIII. fig. 7.)

Exp. 3 in. 7 lin.–3 in. 8½ lin. Nearly allied to *D. dubia*, Pal. de Beauv. *Fore wing*: white spot next base, in discoidal cell, much smaller, or nearly obsolete; subapical white band narrower, and distinctly composed of three spots; white spots of submarginal row smaller; no trace of ochreous scaling on inner margin. *Hind wing*: pale central space broader, uniformly yellow-ochreous. Underside.—Differs similarly from that of *D. dubia*: white spots at bases of wings smaller. *Fore wing*: the bluish edging of the larger markings entirely wanting. Sexes similar.

Hab. Natal.

In the Collections of the South-African Museum, W. C. Hewitson, and R. Trimen.

rioides is rather local than scarce, only occurring in woods at a considerable elevation; and, from Mr. Bowker's observations in Kaffraria, the ♀ would seem to be little, if at all, rarer than the ♂, though, in the only Natalian *habitat* in which I found the species tolerably common, the females were very much scarcer than individuals of the opposite sex. As regards the ♀ *P. Merope**, however, I have no doubt of its comparative rarity, as one may take males abundantly in the forests for days together, without once meeting with a female.

The resemblance to *Echeria* presented by the austral variety of *Papilio Leonidas* (*P. Brasidas*, Felder, Spec. Lep. p. 19, no. 249), appears in the cabinet but a slight one in comparison with the striking imitations just mentioned; but it is a fair-enough likeness in nature, especially when the insect settles †. Certain specimens (usually, but not invariably, females), which have the spots of the fore wings reduced in number and diminished in size, are much more like *Echeria* than others; and, looking at the insect in comparison with the type *Leonidas* of Western Africa (which resembles no known *Danais*), I have no doubt that the southern form has been, and is probably still being gradually modified in the direction of the dominant southern *Danais*.

Danais Echeria presents two varieties as regards the colour of the pale spots in the fore wings—one (the type) in which those spots are ochre-yellow (fig. 3), and the other in which they are white (fig. 7). The former is the prevalent form in the Cape Colony, and the latter in Natal; but I have taken both forms in each Colony, as well as intermediate examples in which the spots near the costal margin of the fore wings are white or whitish, while the rest are yellow. The *Cenea*-form of the ♀ *Papilio Merope* mimics both these varieties, and offers corresponding intermediate specimens; while the ♀ *P. echerioides*, which only inhabits the eastern portion of South Africa, almost always resembles the white-spotted variety, though I have seen, too, unusually small specimens which copy the yellow-spotted *Echeria*.

With reference to *Papilio Merope*, I think it well in this place to offer some observations on what I believe to be a remarkable instance of polymorphism in the ♀ of this species. First figured by Cramer (in 1779 and again in 1782), *P. Merope* has long been known as a native of Western Africa, and more recently as also inhabiting Southern Africa and Madagascar ‡. Its coloration is very conspicuous, and unlike that of any other *Papilio*, the upper surface being uniformly pale sulphur, or creamy-yellow, the fore wings with a narrow costal and broad hind-marginal black border, and the hind wings (which are tailed) having a more or less broken black band across the disk, and some black hind-marginal lunules. The Felders, in their 'Species Lepidopterorum' (1864), have separated the single species generally recognized into three, viz. (in addition to the type *Merope*) *P. sulphureus* of Palisot de Beauvois (figured by that author

* The various forms of the ♀ *Merope* will be discussed further on.

† *P. Leonidas* has the habit (rare in a *Papilio*) of settling not unfrequently on the projecting twig of some tree, and there remaining motionless, with the wings closed and hanging downward, precisely after the manner of *Danais Echeria*, for which species, in this position, I have, on more than one occasion, mistaken it.

‡ Mr. Horace Waller has shown me a specimen taken at Mount Morambala, on the River Shiré, a northern tributary of the Zambesi.

from a West-African specimen) and *P. Meriones*, n. sp., the Madagascarene form, or "Var. B," of Boisduval's 'Spécies Général' (p. 222). The former of the two Felderian species appears to me of doubtful value, being founded upon some slight differences in the outline of the wings (a very variable character in *Merope*) and in the width of the discoidal cell of the hind wings*; but there is some ground for the separation of the form inhabiting Madagascar, as will be seen immediately.

Considering for how long a time this fine *Papilio* has been known, and how frequently it reaches England in collections from the various African settlements, it seems singular that the female should be unknown. I have examined a large number of specimens in the National Collection, the Oxford Museum, and the principal private collections, and found them, without exception, to be males. In Southern Africa, I have been familiar with the butterfly in its native woods for some years, have taken some scores of specimens, and have examined many others from localities which I had no opportunity of visiting: all were males.

But in various parts of the Cape, Kaffraria, and Natal there occurs, within a range corresponding to that of *P. Merope*, the uncommon *Papilio Cenea*, of Stoll, already mentioned as so singularly accurate a mimicker of *Danais Echeria*. I have reason to believe that nearly all the specimens of this at present in collections have passed through my hands; and among the whole number (about 25) from various localities, no male has occurred. A black *Papilio*, without tails†, and marked with ochre-yellow patches and spots, is a very different-looking butterfly from the fine pale-yellow *Merope*; yet there is good reason for believing that *Cenea* is the female of *Merope*, modified in imitation of *Danais Echeria*. A close inspection reveals many points in common between the two insects. The head, thorax, and abdomen are similarly coloured and spotted. The pale spot near the apex of the fore wings, so conspicuous in the dark border of *Merope*, is almost always present (though occasionally smaller) in *Cenea*. On the under surface, the ochre hue of the hind wings and border of the fore wings only differs in *Cenea* by being rather darker; and the cellular and internervular streaks in the basal region, as well as a pale space, between the radials, in the darker band beyond the middle of the hind wings are found in both butterflies. Both in the Cape Colony and Natal, the woods in which *Merope* was common were the only spots in which I met with *Cenea*; and on one occasion I saw *Cenea* chased by *Merope* in the manner peculiar to a male butterfly when in pursuit of the female. Apart from these circumstances, analogy with the case of *Papilio echerioides* (the ♀ of which also copies *Danais Echeria*, while the ♂ is widely different) strongly supports the probability of the view here enunciated.

