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INCLUDING

CEYLON AND BURMA

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BUTTERFLIES.

VOL. I.

BY

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AUTHOR'S PREFACE.

THE study of butterflies, even of Indian species, has progressed largely during the thirty years or so which have elapsed since the publication of Bingham's work in this series. During the past ten years it was felt that a revision of Bingham was necessary, even though the work of Evans, in 1932, helped to fill the gap to a great extent.

Much new knowledge of the subject has been acquired since 1907, and the work of co-ordinating this has involved the almost entire re-writing of Bingham's work, though many of the original descriptions have been used.

In recent years a study of the works of the older naturalists has resulted in new ideas on the subject of nomenclature; and in consequence a number of names hitherto well known to students have had to be changed. In accordance, too, with the increase in our knowledge of the various groups, it will be found that the classification differs in some respects from that adopted in most works hitherto. On the other hand, the arrangement of species is much the same as that adopted by Evans, already an advance upon older systems.

All available information upon the habits and life-history of the species has been incorporated in the volume. The early stages of many species still remain unknown, and much information of other kinds is still lacking. For example, the exact limits of distribution of many forms still remains to

be worked out, as well as the extent to which subspecies overlap and the nature of various individual forms. There is much confusion in the genus *Parnassius*, and this is unlikely to be cleared up until more intensive collecting can be done in the higher Himalayan valleys, and adequate data obtained. It is not enough to have the name of a locality and the month of capture : it is also important to know what forms actually fly on the same ground. Our knowledge of geographical races is, in many cases, still inadequate. It has thus been impossible in this volume to give full details of distribution : a species which may be regarded as rare over a certain area may yet be quite common in a few restricted places.

The Introduction to this volume has been considerably extended to cover the entire range of the subject. No similar account is to be found in any single entomological text-book, and only in the work of Evans (1932) was the subject treated at all fully. This latter work has served as a basis for the present Introduction.

The illustrations are from a variety of sources. Those used in Bingham's work have been, for the most part, used again, and a few errors have been corrected. Owing to the large number of figures in the text—in the opinion of the author a very desirable feature—the number of coloured plates has had to be curtailed. Plates I and II are from drawings generously presented by T. R. Bell, Esq., C.I.E., and Plate III is reproduced from Bingham.

Text-figures were taken from the following sources (full titles of the papers concerned will be found in the Bibliography) :—

Specimens in the British Museum, drawn by Miss D. Fitchew. —Figs. 7, 29 *a*, 33, 34, 35, 42, 47, 48, 111, 117, 119, 121, 122, 124, 125, 127, 129, 137, 139, 145, 146, 147, 150, 155, 158, 161, 166, 171, 172, 180, 184.

Avinoff (1916).—Figs. 78, 80, 81, 86, 86 *a*, 89, 90, 91, 92, 94, 95, 101, 104.

Bang-Haas (1927).—Figs. 76, 77, 84, 99, 103, 105.

Bell (1909).—Figs. 1, 157, 160, 162, 164.

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Gosse (1883).—Figs. 11, 12 *d*, *e*, 13, 14, 16, 19 *c*, 30, 31, 37 *b*, *c*, *d*, 38 *b*, *c*, 39, 43, 45, 49, 51, 61, 62, 63.

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Talbot (1929–1937).—Figs. 6, 114, 115, 124 *a*, 126 *c*, 128, 130, 131, 132, 133, 134.

Tytler (1926).—Figs. 72, 73, 74, 79, 82, 85, 98.

Verity ('Rhopalocera Palæarctica').—Figs. 71, 75, 83, 88, 93, 96, 97, 102, 106, 107.

The structural fig. 8 was drawn by Mr. N. Bennett from specimens dissected by him.

Acknowledgements are tendered to the following for kind permission to reproduce figures:—

The Trustees of the British Museum (Natural History) for the loan of specimens, and some original drawings from Part VI of Talbot's 'Monograph of *Delias*.'

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The Bombay Natural History Society, in respect of the figures from Bell and Tytler.

The Raffles Museum, Singapore, and H. M. Pendlebury, Esq., for the loan of the blocks for fig. 173.

Dr. K. Jordan, F.R.S., Herr O. Bang-Haas, and Dr. R. Verity.

I have pleasure in acknowledging the very kind and ready help received from Brigadier W H. Evans, C.S.I., C.I.E., D.S.O., etc., and from the Authorities of the British Museum (Natural History). Without help from these sources the book could scarcely have been written. Permission to make free use of his work on 'The Identification of Indian Butterflies' was accorded by Brigadier Evans, who also prepared the Table of Faunistic Areas given in the Introduction.

In the work of preparing the Introduction I am especially grateful to Dr. B. M. Hobby, M.A., D.Phil., F.R.E.S., for kindly reading through the manuscript and making most helpful suggestions. In this connection, too, I desire to thank N. D. Riley, Esq., F.R.E.S., Dr. A. S. Corbet, D.Sc., Ph.D., F.I.C., F.R.E.S., and Brigadier Evans.

Finally, I should like to thank the editor, Lieut.-Colonel R. B. Seymour Sewell, C.I.E., Sc.D., F.R.S., for his kindly co-operation, and the printers for their very careful reading of the proofs.

G. TALBOT.

5th December, 1938.

GLOSSARY.

Aberration.—A form that departs in some striking way from the normal type, occurring either singly or, rarely, at irregular intervals.

Adnervular.—Placed against a vein of the wing.

Ædeagus.—The sclerotized outer sheath of the penis.

Æstival.—Occurring in summer.

Allotype.—When a specimen of either sex is chosen as the holotype, a specimen chosen to represent the opposite sex becomes the allotype.

Anal angle.—The tornal area of the hind wing, or the angle between the inner and outer margins of the hind wing.

Anal ring.—A term for the vinculum (*q.v.*).

Androconia.—Scent-scales; specialized scales of peculiar form found on the wings of some butterflies.

Anellus.—A sclerotized structure supporting and often surrounding the terminal part of the ædeagus; it may also articulate with the bases of the valves, and its ventral part, in so doing, often forms a median plate below the ædeagus, which is called the *juxta*.

Antennæ.—Segmented movable appendages of the head; often called feelers.

Anterior.—In front; before.

Apex.—Applied to the anterior distal extremity of the wing.

Apiculus.—Applied to the hook of the antennæ of Hesperiidæ, comprising the segments distad of the angle.

Area.—The space between two veins of the wing; also called interspace or cellule.

Base.—Applied to the part of the wing nearest the body.

Bionomics.—The habits, breeding, and adaptations of living forms.

Bursa copulatrix.—A large sac for holding the sperms, found in the ♀ genitalia.

Carinate.—Keel-like.

Cell.—Applied to the large area in the centre of the Lepidopteron wing from which most of the veins arise; also called basal cell, discoidal or discal cell.

Cellule.—The space between the veins of the wing; also called area or interspace.

Chætotaxy.—The arrangement of the hairs and setæ on a larva.

Chalaza.—A small tubercle bearing a seta at its apex.

Chitin.—A substance forming the main constituent of the insect integument. See also *Sclerotin*.

Chorion.—The outer hard layer protecting the egg, usually called the egg-shell.

Chrysalis.—The pupa of a butterfly.

Cilia.—Applied to the fringe of scales along the edges of the wings; also any fringe of fine hairs. (Sing., cilium.)

Claspers.—In larvæ, applied to the anal prolegs; also organs of the ♂ genitalia. Also called valves (*q.v.*).

Clypeus.—A fixed sclerite above the labium or upper lip.

Cornuti.—Slender, heavily sclerotized spines, occurring on the eversible membrane of the penis.

Costa.—The anterior margin of the wing.

Cotype.—Any one of all the specimens before the describer when a species is named, no single one of which is selected as the type.

Coxa.—The segment by which the leg is articulated to the thorax.

Cremaster.—An anal process of the pupa by which it is attached.

Crochets.—Minute hooks on the soles of the prolegs of larvæ.

Dimorphism.—A difference in form, colour, etc., between individuals of the same species, characterizing two distinct types which occur in the same area.

Discal.—Pertaining to the disc of the wing; applied to a wing-marking which is placed at or near the centre of the wing, and is entirely or partly included within the discal cell.

Discocellulars.—Veins closing the cell of the wing; also called cross-veins.

Distad.—Toward the distal end.

Distal.—The part farthest from the body or base; opposed to proximal.

Dorsad.—In the direction of the dorsum or back of an insect.

Dorsum.—The posterior margin of the wing; also called the inner margin.

Ecdysis.—The act of "moulting" or casting the skin by the larva.

Egg.—The fertilized ovum.

Emarginate.—Notched; with an obtuse, rounded or quadrate section cut from a margin.

Emergence.—The escape of a winged insect from its cocoon, pupal case or nymph.

Epicranium.—The main dorsal part of the head of the imago.

Expanse.—The distance between the apices or other widest point of the wings when fully spread. Usually obtained by doubling the distance between the apex of the fore wing and the centre of the thorax.

Falcate.—Sickle-shaped; convexly curved; of a wing, when deeply excavated below the apex so as to leave the latter acute and a little curved.

Femur.—The leg segment between the trochanter and tibia.

Fold.—A furrow in the wing membrane, lying between the veins.

Form.—Any representative of a species which differs from the normal or type in some uniform character, and with which it interbreeds.

Frenulum.—A stiff bristle or group of hairs on the base of the costa of the hind wing in moths, which fits into the retinaculum (*q.v.*).

Fringes.—The edging of scales or hair on the outer margins of all wings, extending well beyond the margin.

Frons.—The front part of the head above the clypeus ; the face.

Galea.—The inner lobe of the maxillæ.

Geminate.—Arranged in pairs composed of two similar parts.

Geniculate.—Applied to an antenna which is bent in elbow fashion.

Genital plate.—In the ♀ a sclerotized area bearing the copulatory aperture.

Genotype.—The species upon which a genus is based, and which is designated as the type of the genus.

Glazed eye.—The smooth portion of the eye of a pupa.

Gnathos.—A ventral subanal process in the form of a sclerotized arch which is hinged by a membranous base to the ventral side of the 10th segment in some butterflies.

Gonopore.—In the ♀ genitalia a small opening situated beneath the anus, through which oviposition takes place.

Gynandromorph.—An individual of one sex which exhibits on one lateral half the organic characters of the other, more or less completely.

Harpe.—In the ♂ genitalia a sclerotized process of the valve.

Haustellum.—The tongue ; also called the proboscis.

Hermaphrodite.—An insect in which both ♂ and ♀ organs are present.

Histolysis.—The breaking down of tissue.

Holotype.—The single specimen selected by the author of a species as its type, or the only specimen known at the time of description.

Homonym.—One and the same name for two or more different things. (See *Primary* and *Secondary homonyms*).

Imaginal buds.—Groups of special cells formed in the pupa and from which the imaginal tissues are built up.

Imago.—The sexually adult stage of an insect. (Pl., imagines).

Incrassate.—Thickened ; rather suddenly swollen at some one point, especially near the tip.

Inner margin.—The posterior margin of the wing ; also called the dorsum.

Instar.—The larval stage between each casting of the skin.

Intersex.—Among Lepidoptera a rare condition of mixed sexes usually superficially indistinguishable from a gynandromorph, but differing from such in there being no difference in the chromosomes of the ♂ and ♀ parts.

Interspace.—The space between two veins of the wing ; also called area or cellule.

Jugum.—In moths a membranous or spine-like process at the base of the fore wing.

Juxta.—See *Anellus.*

Labium.—The lower lip ; the tongue in Lepidoptera.

Labrum.—The upper lip, which covers the base of the mandible and forms the roof of the mouth.

Larva.—The grub or maggot stage of an insect ; the caterpillar.

Lectotype.—A specimen selected as holotype from a series of syntypes (cotypes), upon which a revised species is based.

Maxillæ.—The second pair of jaws in a mandibulate insect. In Lepidoptera, present in the larva.

Median spur.—A small transverse vein near the base of the fore wing in some butterflies.

Median vein.—The lower edge of the cell from the base to vein 2.

Mendelism.—The theory of organic inheritance advanced by Mendel in 1866 to explain the segregation, in definite mathematical ratios, of certain contrasted characters in subsequent generations.

Mesonotum.—The primitively upper surface of the second or middle thoracic rings.

Mesothorax.—The middle thoracic segment which bears the middle legs and anterior wings.

Metamorphosis.—The transition from the larval to the imaginal stage.

Metathorax.—The posterior thoracic segment which bears the hind legs and hind wings.

Micropyle.—A minute opening or pore at the anterior end of the egg, through which fertilization takes place.

Mutation.—A character, qualitatively new, appearing abruptly without transitional forms or slow development.

Neallotype.—An allotype described after the publication of the original description.

Nomenclature.—The fixing of its proper name to any biological unit ; the study and application of the rules governing scientific names.

Nomen conservandum.—A name which should be preserved and not be relegated to synonymy, as ruled by the International Commission on Zoological Nomenclature, but which does not have priority.

Nomen novum.—A new name ; abbreviated nom. nov. or n. n. Usually applied to denote a name which takes the place of one which for some reason cannot be used.

Nominotypical.—Used where a species is known to have more than one subspecies or form, and representing the form to which was applied the earliest name.

Notum.—A sclerite forming part of the mesothoracic tergum.

Nova species.—New species ; abbreviated as n. s., n. sp., nov. sp., sp. nov.

Nuchal.—Pertaining to the nape or hind part of the neck.

Obsolete.—Almost or entirely absent ; indistinct ; not fully developed.

Occiput.—The posterior portion of the head or epicranium of the imago.

Ocellus.—A simple eye, as distinguished from a compound eye, found on the vertex of the head of some butterflies. Also applied to an eye-like spot on the wing.

Ommatidium.—A single element of a compound eye ; applied to the eyes of larvæ bearing a single corneal lens.

Omnivorous.—Feeding on a variety of plants.

Osmeterium.—Fleshy, tubular, eversible processes producing a penetrating odour and capable of being projected through a slit in the prothoracic segment of certain Papilionid caterpillars and from openings elsewhere in the bodies of other forms. (Pl., osmeteria).

Ovum.—The unfertilized egg-cell.

Palpus.—A movable appendage of the labium or lower lip.

Paratype.—Any specimen in a series from which a description has been drawn up, other than the one specified as the type-specimen of the species, when not otherwise designated.

Paronychium.—A brush-like attachment adjacent to each tarsal claw.

Patagia.—A pair of processes attached to the prothorax; lobe-like structures that cover the base of the fore wing.

Pectus.—The ventral part of the thorax.

Phylogeny.—The development of a genus, family, tribe or class; the genealogy of the species,

Pilose.—Covered with soft down or short hairs.

Planta.—The soles of the prolegs of the larva.

Pleurum.—A lateral plate of the thorax or abdomen.

Plumules.—The specialized scent-scales found on the wings of some butterflies; also called androconia (*q.v.*).

Polymorphic.—Occurring in several forms.

Porrect.—Extending forward horizontally.

Post-discal.—Beyond the disc; applied to a line or other marking on the wing placed beyond the cell, but nearer to the cell than to the margin.

Posterior.—Hinder or hindmost; opposed to anterior.

Precostal cell.—An enclosed area formed by the precostal vein.

Precostal spur.—A short process or veinlet at the base of the hind wing of many butterflies; also called the precostal or humeral vein.

Primary homonym.—A combination of a generic and a specific name which has previously been used as the designation of a new species.

Prolegs.—The abdominal legs of the larva.

Pronotum.—A tufted scale behind the head of a butterfly. The upper or dorsal surface of the prothorax.

Prothoracic shield.—A sclerotized dorsal plate on the prothorax of a larva.

Prothorax.—The anterior thoracic segment.

Proximad.—Toward the proximal end.

Proximal.—The part nearest the base or nearest the body; opposed to distal.

Pulvillus.—A small pad on the end tarsal segment.

Pupa.—The resting stage of an insect; in butterflies also called chrysalis.

Race.—A subspecies (*q.v.*).

Retinaculum.—A bar, groove, or group of bristles in the basal costal area of the fore wing of moths, engaging the frenulum when the wings are expanded.

Saccus.—The posterior process of the 9th abdominal tergite.

Scaphium.—A structure found in many ♂ genitalia, situated beneath the anus and attached to the 10th segment. The true scaphium is a dorsal process of the 10th segment, widely known as the uncus (*q.v.*).

Sclerite.—One of the several hard pieces of chitin which go to form a segment of the insect skeleton; any piece of the body-wall bounded by sutures.

Sclerotin.—The substance or substances forming the hard parts of the insect skeleton, of variable chemical composition. See also *Chitin.*

Sclerotized.—Applied to the insect integument, hardened in definite areas by deposition or formation of substances other than chitin in the cuticula.

Scolus.—A thorny process bearing spiny setæ, found in the larva.

Sculptured eye.—The sculptured portion of the eye of a pupa.

Scutellate.—Divided into surfaces like small plates.

Scutellum.—A small posterior sclerite of the notum.

Scutum.—An anterior sclerite of the notum.

Secondary homonym.—The trivial name of a species transferred from one genus to another, and identical with the name of a species already existing in the genus to which it is transferred.

Seta.—A bristle or hair.

Setiferous.—Set with or bearing setæ.

Somatic mosaic.—The presence on the wing of part of the pattern peculiar to the other sex, the genitalia being of one sex only.

Spatulate.—Rounded and broad at the tip, attenuate at the base.

Specific name.—The true binomial specific name (*nomen specificum*) is the generic name (*nomen genericum*) and the trivial name (*nomen trivialium*) together.

Spermatheca.—The sac or reservoir in the female that receives the sperms.

Sphragis.—A horny pouch on the end of the abdomen of the female of certain butterflies after fertilization.

Spinneret.—An organ of the larval tongue serving to spin the silk.

Spiracle.—A small opening in the outer cuticle by which air is admitted to the tracheæ.

Spiracular.—Of or pertaining to the spiracles.

Sternite.—A ventral plate of the abdomen.

Sternum.—The ventral thoracic plate.

Subspecies.—In Lepidoptera a variety of a species differing from the nominotypical form to a greater or less degree, and occupying a different area. Also called a geographical race.

Supraspiracular line.—In caterpillars, a line or stripe above the spiracles.

Suranal plate.—A sclerotized plate on the last abdominal segment of the larva.

Synonym.—Two or more different names for one and the same thing.

Tarsus.—The foot or terminal segment of the leg.

Tegulæ.—Lateral shield-like processes of the mesonotum; also called shoulder-tufts.

Tegumen.—The modified 9th abdominal segment of the male.

Teratological.—Applied to monstrosities, as the duplication of organs, or absence of organs.

Tergite.—A dorsal sclerite or part of a segment, especially when such part consists of a single sclerite.

Tergum.—The upper or dorsal surface of any body segment of an insect, whether it consists of one or more than one sclerite.

Termen.—The distal or outer margin of the wing.

Thorax.—The anterior division of the body between the head and abdomen, comprising the pro-, meso-, and metathorax.

Tibia.—The leg segment between the femur and tarsus; the shank.

Tibial spurs.—Movable processes of the tibia.

Tornus.—Applied to the posterior distal extremity of the wing.

Tracheæ.—The breathing-tubes of an insect.

Trivial name.—The *nomen trivialium* is the part of the specific name other than the generic name, the specific name (*q.v.*) being generic and trivial name together. Defined by Illiger, 1800, *Terminologie*, pp. 117, 122, but first established by Linnæus in his *Philosophia botanica*, 1751, p. 202.

Trochanter.—A small segment of the leg interposed between the coxa and femur.

Type.—The single specimen or any one of a series of specimens from which a species is described; the species upon which a genus is founded, or which is selected as the type of a genus.

Uncus.—As usually employed, the tergite of the modified 10th abdominal segment of the male. The term is more correctly applied to a dorsal process of the 8th abdominal segment in the male of some butterflies.

Valves.—A pair of large, flattened processes of the 9th segment in the male; also called claspers.

Vein.—A hollow thickened rib on the wing of the insect; also sometimes called nervure or nervule.

Veinlet.—A minor vein, usually occurring in the cell of the wing.

Venation.—The system of veins of the wing; also sometimes called neuration.

Venter —The under surface of the abdomen as a whole; applied usually to the larva.

Verruca —A kind of wart, bearing a tuft of fine setæ, found on the larva.

Vertex.—The upper portion of the head or epicranium of the imago.

Vinculum.—A part of the 9th abdominal tergite of the male; called also the anal ring.

LATIN ABBREVIATIONS AND SIGNS.

Auct.—Auctorum ; of authors.

C, Ca.—Circa ; about ; near.

F.—Forma ; form.

Gen. nov.—Genus novum ; new genus.

Id.—Idem ; the same.

In litt.—In litteris ; in correspondence or letter, and unpublished.

Loc. cit.—Loco citato ; place cited (publication and page).

Non, nec.—Not.

Op. cit.—Opere citato ; work cited.

P.p.—Pro parte ; in part.

Q.v.—Quod vide ; which see.

Sp.—Species.

Sp. nov.—Species nova ; new species.

Spp.—Species (plural).

Ssp,, subsp.—Subspecies.

Supr. cit.—Supra citato ; cited above.

V. et.—Vide etiam ; see also.

♂.—Male.

♀.—Female.

Dc.—Discocellular.

SYSTEMATIC INDEX.

[A list of new names is given on p. 589.]