As *Cenea* occurs only in the south of Africa, its known range being from Knysna

* Dr. Felder does not use the name *sulphureus* to include the West-African form of *Merope*, expressly observing (*loc. cit.* p. 77) that the agreement of Cramer's figures, made from West-African examples, with the South-African *Merope*, precludes him from considering *sulphureus* a geographical subspecies.

† Cramer's earlier figures (pl. 151. figs. A, B) represent *Merope* without tails. This may be, as Boisduval suggests, only the result of mutilation; but these processes are known to be a variable character in many species of *Papilio*, and in *Merope* itself vary in size; so that the existence of a form in which they are wanting, or nearly so, need not be thought impossible.

(lat. 33° 59′ S., long. 23° 3′ E.) to Port Natal, the inquiry naturally arises, where is the female of the tropical *Merope*? One might have been at a loss here, were it not for another, and still rarer, isolated ♀ *Papilio* which is found in Southern Africa, viz. *P. Hippocoon*, Fab. (=*P. Westermanni*, Boisd.), and which appears to be rather commoner on the western coast. This butterfly closely resembles *Danais Niavius*, Linn., a common species, which also inhabits tropical Africa and Natal. *Hippocoon* is brought from the same localities as *Merope* in Western Africa, but is very much scarcer in collections. The markings already mentioned as common to *Merope* and *Cenea* recur in *Hippocoon*; and some remarkable intermediate southern examples in my collection appear to indicate some of the stages by which *Hippocoon's* broad white markings may have been gradually modified in the direction of the dominant southern *Danais*, *D. Echeria*, until so different a form as *Cenea* was the result. In various collections, I have examined fourteen specimens of *Hippocoon*, all of which are females.

A third remarkable *Papilio* must be placed as another form of the ♀ *Merope*, viz. *P. Dionysos*, Doubl.*, a very rare insect inhabiting Western Africa. I had long regarded this butterfly as probably connected with the curious series of forms under consideration, even when I knew it only from the figure in the 'Genera of Diurnal Lepidoptera;' and my opinion has been strengthened by an examination of the type specimen in Mr. Hewitson's collection †. That example, as well as another larger specimen recently received by Mr. Hewitson from Old Calabar, is a female. These two specimens come nearer to *P. Hippocoon* than to any other butterfly; but their colouring is very singular, the larger white space of the fore wings extending the whole length of the inner margin, and being scarcely separated from the subapical white bar by some blackish scaling, while the hind wings are wholly warm yellow-ochreous, except the white-spotted black hind-marginal bordering. On the underside, however, the dull ochre margins of the wings, and the internervular streaks, are like those of *Hippocoon*; and the apical spot in the fore wings, as well as the markings of the body, present no difference. But the strongest proof of the most intimate affinity between the two forms is afforded by a third female specimen, which accompanied that just mentioned from Old Calabar; for in this example the characters of *Hippocoon* and *Dionysos* are unmistakably blended, the markings of the fore wings being precisely those of the former (except that the inner marginal white extends rather further into the wings), while the yellow tint of the hind wings, though paler, is like that of the type *Dionysos*.

The fourth form of the ♀ *Merope* is that described and figured by Professor Westwood ‡ under the name of *Papilio Trophonius*, and suggested by him as possibly the female of *P. Cenea* §. In this form the markings quite agree in size and shape with

* Gen. Diurn. Lep. pl. 3. fig. 4.

† I take this opportunity of recording my warmest acknowledgment of the courtesy and liberality with which Mr. Hewitson has given me unlimited access to his fine collection. I am also indebted to Mr. Bates, Mr. Butler, Mr. Salvin, Mr. Wallace, and Professor Westwood for similar kind assistance.

‡ Arcana Entomologica, i. p. 163, pl. 39. figs. 1, 2.

§ This view of the sexes was adopted by Doubleday, without query, in the 'Genera of Diurnal Lepidoptera;' and upon this authority I unfortunately, without investigation, perpetuated the error in Part I. of my 'Rhopalocera

those of the southern examples of *Hippocoon*; but the hind wings and the broad inner-marginal space in the fore wings are coloured *brick-red* instead of white; and the butterfly thus becomes a very fair imitation of *Danais Chrysippus* *. This form of ♀ is even rarer than *Hippocoon*, the number of specimens that I have seen in collections being seven only, including two that I had the good fortune to capture in the Cape Colony, one at Knysna, and the other at Plettenberg Bay †. Professor Westwood (*loc. cit.*) states that *Trophonius* is a native of Guinea as well as Kaffraria.

We have thus, as it appears to me, a most remarkable case of polymorphism in the female of *Papilio Merope*—three of the four forms being direct mimickers respectively of three prevalent African species of *Danais*, while the fourth, differing from all the others, yet closely related by an intermediate variety to one of them, is probably modified, or in course of modification, in mimicry of some other protected butterfly, possibly not a *Danais* ‡.

But another point remains for consideration. *Papilio Merope* (or its close ally) in Madagascar, presents a female *tailed and coloured like the male*, and differing only in the possession of a broad black bar on the costa of the fore wings, almost crossing the discoidal cell. That this is the rule in Madagascar cannot be doubted, as Mr. Plant's collection contained a series of females presenting little or no variation. The examination of a number of examples from the island in question leads me to think that the form there prevalent is constant in both sexes, and entitled to rank as a distinct species §. But whether we accord or refuse specific rank to *P. Meriones* matters little to those who hold that unmistakably close alliance between two or more forms is at once the result and evidence of community of descent. Place the males from the island side by side with those from the continent of Africa, and perhaps few would be disposed to regard the former as specifically distinct from the latter; and yet we find the female of

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Africæ Australis,' published in 1861. Hopffer has recently (Stett. ent. Zeit. 1866, pp. 131–132) corrected the mistake, pointing out that females of both forms are in the Berlin Museum.—*Vide* 'Zoological Record' (1866), p. 451.

* A curious example, taken (in company with *P. Merope*) near St.-Lucia Bay in South-eastern Africa, by Col. Tower, of the Coldstream Guards, is to some extent intermediate between the *Trophonius* and *Hippocoon* forms, the broad whitish spaces being obscured throughout with a dull-ochreous tint.