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CORRIGENDA.

Page 1.—Marshall & de Nicéville, 1882. This should read August 1883.

Page 75.—No. 6. **Polydorus sycorax** (Gr.-Sm.). This should be

Polydorus priapus egertoni (Distant).

Papilio egertoni, Distant, 1886, Ann. Mag. Nat. Hist. (5) xvii, p. 251 (Perak).

This subspecies extends to the Malay Peninsula only.

It has been shown by Toxopeus (1936, Ent. Meded. Ned.-Indie, ii, p. 57) that the name *sycorax* applies to the race of *Polydorus priapus* Boisduval, from North-Eastern Sumatra.

Order LEPIDOPTERA.

Suborder RHOPALOCERA.

INTRODUCTION TO THE STUDY OF BUTTERFLIES, WITH SPECIAL REFERENCE TO INDIAN SPECIES.

I. History of the Study of Indian Butterflies.

The first account of Indian butterflies was published in 1857 by Horsfield and Moore in their 'Catalogue of the Lepidoptera in the Museum of the Honourable the East India Company,' in which many species from Java were included, and a number of excellent coloured figures were given of larvæ and pupæ. Until the publication of this book little attention had been paid to Indian butterflies, though a number of the more familiar species had been figured in the more general works of older authors. The next step was the publication in 1865 of a paper by Moore in the Proc. Zool. Soc. on "The Lepidopterous Insects of Bengal." Then followed various papers by Moore and Butler on new butterflies from India.

The earliest really comprehensive work was Moore's 'Lepidoptera of Ceylon,' the first volume of which appeared in 1881; this contained detailed descriptions and coloured figures of all the species then known to occur in the island.

In 1881 Lionel de Nicéville began a series of papers in the 'Journal of the Asiatic Society of Bengal' and in the 'Journal of the Bombay Natural History Society.' In collaboration with Mr. Wood-Mason he issued comprehensive lists of the butterflies of Cachar and the Andaman Islands, as well as useful revisions of various genera. In 1882, in collaboration with Major G. F L. Marshall, he published the first volume of 'The Butterflies of India, Burma and Ceylon.' The second volume appeared in 1886, followed by the third in 1890, both by de Nicéville, Marshall having died in the interval. Two other projected volumes were never published, as de Nicéville died in 1901. These three volumes contain a wealth of detail, and constitute perhaps the most important contribution to

the study of Indian butterflies that has yet been produced. This work deals with all but the Papilionidæ, Pieridæ, and Hesperiidæ.

In 1890 Moore commenced the publication of the 'Lepidoptera Indica,' in which he gave a complete description and figure of every known butterfly, besides numerous notes on their habits and distribution. This work ran to ten quarto volumes, of which Moore was responsible for seven before his death; the remaining three volumes were written by the late Colonel Charles Swinhoe, and were completed in 1913.

In 1905 Colonel C. T. Bingham's first volume on butterflies appeared in the 'Fauna of British India' series; this volume contained the families Danaidæ, Satyridæ, Amathusiidæ, Nymphalidæ, and Riodinidæ. Volume II, containing the Papilionidæ, Pieridæ, and part of the Lycænidæ, was issued in 1907, but unfortunately Bingham died before another volume could be written.

Apart from various local lists and general notes, the only other works that have been published on the butterflies of India as a whole are :—

(i) 'List of Indian Butterflies' (W H. Evans, 1912). "The Identification of Indian Butterflies" (W H. Evans), first published in the 'Journal of the Bombay Natural History Society' between 1922 and 1926, and re-issued in book form in 1927 A second edition of this most valuable handbook was published in 1932.

(ii) 'The Butterflies of India' (C. B. Antram, 1924). This work covers only a part of the Indian area, and many species, including all the Lycænidæ and Hesperiidæ, are omitted.

(iii) 'A Guide to Collecting Butterflies of India' (H. D. Peile, 1937). This work gives details of over 600 forms, with much information on the habits, and contains 25 plates, including one in colour. It is a useful handbook for the beginner, based principally on the author's personal experiences in North-West India.

The following important publications should be consulted by the student :—

'Hesperiidæ Indicæ' (E. Y Watson, 1891).

'Classification of the Hesperiidæ' (E. Y Watson, 1893). This was world-wide in its application, but was adapted to the Indian fauna in 1894 ('Journal of the Bombay Natural History Society').

"The Common Butterflies of the Plains of India," by L. C. H. Young in the 'Journal of the Bombay Natural History Society,' from 1905 to 1907, after which date, consequent upon his death, the series was continued by T. R. D. Bell (1909–1927). Bell's papers contain very detailed

descriptions of the early stages, probably the most elaborate accounts of larvæ and pupæ ever written.

'The Butterflies of Ceylon' (W. Ormiston, 1924).

'The Macrolepidoptera of the World' (Dr. A. Seitz): issued in parts, and written by various specialists. It gives brief descriptions of every known species and form, with a great many coloured figures. The Indian species are dealt with in the Indo-Australian and Palæarctic sections.

II. Life-History.

All butterflies, like many other insects, only reach maturity after passing through a series of stages :—

(1) The *egg* or embryonic stage.
(2) The *larva* (caterpillar) or growing stage.
(3) The *pupa* (chrysalis) or resting stage.
(4) The *imago* (butterfly) or sexually mature stage.

The transition from the larval to the imaginal (adult) stage is termed metamorphosis. The change of form is a double one, first from caterpillar to chrysalis, secondly from chrysalis to butterfly.

The length of time in the egg stage is variable ; in the case of some Lycænidæ the winter is passed in this stage.

The larval stage is generally the longest. It varies with the species and climate, and may extend from a few days to many months. In regions with a cold winter season the larvæ of some species hibernate, and commence feeding again in the spring.

All butterfly larvæ are vegetable feeders, with the exception of certain Lycænidæ, which devour Coccidæ (scale insects), Aphididæ, and Membracidæ ; other Lycænids live in the nests of ants and devour the ant-larvæ. The food-plants cover a very wide range from grasses to trees, and in the case of some African Lycænidæ include even lichens. A species may be restricted to a particular plant, or may be omnivorous. Some Lycænidæ feed inside the fruit of the guava and pomegranate and others upon flowers. Cannibalism sometimes occurs. The first meal of the newly-hatched larva is often its own empty egg-shell.

During development the larva casts its skin, or moults, as a rule five times ; moulting is more accurately termed *ecdysis*. The period between two successive ecdyses is called an *instar*. Before the skin is cast the larva becomes quiescent for a short period. When moulting begins, the skin of the head is cast entire, and the skin of the body splits down the dorsum (or back) along segments 2, 3, and 4. The larva often eats the cast skin. In many species each instar shows a progressive change in colour, pattern, and often clothing as

well, so that full-fed larvæ frequently bear no resemblance, quite apart from size, to those that have just emerged from the eggs.

When a larva is full-fed it wanders about for some time in search of a suitable place for pupation. When it finally comes to rest it spins a silken pad which is grasped by the anal claspers; after an interval of some hours the skin splits open to disclose the immature pupa, which soon shrinks and hardens. The length of the time passed in the pupal stage varies in different species from a few days to many months.

Emergence, or hatching from the pupa, is effected by the splitting of the pupal case along the dorsum. As soon as the butterfly is free it takes up a position which allows the wings to expand. The wings are at first small bags filled with fluid. As they expand, by the blood being pumped through the veins, the two sides of the bag come closer and closer together, and finally fuse everywhere except along the courses of the veins. The wings and other parts of the integument gradually harden, and in an hour or so the butterfly is ready for flight.

Before the change to pupa an internal metamorphosis has begun which continues throughout the pupal life. This involves the breaking-up (*histolysis*) of all the larval tissues except the mid-gut, tracheal, and nervous systems, and their rebuilding into the imaginal tissues from groups of special cells called *imaginal buds*.

The final instar is the imago, which differs from all earlier stages in being sexually mature and provided with two pairs of wings. The length of life enjoyed by the imago varies from a few days to over a year. Some butterflies hibernate, or are torpid, during the winter. In captivity certain species can live for at least two years. Our knowledge of the duration of life of the imago is still rather imperfect.

III. External Morphology. (Figs. 1–8).

1. *Egg.*—The egg consists of the *fertilized ovum* or female germ-cell enclosed in a shell. It is often called the ovum by entomologists, but this is biologically incorrect. The egg-shell is called the *chorion*; at the anterior end it is perforated by a tiny opening or group of openings, the *micropyle*, which is

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II. Head of larva, front view: *1*, vertex; *2*, frons; *3*, cheeks; *4*, clypeus; *5*, labrum; *6*, mandibles; *7*, eyes; *8*, antennæ.

III. Pupa: *1–14*, segments as in fig. I, but segment 3 is the thorax; *15*, eye; *16*, palpus; *17*, antenna; *18*, fore wing; *19*, hind wing; *20*, cremastral segment; *21*, girdle; *22*, pads of silk to which the cremastral segment or ends of girdle are fixed; *23*, spiracle of segment 2; *24*, spiracle of segment 8.

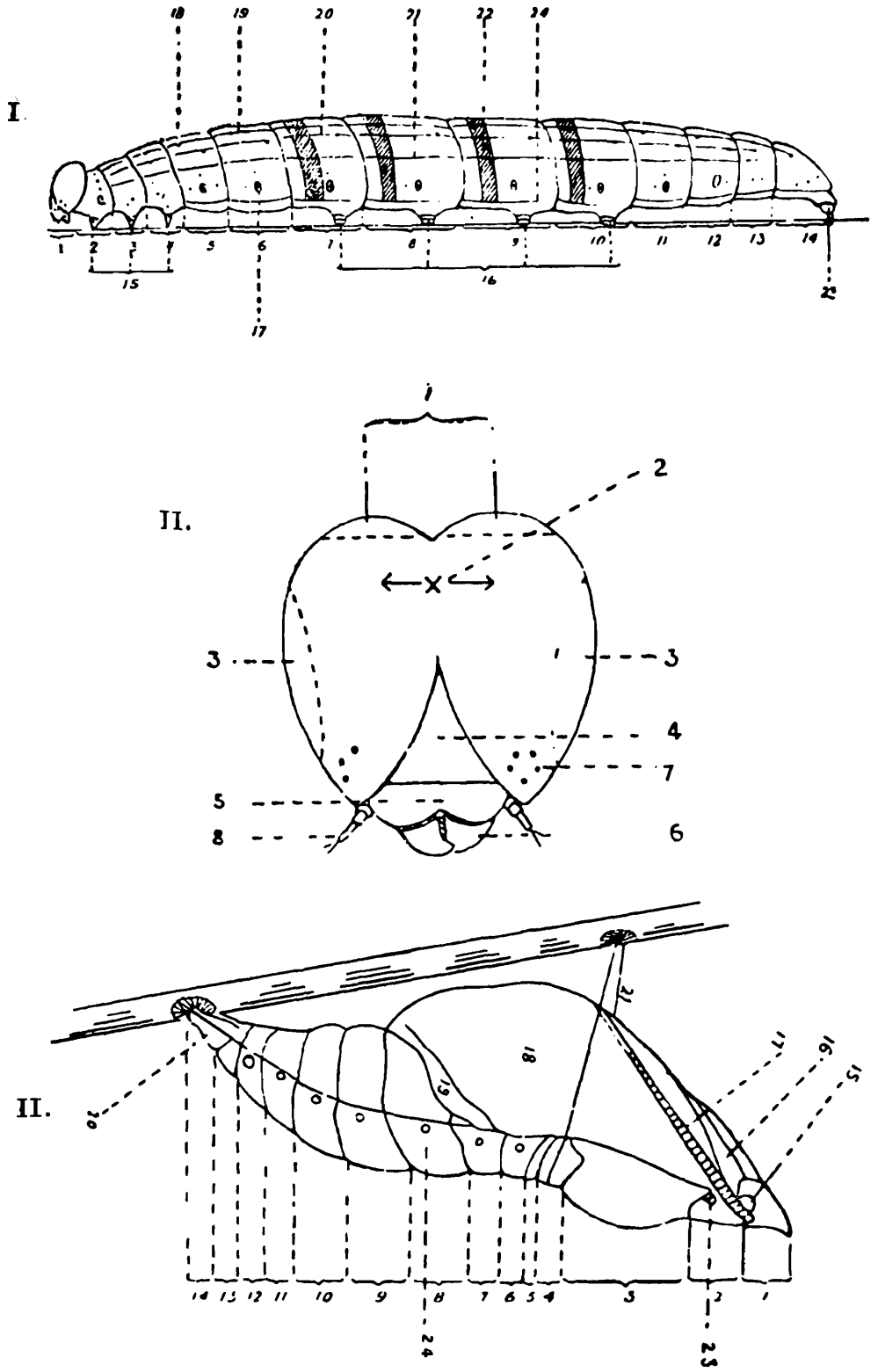


Fig. 1.—Larva and pupa. (After Bell).

I. Larva: *1*, head; *2*, *3*, *4*, thoracic segments; *5–13*, abdominal segments; *14*, anal segment; *15*, true legs; *16*, prolegs; *17*, spiracle of segment 6; *18*, dorsal line; *19*, subdorsal line; *20*, dorso-lateral line; *21*, lateral line; *22*, transverse band; *23*, anal claspers; *24*, dorso-ventral line separating the dorsum from the venter. The black points on the segments show the position of hairs, tubercles, etc., when present.

only large enough to admit a single sperm when fertilization takes place. The chorion is either smooth, ribbed or sculptured.

The shape of the egg varies considerably; it may be spherical, cylindrical or domed. In *Cyrestis* there is a lid which is pushed open by the larva on emergence. The eggs of some Lycænidæ exhibit the most beautiful sculpturing when seen under the microscope. The colour varies from white to green, yellow, orange or red.

The eggs are affixed to the food-plant by means of a sticky secretion. They are laid singly or in clusters.

2. *Larva* (fig. 1, I, II).—The larva or caterpillar is an elongate cylindrical grub with a soft integument, and is composed of 19 segments, of which the first six are fused together and form the head. The head is best treated as a single unit, and is called here the first segment. It is joined to the body by a well-defined neck. The head is hard and *sclerotized* (*i. e.*, composed of chitin mixed with other substances), and is furnished with strong biting mandibles, very short antennæ, and normally a set of six separate eyes (*ommatidia*) on each side, representing the compound eyes of the imago. These larval eyes are often called ocelli, but differ inasmuch as the lens covers only a single eye-element.

The tongue (*labium-hypopharynx*) arises between the mandibles and the maxillæ. It is a reduced, unpaired organ, and carries the slender, pointed *spinneret*, from which the secretion of the silk-glands exudes.

The thorax is composed of segments 2, 3, and 4. Segment 2 is the *prothorax*, 3 the *mesothorax*, and 4 the *metathorax*. The prothorax sometimes bears a more or less strongly sclerotized dorsal shield, the *prothoracic shield*. Each of these segments bears a pair of short legs (the true legs).

The abdomen is composed of ten segments (5 to 14). On segments 7, 8, 9, and 10 are four pairs of short, stumpy, abdominal legs called *prolegs*. These are furnished with minute hooks (*crochets*) on the soles (*planta*). At the end of the last or fourteenth segment are the anal prolegs or *claspers*. The last segment carries a more or less strongly sclerotized plate called the *suranal plate*.

The *spiracles* are located on segments 5 to 12 to the number of eight pairs; there is also a pair on the prothorax. The spiracle is seen on either side of the abdomen as an oval horny area, and a small opening in each leads to the breathing-tubes (*tracheæ*).

The larva may be smooth, more or less clothed with hair, or provided with bristles or setæ. The arrangement of this vestiture is of taxonomic importance, and is called the *chætotaxy*. In all LEPIDOPTERA in the first instar there are twelve *primary setæ* on each segment except the head. Four additional

subprimary setæ may appear at the second instar. Each seta is primarily borne on a small papilla, or the seta may proceed from the apex of a small tubercle, called a *chalaza*. In many butterflies and some moths each originally single seta is replaced after the first instar by a tuft of fine setæ borne on a wart (*verruca*), or by spiny setæ borne on a strong thorny process (*scolus*). Some larvæ are furnished with filamentous appendages or tentacles (*e. g.*, Danaidæ), and others are covered with fleshy tubercles. In the Papilionidæ there is a peculiar organ situated behind the head, consisting of a protrusible tube dividing into two branches ; this is called the *osmeterium*, and it emits a pungent smell, characteristic of the various species.

The coloration and markings of the larva vary considerably. The markings are usually in the form of longitudinal or obliquely-placed stripes. These are described as dorsal, subdorsal, dorso-lateral, lateral, sublateral, dorso-ventral, spiracular, and subspiracular, according to position.

3. *Pupa* (fig. 1, III).—The butterfly pupa is commonly called a chrysalis. It has a hard, usually smooth, rounded and externally solid integument, no mandibles, and the appendages completely soldered down and covered over by external plates. It is usually attached to a silken pad by means of the *cremaster*. The cremaster, which varies in form in different species and genera, is a specialized process formed from the suranal plate of the larva, and carries numerous minute hooks. The eyes of the pupa are divided into a smooth portion called the *glazed eye*, and a sculptured portion called the *sculptured eye*. The second and third abdominal segments are usually free.

The position in which the pupa is placed varies, and is of systematic importance. In the Danaidæ, Satyridæ, Amathusiidæ, Nymphalidæ, and Riodinidæ (Erycinidæ) it is suspended free by the cremaster, head downwards. In the remaining families it is fastened, in addition, by a silken girdle round the middle. In the Papilionidæ and Pieridæ the pupa is placed head upwards. The pupa of *Parnassius* is enclosed in a slight cocoon placed just below the surface of the ground. In the Hesperiidæ the pupa is enclosed in a cell formed from a leaf. The great majority of butterfly pupæ are attached to leaves, twigs, stems or bark.

The coloration is often dull, but many butterfly pupæ are decorated with metallic gold or silver markings. The pupa may be either smooth or angulate and furnished with spines, and in some groups the wing-cases are sharply projecting.

Sex of Pupa.—It is usually possible to determine to what sex the pupa belongs. If the ventral part of segments 13 and 14 are examined, certain marks or scars will be seen. The scars of the anal claspers are on segment 14 above the

cremaster, and form two slight, narrowly oval protuberances on either side of a short depression. In the ♂ pupa there is a similar but smaller mark on segment 13. In the ♀ pupa, besides the marks described above, the middle anterior portion of segment 14 is produced as a narrow process across segment 13 as far as the middle of 12, and its apical part bears a median depression. In cases where these characters are not easily seen, a single mark on segment 13 and no mark on 12 always indicates a ♂ pupa ; a blurring of the segment margins and a mark in the middle of segment 12 always indicates a ♀. The particular segments are easily found by counting down from 9, which is the first broad segment on the ventral side. (See Bell and Scott, 1937, p. 15, figs. 4 C, D).

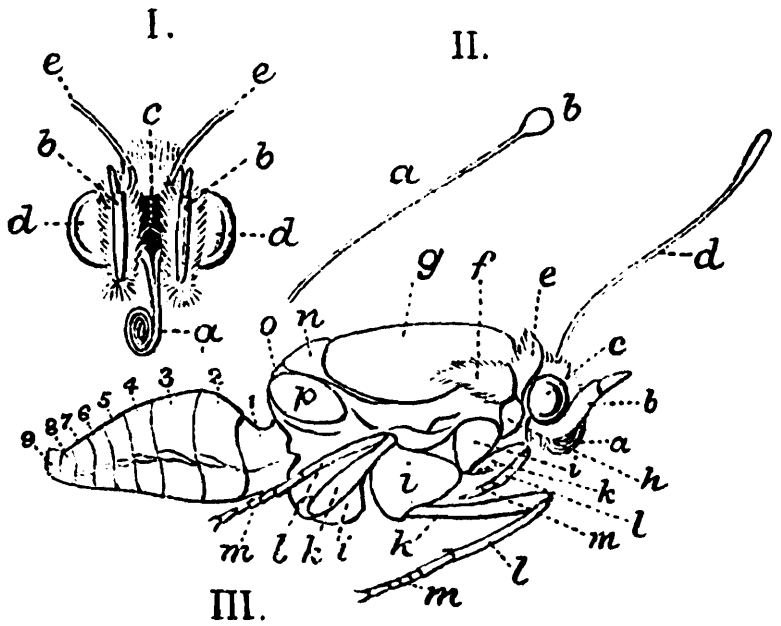


Fig. 2.—External morphology of imago.

I. Head (*Argynnis*) : *a*, haustellum ; *b*, *b*, labial palpi ; *c*, clypeus ; *d*, *d*, compound eyes ; *e*, *e*, antennæ.
II. Antenna : *a*, shaft ; *b*, club.
III. Side view of head, thorax, and abdomen, scales and wings removed (*Charaxes*) ; *a*, haustellum ; *b*, labial palpi ; *c*, compound eyes ; *d*, antenna ; *e*, pronotum ; *f*, patagium ; *g*, mesonotum ; *h*, episternum ; *i*, coxæ ; *k*, femora ; *l*, tibiæ ; *m*, tarsi ; *n*, scutellum of mesothorax ; *o*, post-scutellum ; *p*, metathorax ; 1–9, segments of the abdomen.

4. *Imago.*—The body is divided into the head, thorax, and abdomen. The various segments are composed of separate hard pieces of chitin termed *sclerites*.

(a) *Head* (fig. 2, I).—Small, hairy or scaled. The main dorsal part is called the *epicranium*, the posterior portion of which is called the *occiput*, the upper portion the *vertex* ; the anterior portion above the clypeus is the *frons*. The *clypeus* (fig. 2, I, *c*) is a fixed sclerite above the labrum or upper lip, and is well developed in butterflies.

Eyes compound, placed on both sides of the epicranium, and separated. Externally each compound eye consists of a large number of hexagonal *corneal lenses* formed of transparent chitin; each corneal lens is the outer covering of a single eye-element, or *ommatidium*, connected at its inner end with a nerve from the optic ganglion. Besides the compound eyes, two simple eyes (*ocelli*) are often present, situated in a small triangle on the vertex. The ocellus differs from the ommatidium of a compound eye in that its single lens covers a number of internal eye-elements.

The *antennæ* (fig. 2, II; fig. 3) are segmented, movable appendages placed in sockets and lying more or less between or in front of the compound eyes. Their length varies from a half to three-quarters of the length of the fore wing, sometimes very short in Hesperiidæ. The shaft gradually thickens to a more or less pronounced club at the end, which in some genera is grooved on its lower side. The club usually narrows

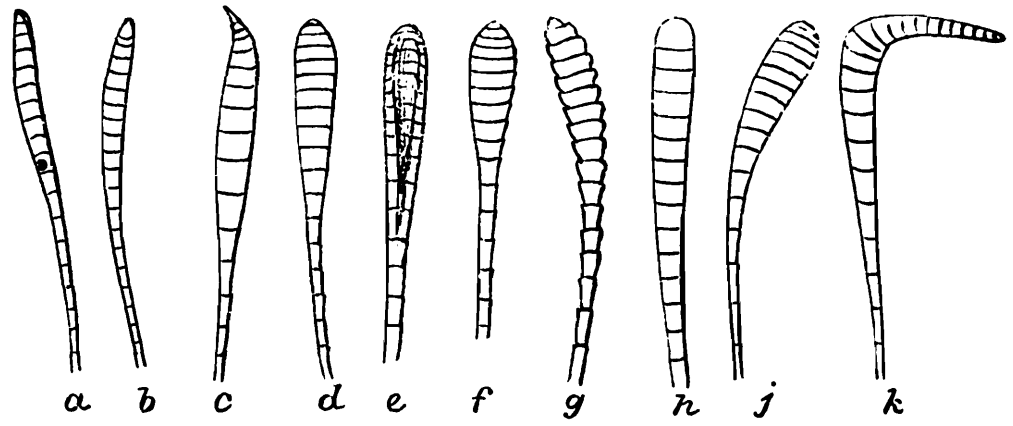


Fig. 3.—Antennæ (apical portions much enlarged).

a, Danaus; *b, Orsotriœna*; *c, Hypolimnas*; *d, Acræa*; *e. Libythea*; *f, Abisara*; *g, Papilio*; *h, Pieris*; *j, Lampides*; *k, Tagiades.*

gradually to the tip, which may be rounded or pointed. In most Hesperiidæ the antennæ are gradually or abruptly bent about the middle of the club, sometimes into a hook (elbowed or *geniculate*); the club often ends in an abruptly formed point (*apiculus*). The antennæ are organs of perception and are provided with sensory hairs.

The *palpi* (fig. 2, I, *b*; fig. 4) are movable appendages of the labium or lower lip, which in butterflies is reduced to a small basal piece; they usually curve up in front of the face between the eyes. They are composed of three segments, which vary in shape in different groups. There is a short basal segment, a comparatively long middle one, and a narrow terminal one of variable length; the basal and middle segments are densely clothed with scales and often with hairs; the terminal segment may be blunt or pointed and may be

placed at an angle with the second segment, inside which it may sometimes be concealed. The palpi may be either erect (against the frons) or porrect (horizontal).

Mouth-parts (fig. 2, I, *a*).—Butterflies feed by sucking up plant juices through a long sucking-tube which, when not in use, is coiled up like a watch-spring between the palpi. This tube is a modification of the inner lobes (*galea*) of the maxillæ ; each galea has become elongated, and both are fused together to form the tongue, the inner grooves of the galea forming the cavity of the tube. This organ is often loosely called a proboscis, but is better termed the *haustellum*.

(b) *Thorax* (fig. 2, III).—Composed of three segments, called the *prothorax*, *mesothorax*, and *metathorax* (fig. 2, III, *p*) respectively. Each of these bears a pair of segmented legs. The prothorax is small and like a collar ; it carries a pair

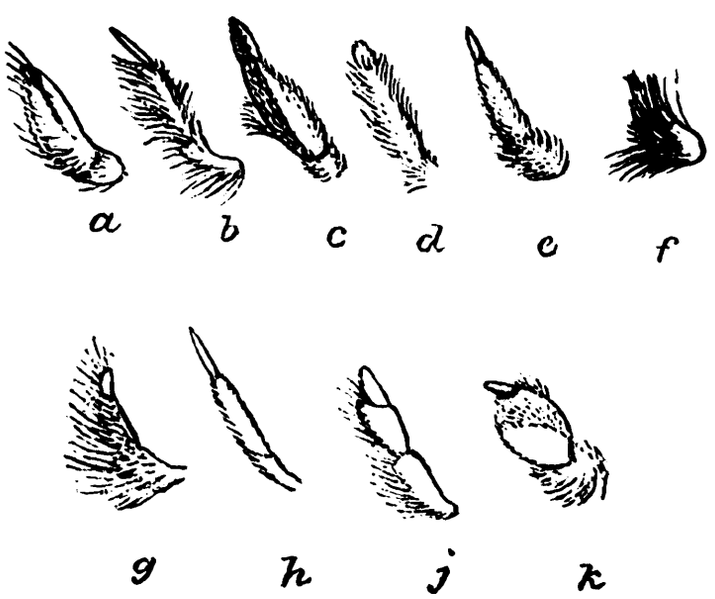


Fig. 4.—Labial palpi (much enlarged).

a, *Idea* ; *b*, *Orsotriæna* ; *c*, *Hypolimnas* ; *d*, *Acræa* ; *e*, *Libythea* ; *f*, *Abisara* ; *g*, *Papilio* ; *h*, *Lampides* ; *j*, *Colias* ; *k*, *Tagiades*.

of dorso-lateral processes directed backwards, termed *patagia* (fig. 2, III). In front of the patagia, behind the head, is the *pronotum* (fig. 2, III, *e*), developed as a tufted scale. The mesothorax is large, the metathorax much reduced.

Each thoracic segment is divided into a dorsal plate or *tergum*, right and left lateral plates or *pleura*, and a ventral plate or *sternum*. There are secondary divisions of these. The tergum of the mesothorax has a strongly-built sclerite called the *notum*, and this has an anterior sclerite called the *scutum*, with a small posterior sclerite, the *scutellum* (fig. 2, III, *n*); the scutum is very large and convex. These sclerites of the mesothorax are, therefore, called the *mesonotum* (fig. 2, III, *g*), etc., those of the metathorax the *metanotum*, etc. On the

mesonotum, at the sides anteriorly, are a pair of backwardly-directed shield-like processes called the *tegulæ* or shoulder-tufts, usually heavily scaled. A pair of spiracles is present in the membrane between the pro- and mesothorax.

(c) *Legs* (fig. 5).—The fore legs arise from the prothorax, the mid-legs from the mesothorax, and the hind legs from the metathorax. Each leg consists of five segments: the *coxa* (fig. 2, III, *i*) or hip, the *trochanter*, the *femur* (fig. 2, III, *k*) or thigh, the *tibia* (fig. 2, III, *l*) or shank, and the *tarsus* (fig. 2, III, *m*) or foot. The coxa is the segment by which

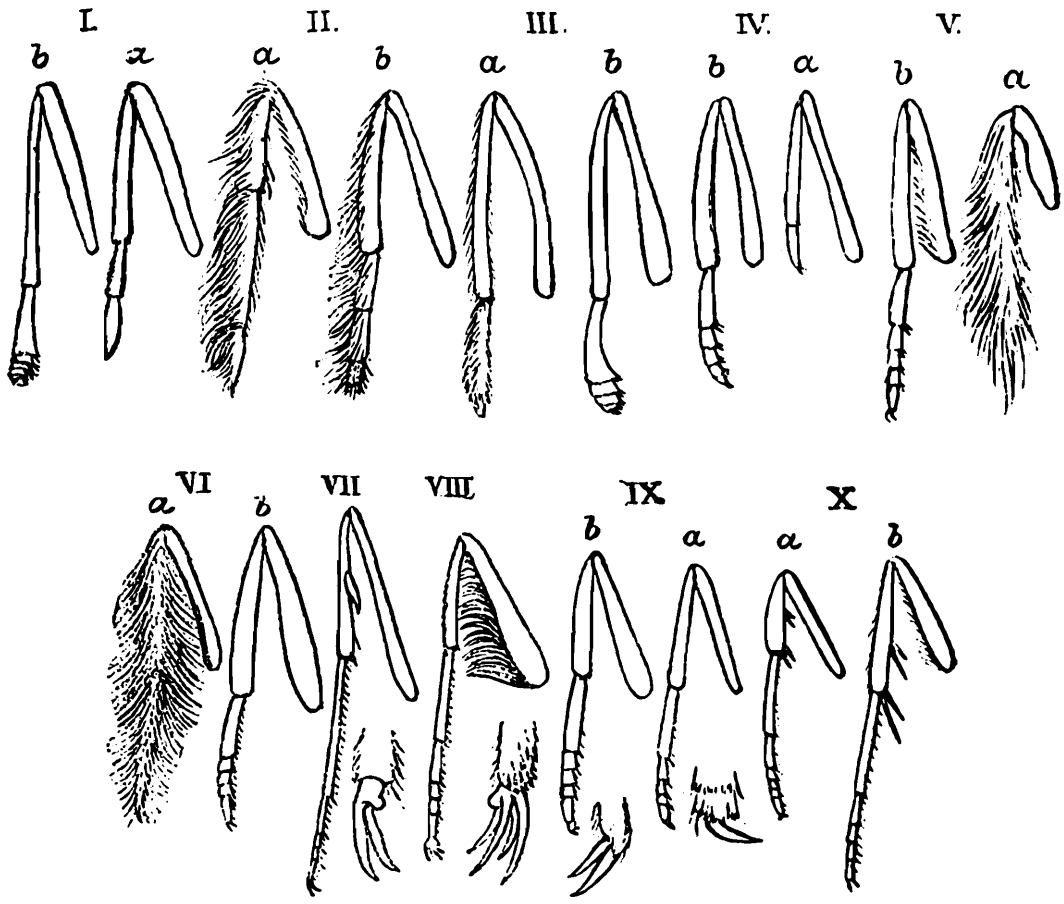


Fig. 5.—The fore leg (*a*, ♂; *b*, ♀).

I, *Idea* (Danaidæ); II, *Mycalesis* (Satyridæ); III, *Vindula* (Nymphalidæ); IV, *Acræa* (Acræinæ); V, *Libythea* (Libytheinæ); VI, *Abisara* (Nemeobiinæ); VII, *Papilio* (Papilionidæ), claws simple (♂ tibiæ with pad on inner side); VIII, *Pieris* (Pieridæ), claws bifid; IX, *Lampides* (Lycænidæ), ♂ tarsus imperfect, with only one claw; X, *Tagiades* (Hesperiidæ), tibiæ with a median as well as an apical pair of spurs.

the leg is articulated to the thorax; in butterflies it is large and more or less elongate. The trochanter is a very small segment interposed between the coxa and femur. The femur is the strongest part of the leg, usually not very stout, and is shorter than the tibia. The tibia is slender, and of medium

length or long; it articulates with the femur by the knee-joint, which is freely movable, and usually rests at a sharp angle to it. The tibia is frequently armed with one or two pairs of movable spurs called the *tibial spurs* (fig. 5, X); the tibiæ may also be spiny, and sometimes are more or less densely fringed with hair. The tarsus is composed of five segments of variable length, the fifth one ending in a pair of claws, sometimes bifid (fig. 5, VIII), beneath which is a small pad, sometimes absent, called the *pulvillus*; adjacent to each claw is a brush-like attachment, the *paronychium*, which is, perhaps, used for cleaning.

The legs furnish characters of considerable taxonomic importance. In some families (fig. 5, II–VI) the fore leg is short, slender, and undeveloped, particularly so in the male, in which the tarsus consists of a short brush, or, in Lycænidæ (fig. 5, IX), of a single claw; the female tarsus in such cases is less hairy, or is simply scaled, and does not bear a claw, the fifth segment being furnished with a few short spines. Most butterflies have a pair of spurs at the distal end of the hind tibiæ; in all Hesperiidæ (fig. 5, X) there is a similar pair of spurs on the mid-tibiæ, and usually a second pair on the hind tibiæ.

(d) *Wings.*—The wings are flattened, membranous expansions, strengthened by a system of thickened hollow ribs called *veins* or *nervures*. The fore wing is attached to the mesothorax, the hind wing to the metathorax. Each wing has been developed as a lateral expansion of the notum to which it belongs. The developing wing-sheath is supplied with a number of tracheæ which arise from two tracheal trunks at its base. The veins are first laid down as pigment bands in the developing wing-sheath, following the courses of the tracheæ. The vein itself is formed as a strong arch of chitin deposited over the channel of the trachea at metamorphosis.

The wings are movably articulated to the sides of the notum. When at rest they are usually held vertically upwards with their upper surfaces pressed close together and their under-surfaces exposed. They can be spread out horizontally, and sometimes the fore wing is brought back to cover a large part of the hind wing.

The shape of the wing is very variable. The upper or anterior margin is called the *costa* (fig. 7, *cm*), the posterior edge the *inner margin* or *dorsum* (fig. 7, *im*), the part next to the thorax the *base* (fig. 7, *b*); the distal extremity of the costa is called the *apex* (fig. 7, *a*), and the similar extremity of the inner margin the *tornus*; the edge between the apex and tornus is called the *outer margin*, *distal margin* or *termen*

(fig. 7, *om*). On the hind wing the tornal angle is often called the *anal angle*.

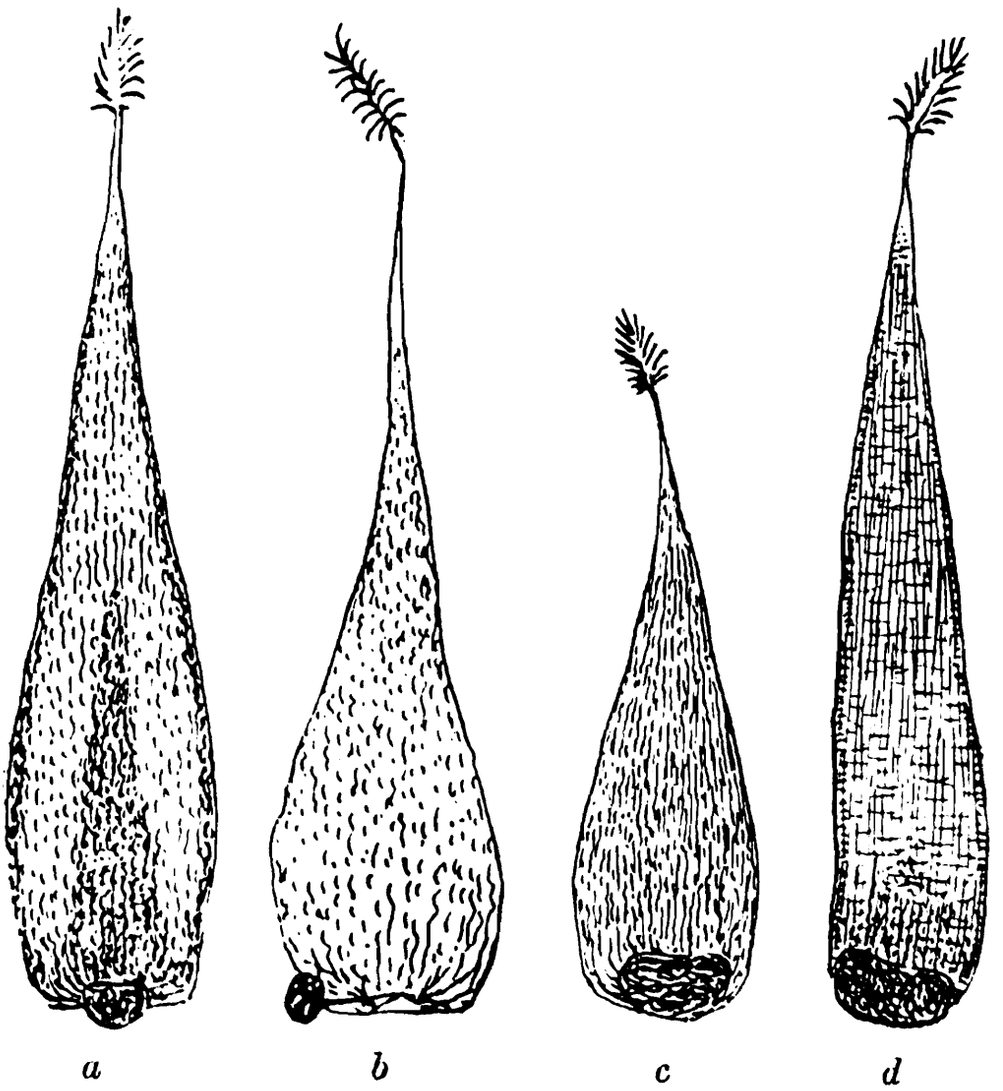
The costa may be straight or highly arched, sometimes concave on the hind wing, and occasionally serrate or minutely saw-toothed on the fore wing. The apex may be rounded, pointed or falcate. The outer margin is usually more or less convex on the hind wing; on the fore wing it is more often straight or even concave, and is often crenulate or dentate. The hind wing is frequently caudate (tailed) at the end of one or more of the veins towards the tornus, which itself is often produced and frequently lobed. Along the outer margin is a regular fringe (the *cilia*) composed of closely-packed scales in a double row, those of the underside slightly projecting. The inner margin is normally straight, but may be concave or convex.

The wing-membrane is clothed to a greater or less extent, usually entirely, with *scales*. These scales are minute specialized hairs, and each is inserted in a very minute socket. Each scale usually contains a pigment derived from the blood, and so gives to the wing the colours and markings so characteristic of butterflies. The scales are arranged in regular rows and overlap like tiles on a roof. They are of varied form and sometimes characterize a group of butterflies. They usually bear minute ribs and pits, and in some species they are iridescent, the colour being usually due to the interference of light at the surfaces of extremely delicate laminæ; white is usually produced by reflection or refraction of light by structural elements located in the scale. In the Pieridæ the white colour is produced by a group of pigments called "pterins."

In addition to the normal scale described above, scales of another type are often found in the male; these are called *plumules*, *androconia* or *scent-scales* (fig. 6, pp. 14 & 15). They are specialized scales which are connected with a scent-producing gland in the wing-membrane. Such a scale consists of an accessory disc, absent in Lycænidæ, apparently bulbous, connected with a short pedicel or footstalk, from which arises the lamina. The lamina is typically elongate, but may be oblong or rounded, and at the apex is furnished with fimbriæ (plumes), which presumably serve to distribute the odour. These scales present a great variety of form, and are often very useful as an aid in distinguishing genera or species.