† It is worthy of notice that on each occasion of my meeting with *Trophonius*, I took, in the same spot, a specimen of the *Cinea* form of ♀.

‡ It may be objected that, in the strict sense of the term, this is not a true case of polymorphism, seeing that intermediate varieties still occur which more or less connect the different forms. I am willing to admit that the phenomenon is not yet absolutely complete; but the three forms that imitate the three species of *Danais* are already so marked that the elimination of the few individuals of intermediate or unstable character, that serve to link to some extent two or more of those forms, will probably be the work of no very extended period.

§ In the insular form, the black border of the *fore wings* forms much sharper projections inwardly on the nervules, and the costal edging is brownish instead of black, in the ♂ never extending below the subcostal nervure. The band crossing the *hind wings* is always widely interrupted in two places, and the intermarginal black edging is wanting, while the tails are all fuscous except the broad ochreous tip. On the *underside*, the ochreous colouring is rather paler and more rufous in tint; and in the ♀ the *hind wings* are clouded from the base, over the disioidal cell, and the inner-marginal region with brownish. The spots of the head and thorax are yellowish, and in the ♂ almost concealed by a clothing of brownish hairs; and the abdomen is without the ordinary dark spots (save some very faint traces in the ♂), being coloured almost uniformly of the same pale yellow as the upper surface of the wings.

the insular race constant to one pattern, and not differing greatly from the male; while the African female presents four distinct forms (besides certain intermediate varieties), not one of which resembles the male. It would appear reasonable to argue from this that Madagascar was the original starting-point of this type of *Papilio*, and that the harder and more complex conditions of African life, causing a severer persecution, had occasioned a necessity for the less active, and perhaps, as now, scarcer ♀ to assume the protective colouring and outline of the surrounding *Danaidæ*. Yet the very wide dispersion of this butterfly over the continent seems rather to indicate that the original form of *Merope* was of African derivation, and at one time had extended to Madagascar, possibly before that region became insulated, but that since that period, during slowly-changing conditions of life, natural selection has induced the elimination in Africa of all the pale, conspicuous females of the male coloration, only preserving those that more or less resembled the protected *Danaidæ*,—while in Madagascar the female, in the absence of any keenly persecuting agency, has retained the form and colour possessed by the first immigrants from the continent. In the broad black costal bar of the fore wings which distinguishes the female in Madagascar, regarded in relation to the hind-marginal black border, it is not difficult to recognize the material upon which natural selection might gradually work, to the ultimate production of a Danaidiform butterfly like *Hippocoon* or even *Cenea*; and it is remarkable that, in all the African forms of the female, an oblique, narrow, whitish marking remains near the extremity of the discoidal cell of the fore wings, in a position exactly corresponding to the outer border of the costal bar, as if to record, with the other pale spots and markings, how the black of the margins had gained upon the ground-colour as the process of increasing resemblance to *Danais* was slowly wrought out.

Returning to the subject, from which this has been so lengthy a digression, it is worthy of note that the mimicking *Diadema* above described seems only to occur at Natal, and correctly copies the variety of *Danais Echeria* which is there prevalent, viz. that which has all the spots of the fore wings white.

4. Danais Niavius, Linn. (Tab. XLII. fig. 6.)

Danais Niavius, Syst. Nat. ii. p. 766. no. 109 (1767); Cram. Pap. Exot. t. 2. figg. E, G.

This is an abundant butterfly in Tropical Western Africa; but the only special localities that I have found recorded for it are Sierra Leone, Ashanti, and Angola. In the two former of these districts occur two very accurate imitators of *Niavius*, viz. *Diadema Anthedon*, Doubl., and the prevalent West-African form of the ♀ *Papilio Merope* (*P. Hippocoon*, Fab.). The *Papilio* has also been received from Calabar.

It is to this striking case of mimicry that Boisduval refers in the passage which I have quoted at the head of this paper. He mentions, it is true, *Diadema dubia*; but this is owing to the confusion that has prevailed regarding the closely allied mimetic *Diademæ*, *D. Anthedon* being the species concerned, and being easily distinguished by the very large inner-marginal white patch, and broad subapical bar of the fore wings. Cramer, as Prof. Westwood has pointed out (Arc. Ent. i. p. 152), figured the *Papilio* as the ♀ *Niavius*, in his Plate 234. fig. A; and Palisot de Beauvois subsequently did the same

(Ins. recueillis en Afrique, &c. t. vi. figs. 1 *a*, 1 *b*). *Danais Niavius* is not confined to West Africa, but also inhabits Natal, where it constantly presents broader white markings, particularly in the hind wings * ; and it is most interesting to find that both the *Diadema* and the *Papilio* in that part of Africa vary in exactly the same manner from the tropical type-form. *Diadema Anthedon* † has been taken at St. Lucia Bay by Col. Tower, and is recorded from the Querimba Islands by Hopffer (in Peters's 'Reise nach Mossambique,' p. 385); and there can therefore be little doubt of its occurrence in company with *Niavius* in the intermediate Zambesi region.

I did not find this *Danais* commoner than the *Diadema* at Natal, during my visit in the early part of 1867; but Mr. M'Ken, the Superintendent of the Botanic Gardens at D'Urban, informed me that it was more plentiful at another season of the year. So close is the resemblance between this butterfly and *Diadema Anthedon* on the wing, that I was never certain as to which butterfly I had captured, until close examination had been made. The *Hippocoon*-form of the ♀ *Papilio Merope* seemed very rare at Natal, one example only being taken, by my Kafir collector, near D'Urban. As far as my present knowledge extends, however, this form of the female *Papilio* appears to range further southward than either the *Danais* or the *Diadema*; for I have seen two examples captured in Kaffraria proper by Mr. J. H. Bowker, and another taken near Grahamstown by Mrs. Barber. The ♂ *Papilio Merope*, it should be observed, as well as the *Cenea*-form of ♀, occurs in both those localities, and as far to the south and west as the Knysna River.

5. Danais Chrysippus, Linn. (Tab. XLII. fig. 5.)

Danais Chrysippus, Syst. Nat. ii. p. 767; Cram. Pap. Exot. t. 118. figg. B, C.
Var. A. *Alcippus*, Cram. *op. cit.* t. 127. figg. E, F.
Var. B. *Dorippus*, Klug, Symb. Phys. pl. 48. figs. 1–5.