The wing-markings are described according to their position. The wing may be divided into a proximal and distal half, the former covering the area between the end of the cell and the base, the latter comprising the remaining outer area. The part around the base of the wing is the basal area, between

which and the middle of the cell lies the subbasal area; between the middle and end of the cell is the discal area; between the end of the cell and a point half-way to the outer margin is the post-discal area; between the post-discal area and the margin is the submarginal area, whilst markings placed very near the margin are termed antemarginal. The median area lies along the lower edge of the cell and below it, whilst between this and the inner margin lies the submedian or inner area. The markings are, therefore, described as basal, subbasal, discal, costal, apical, etc. They consist of bands, lines, spots, patches, and rings (eye-spots or ocelli) placed upon a general ground-colour which itself may vary in different parts of the wing. The bands or fasciæ may be solid, macular, or chain-like (*catenulate*). Lines may be continuous or formed of connected crescents (*lunulate*). Spots may be of any shape, usually round, triangular or somewhat square. Round spots, bearing one or two pupils, and perhaps surrounded by an iris, are called *ocelli*. The more exact disposition of the markings is described by reference to their



a *b* *c* *d*

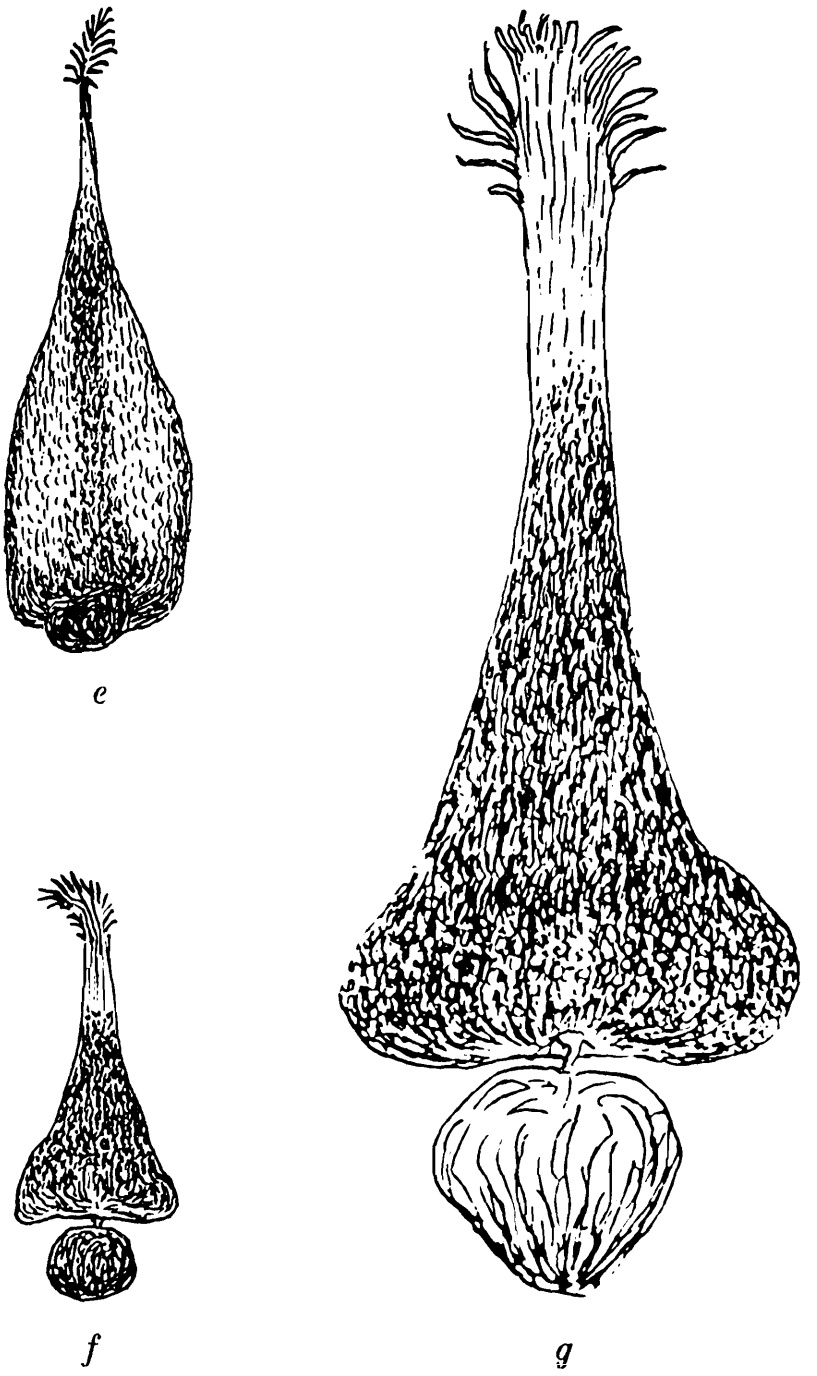


Fig. 6.—Scent-scales of *Delias*, all greatly magnified. (After Talbot).

a, *D. singhapura* (Wall.); *b*, *D. berinda* (Moore); *c*, *D. aglaia* (Linn.); *d*, *D. descombesi* (Boisd.); *e*, *D. agostina* (Hew.); *f*, *D. eucharis* (Drury); *g*, *D. eucharis*, much more magnified.

place in respect of the veins. The space between each vein is called an *area*, *interspace* or *cellule*, and these are given numbers, as shown in fig. 7 (p. 16). When no reference is made to these spaces the veins themselves are referred to by name or number.

(e) *Wing-venation* (fig. 7).—In butterflies and moths this is of a characteristic type. It consists of a large *cell*, called also the *discoidal*, *basal* or *discal cell*, usually closed, with a number of veins radiating from it. A typical butterfly fore wing has twelve veins, the first and last arising from the base, the others from the cell. The hind wing has eight veins, arising in the same way as those of the fore wing. Very often one or more veins are absent, especially on the fore wing.

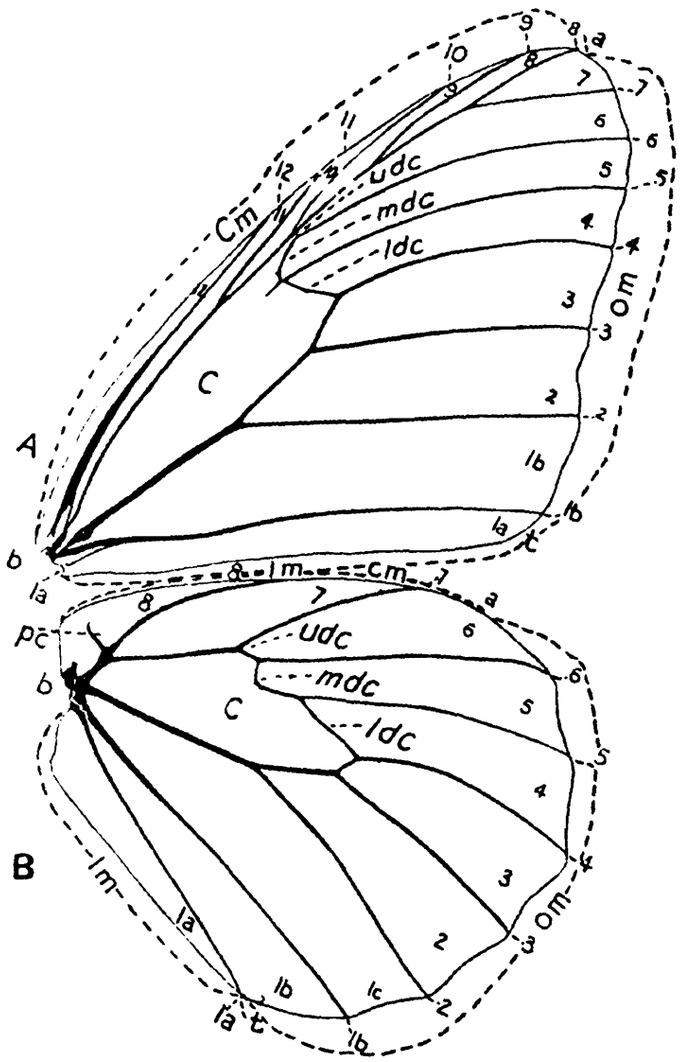


Fig. 7.—Venation (*Danaus*).

A. Fore wing: veins and areas lettered 1 *a*, 1 *b*, *2–12*. B. Hind wing; veins lettered 1 *a*, 1 *b*, *2–8*; areas lettered 1 *a*, 1 *b*, 1 *c*, *2–8*. *a*, apex; *b*, base; *c*, cell; *cm*, costal margin; *im*, inner margin; *ldc*, lower discocellular vein; *mdc*, middle discocellular vein; *om*, outer margin; *pc*, precostal vein; *udc*, upper discocellular vein.

Different systems of notation are in use to describe the venation. It is convenient to use the numerical notation as being most easily understood, though it takes no account of vein homologies.

Vein 1 is the posterior vein from the base, and two such veins, arising from the base, are typically present in that area, known as veins 1 *a* and 1 *b*. Veins 2 to 11 on the fore wing are from the cell, though veins 6 to 9 may be stalked. On the hind wing veins 2 to 7 are from the cell, 6 and 7 being sometimes stalked, and vein 8 is from the base ; in Hesperiidæ vein 5 is usually absent. On the fore wing of some butterflies there is a short branch or spur from vein 1 near the base and directed towards the base (basad), representing vein 1 *a* ; in addition, in most Papilionidæ, there is a short transverse vein near the base between the cell and vein 1 ; this is called the *median spur* ; moths possess neither this vein nor the short vein 1 *a* described above.

On the hind wing near the base of vein 8 there is in most butterflies a short spur projecting from vein 8 towards the costa, being directed either basad or distad, but being sometimes almost at right-angles to the costa ; this spur is called the *precostal* or *humeral vein* and is usually two-branched at the end ; strictly speaking, this is a veinlet as distinguished from a vein. In some cases the proximal branch is prolonged to the base of the cell and so forms a small secondary cell called the *precostal* or *basal cell.*

Special names have been given to each vein, and as these names often occur in descriptions, it will be useful to explain them here.

On the fore wing vein 12 is known as the 1st Subcostal or the Subcosta, and is often referred to as the Costal Vein ; vein 11 is the Radius or 2nd Subcostal ; veins 10 to 7 are the Radial Branches 2 to 5, or Subcostals 3 to 6 ; veins 6 to 4 are the Median Veins or Radials 1 to 3 ; veins 3 and 2 are the Upper and Lower Cubital Branches, or Medians 1 and 2 ; veins 1 *b* and 1 *a* are respectively the 1st and 2nd Anal and 3rd Anal, or 1st and 2nd Submedians.

On the hind wing vein 8 is the Subcosta or 1st Subcostal, often referred to as the Costal Vein ; vein 7 is the Radial Sector or 2nd Subcostal ; veins 6 to 4 are the Medians or Radials 1 to 3 ; veins 3 and 2 are the Upper and Lower Cubital Branches, or 1st and 2nd Medians ; vein 1 *b* is the 1st and 2nd Anal or 1st Submedian ; vein 1 *a* is the 3rd Anal or 2nd Submedian.

The distal end of the large cell is usually closed by three veins between veins 4 and 7 ; these are most often known as the *discocellulars*, but are also, perhaps more correctly, termed *cross-veins* ; they are distinguished as upper, middle, and lower. One or more of these veins may be weakly developed or absent ; in the latter case the cell is said to be open.

Small *veinlets* are often found projecting into the cell of the fore wing, and less frequently on the hind wing. Between

the veins are found furrows or *folds* as they are called ; these are most strongly developed in areas 1 *a* to 1 *c*.

The Table given below will enable the student to understand what veins are meant when consulting a description involving either the Comstock and Needham or the Rothschild and Jordan notations.

Table showing Notations for the Venation of Rhopalocera.

N.=Numerical notation; C.–N.=Comstock–Needham notation; R.–J.=Rothschild & Jordan notation. (FW.=Fore wing; HW.=Hind wing).

N.		C.–N.		R.–J.		Vein.
FW	HW	FW	HW	FW.	HW	
12	8	SC	SC + R_1	SC^1	SC^1	Subcostal, or Costal.
11	8	R_1	SC + R_1	SC^2	SC^1	Radius : 1st or 2nd Subcostal.
—	7	—	R_3	—	SC^2	Radial Sector ; 2nd Subcostal.
10	—	R_2	—	SC^3	—	First Radial Branch ; 3rd Subcostal.
9	—	R_3	—	SC^4	—	Second Radial Branch ; 4th Subcostal.
8	—	R_4	—	SC^5	—	Third Radial Branch ; 5th Subcostal.
7	—	R_5	—	SC^6	—	Fourth Radial Branch ; 6th Subcostal.
6	6	M_1	M_1	R^1	R^1	First Median Branch ; 1st Radial Branch.
5	5	M_2	M_2	R^2	R^2	Second Median Branch ; 2nd Radial Branch.
4	4	M_3	M_3	R^3	R^3	Third Median Branch ; 3rd Radial Branch.
3	3	$CU_1 a$	$CU_1 a$	M^1	M^1	Upper Cubital Branch ; 1st Median.
2	2	$CU_1 b$	$CU_1 b$	M^2	M^2	Lower Cubital Branch ; 2nd Median.
1*b*	1*b*	1 A + 2 A	1 A + 2 A	SM^1	SM^1	First + 2nd Anal ; 1st Submedian.
1*a*	1*a*	3 A	3 A	SM^2	SM^2	Third Anal ; 2nd Submedian.

(f) *Abdomen.*—This consists of ten segments (fig. 2, III, 1–9); in the female the ninth and tenth are fused together. Each segment consists of a strongly sclerotized dorsal half-ring (the *tergite*), a somewhat less strongly sclerotized ventral ring (the *sternite*), and between them a soft membranous *pleural region* on either side. The sternite of segment 1 is always reduced.

The abdomen is cylindrical or fusiform and completely covered with scales. The anal extremity in the male often bears a short tuft of hairs or of elongate scales. Spiracles are present on segments 1 to 7. Segments 8 to 10 contain the copulatory organs, 9 and 10 being modified. In the male this modification presents a vast variety of form. Such variation is of great value in distinguishing species, and in some cases even groups. This does not always imply, however, that if two insects possess a similar structure they necessarily belong to the same species, though usually they are identical.

Male Organs.—These will be understood by reference to fig. 8, which is a composite diagram of the genitalia of a butterfly.

The ninth segment is entirely sclerotized, and comprises the tegumen, vinculum, and valve. The *tegumen* (*t*) is the dorsal part or tergite. The *vinculum* (*vi*) is the sternite, a ventral sclerotized band, often with a posterior prolongation termed the *saccus* (*s*). The *valve* (*va*), also called clasper, is an enormously developed lateral process, basally articulated to the vinculum ; it often bears a process termed the harpe (*h*), located in the central area. The harpes serve as prehensile organs, and are well developed in Papilionidæ.

The tenth segment is mostly membranous, and is usually concealed within the ninth segment. It bears the uncus, scaphium, and gnathos, and the anal tube passes between the dorsal and ventral parts. Mehta (1933 *a*) has shown that the tenth segment, in the pupal stages, is visibly distinguished as a tergal and sternal part, the anal tube passing between the two sclerites. The dorsal process is termed the *uncus* (*u*) by most authors, although when first distinguished by Gosse (1883) it was meant to indicate a process of the eighth segment, found in *Papilio*. The uncus is situated above the anus, and is usually fused with the tegumen. It is not well defined in Lycænidæ and Danaidæ.

Attached to the dorsal surface of the anal tube is a sclerotized shield termed by most authors the *scaphium*. When first distinguished by Gosse (1883) it was meant to indicate the organ described above as the uncus (fig. 8, *u*). The scaphium is conspicuous in the Papilionidæ and in some HETEROCERA.

Arising from the base of the uncus is a pair of hairy pads or lobiform processes which lie on either side of the anal tube. These are termed *socii*, and are not seen in all groups. In the Lycænidæ they are prominent as long, curved, spine-like processes. Arising from the tegumen on either side, near its apex, is sometimes found a slender, curved, spine-like lobe. This is termed the *side lobe* (*sl*), and is prominent in Hesperiidæ ;

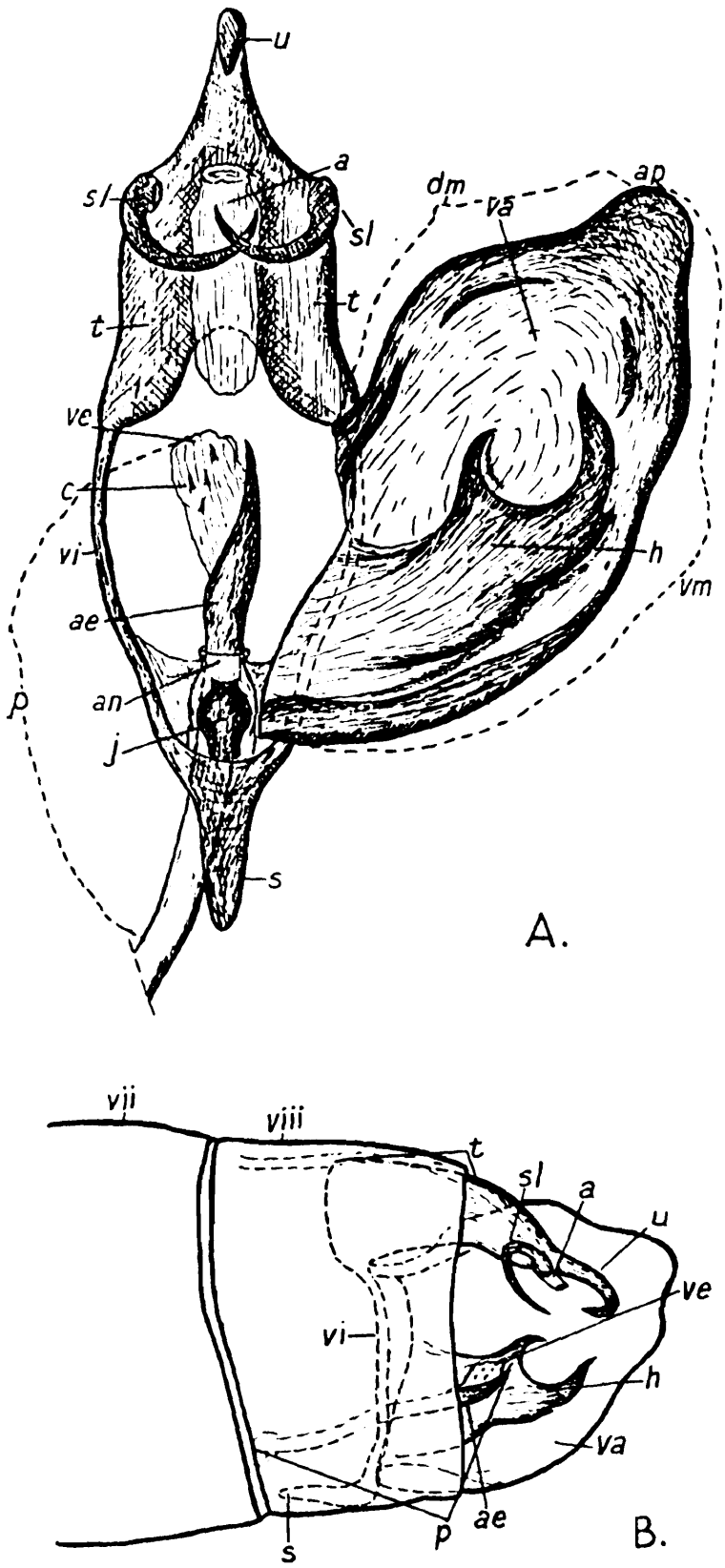


Fig. 8.—Diagrammatic view of ♂ genitalia.

A. Ventral view, left valve removed; *a*, anal tube; *ae*, ædeagus; *an*, anellus; *c*, cornuti; *h*, harpe; *j*, juxta; *p*, penis; *s*, saccus; *sl*, side lobes; *t*, tegumen; *u*, uncus; *va*, valve (*ap*, apex; *dm*, dorsal margin; *vm*, ventral margin); *ve*, vesica; *vi*, vinculum.

B. Lateral view, left valve removed; vii, viii, abdominal segments; other lettering as for A.

in Lycænidæ the lobes are strongly curved and are usually termed the *falces*.

The *gnathos* is a ventral subanal process in the form of a sclerotized arch which is hinged by a membranous base to the ventral side of the tenth segment. It is usually well developed in the Nymphalidæ.

In addition to the processes of the ninth and tenth segments described above, there is the intromittent organ or *penis* (*p*), with which are associated the anellus and juxta.

The *penis* arises from between the bases of the valvæ. It is composed of an outer sclerotized sheath, termed the *ædeagus* (*ae*), which encloses a membranous tube, the *ductus ejaculatorius*; the eversible part of this duct is termed the *vesica* (*ve*), and it is sometimes armed with small spines termed *cornuti* (*c*) (seen in Nymphalidæ and Danaidæ).

The ædeagus is supported, where it enters the body, by a hollow cone-like structure, which may be either strongly sclerotized all round, thus forming a ring, or else sclerotized only ventrally. This structure is ventrally supported by the vinculum, and on either side by the valvæ; it is termed the *anellus* (*an*), and is well developed in Nemeobiinæ, Lycænidæ and Hesperiidæ. The sclerotized ventral part of the anellus, forming a sort of shield or plate, is termed the *juxta* (*j*); this is well developed in Amathusiidæ.

The fundamental parts of the genital armature are the valvæ, tegumen, vinculum, and penis. Other structures have been evolved at different times, and so no single species exhibits all the structures described above, some being absent or reduced.

Female Organs.—Segments 9 and 10 are fused together, usually forming a complete chitinous tube with the anal opening at its end, and the opening of the oviduct (through which oviposition takes place) immediately beneath it. This opening has been termed the *gonopore*. The vaginal orifice is placed in the membrane between segments 7 and 8. This leads by way of a chitinous duct into a large sac, the *bursa copulatrix*, for holding the sperms; and thence by a tiny *seminal duct* to a small *spermatheca*, not always present, and continuing into the common *oviduct*. This arrangement enables the eggs to be deposited over a long period, the sperms being passed a few at a time into the spermatheca, whence they can reach and fertilize the eggs as they pass down the oviduct. The copulatory aperture lies in a sclerotized area, the *genital plate*; this is variously modified and is often of taxonomic value.

The fertilized females of *Parnassius*, and to a less noticeable extent those of *Acræa*, exhibit a peculiar horny pouch (*sphragis*) at the end of the abdomen. This is formed

by the hardening of a fluid discharged by the male during copulation ; the shape of the pouch varies with the species. The females of some species, e. g., *Chætoprocta, Tagiades* (Hesperiidæ), are furnished with a dense tuft of short hairs at the end of the abdomen, but as a rule there is no hairy tuft in the female.

IV Classification.

Butterflies belong to the order Lepidoptera or scale-winged insects (*lepis*, a scale, *pteron*, a wing). The order is conveniently divided into two main divisions or suborders : (1) Heterocera, (2) Rhopalocera. Some authorities distinguish a third division, the Grypocera, which comprises the Hesperiidæ. The first constitutes the moths, the second the butterflies with clubbed antennæ, whilst the Grypocera include the butterflies with hooked antennæ. These antennal characters are, however, not to be entirely relied upon for distinguishing the divisions.