This well-known species seems to inhabit the whole of Africa, ranges through southern Asia from Syria to Hongkong, and is recorded from Java, Ceram, and Timor, in the Malayan Archipelago. It even extends into Southern Europe (Greece and Turkey), and, according to Godart, has been taken at Naples. It presents two varieties,—one (*Alcippus*, Cr.) in which the disk of the hind wings is more or less suffused with white; the other (*Dorippus*, Klug) in which the black apex of the fore wings, and its oblique white bar, are obliterated by the brick-red ground-colour ‡. Both these varieties seem to be most frequent in Africa, *Alcippus* being known from four, and *Dorippus* from three different parts of that continent. It is needless to dwell upon the very striking

* An example of this southern variety was brought from the Zambesi by the Rev. H. Rowley, and is now in the Hope Museum at Oxford.

† In my 'Rhopalocera Africæ Australis,' pt. ii. p. 338, I have given *Anthedon* as a synonym of *dubia*. This is an error, into which I was led, in the absence of specimens of *dubia*, by Boisduval's description (Faune Ent. de Mad. &c. p. 40), and by his mention of *dubia* as having a special analogy with *Danais Niavius*.

‡ The type of Klug's *Dorippus*, figured in 'Symbolæ Physicæ' (*loc. cit.* figs. 1–4), consists of examples of both sexes, from New Dongola and Ambukhol, on the Nile in Lower Nubia, which present both the red suffused apex of the fore wings and a broad white suffusion over the disk of the hind wings. The "variety" of the male, however (fig. 5), wants the white in the hind wings, but has a dull fuscous shade over the basal half of both wings.

resemblance borne to *Danais Chrysippus* by the female *Diadema Bolina*, Linn., as this is one of the most generally known cases of mimicry in existence. The *Diadema* accompanies the *Danais* throughout its range, with the single exception of the European shore of the Mediterranean—and is even recorded from Australia and South America *, regions in which *Chrysippus* does not occur. It is very seldom that one receives a collection, however small, containing *Chrysippus*, in which *Bolina* is absent. I have been careful to note all the recorded localities of specimens of both butterflies that have come under my notice, and find that the two coexist in twenty-two different localities, in addition to which there are seven instances of their occurrence in closely adjacent districts †. Still more interesting is the fact that the ♀ *Diadema* presents two varieties exactly corresponding with the varieties of *Chrysippus* mentioned above, viz. one in which the hind wings are more or less clouded with white, and another (*Inaria*, Cram.) that has the apical black and white of the fore wings replaced by the brick-red ground-colour ‡. In each of these cases, I have not succeeded in finding more than one locality where the variety of *Chrysippus* is known to be accompanied by the corresponding variety of *Bolina*, viz. Sierra Leone, where the white-clouded form of both butterflies occurs, and D'Urban, Port Natal, whence I have both *Dorippus* and *Inaria*; but there seems little reason to doubt that they are to be found together in many other places, when we consider how widely the varieties of both insects range.

In nature, the imitation of *Chrysippus* by the ♀ *Bolina* is singularly deceptive, as well when the butterfly is settled on flowers as when it is on the wing; and it requires a keen eye and close observation to distinguish one insect from the other. I am disposed to imagine that the closeness of the mimicry even deceives the male *Chrysippus*; for, on one occasion, at Port Natal, in a spot where the *Danais* was abundant, I was for some time watching two females of *Bolina* that I had carefully marked, and was as much surprised as interested to observe a *Chrysippus* pertinaciously chase one of the *Bolinæ* about the place. The female *Diadema* naturally gave *Chrysippus* no encouragement, and, being more active on the wing, repeatedly evaded her pursuer §. Waiting to see the close of this singular chase, I unfortunately lost sight of the *Chrysippus* among the other specimens floating about; but I captured the ♀ *Bolina*, and have no doubt that the pursuer was of the male sex.

I have already noticed the rare form of the female *Papilio Merope* (*P. Trophonius*, Westw.), which mimicks *D. Chrysippus*. This imitation is not by any means as close

* Regarding the latter region, it seems to be doubtful whether *D. Bolina* has succeeded in naturalizing itself in any of the localities mentioned by authors; but the insect certainly appears to have been taken in Guiana (Boisduval and Doubleday), Surinam (Cramer and Boisduval), Cayenne (Godart), and Pará (Hopffer).

† Even in the oceanic islands to which *Chrysippus* extends, such as St. Helena (Coll. Burchell), Bourbon, and Mauritius, *Bolina* appears as its constant companion; but I have not heard of the latter's occurrence in Teneriffe, where *Chrysippus* has been taken.

‡ Similarly to Klug's type of *Dorippus*, the *Inaria*-form of the ♀ *Bolina* is sometimes found with a white suffusion on the hind wings.

§ The ♂ *Bolina*, when pursuing the female, keeps a little below her, with his wings constantly and rapidly quivering, while the female slowly rises, with little motion of the wings, towards the summit of some adjacent tree. Mr. J. H. Bowker observed this in Kaffraria, in the year 1863; and I have since noticed he same in Natal.

as that by *Diadema Bolina*, but it is sufficiently near to deceive the collector when the butterfly is on the wing. Until they settled on flowers, when the tremulous motion of the wings at once betrayed their disguise, I mistook both the examples of this *Papilio* that I captured for *Chrysippus*.

In Western Africa (Ashanti) occurs a fine Nymphalide, *Romaleosoma Eleus*, Dru., the colouring and pattern of the female of which show a strong, but far from exact resemblance to those of *D. Chrysippus*, the principal element of difference being the possession by *Eleus* of a broad black band, containing conspicuous white spots, which borders the hind wings. There is, however, in the British Museum, a variety of the ♀ *Eleus*, from Congo (in 6° S. lat.), which more nearly approaches the aspect of *Chrysippus*. Compared with the type-form, it is smaller, and with more elongated fore wings; the ground-colour is redder and clearer; the apical black of the fore wings occupies a smaller space, while its white bar is broader; and the border of the hind wings is narrower, though still broad and conspicuous*. Congo is one of the known *habitats* of *Chrysippus*.