1. *Distinguishing Characters.*—A butterfly can be always distinguished from a moth by the practised entomologist, but it is sometimes difficult for the amateur to decide. The following summary of the differences, as given by Evans (1932 *a*), will enable the collector to distinguish one from the other after a little practice :—

(*a*) Egg usually dome-shaped, upright and sculptured. In moths it is usually rounded or flat, scale-like and reticulate.

(*b*) The caterpillar has, in addition to the three pairs of true legs, five pairs (four central, one anal) of prolegs, one or more pairs of which may be absent or reduced in moths. Also in moths the end of the proleg may be triangularly dilated, and the anal pair may be held stretched out behind, with the basal fleshy part often broad and flattened. A butterfly caterpillar very rarely has hairs arranged in tufts or pencils, or dense enough to obscure the surface. Butterfly caterpillars often have spines, branched or simple, but fleshy processes are unusual.

(*c*) The chrysalis of a butterfly may hang from a twig, be secured thereto by a girdle, or lie on a leaf or on the ground, or be enclosed in a cell made from a leaf. Moths commonly construct a cocoon for the chrysalis, bury the chrysalis in the ground, or conceal it under bark or in other places.

(*d*) Butterflies fly by day and moths by night as a rule, though quite a number of brightly coloured moths are often to be seen flying in India by day. Some butterflies remain dormant till dusk, and some prefer the shade to the sun.

(*e*) Butterflies sit with the wings erect or spread out flat—not, as moths often do, with the wings folded back.

(*f*) The butterfly antenna is usually knobbed or hooked at the end, and is never branched or furnished with cilia. The antennæ are always held straight, either erect or extended in front of the head; they are never curved, twisted, or folded back along the body or concealed under the wings.

(*g*) The butterfly eye is usually larger and more prominent than that of the moth.

(*h*) The division between the thorax and abdomen is better defined in butterflies, a distinct "waist" being formed only in a comparatively few moths.

(*i*) In order to ensure rigidity of the wings the base of the hind wing in butterflies is expanded into a shoulder fitting under the fore wing. In moths rigidity is attained as a rule by means of a frenulum or jugum, The *frenulum* is a stiff bristle (♂) or group of hairs (♀) at the base of the costa of the hind wing above. This engages in a catch, groove or group of bristles (*retinaculum*) on the lower surface of the fore wing; some "Skippers" are provided with this apparatus in its most elementary form. The *jugum* is a membranous or spine-like process from the base of the inner margin of the fore wing, passing under the hind wing and holding it between the jugum and fore wing.

(2) *Scheme of Classification.*—The RHOPALOCERA are divided into a number of families, arranged by some authorities in three superfamilies. The families are divided into subfamilies, which may contain large groups or tribes. The subfamilies and tribes are made up of genera. The genus consists of one or more distinct species which often form subsidiary groups. Such groups have been called subgenera. The subgenus is not recognized in the present volume; it is inconvenient and found to be unnecessary, and its use is being discontinued by many entomologists. In place of the subgenus the term "species group" is used, the name of the group being that of the species having the oldest name. The species itself consists of subspecies and forms.

The *species* is the basis of any scheme of classification. It is not always easy of definition. Where two forms fly together and do not interbreed they are regarded as species, and may be found to have differences in the genitalia. Where two similar forms do not fly together, and there are no important structural differences, they are usually regarded as subspecies of the same species.

A *subspecies* is a geographical race usually separated from another such race by barriers (horizontal, or vertical in mountain areas) which prevent free and complete interbreeding between the two. In island races interbreeding can rarely occur, but over land areas two races may easily meet and mix along the boundaries of their respective areas.

The term *form* is used in this volume to denote types of normal variation below the rank of subspecies. The term may be used alone when the nature of the variation is not known. Usually it can be designated, and the following forms may be recognized :—Local form, individual form (or aberration), ♂ form, ♀ form, wet-season form, dry-season form.

The term " variety " has nowadays no precise meaning, and cannot be regarded as a scientific term.

The various forms may occur everywhere within the range of the species. The local form, so often termed " variety," may be represented in another area as a subspecies, indicating perhaps the persistence or the recurrence of an earlier stage in the history of the species. The sporadic occurrence of a subspecific form outside its special area is compatible with the existence of two distinct races. A subspecies may sometimes be represented by the dry or wet form occurring in another area. These forms are discussed at greater length in the section dealing with variation.

3. *Phylogeny.*—This treats of the presumed origin from previously existing forms, and indicates a view of their supposed genetic relationships. As knowledge increases, ideas on the natural or phylogenetic order of arrangement alter, and numerous systems of classification have been proposed and used since the commencement of the study of entomology.

The system adopted in this volume is the one which has found most favour among Lepidopterists, and is in more general use. When possible, the arrangement of genera and species is the one adopted in the most recent scientific revision. A phylogenetic scheme of arrangement of the families of the Indian RHOPALOCERA, corresponding to the system in most general use, is given on p. 53.

4. *Nomenclature.*—Each species is given two names, the first being the name of the genus, the second that of the species. If a species has one or more subspecies the binomial system is expanded to the trinomial. An an example, *Papilio machaon machaon* Linnæus is the nominotypical subspecies upon which the species name was founded. *Papilio machaon asiatica* Ménétries is the subspecies subsequently described from the North-West Himalayas. If no second race is known the name is written in the binomial form, e.g., *Papilio crino* Fabricius. The species name, other than the generic name, is termed the *trivial name.*

It will be noticed that the name of the author (*i. e.*, the person who first published the name) is placed after the name of the species. This is usually abbreviated to save space, but it should be given in full in the case of a bibliographical reference. Again, the International Rules now demand that no comma be placed between the specific name and that of the author

When the species or subspecies is referred to a genus different from that in which it was originally located, the author's name is placed in parentheses, e. g., *Troides helena darsius* (Gray).

A code of international rules, called " The International Rules of Zoological Nomenclature," has been set up by zoologists for the guidance of authors, and for scientific clarity in the use of names. These rules have been revised from time to time, and in their latest form are published in the ' Proceedings of the Biological Society of Washington,' vol. xxxix, pp. 75–104, July 30th, 1926. Up to this time few careful studies of the older literature had been made, and while such study is being prosecuted, the application of the rule leads necessarily to some changes of names. This may cause some irritation to those who have been long familiar with a given name, and here is a striking case : *Pieris* (*Anapheis*) *mesentina* (Cramer) has become *Anapheis aurota* (Fabricius). One has to remember, however, that such changes are for the general good, intended to reduce chaos to order, and making for stability by eliminating confusion. This process will necessarily take some time. The credit for a name must, as a rule, be given to the earliest author A number of butterfly genera, which would become synonyms by a strict application of the rules, were finally accepted by the International Committee of Zoological Nomenclature as conserved (Rep. Comptes Rend. XII Int. Zool. Congr., Lisbon, vol. i, pp 181–96, 1936).

When an account is published relating to any previously described species or form, the rules direct that either the date of publication of the name or a full reference to such publication be inserted.

Those who propose to describe new forms must ponder well before coining a name, and unless they are well acquainted with the genus, the bibliography, and the rules, should seek the advice of a specialist. A name which has been used already in the genus will become a *homonym*, and one used already for the same species will become a *synonym* ; in both cases the names are invalid and cannot be used.

5. *Descriptions of New Forms.*—The method of describing a new species, race or form should follow certain principles. A new name should appear only in a recognized scientific journal ; it should be given due prominence in style of type, and should not appear in a footnote. In the case of a race or form, the author of the species or race to which the new name is attached should be given. The sex should be stated, and the description should be as detailed as possible with reference to the presumed nearest allied species or form. In the case of a species, or where the size is obviously different from that of the allied form, the expanse of wing and length of fore wing should be given in millimetres. The number of specimens

of each sex should be stated, with their localities, the information under the latter heading being as complete as possible. The locality and sex of the holotype must be clearly stated, as well as its location in a definite museum or collection. Where both sexes are described it is advisable to indicate also the allotype. In the case of a new and obscure species, a description and figure of the ♂ genitalia should be given; in all cases a figure of the imago should be included whenever possible.

Names should not be given to aberrations, teratological (abnormal) examples, or to local forms which show no important differentiation from other forms flying with them, being subject to individual variation. Such names serve only to encumber the literature which, in the case of European butterflies at least, is overburdened with them (*cf.* the European *Parnassius apollo* Linn.). A single specimen will often be found to exhibit the characters of several so-called forms. Names given to the forms above mentioned have no recognized status in nomenclature.

6. *Types.*—The specimen which has served for the description, or the specimen selected by the author as representative of a series which has been used for the description, is termed the *holotype*. This is the chief type, and this alone should be used for comparison; reference thereto is necessary to settle any doubt as to what the name represents. When both sexes are described, the sex which is not marked as "type," or is second in the description, is taken as the ♀ or ♂ *allotype*, as the case may be. When the opposite sex is described subsequently in another article it is called the *neallotype*. When other specimens exist of the original series (from which the holotype was selected), these are called *paratypes*; they were formerly known as "co-types," in cases where no holotype was originally selected. A co-type may be selected subsequently to represent the holotype; such a type is called a *lectotype*. A species selected as the type for a genus is called a *genotype*.

It is important that all type specimens be provided by the author with a label giving the name and type designation; if possible the sex and year of publication should be added. The word "Type" alone on a specimen is not sufficient. Paratypes may all bear labels as such. These are sometimes very useful for exchange or to send to a museum in which the type does not exist. In cases where such paratypes comprise more than one species under a single name, as has frequently been the case, the error will in time be discovered by the specialist. In this way paratypes are unsatisfactory, but are useful if carefully confirmed.

It cannot be too strongly emphasized that all holotypes should be placed in national or other large museums where entomology is studied, and elaborate precautions are taken to protect the specimens. The main idea is for general accessibility and preservation.

V Ecology.

1. *Senses.*—The organs of touch and taste are well developed in most butterflies, sight to a less extent. The eye, although complicated in structure, is not of high efficiency ; it perceives a mosaic of indifferent definition at about a range of 2 inches, whilst at 3 feet it sees a mere blur. Experiments seem to show that butterflies are able to distinguish colours, but the ability to do so varies greatly according to the species. Colour can only be distinguished at short range, up to about 50 feet. Unusual movement is perceived at a distance, but whether or not by sight is not certain.

Organs of hearing have not been found in butterflies, though in moths a tympanic organ is often well developed.

The sense of smell is strongly developed, as butterflies are attracted to scented flowers and to a variety of odoriferous substances, whilst repelled by others. The males of many species have scent-producing glands, the odour from which is perceived by the female. Again, the female is able to distinguish the plant upon which to deposit her eggs.

The organs of smell, and probably of touch, are situated in the antennæ. Four types of sense-organs are found in the antennæ :—(1) A short projection set in a cavity, (2) sensory hairs on the outer surface, (3) a stout, minutely toothed process, (4) a long, pointed bristle. The first and third are used probably for smelling, one for food and the other for the opposite sex. The second and fourth are used probably to sense objects to be avoided. It is well known that a butterfly can fly through a forest at great speed without touching a twig ; if deprived of its antennæ it is unable to find its way about.

A fifth sense-organ exists at the end of the anterior or 3rd segment of the palpus, in the form of a comparatively large pit with a very minute opening ; the numerous sensory hairs at the bottom of the pit are carefully protected from direct contact with solids. The function of this organ is unknown.

At the end of the tongue are tiny projections or papillæ which are considered to be organs of taste.

The pulvillus or pad on the last tarsal segment is probably connected with the sense of touch. It is certain that some butterflies can detect sweet substances, for example by means of sense-organs on their feet.

2. *Scent-organs.*—The plumules or scent-scales have been described on p. 13. Other scent-producing organs are found on the wings and bodies of many male butterflies. These consist of brushes, brands or pouches containing specialized scales. Such structures are often associated with a displacement of veins or a distortion of the wing. Besides glands producing odours attractive to the female, there are glands which secrete repulsive odours, serving as a protection against certain enemies.

The following summary of these characters in the various families may be of interest. The greater part is taken from Evans, 1932 *a* :—

(a) *Papilionidæ.*—Many species have a fold on the inner margin of the hind wing, and within this fold there is a cottony-looking fluff. Other species have pilose stripes on the fore wing.

(b) *Pieridæ.*—The fore wing and sometimes the hind wing are often furnished with plumules. Certain species of *Colias*, *Colotis*, and *Eurema* have sexual brands. Those of the genus *Appias* have a tuft of hair on either side of the anal segment of the abdomen.

(c) *Danaidæ.*—All are furnished with two (in *Hestia* four) extrusible brushes at the end of the abdomen, and many species have a brand or pouch on the hind wing. Many Euplœines have one or two brands on the fore wing, and often a patch on the hind wing above.

(d) *Satyridæ.*—The greater number of species are furnished with one or more of these organs. Most species of *Mycalesis* and *Elymnias* have an erectile tuft of hair overlying a brand on the hind wing above, correlated with a brand on the fore wing below. One *Mycalesis* has, in addition, a recumbent tuft on the hind wing, others have a tuft overlying a groove on the fore wing above, and one has a brand near the tornus of the hind wing. Many genera (e. g., *Pararge*, *Lethe*) have scent-scales on the fore wing. Some *Maniola* have a peculiar brush within the abdomen, internal to the genitalia, called the *Julian organ*.

(e) *Amathusiidæ.*—Nearly all have these organs. They attain their greatest development in a *Zeuxidia* ; this has four brushes or hair-pencils on the hind wing overlying brands, a brush on either side of the abdomen, and a brand on the underside of the fore wing.

(f) *Nymphalidæ.*—Very few possess these organs. Certain *Argynnis* and *Cirrochroa* have pilose vein-stripes on the fore wing above, and *Ergolis* has a large black area of modified scales on the fore wing beneath.

(g) *Riodinidæ* (*Erycinidæ*).—This family appears to be devoid of scent-organs in so far as its Indian species are concerned.

(h) *Lycænidæ.*—These display a variety of characters. The subfamily Poritiinæ have a tuft on the hind wing; the Gerydinæ a brand or thickened vein on the fore wing. Among the Theclinæ *Curetis* and *Amblypodia* have none; some species of the *Thecla* group have a brand in the cell of the fore wing, and in other genera a brand on the hind wing is correlated with a tuft on the underside of the fore wing, and a patch of modified scales is often found on the fore wing above. The Lycæninæ or "Blues" generally possess scent-scales on the fore wing, mostly of battledore-shape, traversed by longitudinal ribs.

(i) *Hesperiidæ.*—Many Cœliadinæ have brands or patches on the fore wing, or streaks of specialized scales along the veins. Some species of Celænorrhinæ and Pyrginæ have a costal fold on the fore wing; most have a pencil of hair on the hind tibiæ, some have an additional pencil on the mid-tibiæ, and one or two have it on the fore coxæ. An *Odontoptilum* has tufts at the end of the thoracic scapulæ fitting into grooves on the hind wing. A *Carcharodus* has a thick tuft of hair on the underside of the fore wing. The Hesperiinæ and Heteropterinæ often have brands as well as patches of modified scales and hair-pencils. *Cupitha* has a peculiar gland on the hind wing whence a wax-like substance oozes. The genus *Ge* has a curious circular tuft on the fore wings.

The nature of the brushes and brands in some Danaidæ has been investigated by Dr. H. Eltringham, F.R.S. The brush consists of a delicate bag, from the inner surface of which arise long hairs or bristles. The bag can be turned inside out, and when thus everted the hairs stand out at right-angles to the surface of the bag. The brushes are impregnated with the scent and distribute it as the butterfly moves through the air. Some species have a small brand on the hind wing. This is a scent-producing organ containing compartments, each closed above by a membrane having a minute orifice in the centre and covered by a special scale. The scent-material doubtless oozes out from the pores and is retained by the cover-scale. The butterfly, in the few cases so far observed, strokes the wing-gland with its brushes and so transfers the scent to them for distribution. The scent is absorbed by a very fine dust formed in the brush-bag, and this dust is scattered by the brushes. In fact, in the words of Dr. Eltringham, "the apparatus is really an animated powder-puff." Not all brush-bearing Danaids produce dust to distribute the scent. In *Euplœa midamus* the scent is produced by glands in the brush-bag itself (*cf.* Eltringham, 1923).

3. *Habits.*—Every butterfly, upon taking its first flight, seeks food and a mate. Its food consists largely of the nectar

from flowers, but many species will feed upon decaying animal matter and excrement. Others are attracted by rotting fruit or the exuding sap of trees. After pairing, the female seeks a plant upon which to deposit her eggs. It seems a mystery how the correct plant is always distinguished, whether it be a low herb, a shrub, a sapling, or the tender top shoots of a tall tree.

The flight of butterflies is as varied as that of birds. The practised collector can often distinguish similar-looking butterflies by their flight. The swift, galloping flight of many Papilios is in striking contrast with the weak, hesitating flight of many Pieridæ and Danaidæ. The characteristic flight of the Hesperiidæ has given to them the cognomen of "Skippers." The flight of butterflies has been discussed by Kheil (1884, p. 12), and his diagrammatic presentation may be worth further investigation.

The resting position of butterflies has been detailed already in sections 3, 4 (*d*).

The time of day when a butterfly is on the wing varies with the species or group. Most species fly up as soon as the sun has warmed the air; they rest again during the hotter part of the day, and fly again for two or three hours before sunset. Other species are only on the wing for a short time each day, and yet others may be seen at all hours of daylight. Some species, at home among the tree-tops, descend for a short time to suck moisture on the ground, or to feed at flowering shrubs. The sexes are not always found together, the males often congregating with other species, whilst the females fly singly in secluded places in the woods. Owing to these diverse habits it may easily happen that the collector seldom sees the insect, and it is considered as very rare, though in reality it may be common enough at the right time and place.

A peculiar instinct possessed by certain butterflies is that of *migration*. This has been observed in various parts of India. The available records from Ceylon and South India were summarized by Mr. C. B. Williams (1927). In the Palni Hills 21 species of Papilionidæ, Pieridæ, Danaidæ, and Nymphalidæ were observed to migrate southwards in the autumn, certain Pieridæ (*Catopsilia* and *Appias*) northwards in the spring, and a Lycænid (*Cosmolyce bœticus*) north-east, also in the spring. In Ceylon 69 species were found to migrate in the spring and again in the autumn, mostly from the northern part of the island. In North-West India *Vanessa cardui* and *Cosmolyce bœticus* have frequently been observed migrating in the spring. In general, butterflies are frequently met with proceeding in a certain direction, and they are often observed far out at sea.

4. *Enemies.*—Butterflies are menaced by enemies in all stages of their existence. This is counteracted largely by the great number of eggs laid, many more than would otherwise be necessary to carry on the species at normal strength.

In the egg-stage the only protection is concealment and assimilation to the surroundings, whilst small size may be helpful. Cockroaches devour any eggs they find, whilst parasitic Hymenoptera often deposit their eggs in those of the butterfly.

The larva has many enemies, of which the chief are probably birds ; but ichneumon-flies, besides other smaller Hymenoptera and Diptera, exact a large toll. The caterpillar may even change to a chrysalis, from which emerge one or more, often many, flies, but no butterfly.

In the imaginal stage the principal enemies are lizards, mantids, spiders, and birds to a minor extent : a lesser toll is exacted by dragonflies and Asilid flies. Most butterflies are well equipped to deal with these enemies—a swift, zigzag or turning flight, wing-coloration, and resting position. As the danger of attack is greater when the butterfly is at rest, it has in many cases evolved an underside coloration which more or less harmonizes with its surroundings.

The various protective devices in the larva and imago are dealt with in the section on Mimicry.

VI. Protective Resemblance and Mimicry.

The phenomena with which this section is concerned may be grouped under two headings :—

(*a*) Protective Resemblance, covering all cases in which the insect resembles its surroundings, and (*b*) Mimicry, in which the insect resembles another insect.

The subject is one of the most interesting and at the same time one of the most keenly debated of insect bionomics. It treats of the pattern- and colour-assimilation to the surroundings ; also of the similarity of pattern and other likenesses which exist between butterflies of different families and different genera. Any discussion of this subject is inseparable from attempts to explain the phenomena. The Theory of Mimicry endeavours to explain these resemblances and tries to account for various pattern combinations and colour features, including also the development of curious structures and habits.

Whilst no one denies the existence of these resemblances, considerable controversy has arisen over the explanations offered to account for them. The theory usually accepted is based on evolutionary principles ; it postulates that the cause

of mimicry is selective feeding by birds. The data necessary to support this idea have been very slowly accumulated, and are as yet far too few to convince the sceptic. In spite of this, one cannot say with certainty that birds have not had a large share in directing the evolutionary steps towards the perfection of mimetic resemblances.

Whatever the various factors were which operated in producing protective and mimetic resemblances, they are, like other structures, the result of natural selection.

The subject is one of great complexity, and can here be dealt with but briefly. Reference should be made to the writings of Sir Edward Poulton, F.R.S., our greatest exponent of mimicry, who has given it the status of a science in itself. Many important papers by Poulton, Eltringham, Carpenter, Dixey, and others will be found in the Transactions and Proceedings of the Royal Entomological Society of London.