6. Acræa Gea, Fab.

♂ *Papilio Gea*, Fab. Sp. Ins. ii. p. 32.
P. Epea, Cram. Pap. Exot. pl. 230. figs. B, C.
♀ *Papilio Iodutta*, Fab. Ent. Syst. iii. 1. p. 175.
♂, ♀. *Acræa Gea*, Godt. Enc. Méth. ix. p. 238.

I have no doubt that Godart rightly considered the *Iodutta* of Fabricius to be the ♀ of that author's *Gea*, as the difference in colour of the pale bands is the only distinction, and there are several instances of allied *Acrææ* in which the fulvous or yellow markings of the male are replaced by white in the female. Doubleday ('Gen. Diurn. Lep.' p. 141) gives the *Timandra* of Jones's 'Icones' as the female of *Gea*, while Godart refers it to *E. Euryta*, Linn. The specimens named *Timandra* in the National Collection agree well with Fabricius's description of *Iodutta*, and are evidently females of *Gea*.

The male has been received from Ashanti, Calabar, and Congo; the female from Sierra Leone and Calabar. Two other butterflies inhabiting both Ashanti and Calabar are close mimickers of this *Acræa*, viz. *Panopea Hirce*, Dru., and the female *Papilio Cynorta*, Fab. (= *P. Boisduvallianus*, Westw.)†. In the *Panopea*, the imitation is twofold, the differing male and female of the *Acræa* being copied by the corresponding sexes of the mimicker; but in the *Papilio* it is the female only that copies (very exactly) the female *Gea*, the male being of a very different pattern as regards the fore wings. In addition to

* *Danais Chrysippus* is not without its mimickers among the eastern *Nymphalidæ*, the most remarkable of which are the Javan *Cethosia Penthesilea*, Cr., and the female of *Argynnis Niphe*, Linn., inhabiting India and China. The *Cethosia* differs widely from *Chrysippus* on the under surface, but the upperside is a very close copy, both in pattern and colours, of that of the *Danais*, differing only in the possession of a submarginal row of spots in the hind wings. The case of the ♀ *Argynnis* is the more interesting from the fact of the sexes being so dissimilar, the male being of the ordinary colouring of the genus.

† I have elsewhere discussed the grounds for considering *P. Boisduvallianus* to be the female of *Cynorta* (see Trans. Ent. Soc.).

the localities named, the *Papilio* has also been found at Sierra Leone and the Gaboon, at the former of which places the *Acræa* occurs.

There is a difference in the outline of the wings between the male and female of *Acræa Gea*, as in many other species of the same genus; and this discrepancy is reproduced in *Panopea Hirce*, the female of which has the fore wings blunter and broader than those of the male. So deceptive is the mimicry of the ♂ *Gea*, by the ♂ *Hirce*, that Godart (*loc. cit.*) quotes Drury's figure of the latter as a representation of the *Acræa*. In the Linnean collection there is a specimen of the *Panopea* labelled "*Acræa Gea*, Fab."; and I found an example associated with a specimen of the same *Acræa* in the Banksian Collection at the British Museum. The figure of "*Euryta*" in Clerck's 'Icones' (t. 31. f. 180), to which Linné refers in the twelfth edition of the 'Systema Naturæ,' is evidently drawn from a female of the same *Panopea**.

This species of *Panopea* further presents several varieties of the female, which agree with no known examples of *Acræa Gea*, but, strangely enough, are very fair imitators of certain varieties of an allied species, *A. Euryta*, occurring in the localities (Calabar and Congo) which they inhabit†. In the British Museum there is an interesting specimen of the female *Hirce*, in which the bands, though paler, are coloured like those of the male. This example only bears the label "West Africa," and I am therefore unable to state whether this apparently rare form of the female occurs in company with that which is white-banded.

Most of the examples of *Melanitis Phegea*, Fab., a member of the *Eurytelidæ*, are mimickers of *Acræa Euryta*; but a female specimen, from Ashanti, in the National Collection (which is, I believe, the type of *M. Bammakoo*, Westw. Gen. D. Lep. pl. 68. f. 3) bears a nearer resemblance to the female *A. Gea* in the position of the subapical bar of the fore wings, and in the extension of the white band of the hind wings over the inner margin of the fore wings.

7. Acræa Euryta, Linn.

Acræa Euryta, Syst. Nat. ii. p. 757. n. 69; Cram. Pap. Exot. pl. 233. figs. A, B.

This is a most variable species in both sexes. Mr. Hewitson has recently (October, 1867) devoted two plates of his 'Exotic Butterflies' to the delineation of the principal varieties‡. It is not unlikely that a knowledge of the stations and habits of these but-

* Mr. Butler, who kindly pointed this out to me, has suggested that the *Panopea* should stand as *P. Eurytus*, Clerck, this name being older than Drury's. But it seems clear that Clerck figured the insect in the belief that it was Linné's *Euryta*, which is an *Acræa*; and it thus appears to me desirable, especially with the view of avoiding confusion in names, to retain the appellation of *Hirce* for the *Panopea*. Linné's description, too, as Mr. Hewitson remarks ('Ex. Butt.' Oct. 1867), accords with the *Acræa*, notwithstanding that he quotes Clerck's figure.

† Mr. Hewitson, who has already, in his 'Exotic Butterflies' (part for October, 1867) delineated the varieties of *Acræa Euryta*, and in whose collection I saw these singular varieties of *P. Hirce*, is about to publish the latter also; and I therefore refrain from more particularly describing the imitations in question.

‡ After examining Mr. Hewitson's fine series of this butterfly, I am disposed to agree with him that it is at present impossible to separate the numerous forms which he has figured, with the exception of the female shown in the second plate, fig. 29, which appears to be a distinct species.

terflies would enable us to distinguish several local races, if not distinct species; but, with the scanty information at hand, the attempt to do so would prove of little value.

As already mentioned, certain varieties of this abundant *Acræa* (which is known to inhabit Sierra Leone, Ashanti, Old Calabar, the Gaboon, and Congo) are the objects of imitation by varieties of *Panopea Hirce*, ♀, received from Congo and Old Calabar. The particular varieties of the *Acræa* that are so imitated are known to inhabit the same localities as the mimickers.

Another imitator is the scarce Eurytelide, *Melanitis Phegea*, Fab. This butterfly, like others of its family, is marked on the underside of the wings with numerous short transverse lines; and it is interesting to observe how, at the base of the hind wings, several of these lines are confluently grouped, in manifest imitation of the spots which occupy the same position in the *Acræa*. The fulvous-marked examples of *M. Phegea*, of which I have seen two, appear to be males; but the variety of *Euryta* which they most closely resemble is a female, figured by Mr. Hewitson (*loc. cit.* f. 30), in which the fulvous bar of the fore wings is rather narrow and with an ochreous tinge, and the inner margin coloured with fulvous. The white-banded females of the *Melanitis* copy the ♀ *Acræa* figured on the same plate (f. 31), which has the band of the fore wings rather broader than usual, and that of the hind wings, with the inner margin of the fore wings, slightly tinged with yellow. *M. Phegea* has been brought from Old Calabar and Ashanti, as well as from other West-African regions not specially recorded.

8. Acræa Aganice, Hewits. (Tab. XLII. fig. 2.)

Acræa Aganice, Hewits. Exot. Butt. ii. pl. 6. f. 3; Trimen, Rhop. Afr. Austr. i. p. 109. n. 69.

This *Acræa* is closely related to *A. Euryta*, Linn., differing chiefly in the smaller size and distinct coloration of the male, which has the pale bands yellowish, or yellowish white, instead of fulvous. It is only known to occur in the South of Africa, inhabiting Kaffraria proper and Natal, and is accompanied in the latter district by a mimicking *Panopea*, which is nearly allied to *P. Lucretia*, Cram., and which I have recently described, in the Transactions of the Entomological Society of London, as *P. Tarquinia*. I mentioned (*loc. cit.*) the fact of this Nymphalide flying in the same woods with *Acræa Aganice*, and have noted its rarity*, and how completely in general appearance and habits it resembles its model. When, however, the insects are closely compared, the mimicry is not so striking, as the *Panopea* possesses an additional small whitish bar near the apex of the fore wings; but this is a subordinate feature, not noticeable when the butterfly is on the wing.

9. Acræa Lycoa, Godt.

Acræa Lycoa, Godt. Enc. Meth. ix. p. 239. n. 27.

A range of some extent is recorded for this *Acræa*, viz. Sierra Leone, Ashanti, Calabar,

* Since the paper referred to was written, I have seen two other examples of *Tarquinia* in Mr. Hewitson's collection—one from Natal, and the other from the Zambesi. The former of these has much yellower bands than those of the two that I met with in Natal, and evidently copies the yellower examples of *Aganice*.

and Congo. The species may at once be known from its allies by the peculiar pattern of the fore wings—the inferior pale marking running almost parallel with the subapical bar, and nearly to the posterior angle, instead of forming an inner-marginal space adjacent to the band crossing the hind wings. *Panopea Lucretia*, Cram., appears to mimic this *Acræa*; but the resemblance is not so accurate as that between *P. Tarquinia* and *A. Aganice*. Sierra Leone, the Gold Coast near Ashanti, and Calabar are the known localities inhabited by *P. Lucretia*, which seems as rare as *P. Tarquinia*, one specimen in the British Museum, two in Mr. Hewitson's collection, and two in the possession of Mr. Swanzy being all the examples that I have seen.

10. Acræa Zetes, Linn. (Tab. XLII. figs. 8, 9.)

Acræa Zetes, Syst. Nat. ii. p. 766. n. 110.
P. Menippe, Dru. Illustr. N. H. iii. pl. 13. f. 3, 4; Stoll, Suppl. Cr. Pap. Ex. pl. 28. f. 1.
Var. *Acræa Acara*, Hewits. Exot. Butt. iii. pl. viii. f. 14, 15.
Acræa Caffra, Felder, Reise der Novara, ii. p. 369, pl. xlvi. f. 10, 11.

North of the Equator, the type-form of this species has an extensive range on the western coast, but it does not appear to occur further to the south than Fernando Po. Specimens in various collections have been received from the island in question, as well as from Calabar, Ashanti, Cape Palmas, and Sierra Leone. In Southern Africa, the species is represented by a well-marked variety, *A. Acara*, Hewits.*, which differs, on the upper surface, in having all the markings of the fore wings strongly defined (the red ground-colour being wholly free from the almost universal fuscous suffusion so constant in the type), and in possessing a conspicuous subapical ochreous bar. Both in the type-form and in the southern variety, the colouring of the female is universally very much duller and fainter than that of the male.

From Old Calabar and Ashanti a rare and handsome Nymphalide, *Panopea Boisduvalii*, Doubl. (Gen. D. Lep. pl. 37. f. 3, ♀), which closely imitates the type *Acræa Zetes*, has been received. A male from the former district, in the collection of Mr. Hewitson, and a female from the latter, in the British Museum, are the only West-African specimens that I have seen; but these two examples respectively resemble in their differences the dissimilar male and female of the *Acræa*, the female exhibiting an incomplete subapical whitish ray, answering to that of the ♀ *Zetes*.

In Natal *Boisduvalii* reappears†, in company with, and evidently mimicking (in the red and black colouring of the fore wings and their ochreous subapical bar) the *Acara* form of *A. Zetes*; and here, again, each sex of the *Acræa* is copied by the corresponding sex of the *Panopea*. A singular example of the male *Panopea*, taken at Port Natal by

* *Acræa Caffra* of Felder. Mr. Hewitson notes (*loc. cit.*) that *Acara* is "perhaps only an extraordinary variety of *A. Menippe*."

† I have examined eight Natalian specimens in collections, five males and three females. Six of these were taken by Mr. M'Ken, the Superintendent of the Botanic Gardens at D'Urban, who has kindly contributed specimens to the South-African Museum and to my own collection, and who informed me that this beautiful insect is one of the rarest of the native butterflies, but haunts the same spots as *Acræa Zetes*. I saw but one individual (a female) on the wing during my stay in Natal, but did not succeed in capturing it.