(a) *Protective Devices and Resemblances.*—Besides distasteful juices, a tough integument, and cryptic wing-patterns, many other devices have been evolved among butterflies to protect them from enemies, not alone in the imaginal, but also in the larval and pupal stages. The larva is frequently coloured to harmonize with its surroundings; it may be armed with spines, or it may possess markings which, together with certain movements, give it ostensibly a terrifying aspect. Some larvæ can eject a distasteful fluid to the discomfiture of an enemy. Others are brightly coloured, and feed by day exposed to view; these are possessed of distasteful qualities and exhibit warning patterns, as do the imagines. Contrasted with these are the palatable larvæ, which hide during the day and feed only at night; some of these are rendered inconspicuous by resembling flowers and other plant-structures, birds' droppings, etc. The larvæ of certain Lycænids are protected by their association with ants. Such larvæ possess "honey-glands," which exude a nectar of which the ants are very fond. In some cases the larva, when nearly full-grown, is carried by the ants to their nest, where it is tended by them until it pupates, emerging as a butterfly direct from the nest.

In the pupal stage still greater protection is attained. The pupa is usually concealed by its coloration and shape, and is further protected by its hard case and sheltered position. The pupæ of some Papilionidæ resemble pieces of broken-off twigs, and others are flattened and coloured to resemble the stone or rock to which they are attached. The pupæ of some species, *e. g.*, the Hesperiid *Gangara thyrsis*, are able to make a rattling and hissing noise when disturbed.

In the imaginal stage we find other protective devices besides warning colours and cryptic coloration. Many Lycænids have tails, with eye-spots at their bases, in the anal part of the hind wing. When the wings are closed this part is deceptively like a head with antennæ; an enemy seizing this "false head" secures only a mouthful of hind wing, and the insect flies off again. Many species, when resting in the sun, orientate themselves so that they do not cast a conspicuous shadow. Such action may be heliotropic; in any case the insect does not make the movement on purpose.

The mode of flight of many mimetic butterflies resembles the flight of the model. This is noticeably the case with some Papilios (*Chilasa*), but these have also retained the original Papilionid flight and, when danger definitely threatens, resort to this rapid flight to escape. The element of surprise in effecting a quick change, whether of flight or pattern, is often successful in deluding a pursuer. This again is well shown in the case of the Leaf-butterfly (*Kallima*), well known in India as the most striking instance of cryptic coloration.

Some species of *Kallima* exhibit great variability in their resemblance to dead leaves, all shades of brown and dark green and all types of leaf-marking being represented on the underside. The upperside of the fore wing is usually adorned with a band of bright colour, rendering the butterfly a conspicuous object in flight. This serves to make the discomfiture of the enemy more complete when the insect comes suddenly to rest, protected by its leaf-like underside.

There is as yet, perhaps, no observation on record of a bird having been seen chasing a *Kallima*. They appear to be attacked, probably by lizards, as many specimens in collections have damaged hind wings. There is, of course, no evidence to show how the group was persecuted in the past, but to suppose that it suffered considerably is the only satisfactory explanation of this strange combination of cryptic coloration and bright colours.

(b) *Mimicry*.—Two explanations are generally accepted to account for the mimetic patterns. The first was propounded by H. W Bates in 1861 as the outcome of his observations on butterflies in Tropical South America. He submitted that one group, much more numerous in individuals, and possessing distasteful qualities, acted as the model for another group, less numerous, and not possessed of defensive qualities. The first group exhibited striking patterns and colours allied with distasteful qualities; such colour-patterns were termed

" Warning Coloration." This is known as *Batesian Mimicry*; it is less frequent than a second kind, the explanation of which was offered by F Müller in 1879, from his observations on butterflies in South Brazil. He found that different species of distasteful butterflies mimicked each other, and explained how the loss from enemy attack would be greatly lessened by pattern associations among distasteful species. This is called *Müllerian Mimicry*.

These two basic hypotheses do not explain how a sufficiently definite initial likeness came to be developed before it could prove of selective value—a very general difficulty in all evolutionary problems—nor how the many degrees of distastefulness were obstacles to survival of pattern, nor how the intrusion of other factors have aided or retarded the mimetic development. The student should consult the authorities mentioned above who have dealt with these questions.

Mimicry involves no conscious action on the part of the insects themselves, as is sometimes thought by those unfamiliar with the subject.

Models.—The butterflies which act as models for mimicking species must possess qualities which render them distasteful to enemies, also they must be very common—on the whole more common than the mimicking species. They must possess a well-defined pattern. The addition of a striking coloration will also aid in protection, warning the enemy to leave them alone. The various types of Warning Coloration are found primarily in models.

Among the butterflies of the Indian region the Danaidæ are the models for most mimetic species. The subfamily Danainæ are all of striking coloration, with black and white, or yellow or greenish stripes and markings. In the subfamily Euplœinæ are many with white spots or patches upon a brown or black ground, and others with the wings shot with blue or purple. They are slow fliers and are very tenacious of life.

The larvæ of Danaids feed upon species of Asclepiadaceæ, which are believed to contain poisonous substances; in one species at least a poisonous constituent has been found to be present as a complex organic acid.

Another group of models is found in the genus *Polydorus*, a section of Papilionidæ, whose larvæ feed upon species of *Aristolochia*. These plants, or at least some of them, emit repulsive odours and contain poisonous alkaloids.

Another group of models is provided by the genus *Delias*, most of which have brightly coloured undersides. Their larvæ all feed upon species of Loranthaceæ (mistletoe). Little is known of the chemical constituents of these plants, but at least one species has been found to contain a powerful narcotic.

The powdered dry leaves of *Viscum monoicum* are used in Calcutta as a substitute for strychnine and brucine.

It seems very probable, as suggested by Corbet and Pendlebury (1934) and others, that the organic poisons absorbed by the larva from its food-plant can be retained in an active form through the pupal stage to the imago. Here is a field for instructive chemical research.

Mimics.—The mimicking species may be either palatable or distasteful to enemies, and may be either as common as or rarer than their models. They usually belong to groups which exhibit considerable variation. Generally speaking, the mimic is palatable, with feeble means of protection, and is less numerous than the model. In many cases the ♀ is the mimic, whilst the ♂ may either resemble another model or differ altogether in pattern. Other species may mimic the same model in both sexes. Many mimics have the underside of the wings cryptically coloured, so that they harmonize with their surroundings when at rest, and are either comparatively invisible to an enemy or can be mistaken for a leaf or other object as the case may be. The model has no need of this additional cryptic protection, and has usually an underside pattern almost as striking as that of the upperside, being even adorned in many cases with some additional brightly coloured marking. Such markings are sometimes copied by the mimic, especially when cryptic colouring is not developed.

Models and mimics usually will be found to occupy the same faunistic area, and to fly together. Where the model gives rise to geographical races, the mimic is found to vary in the same way. As a general rule the mimic is not found beyond the geographical range of the model; but there are some notable exceptions, as, for example, the forms of *Valeria*, which resemble Danaids that do not fly in the same area. This case is explained on the grounds that their chief enemy is a migratory species of Wagtail (*Rosa*, 1937).

The phenomena of mimicry are still far from being perfectly understood, and a wide field for research into its causes still exists. Butterflies should be watched as closely as birds, and naturalists who do not wish to collect them may obtain much valuable data by patient watching and compiling notes *on the spot*. Any records, especially of attacks by birds, or specimens which bear clear marks of attack, will be welcomed by the Hope Professor of Entomology, University Museum, Oxford.

Following are a few of the more outstanding examples of mimicry in India. But it should also be mentioned that among the large family of the Nymphalids there exists a great

deal of intergeneric resemblance, probably of protective value ; certain pattern associations are formed, usually black and white or black and brown, e. g., *Limenitis, Parathyma, Neptis.*

Models.	Mimics.
Polydorus aristolochiæ	*Papilio polytes romulus*, ♀ form *stichius.*
Polydorus hector	*Papilio polytes romulus*, ♀ form *romulus.*
Delias belladonna	*Prioneris thestylis.*
Delias eucharis	*Prioneris sita.*
Danaus chrysippus	*Hypolimnas misippus*, ♀.
Danaus aspasia	*Valeria valeria*, ♀.
Danaus similis	*Graphium megarus, Graphium macareus, Elymnias nesæa timandra.*
Danaus melaneus	*Hestina nama.*
Danaus tytia	*Hestina nama, Chilasa agestor.*
Euplœa deione	*Chilasa slateri.*
Euplœa mulciber, ♂.	*Elymnias malelas*, ♂.
Euplœa mulciber, ♀.	*Elymnias malelas*, ♀.
Euplœa diocletiana, ♂	*Chilasa paradoxus telearchus* form *danisepa.*
Euplœa diocletiana, ♀	*Euripus halitherses*, ♀.

VII. Variation.

The perfect butterfly is subject to individual, sexual, seasonal, and geographical variation to a remarkable extent. Species differ in the degree of variability of the wing-pattern, some species being more stable than others.

The sexes of most butterflies differ to a greater or less degree, either in pattern or colour or both. When the sexes differ in appearance the species is said to exhibit *sexual dimorphism* ; when either sex exhibits two different forms that sex is said to be *dimorphic* ; when more than two forms occur the species is said to be *polymorphic.* The best known examples of polymorphism among Indian butterflies are the females of *Papilio polytes* and of *Papilio memnon*, which are trimorphic in certain areas. *Chilasa clytia* and *C. paradoxus* are dimorphic in both sexes The female of *Euripus halitherses* is definitely dimorphic, and each form is rather variable.

Seasonal variation is most marked in certain Indian butterflies, particularly in the areas affected by the South-West Monsoon. It is doubtless due in part to the effect of the climate on the larva and pupa, and in part to the very different state, at different seasons, of the vegetation upon which the larva feeds. In some species it seems likely that the characteristic has been inherited from ages past, and persists though the original causes have disappeared. This may account for " dry " or " wet " forms occurring simultaneously, or even in

the opposite type of season, and in countries like Malaya, where there is little or no seasonal change. Microclimatic conditions seem also to play a part in the production of these forms.

In the Himalayas most butterflies have two broods, the spring and summer ones, and these show more or less marked differences ; *Polygonia egea* is a good example. In the rest of India butterflies are on the wing all the year round, since life is never completely dormant as it is in the Himalayan winter. In some species, as in *Eurema* for example, brood succeeds brood, and the extreme dry- and wet-season forms, though very different in appearance, can be connected by a series of intermediate variations. In many species there are two sharply differentiated broods, striking examples occurring in Satyridæ (e. g., *Melanitis*, *Mycalesis*), in which the underside of the dry-season form resembles a dead leaf, whilst that of the wet-season form shows conspicuous ocelli and striated or freckled markings.

Two other, and less common, types of variation occur in all families of butterflies. One of these is heritable whilst the other is rarely so. The first may be regarded as a "sport," but more truly as an *individual form.* It may exist as a colour change, certain markings may have increased or disappeared, or a new pattern-character may be observed. The other type is called an *aberration*, and represents some derangement or upset of the organism ; with it are classed specimens with a duplication or absence of organs (*teratological*), which are not known to be, or are rarely, inherited. It is often difficult to know to which type a certain variation belongs. The individual form is much more common than the aberration As examples of the latter can be cited two unusually striking aberrations of *Papilio polytes*. These received the names, as distinct species, of *sakontala* Hew. and *walkeri* Jans. As examples of the individual form can be cited *Chilasa clytia* f. *dissimilis*, with forms *janus*, *papone*, etc.

Another, and still rarer, type of variation is the *gynandromorph*, the insect being partly male and partly female. Similar to these are the *somatic mosaics*, in which certain areas of the wings are marked as in the opposite sex, whilst the body-structure is of one sex only.

There remain to be considered the hybrids between different species. These are believed to be very rare in nature, and no specimen should be accepted as a hybrid in the absence of conclusive evidence.

Individual variation, when extended and reproduced over a certain area, leads to the formation of geographical races, and these may ultimately become so distinct as to be ranked as species. Such variation is to be observed in species

confined to forest areas, in those separated from each other by impassable deserts, by cultivated areas, high mountains, broad rivers, or the sea. A very instructive account of how such races may be produced is given by Evans (1932 *a*), and may profitably be cited here :—

" So long as conditions are suitable a species will extend its sphere to the possible limits. Gradually conditions change and the sphere occupied by a species may become divided into areas separated from one another by zones where the butterfly cannot exist. The climate and vegetation of one of the separated areas may change, and the butterfly will also change, either by bounds or little by little conformably with changes in the area, so that its appearance, structure or habits diverge more and more from the original form. Further changes may cause the separated area to become once more united with an area where the original species still exists, though probably in a modified form. The two forms of what were the same species may find that they are able to interbreed freely, when either one form will completely swamp the other ; or there may remain a neutral area on either side of which one form is dominant ; or they may carry on as dimorphs. The two forms may find interbreeding impossible and must then be regarded as constituting two independent species, and will always remain so, though they will develop on parallel lines and may in course of time resemble one another exactly and inhabit identical areas."

As an example of this geographical variation in India, Evans (1932 *a*) writes as follows :—

" *Papilio memnon* affords an interesting study. It flies from Sikkim to Malaysia ; the ♂ is more or less uniformly dark and tailless ; there are three quite distinct forms of female, one of which is tailed and looks quite different from the male. In South India, and in a slightly modified form in Ceylon, there flies a closely allied species, *Papilio polymnestor*, which is tailless, has the sexes nearly alike, differing from the male of *memnon* in having a broad blue band above. The two species meet in the lowlands of Sikkim, whence aberrations (variations) of *memnon* have been obtained showing a resemblance to *polymnestor*. The inference is that they can interbreed, probably with difficulty, but each retains its dominance in its own area and their border line is probably defined by the change in food-plant, preventing penetration into each other's areas. In the Andamans there flies the closely allied *P. mayo*, which has a male resembling *polymnestor* and an entirely different female resembling the tailed female of *memnon*."

In some species variation in wing-pattern is relatively slight, and no geographical race has been developed. Such a species is said to be fixed, but there is nothing to show that

it may not produce a new form at some future time. Other species resemble one another so closely in pattern that they were formerly classed as a single one. Structural characteristics, as in the genitalia, alone may have led to their separation, the considerable morphological differentiation being obscured by external similarities. Striking examples of this phenomenon are found among the Hesperiidæ and to a still greater extent among moths ; other examples occur in the Satyridæ (*Mycalesis*) and Lycænidæ (*Tarucus*). Evans notes that a single *Zizyphus* bush may harbour a crowd of the little spotted *Tarucus* butterflies, consisting of as many as three distinct species, all superficially indistinguishable.

VIII. Distribution.

The world is divided by zoologists into five faunistic regions, each of which has in the aggregate a special type of butterfly fauna. Each region is divided and subdivided into faunistic areas, each also with its peculiar types of species :—

I. *Palæarctic Region.*—This comprises all Europe, extending from Africa north of the Sahara (including Madeira, Canary Islands, and the Azores), and eastwards, embracing Western, Central (north of the Himalayas), and Northern Asia, Japan, and neighbouring islands. It may be regarded as forming a part of a Holarctic Region, in which is also included the North American or Nearctic Region.

II. *Oriental Region.*—This comprises India proper, east of the hills bordering the North-West Frontier and south of the Himalayas, Burma, Southern China, Formosa, Hainan, and extending southwards to include the Philippines, Celebes, Flores, Java, and Sumatra.

III. *Australasian Region.*—This comprises the Moluccas, New Guinea, Australia, New Zealand, and the Pacific islands.

IV *Aethiopian Region.*—This comprises Africa south of the Sahara, Madagascar, Mauritius, the Seychelles, Comoro, and other adjacent islands.

V *South American* or *Neotropical Region.*—This comprises South and Central America and the southern part of North America.

The faunas of all these regions have affinities with each other, sometimes possessing identical genera and species. We are here concerned mainly with the first two. A certain African infiltration is found in the western part of the Indian area.

The political boundaries of India in the north and west coincide very generally with the northern boundary of the Oriental and the southern boundary of the Palæarctic areas in the region dealt with in this volume. This region has been divided into eight areas by Evans, who has prepared the following table specially for this Introduction.

The Indian Faunistic Areas.

I. *Ceylon.*

II. *Peninsular India* (east of the Indus River, south of the Himalayas and west of the Brahmaputra River):

South India.
- A. Western Ghats:
  - (*a*) Travancore and Palni Hills.
  - (*b*) Nilgiri Hills.
  - (*c*) Coorg.
  - (*d*) Kanara (to Bombay).
- B. South India Plains (Madras, Mysore, and Hyderabad).

S.E. India.
- C. Central Provinces.
- D. Eastern Ghats.
- E. Orissa.

Plains of India.
- F Bengal, Bihar, and United Provinces.
- G. Central India, Rajputana, and Punjab.
- H. Western India (Gujarat, Kathiawar, Cutch, Sind).

III. *North-West India* (Sulaiman Range, Safed Koh, Hindu Kush, Karakoram):

- A. Baluchistan and Zhob (Sulaiman).
- B. Trans-Indus, N.W Frontier Province (Safed Koh; Gomal to Peshawar).
- C. Chitral. } Hindu Kush.
- D. Gilgit and Yasin. }
- E. Hunza Nagar. } Karakoram.
- F Baltistan. }
- G. Ladak. }

IV *West Himalayas*:

- A. Kashmir (and Murree to Abbottabad).
- B. Lahoul and Spiti (Inner Ranges).
- C. Kangra.
- D. Kulu (Simla).
- E. Garhwal (Mussoorie).
- F Kumaon.
- G. Nepal.

V. *North-East India*:

- A. Sikkim (Teesta and Chumbi Valleys).
- B. Bhutan.
- C. Assam:
  - (*a*) Khasi and Jaintia Hills.
  - (*b*) Abor Valley.
  - (*c*) Mishmi Hills.
  - (*d*) Manipur and Naga Hills.
  - (*e*) Lushai Hills to Chittagong.

VI. *Burma*:

A. North Burma (Irrawaddy and Chindwin Valleys above Mandalay):

(*a*) Kachin Country.
(*b*) Chin Hills.
(*c*) Bhamo and Ruby Mines area.

B. Mid-Burma:

(*a*) Arakan Yoma to Bassein.
(*b*) Pegu Yoma to Rangoon.
(*c*) North Shan States (Maymyo).
(*d*) South Shan States (Kalaw to Taunggyi).
*(*e*) Karen Hills (Toungoo to Thandaung).

C. South Burma:

*(*a*) Moulmein (Dawnas Range, Ataran Valley).
*(*b*) Tavoy area.
*(*c*) Mergui area.
*(*d*) Victoria Point and Lenya Valley.

VII. *Andaman Islands*:

(*a*) North Andamans.
(*b*) Middle Andamans.
(*c*) South Andamans.
(*d*) Little Andaman Island.

VIII. *Nicobar Islands*:

(*a*) Car Nicobar.
(*b*) Central Nicobars (Camorta, Nancowry, Kachall, and Trinkat).
(*c*) South Nicobars (Little and Great Nicobar, Kondul and Pulo Milo).

1. *The Areas considered.*

Ceylon is closely allied to South India and has a number of peculiar forms, some of which are related to those of the Malaysian Subregion.

Peninsular India, in its southern part, is geologically a very old country, with some endemic species found nowhere else. Generally speaking, the butterflies are nearly allied to those of the Malaysian Subregion. The hills are the habitat of two or three Palæarctic species.

Baluchistan is mainly Palæarctic, and has affinities with Persia.

Chitral is in the main a part of the Central Asian section of the Palæarctic Region, with a strong infiltration from the Himalayas.

* Collectively the political district of Tenasserim.

The *West Himalayas* are in part Palæarctic, particularly the inner ranges, and part Oriental, due to infiltration from the South and North-East India divisions.

North-East India is one of the most interesting and richest areas in the world. The Central Asian and Chinese divisions of the Palæarctic Region here meet the South Indian and Malaysian divisions of the Oriental Region. It constitutes a portion of the Indo-Chinese Subregion of the Oriental Region. Faunal boundaries are principally a question of altitude.

Burma has affinities with Assam, South China, Tong-king, and Siam on the one hand, and with Malaya on the other. The accepted border between the Indo-Chinese and Malaysian Subregions runs through Victoria Point. The fauna is very rich, and many of the species are still very rare in collections.

The *Andaman Islands* show a close relation to the Indo-Chinese Subregion, though many of the forms are much modified.

The *Nicobar Islands* are to be included in the Malaysian Subregion, exhibiting a close affinity with Sumatra. The forms are mostly modified, with races in North, Central, and South Nicobars.

2. *Distribution of Species in India.*

The table below shows how the species in the various families are distributed between the eight areas. The figures re from Evans (1932 *a*), with slight alteration :—

Family.	Ceylon.	Peninsular India.	North-West India.	West Himalayas.	North-East India.	Burma.	Andamans.	Nicobars.	Total species.
Papilionidæ .	15	19	17	35	62	66	11	5	94
Pieridæ .	29	34	56	42	52	55	15	9	99
Danaidæ. .	12	11	7	8	14	32	5	11	38
Satyridæ .	16	31	46	56	103	93	7	6	184
Amathusiidæ .	1	3			14	24	2		26
Nymphalidæ .	37	51	50	86	158	174	31	16	232
Riodinidæ .	3	3	2	9	18	23	1		25
Lycænidæ .	80	89	79	122	243	314	59	34	438
Hesperiidæ. .	45	74	28	63	189	233	39	14	307
Total. .	238	315	285	421	853	1014	170	95	1443

Before the volumes on butterflies are completed there will be doubtless some alteration in the data given in this table, but the proportional specific representation is unlikely to be changed to any appreciable extent for any one area.

IX. Collecting and Preserving. (Fig. 9).

1. *Collecting.*—The first requisite is a net. The Kite or Balloon net, sold by most dealers in entomological requisites, is very useful, as it can be taken to pieces and put together again very quickly. The main support is a brass "Y" into which are fitted the cane frame and the handle. If such a brass "Y" is obtained one can make the net by bending a piece of cane for the frame and cutting a strong stick for the handle. The bag may be of strong mosquito-netting, and should be dyed green, brown or black, as white is apt to alarm some butterflies. The bag must be rounded at the bottom. There is another kind of net that is also very useful: this has an all-metal frame which folds together, and at the stick end is a ferrule arrangement to tighten up the frame, and into which the stick is inserted. This net has the advantage of greater reliability, as the frame of the Kite net is apt to break under a particularly strong sweep, and nothing is more annoying than to find one's net become suddenly useless when pursuing a specially desirable specimen. Nevertheless it is sometimes an advantage to possess a few Kite nets when employing native collectors.

To catch the insect in flight, make a rapid side-stroke; an insect at rest is best secured by a downward stroke. The bag should be at once twisted over the frame to prevent the insect from escaping, and then the butterfly must be killed. Get the insect into a fold of the net with its wings closed and then pinch the underside of the thorax. In the great majority of cases a light pinch is sufficient, but for a Danaid or *Parnassius* a much harder pinch is necessary. There are many butterflies (Lycænids, Hesperiids, most Satyrids, etc.) which should advisably not be killed in this way; either damage to the fore legs or thorax or scales rubbed off the wings may be the result. The use of a killing-bottle is recommended for these insects. This consists of a stout glass tube, fitted with a cork or rubber bung. At the bottom of the tube place a layer of potassium cyanide crystals and press it down; over this place a layer of dry plaster of Paris and press this down; three or four thicknesses of blotting-paper are now cut to size and laid upon the plaster, followed by a small wad of cotton-wool; a further three or four thicknesses of blotting-paper should be pressed down upon the wool. Not more than a quarter of the tube should be occupied by the killing agent

and packing. Such a tube will remain dry for a long time, and after a while the moisture in the cyanide will cause the plaster to set and harden. As soon as the insect is dead it should be removed from the tube. Should it be desired to kill larger specimens by means of cyanide, a wide-mouthed glass jar must be prepared. A layer of cyanide crystals is placed at the bottom, and these are covered with a paste of plaster of Paris to a depth of about half an inch. When the plaster has set, it should be covered with several sheets of blotting-paper cut to size; when this becomes wet it must be removed, and either consigned to the fire or buried out of harm's way.

Another useful killing agent is carbon tetrachloride. As this is a liquid, some sort of absorbent pad must be provided. A wad of felt, or a piece of spongy rubber, secured at the bottom of the tube and covered with a few thicknesses of blotting-paper, will serve the purpose. This should be made damp, but not wet, with the liquid, drops of which can be added when necessary. For this purpose the tetrachloride can be carried in one of the brass chloroform bottles sold by the dealers. The liquid is extremely volatile, and an air-space must be left in the bottle containing it. If the vapour be inhaled it is liable to cause a headache. The vapour kills rapidly, and it is advisable to place the killing-tube against the outside of the net so as to quieten an insect, which can then easily be transferred to the tube. It is not known to change the colour of specimens, as is often the case with many Pierids subjected to cyanide.

After killing, the collector can adopt one of two courses. The insect may be either transferred to a paper envelope or pinned in a cork-lined collecting-box; all handling should be done with a pair of plain blunt entomological forceps. When the insect is transferred to an envelope the wings are closed over the back, with the antennæ between them or against the costal margins. It is important to place only *one* butterfly in an envelope.

The envelopes, or "papers" as they are called, should be made of some fairly smooth paper, not too thick nor too thin. Very smooth paper should be avoided, as the insect is apt to slide about when the papers are handled or a parcel is in course of transport. Transparent paper, often sold by the dealers, is also not to be recommended. In the absence of special paper, old magazines and certain newspapers may be used. The triangular envelopes are made by cutting out rectangular pieces of paper, and three useful sizes are 3 in. × 4 in., 4 in. × 5½ in., 5 in. × 7 in. The method of folding the paper is shown in fig. 9 (1). The paper is folded along the diagonal AB so that the edge BC lies along the line BD. The flaps E and F are now folded over

on each side. The completed envelope is shown in fig. 9 (2). The projecting edges of the flaps may be turned over or cut off. Note the position in which the butterfly is placed in the envelope. The flaps should not be gummed down, and the folds must be pressed flat before the envelope is ready for use. A quick and easy method is to pass the papers

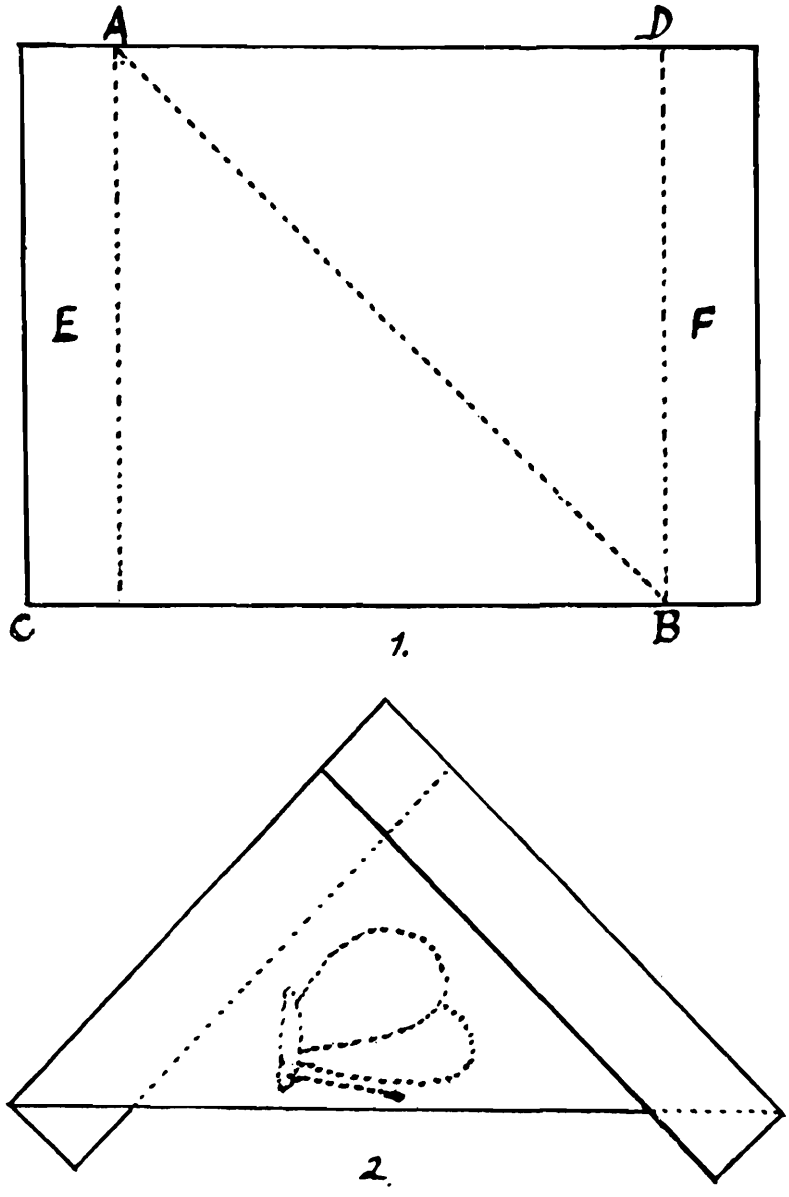


Fig. 9.

1. Method of folding paper for envelopes.
2. Completed envelope.

through a mangle or wringer ; otherwise keep them under pressure for at least 24 hours. It is an advantage to use plain paper, as one can write the data upon it.

A supply of envelopes of different sizes should be carried in a pocket-box, and as they are filled they should be transferred to another box.

Upon arrival home it is advisable to place the envelopes containing specimens for a short time in a killing-jar, or in a box containing cyanide or tetrachloride, to make sure that life is extinct and to ensure the destruction of all parasites ; otherwise many Danaids and *Parnassius*, for example, will be found to have recovered, and even after several days may fly off when the envelope is opened.

Papered butterflies should be stored in a box (preferably of wood) fitted with a good lid and having plenty of powdered naphthalene at the bottom. If the specimens are to remain in the box for some months or more it may be advisable to coat the bottom of the box with a solution of naphthalene in chloroform and phenol. This will prevent mildew, as well as keep away pests. Such a wooden box should be enclosed in a tin one as a further protection against pests. Before the papered insects are packed they should be laid out to dry thoroughly ; if packed when fresh they may become mildewed, especially in a tin. It is of course easier to pack a fresh specimen, and more envelopes can be pressed into the box without harm ; but they must not remain thus packed for any length of time.

When the day's collecting is over it is advisable to go through the specimens, and in the case of Lycænids and Hesperiids, and in others where the sexes are not known, to squeeze the abdomen gently with tweezers so as to extrude the genitalia ; in some cases a pin can be inserted near the apex of the ventral surface and the genital structures be pushed out. This will facilitate the determination of sex and of obscure species. Care should be taken to see that the body is sufficiently relaxed to permit such manipulation ; in dry weather it is advisable to perform the operation in the field.

An important adjunct to the collector's outfit is a supply of bait which will attract many butterflies that otherwise are not often seen and are sometimes rare. The best bait is over-ripe or rotting bananas, pineapples, etc., as well as rotting meat of any kind. The fruit should be crushed, enclosed in large leaves, and suspended from low bushes in tall forest. These baits should be inspected in the late afternoon and early morning, and perhaps at midday. After heavy rain they must be renewed.

Whenever the collector comes across a butterfly new to him he should catch a good series, however common it may appear to be. Certain examples of some rarities in our museums still remain as samples taken because they were thought to be common and easily obtained species.

Another branch of collecting is concerned with larvæ and pupæ. Too little is known of these earlier stages, and every endeavour should be made to collect and breed them. If the

rearing of larvæ is accompanied by full data as to food-plant, times between and number of moults, and descriptions or drawings at each stage, important advances in our knowledge may be made. The caterpillars should be placed in airy cages covered with mosquito-netting, furnished with fresh food from the known plant, and kept very clean. When the larvæ are full-fed some sticks, preferably from the food-plant, should be cut and placed in a sloping position in the cage. The larva will pupate upon these, and when the imago emerges it will climb up them to dry and expand its wings. The cages must be isolated from ants, being furnished with short legs which are placed in small vessels containing water with a little paraffin or creosote ; or they may be suspended by wire or string which has been soaked with these strong-smelling liquids.

Where it is possible to breed a complete family from the eggs it is often worth while to keep all the resulting imagines in one series, and if the species be variable, and the parents are known and included, such a bred family becomes of much scientific interest, and may prove of considerable value in the study of genetics and variation. Any such bred families should be sent to the Hope Professor at the Hope Department of Entomology, University Museum, Oxford ; here, in due course, they will become the subject of expert study.

2. *Preserving.*—Before the butterfly is ready to be placed in the collection the wings must be spread out, also the antennæ, and perhaps the legs. For this purpose the specimen must be relaxed, unless it is still fresh and limp. Relaxing can be done in a tin with a good lid, or in a shallow glass vessel fitted with a lid or covered by a glass plate. A layer of damp sand, damp blotting-paper, or a large plug of damp cotton-wool is placed in the receptacle. Papered specimens can be placed on the damp surface, but loose ones must be laid on a dry sheet of paper. Precautions against mould must be taken, and the damp sand or papers should be changed frequently. It is not advisable to introduce carbolic acid as a preventative, but some crystals of thymol will be effective and are also harmless to the specimens. The time taken to relax varies. After a few hours the specimens may be picked up with the forceps and the underpart of the thorax gently squeezed. If the wings are readily movable, and can be pressed open easily with the forceps placed against the bases of the wings, the insects are ready for setting.

Another method of relaxing which has been recommended (Sevastopulo, 1936, J. Bombay Nat. Hist. Soc. xxxviii, pp. 634–6) is to damp the papers and contents with methylated spirit and shut them up in an air-tight tin for two days. Specimens so relaxed can be removed from the setting-board

after 24 hours. Care must be taken to see that the papers do not bear writing in ink or copying-pencil, as the spirit will affect it.

When the insects are properly relaxed they are first pinned into the groove of a setting-board of suitable width, the wings being spread out with the aid of a setting-needle and secured with tracing-linen or paper strips. There is not space here to give an adequate description of the method of setting. This is best shown by an expert in this operation, of which excellent accounts are given by Evans (1932 *a*) and by Corbet and Pendlebury (1934).

The boards with specimens must be placed in a ventilated box securely isolated from ants. When the abdomen is stiff and hard the insects must remain on the board for another 24 hours. In the case of butterflies which have been kept dry in papers for some time they should remain on the boards for at least two weeks. Specimens may of course be dried before a fire or placed in an oven with a gentle heat. An hour or so will suffice, but the insects must still remain *in situ* for several hours longer, or the wings are liable to spring upwards more or less after removal from the board.

The store-box or drawer to contain the specimens will be of a depth suited to the length of pin. If long pins are used for mounting, a store-box should be corked on one side only. It is preferable to use long pins of rustless steel ; the specimen can be handled more easily, and there is more room for labels.

To guard against pests the most efficient substance is para-dichlorobenzene in crystals. This will kill anything introduced into the box, including the larvæ of museum beetles. In very damp climates it is as well to keep the store-boxes in a zinc-lined drying case fitted with calcium chloride dryers.

When set specimens " spring," *i. e.*, when the wings move from the set position, as they often do in damp climates, the specimen should be reset and a little viscous shellac (prepared by dissolving shellac in alcohol) applied to the base of the wings below.

Besides shellac for re-fixing the abdomen in some cases, another useful cement may be made by dissolving celluloid in amyl acetate. One can use discarded photographic films, which are stripped of gelatine and cut up into very small pieces. This cement is of value in fixing antennæ, wings, and pieces of damaged wing.

Gum may be required for labels and for mounting dry dissections. The following formula given by Tillyard (1926) is for a gum that will not become brittle in hot, dry weather, and will not form mould under damp conditions :—Gum arabic (60 parts) ; sugar (30 parts) ; carbolic acid (2 parts) ; alcohol at 95 per cent. (8 parts) ; water (45 parts).

3. *Preparation of Genitalia.*—For the benefit of those who wish to study these structures (and an examination of them is often necessary in the case of obscure species) a general account of the method to be adopted is given below.

It has been stated already, in the section dealing with collecting, that the genitalia can be squeezed out whilst the specimen is fresh. In this case the parts can usually be seen clearly at any time with the aid of a pocket lens. On the other hand, where the parts are not visible, proceed as follows :—

The end of the abdomen is wetted with wood-naphtha, which will relax the parts; after removing one clasper apply the spirit to the inner cavity; only a minute or two is necessary for all Hesperiids and the larger Lycænids. Having thus relaxed the parts the insect, or the detached abdomen, must be placed under suitable magnification whilst dissection is carried out. Use a pair of fine-pointed forceps and a needle which has been ground down to three cutting-edges. The parts are kept in a relaxed condition by frequent applications of wood-naphtha, using a small paint-brush. One or both claspers may be detached, and afterwards the uncus with tegumen and vinculum, and claspers separately, are mounted on a card fastened to the pin which carries the insect. The clasper should be mounted to show the inside, and the uncus upright. Some practice will be necessary before a dissection can be made without damage; the work will be greatly facilitated by the use of a binocular microscope. This may be called the dry method; it is not recommended for Lycænidæ.

For wet preparations the procedure varies with different workers. The abdomen is softened in a solution of 10 per cent. caustic potash, either by boiling in a small open dish (not in a tube) or by allowing the specimen to remain in the cold liquid for many hours. After washing in water, the genitalia can be dissected away from the body under water by means of two needles and the fine-pointed forceps. If the organs still require further cleaning they can be heated in the potash again, care being taken not to destroy the hairs and bristles. The genitalia, after being well washed in several changes of water, should now be examined, and a preliminary study made of the parts before they are dissected. The parts must then be transferred to 70 per cent. alcohol, twice changed, for a few minutes; thence through 90 per cent. alcohol to absolute alcohol, and finally into xylol or toluol for some minutes, after which transfer back through fresh alcohols to 70 per cent., unless it is desired to mount on a slide. Mounting on a slide is not recommended for the larger preparations. Once mounted, a complete examination cannot be made in

these cases; moreover, some distortion may result from pressure, or the part may move during mounting, and not be in the desired position.

Prepare some small tubes containing 70 per cent. alcohol and fitted with stoppers made of elder-pith; corks are apt to stain the alcohol and discolour the specimen. These tubes should be placed in a jar, such as a fruit-preserving jar, with a stopper that hermetically seals the contents. This jar has a layer of cotton-wool on the bottom, and is filled with 70 per cent. alcohol. The tubes should contain a small label, written in indelible ink, bearing the number of the specimen from which it was derived. A large label on the outside of the jar will give a list of the contents. Any specimen of genitalia so stored is readily accessible for complete examination.

4. *Preparation of Larvæ.*—The collector should endeavour to preserve the early stages of the species he is collecting, whenever these can be acquired. It may be found convenient to have these in the collection with the imago. To kill the larvæ it is best to use a fixative to ensure rapid killing and prevent contraction. Blés Solution is well recommended, and is prepared as follows:—Alcohol 70 per cent. (90 parts); formalin (40 per cent. solution formaldehyde) (7 parts); glacial acetic acid (3 parts).

The following method of preparing dry specimens of larvæ is given by Tillyard (1926):—

"Fix the specimens alive in Blés Solution, laying the tubes on their sides so that the insects die extended. In the case of certain larvæ covered with a waxy film, into which the fixative will not penetrate, immersion for a short time in chloroform is usually sufficient to remove the film. Leave in the fixative till thoroughly hardened (several weeks for medium to large specimens); then dehydrate in absolute alcohol for one to three days. Make a few incisions here and there in the cuticle with the sharp point of a knife or scalpel, and transfer specimens to xylol or chloroform. When the specimen is thoroughly cleared, remove from the liquid and allow to dry on a piece of filter-paper. The tissues being hardened, the insect will not collapse, and can be mounted in any suitable way required; in the case of green larvæ the colour will have been lost. For larvæ which are semi-transparent in life, the natural appearance can be attained by passing the specimen from chloroform into a solution of paraffin-wax in the same liquid at about 40° C. for some hours; then rinse sufficiently in chloroform to remove the film of wax on the cuticle, and dry as before. As considerable quantities of absolute alcohol are required in these processes, it is best prepared by heating crystals of copper sulphate until the anhydrous form is obtained, and then shaking this up in a jar

of strong spirit and allowing to settle ; the anhydrous copper sulphate will extract all the water from the alcohol, and the decanted remainder will be near enough to absolute for this purpose ; the same alcohol can be dehydrated and used again and again."

Another method of preparing the dry larva is by blowing, the empty skin being distended by air and dried in an oven. Much practice is required in order to preserve the natural shape and size. The necessary apparatus, with full instructions, can be obtained from the dealers in entomologist's requisites.

Again, larvæ may be preserved simply in alcohol, which, however, strongly affects the colour. All preserved larvæ should be accompanied by a description of the colours and markings in life, and in the case of species which appear to be unknown, the description should be as complete as possible, and made from freshly killed specimens.

5. *Labelling.*—Every specimen must bear a label showing the more important data obtained by the collector. The first necessity is the locality, which must be clearly stated ; the mere name of a town or village is often difficult to trace by those who may one day have to examine the specimens ; so the district must be given, or the latitude and longitude. Next comes the date, the day, or at least the month and year, being stated ; any unusual time of flight can also be noted. Next comes the elevation above sea-level, very important in mountain areas. Lastly, the name of the collector is placed at the bottom.

If specimens have been reared the fact must be noted, and the locality where the larva was found must be stated. When insects have been taken *in copula* this must be noted by writing—for example : " A *in cop.* with B," or " 1 *in cop.* with 2," care being taken not to use the same letter or number for a second pair. When specimens are received by gift or exchange it is usual to add " Ex coll. .," giving name and year.

If any further information is obtained, for which there is no room on the labels, this could be entered in a note-book, and a reference number be marked on the back of the locality label. The following details are often useful :—In the case of a mountain, the particular side ; in the case of a river, whether right or left bank ; season, whether wet or dry, or an extreme of either ; prevailing wind ; habits of the species, such as flight, feeding-haunts, protective coloration, whether sexes fly together or have similar habits, resting attitude, etc., etc. The inclusion of a sketch-map in the collector's notebook, showing the area, with localities marked, would often be of value.

6. *Reference Collections.*—Collections of Indian butterflies are maintained at the following institutions, all of which would be glad to receive specimens from the less known localities :—

The Prince of Wales's Museum, Bombay, under the supervision of the Bombay Natural History Society.

The Indian Museum, Calcutta (the Zoological Survey of India). This contains the important de Nicéville Collection, now incorporated in the main collection.