Mr. M'Ken, and in the collection of the South-African Museum, is interesting from its entirely wanting the ochreous subapical bar of the fore wings, all the apical region being simply semitransparent fuscous grey (as in the tropical form), though the basal and inner-marginal region has the red ground and black spotting as conspicuous as usual in South-African specimens. This example thoroughly links the southern *Boisduvalii* with the West-African type-form, and seems to indicate that the process of assimilation to the southern form of the *Acræa* has not been fully completed.

Both sexes of the southern *A. Zetes*, but especially the male, exhibit a tendency to whitish suffusion about the discoidal cell and median nervules of the hind wings. Even this slight variation is imitated by the *Panopea*; for the only example, a male, brought from the Zambesi by the Rev. H. Rowley* has some faint whitish clouding in the same part of the hind wings; and a female from Natal, in the South-African Museum, is marked in the same manner.

It is not only on the upper surface that *Boisduvalii* successfully copies *Zetes*; the underside is very effectually imitated, as well as such Acræoid characters as the yellow palpi and the spotting of the thorax and abdomen. Even in outline (the female *Acræa* having less produced and blunter fore wings than the male) *Boisduvalii* is in both sexes a faithful imitator.

11. Acræa Egina, Cram.

Acræa Egina, Cram. Pap. Exot. pl. 39. f. F, G†.
A. Zidora, Godt. Enc. Méth. ix. p. 237.

The principal characters distinguishing this species from its near ally, *Zetes*, Linn., are as follows, viz.: in the *fore wings* the rufous marking near the posterior angle is much enlarged and conspicuous; the innermost of the three black spots in the discoidal cell, the customary ochreous marks along the hind margin, and the whitish-ochreous clouding beyond the costal black bar (all marked characters of *Zetes*) are wanting, and the costal bar itself is much narrower; while, in the *hind wings*, the black spots are larger, more numerous, and grouped nearer to the base, and there are no red spots in the hind-marginal border. These differences prevail in both sexes; but the ♀ is much duller and obscurer than the ♂, and with faint markings.

Like *A. Zetes*, *Egina* inhabits Sierra Leone and Cape Palmas; but it also occurs in Congo. From the latter region only there has been received *Papilio Ridleyanus*, White, a very rare butterfly‡, which, in pattern and coloration, stands alone in its great genus, though apparently belonging to the *Leonidas* and *Cyrnus* group. The likeness which this *Papilio* bears to *A. Egina* is very striking; and on the wing it must with difficulty

* This specimen is in the Hope Museum at Oxford, where Professor Westwood kindly pointed it out to me. I have not found *Acræa Zetes* recorded as a native of the Zambesi country; but the presence of *P. Boisduvalii* (of the southern form) renders it highly probable that *Zetes* inhabits that region.

† The *Egina* of Stoll (Suppl. Cramer, t. 25. f. c, 3 c) is distinct, being a smaller insect, with only a narrow reddish line along the inner margin of the fore wings and a very narrow black hind-marginal edging to the hind wings.

‡ I know of but three examples, viz. a male and female in the British Museum, and a male in Mr. Hewitson's collection.

be distinguishable both from that *Acræa* and from *A. Zetes*. I have been doubtful whether the *Papilio* better mimicked *Zetes* or *Egina*, but, on close comparison, believe the latter to be the special object of imitation, in consequence of the red discal band in the fore wings of *Ridleyanus* evidently copying the corresponding rufous space presented by *Egina*—though the red spots in the border of the hind wings resemble those of *Zetes*, and of *A. Perenna*, Doubl., a native of Ashanti*. The female *P. Ridleyanus* resembles the female *Egina*, not only in its coloration being much duller than that of the male, but (as in the case of *Panopea Boisduvalii* and *Acræa Zetes*) in the blunter, more rounded outline of the fore wings†.

The palpi of the *Papilio* are yellow, like those of the *Acræa*; and the hinder portion of the abdomen of the male is almost wholly yellowish beneath, and marked laterally with spots of the same colour, increasing in size to the extremity, so as to approximate to the colouring of the same part in the male *Egina*, while the paler and more distinct spots on the distended abdomen of the female present a nearer resemblance to the markings of the female *Egina*.

I have now passed under review the most remarkable instances, eleven in number, of mimetic analogies known to occur among the butterflies of Africa‡. It has been shown, (1°) that the mimicking butterflies invariably occur in districts inhabited by the species mimicked, and in six cases (of southern species or varieties) are found in the very same localities; (2°) that, in eight cases, the mimickers are known to be very much scarcer than the species which they copy; (3°) that, in five cases, where the *Danais* or *Acræa* presents local forms, or merely slight varieties, even these are imitated by individuals of the mimicking species; (4°) that, in three cases, where the sexes of the insect mimicked differ remarkably from each other, the sexes of the mimicker present corresponding differences; and (5°) that, in four cases observed by me in nature, it was next to impossible to distinguish the living mimicker from the species which it imitated. In the instance of *Danais Echeria*, I have demonstrated how, in addition to a *Diadema*, no less than three species of *Papilio* copy that butterfly, the two closer mimickers in *Papilio* being females of wholly dissimilar males, and belonging, in fact, to different sections of the genus! In the very remarkable case of the polymorphic *Papilio Merope*, it has been my endeavour to point out how three of the four forms of female in Africa are protected

* *A. Perenna* also has the rufous space near the posterior angle of the fore wings, but it is a considerably smaller insect than either *Egina* or the *Papilio*, and has the fore wings remarkably narrow and elongated.

† In the dull-fulvous suffusion of the hind wings, the ♀ *Ridleyanus* more resembles some female examples of *A. Zetes*.

‡ The vastness of the African regions that have never been entomologically explored renders it almost certain that many other equally striking cases of mimicry remain to be discovered. No part of Equatorial or even Tropical Africa has yet been searched by a competent lepidopterist—the collections transmitted to Europe from the western coast and other parts having been formed by persons who collected at random, with little, if any, care to record special localities or stations. Some idea of the Rhopalocerous riches of the region within a few degrees of the equator may be formed from an inspection of the third volume of Mr. Hewitson's 'Exotic Butterflies,' in which plate after plate is filled with figures of new species from Old Calabar, the fruit of the labours of a single collector, who, but for a short time and in a limited area, entomologized in that district.

by wearing the aspect, respectively, of three prevalent species of *Danais*; while the Madagascarene *Papilio Meriones*, so closely allied to *P. Merope* as to be regarded by most authors as merely a local race of the latter, presents but one form of female, not greatly differing from the male.

Such results as these, confirming and supplementing, as they do, the similar series of facts observed by Mr. Bates in Equatorial America, as well as those tabulated by Mr. Wallace in reference to India and the Malayan archipelago, are of the deepest significance. Inexplicable as they must ever remain when regarded on the theory of the independent creation of all organic beings precisely as we now behold them, they become clearly intelligible when viewed as the natural consequences of the innate variability of species, and the preservation and development by inheritance, through all time and under all changes of surrounding conditions, of every successive variation advantageous to the organism originating it. In the infinitely complicated "struggle for life," any advantage, however slight, inevitably has its effect; and the individuals possessing it will not only hold their ground to the exclusion of less fortunate competitors, but will transmit the precious quality to some at least of their descendants. The process by which natural selection gradually effects those innumerable protective resemblances of which these mimetic analogies among butterflies form but a small portion, has been so ably traced by distinguished naturalists, that it is unnecessary for me to attempt what could at best be but a repetition of arguments already adduced; but I may be permitted, in conclusion, to express my conviction of the harmonious relation in which the theory of the mutability and gradual origin of species stands in regard to what is now universally admitted respecting inorganic nature. No one disputes, at the present day, that the crust of the earth has undergone profound changes both structurally and chemically; but who is now found attempting to account for these mutations on the exploded theory of vast convulsions of nature or general cataclysms? It is conceded on all hands that the known forces and agencies at work under our eyes are sufficient, in the lapse of ages, to account for all the past changes, however stupendous, of which the records remain; but, with a strange inconsistency, any suggestion of gradual change in the incomparably more plastic and variable organic world is too often rejected with incredulity or disdain; and many men of science still cling to the theory of successive whosesale destructions and as sudden creations to account for the extinct organisms revealed by palæontology.

It may, with confidence, be predicted that the day is not far distant when such discordant views of Nature will be unknown in the scientific world; for the progress of discovery proclaims, with ever-increasing force, that the famous axiom *Natura non facit saltum*, is a truth of universal application, and that it is as impossible to sever the life of the present from that of the remotest past as to interpose a barrier between the present and the unknown future.

EXPLANATION OF THE PLATES.

The Plates partially illustrate the most striking cases of Mimicry among South-African Butterflies,—Plate I. consisting chiefly of the species of *Danaidæ* and *Acræidæ* that are the objects of imitation, and Plate II. of the imitating forms belonging to other families.

Plate I.

Fig. 1. *Papilio Meriones*, Felder, ♀, from Madagascar.

The black costal bar in the fore wings indicates how the extreme disparity between the sexes of the very closely allied *Papilio Merope* of the African continent may have originated.

Fig. 2. *Acræa Aganice*, Hewitson, ♂, from D'Urban, Natal.

This species is mimicked by the following, a member of the Family Nymphalidæ, viz.:—

Fig. 4. *Panopea Tarquinia*, Trimen, ♂, from D'Urban, Natal.

Fig. 3. *Danais Echeria*, Stoll, ♂, from Knysna, Cape Colony.

The type-form, prevalent in the Cape Colony, but scarcer to the eastward of it, and rare in Natal.

Fig. 7. *Danais Echeria*, Stoll, var., ♀, from D'Urban, Natal.

This variety prevails in Natal, almost to the exclusion of the type-form.

Fig. 6. *Danais Niavius*, Linn., var., ♂, from D'Urban, Natal.

A Southern form, differing from the Tropical West-African type in the much larger white space of its hind wings.

Plate II.

Fig. 1. *Papilio Merope*, Cramer, ♂, from Knysna, Cape Colony.

Fig. 3. *Papilio Merope*, Cramer, 1st form of ♀, from Knysna, Cape Colony. (*P. Cenea*, Stoll.)

Mimics the type-form of *Danais Echeria*.

Fig. 4. *Papilio Merope*, Cramer, 1st form of ♀, from D'Urban, Natal. (*P. Cenea*, Stoll., var.)

Mimics the Natalian variety of *Danais Echeria*.

Fig. 7. *Diadema mima*, Trimen, n. sp., ♂, from D'Urban, Natal.

Also mimics the prevalent variety of *Danais Echeria* in Natal.

Fig. 2. *Papilio Merope*, Cramer, ♀, variation, from Tsomo River, Kaffraria.

Intermediate between the 1st form of ♀ (*P. Cenea*, Stoll.) and the 2nd form (*P. Hippocoon*, Fab.), and indicative of the yet unstable character of the polymorphic ♀ *Merope*.

Fig. 6. *Papilio Merope*, Cramer, 2nd form of ♀, from Graham's Town, Cape Colony. (*P. Hippocoon*, Fab., var.)

Mimics the Southern form of *Danais Niavius*, and, like the latter, differs from the West-African *Hippocoon* in the much larger white space of its hind wings.

Plate I.

Fig. 5. *Danais Chrysippus*, Linn., ♀, from Cape Town, Cape Colony.

Fig. 8. *Acræa Zetes*, Linn., var., ♂, from Pietermaritzburg, Natal.

A Southern form, *A. Acara* of Hewitson, differing from the Tropical West-African type in the bright, unsuffused colouring of the upper surface of the fore wings.

Fig. 9. *Acræa Zetes*, Linn., var., ♀, from D'Urban, Natal.

The ♀ of the Southern form, *Acara*, Hewitson.

Plate II.

Fig. 5. *Papilio Merope*, Cramer, 4th form of ♀, from Knysna, Cape Colony. (*P. Trophonius*, Westwood.)

Mimics *Danais Chrysippus*, which is abundant at Knysna and throughout the Colony.

Fig. 8. *Panopea Boisduvalii*, E. Doubleday, var., ♂, from D'Urban, Natal.

Mimics the ♂ of the Southern form of *Acræa Zetes*, and, like that insect, differs from the Tropical West-African type in the bright colouring of the fore wings.

Fig. 9. *Panopea Boisduvalii*, E. Doubleday, var., ♀, from D'Urban, Natal.

Mimics the ♀ of the Southern form of *Acræa Zetes*.