The Forest Research Institute, Dehra Dun.

The Imperial Agricultural Research Institute, Delhi.

The Madras and Colombo Museums.

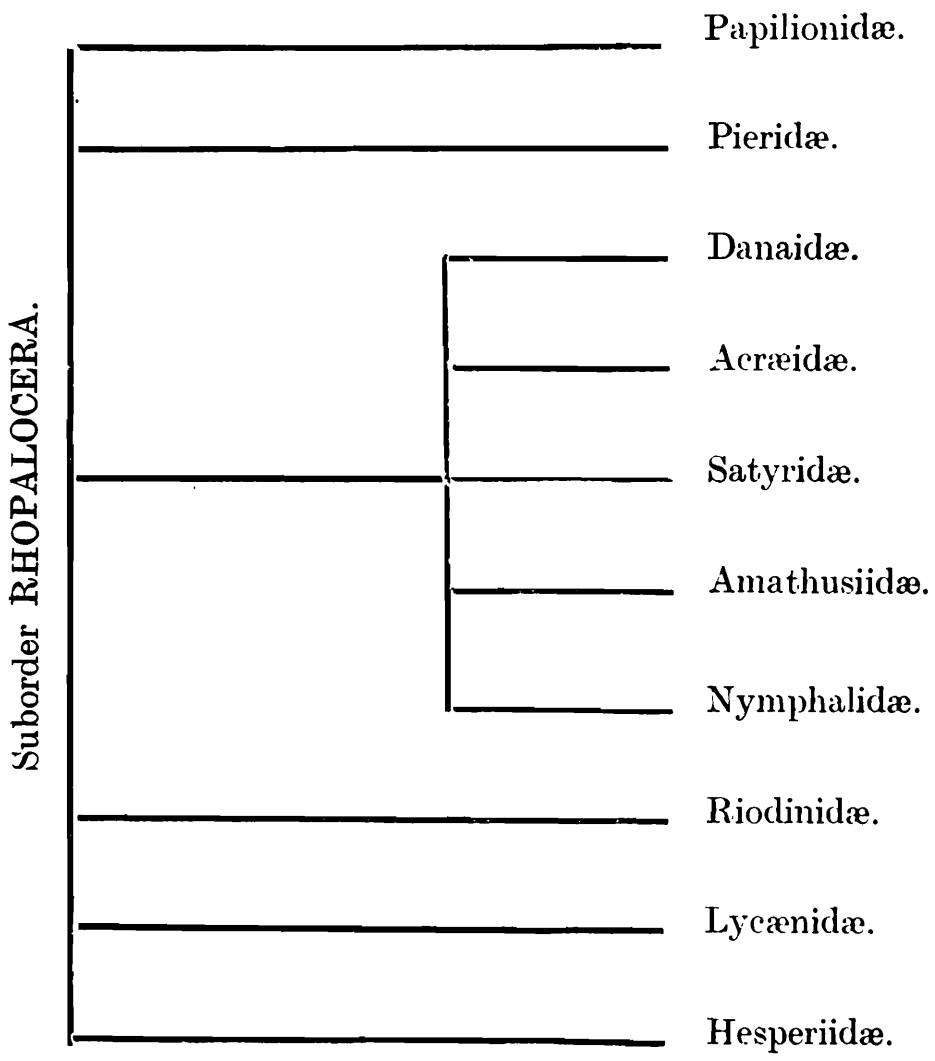
The British Museum (Natural History), London, S.W 7 This contains the best preserved and most complete collections of Indian and other butterflies in the world. Application to see the study collections should be made to the Keeper of Entomology.

The Hope Department of Entomology, University Museum, Oxford. This contains large collections illustrating Protective Resemblance and Mimicry, as well as a systematic collection. Application should be made to the Hope Professor.

Order **LEPIDOPTERA.**

Suborder **RHOPALOCERA.**

Phylogenetic Scheme of the Families of RHOPALOCERA *occurring in the Indian Region.*



Key to Families of Butterflies.

1.	Fore wing with vein 7 forked. Antennæ approximate at the base.	2.
	Fore wing with all veins arising from the cell. Antennæ wide apart at base, and often with a hooked club . .	**Hesperiidæ.**
2.	Hind wing with a precostal vein (except in a few Pieridæ) . .	3.
	Hind wing without a precostal vein.	**Lycænidæ.**
3.	Fore legs fully developed in both sexes	4.
	Fore legs not perfect in one or both sexes	5.
4.	Hind wing with vein 1 *b* absent	**Papilionidæ**, p. 54.
	Hind wing with vein 1 *b* present	**Pieridæ**, p. 300.
5.	Fore legs imperfect in both sexes . ..	6.
	Fore legs imperfect and brush-like in the ♂; developed for walking in the ♀ .	**Riodinidæ.**
6.	Both wings with the cell closed; cross-veins present. . . .	7.
	Hind wing with the cell open; cross-veins absent (cell slenderly closed in a few cases)	9.
7.	Fore wing with vein 1 *a* forked with 1 *b*.	**Danaidæ.**
	Fore wing with vein 1 *a* free.	8.
8.	Fore wing with one or more veins (except in a few cases) inflated or swollen at base. Wings normally scaled, not spotted .	**Satyridæ.**
	Fore wing without any vein inflated at base. Wings thinly scaled and spotted	**Acræidæ.**
9.	Palpi small, narrow, and sharp in front ..	**Amathusiidæ.**
	Palpi large, broad, rounded in front. Cell of wing usually open	**Nymphalidæ.**

Family PAPILIONIDÆ. (Fig. 10).

Papilionidæ, Leach, 1815, p. 127 (part.).

Egg.—Without prominent sculpturing. Dome-shaped, opaque, smooth or minutely pitted; white, green, orange, or blotched.

Larva.—Stout, smooth or with one or more pairs of fleshy tubercles on the dorsum, or furnished with hard spines; sometimes with a raised fleshy protuberance (the so-called hood or crest) on the fourth segment, which generally is also thickened above. The prothorax is furnished with a fleshy forked process, which is extrusible and connected with a scent-gland; this organ is called the osmeterium, and emits a strong, somewhat pleasant, but always penetrating odour.

The young larva is furnished with rows of bristle-bearing tubercles, which in the later stages disappear.

"The larva lives free, but some Papilios, by bending over the edges of leaves, make a sort of tunnel in which the larva conceals itself; many forms hide during the day, many also are gregarious" (*Jordan*, 1908).

Pupa.—Variable in form, but superiorly most often curved backwards, sometimes very strongly so; angulate, with the

head truncate or rounded, often bifid; back of abdomen smooth or tuberculate; attached head upwards by a cremaster and by a girdle encircling the thorax and wing-cases. In *Parnassius* the pupa is enclosed by a loose cocoon placed on the earth or just below it.

Imago.—Wings very variable in shape. Fore wing (except in *Parnassius* and *Hypermnestra*) with 12 veins, and in addition a short internal vein, vein 1 *a*, that invariably terminates on the dorsal (inner) margin. There is also a short transverse vein, the median spur, present near the base of the wing between the cell (median vein) and vein 1 *b* in all genera except *Armandia*, *Parnassius*, and *Hypermnestra*. Veins 7 and 8 are stalked. Vein 2 rises before the middle of the cell,

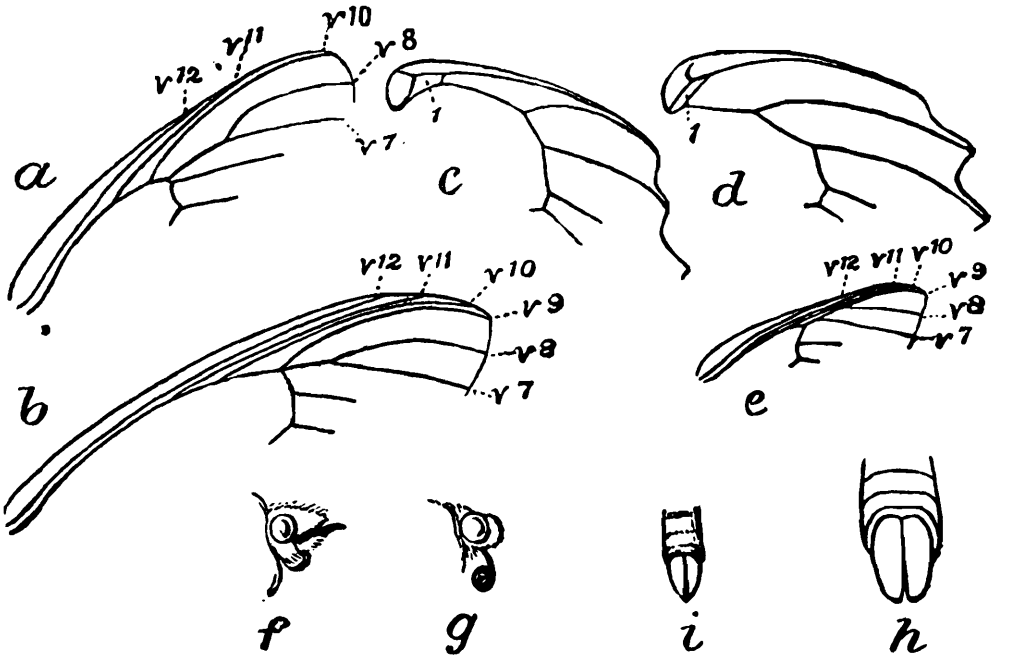


Fig. 10.—*a*, venation of anterior portion of fore wing in *Parnassius*; *b*, venation of anterior portion of fore wing in *Papilio*; *c*, venation of anterior portion of hind wing in *Armandia* (*1*, precostal cell); *d*, venation of anterior portion of hind wing in *Papilio* (*1*, precostal cell); *e*, venation of anterior portion of fore wing in *Lamproptera*; *f*, side view of head of *Teinopalpus*; *g*, side view of head of *Papilio*; *h*, anal valves of *Troides* group; *i*, anal valves of typical *Papilio*.

and four veins rise from the outer lower edge of the cell. Cell closed in both wings. Hind wing very frequently with a tail, which may be slender, or broad and spatulate, but is always an extension of the termen at vein 4. In the genus *Armandia* the termen is prolonged into tails at the apices of veins 2 and 3 as well as at vein 4. Vein 1 *b* is absent. A basal cell and a precostal (basal) vein are both present. The inner (abdominal) margin is frequently folded over, and within the fold, in the ♂, the wing often bears a patch of special scales known as androconia or scent-scales, a mass of woolly

pubescence, or a brush of hair often strongly scented. In the males of some species, certain veins on the fore wing above are edged with pilose scent-stripes.

Proboscis well developed. Palpi small and appressed to frons, rarely large and projecting (*Teinopalpus*). Antennæ comparatively short, with generally a distinct club ; upperside either scaled or naked. Three types of antenna occur : " The fine sensory hairs beneath and laterally are almost equally distributed over the proximal part of each segment, or there is a cavity on each side which is covered with sensory hairs (recalling the Nymphalids), or there is only one row of such cavities present (recalling the Pierids)."

" Mesothorax very powerful, the sternum completely fused with the episternum, the suture outwardly quite wanting as in the Pierids, which distinguishes these two families from all other Lepidoptera " (*Jordan*, 1908).

Fore leg fully developed ; fore tibia with spur on the underside. Hind tibia with middle spurs. Claws simple, rarely with a tooth ; paronychium and pulvillus wanting.

Genitalia.—♂. " Valve simple, broad or elongate, usually with well-developed chitinized harpe. Tegumen broad, uncus slender, acuminate or curved ; side lobes sometimes present (*e. g.*, *Parnassius epaphus* Boisd.). Scaphium well developed, central lip divided. Vinculum U-shaped. Penis long and stout ; anellus lobes often present " (*Mehta*, 1933 *b*).

♀. According to Eidmann (1930) the pair of tubes which lead from the bursal sac are of a different form in two groups. In the *Aristolochia*-feeding species the tubes are curved round in a single spiral at the base. In the tribe PAPILIONINI these tubes are not so curved, but emerge direct. Each of the three tribes appears to be distinguished by a distinct type of ♀ genital apparatus.

Classification.—The Papilionidæ are generally considered to be related to the Pieridæ, and to represent a final stage in the development of the RHOPALOCERA. The family is here divided into three subfamilies : Papilioninæ, Parnassiinæ, and Zerynthiinæ. The Papilioninæ have been divided into a great number of genera, many of which are untenable as their characters are not constant. The genera required may be reduced to seven : *Troides*, *Polydorus*, *Chilasa*, *Papilio*, *Graphium*, *Lamproptera*, and *Teinopalpus*.

The Parnassiinæ are more homogeneous, and are represented in the Indian region only by *Parnassius* and *Hypermnestra*.

The Zerynthiinæ are represented in the Indian region only by the genus *Armandia*.

Distribution.—The family is found everywhere in the world except in the extreme north and south, and in desert areas. It is as abundant in the tropics of America as it is in the tropics

of the Old World. The number of species, excluding *Parnassius*, inhabiting the Oriental Region from India to the Pacific is 209, of which 81 are recorded from the Indian area, 76 belonging to the true Papilios. Altogether, in the Indian area, 92 species of Papilionidæ are to be distinguished.

The species are distributed as follows :—Burma, 65 ; North-East India, 60 ; West Himalayas, 33 ; Peninsular India, 20 ; Ceylon, 15 ; North-West India, 15 (including 9 *Parnassius*) ; Andaman Islands, 9 ; Nicobar Islands, 6.

A number of Papilionids occur nowhere else but in the Indian area. *Polydorus rhodifer* Butl. (Andaman Islands), *jophon* Gray (Ceylon and Peninsular India), *hector* L. (Ceylon and Peninsular India), *adamsoni* Gr.-Sm. (Burma), *latreillei* Don. (West Himalayas to North-East India and Burma), *polla* Nicev. (North-East India to Burma) ; *Papilio polymnestor* Cram. (Ceylon and Peninsular India), *mayo* Atks. (Andaman Islands), *elephenor* Doubl. (Assam), *crino* Fabr. (Ceylon and Peninsular India), *buddha* Westw. (Peninsular India), *dravidarum* W.-M. (Peninsular India), *liomedon* Mre. (Peninsular India) : *Graphium gyas* Westw. (North-East India to Burma) ; *Teinopalpus imperialis* Hope (North-East India to Burma) ; *Parnassius hardwickei* Gray (North-West to North-East India), *stoliczkanus* Gr. Gr. (West Himalayas), *hannyngtoni* Avin. (Sikkim), *acco* Gray (West Himalayas to North-East India).

It will be seen from the list above that no fewer than eight out of fourteen species of Papilioninæ are to be found only in Ceylon and Peninsular India. *P. polymnestor* may possibly be considered as a race of *memnon*.

Keys to Larvæ and Pupæ.

These keys are given as a general guide, but our knowledge of the early stages is as yet not sufficiently advanced, nor is the necessary material available, to enable more comprehensive keys to be constructed.

1. *Key to Genera.*

Larvæ.

1. *Aristolochia* feeders, covered with many large hairy tubercles . . . . . [*dorus*, p. 70.
   Never feeding on *Aristolochia*. Without hairy tubercles . . . . . *Troides*, p. 61, and *Polydorus*, p. 70. 2.
2. With spiny tubercles or short spines . . . 3.
   Without spines, almost smooth . . . . . 4.
3. A pair of short spines on each of the three thoracic segments and on the last segment. Thorax swollen. Anal segment produced to two short points. Feeding on Anonaceæ and Lauraceæ . . . . . *Graphium*, p. 200.
   Many spiny tubercles. No oblique bands, but spots. Feeding on Lauraceæ . . . *Chilasa*, p. 106.

4. Spotted or with oblique bands. Anal segment not produced to two short points. Feeding chiefly on *Citrus* . . . . . *Papilio*, p. 120.
Covered with short hairy warts, cylindrical, strongly tapering at both ends. Feeding on *Saxifraga*, *Sedum*, *Sempervivum*, *Corydalis*, *Scabiosa* . . *Parnassius*, p. 256.

Pupæ.

1. Formed below ground *Hypermnestra*, p. 253.
Formed above ground . . 2.
2. Formed within a cocoon on the ground. . *Parnassius*, p. 256.
Not formed within a cocoon 3. [*dorus*, p. 70.
3. Wing-cases strongly projecting. . *Troides*, p. 61, and *Poly-*
Wing-cases not strongly projecting 4.
4. Stick-like, head without horns, truncate. *Chilasa*, p. 106.
Not stick-like, head with two horns, not truncate . . . . . 5.
5. Width moderate. Abdomen without dorsal carinæ . . . . . *Papilio*, p. 120.
Narrow. Abdomen with two dorsal carinæ. *Graphium*, p. 200.

2. *Key to some Larvæ.*

This was published by T. R. Bell (1911), and is given here as it will be of use to students in Peninsular India; it deals with eighteen species in that area.

SECTION I. Larvæ when full-grown without conical fleshy tubercles.

A. Full-grown larva with anal segment continued into two short parallel, sharply conical points, close together.

a. Full-grown larva having the appearance of being transversely lined, segment 4 coloured differently to the rest.

a'. Full-grown larva black on dorsum of segment 4 . . . [(Esp.), p. 207. *Graphium nomius*

b'. Full-grown larva green on dorsum of segment 4 . . [(Cram.), p. 212. *Graphium antiphates*

b. Full-grown larva more or less concolorous.

a'. Lateral spine on segment 4 broadened out into a triangular tooth, white, the two connected by a crest or ridge across the dorsum . . [(Linn.)*, p. 219. *Graphium sarpedon*

b'. Lateral spines of segment 4 perfectly conical and sharp.

a^2. Colour green, sullied with blotches of a very slightly darker shade. [(Linn.),* p. 229. *Graphium agamemnon*

b^2. Colour pure green or rusty black. . . . . [(Linn.),* p. 225. *Graphium eurypylus*

B. Full-grown larva with anal segment not continued into such points, these being represented by mere knobs much more widely separated; the segment high, sometimes nearly perpendicular to the longitudinal axis of the rest of the body,

* SECT. I. A : *b*.—These three are all black in their first stage, and profusely covered with little branched spines which are gradually lost in the successive stages, finally disappearing in the fourth stage.

while that of the A division is nearly continuous in the same plane as that axis.

a. Full-grown larva green, a prominent broad, green, whitish or yellow band from dorso-ventral margin of segment 8 running up and back to hind margin of segment 10 on dorsum or in that direction; a triangular whitish patch occupying the whole of the spiracular region of segment 10

a . Full-grown larva with a dorso-lateral, small, conical, fleshy tubercle on segment 9 ... .. [Moore, p. 184. *Papilio liomedon*

b'. Full-grown larva without such tubercles.

a^2. Band on segments 8, 9 yellow-brown, spotted lighter; this band sometimes broken, irregular .. [p. 187. *Papilio demoleus* Linn.,

b^2. Band on segments 8, 9 green, indistinct because of same colour, more or less, as larva . ... [W.-M., p. 159. *Papilio dravidarum*

c^2. Band on segments 8, 9 with ground-colour white, sullied as a rule with grey or brown.

a^3. Full-grown larva with a lateral ocellus on segment 4 black, a brown line across centre and yellow-brown margin. Above average size ... . . [Hamps., p. 169. *Papilio helenus daksha*

b^3. Full-grown larva with lateral ocellus on segment 4 black, a white line across centre and bordered brown in front, blue behind. Above average size.. [Cram., p. 124. *Papilio polymnestor*

c^3. Full-grown larva with lateral ocellus black, not quite as above. Very much smaller [p. 176. *Papilio polytes* Linn.,

b. Full-grown larva green, not marked by bands.

a . Ocellus on segment 4 orange-brown, small and not well developed, the crest joining them white . .. [Moore, p. 149. *Papilio paris tamilana*

b . Ocellus on segment 4, otherwise the crest joining them yellow .. [p. 156. *Papilio buddha* Westw..

SECTION II. Larvæ with many conical, fleshy, pointed tubercles.

A. Conical tubercles not red-tipped; larva with broad creamy markings ... [p. 114. *Chilasa clytia* (Linn.),

B. Conical tubercles red-tipped; larva with no yellow markings; markings, if present, white or pinkish.

a. No band on segment 7 [(Linn.), p. 83. *Polydorus hector*

b. A band on segment 7.

a . The front margin of segment 2 rose-white .. . .. [*diyana* (Moore), p. 81. *Polydorus jophon pan-*

b . The front margin of segment 2 not white.

a^2. Colour more or less evenly black. [(Fabricius), p. 85. *Polydorus aristolochiæ*

b^2. Colour dark rose-brown, marbled satin-grey. [(Cramer), p. 65. *Troides helena minos*

Note on some Ceylon Species.

The larvæ of *demoleus*, *polytes*, *parinda*, and *mooreanus* are very much alike. They are thus distinguished by Fryer (1911) :—

A. Fourth and fifth segments markedly swollen.
  a. Diagonal bands on segments 8 and 10 mainly brown, and meeting in the dorsal middle line . . .. [p. 168. *mooreanus* Roths.,
  b. Diagonal bands mainly white, not meeting in the middle line . .. *parinda* Moore, p. 127.
B. Fourth and fifth segments not markedly swollen.
  a. Caudal tubercles white, much reduced .. . . *romulus* Cram., p. 178.
  b. Caudal tubercles brown, size moderate *demoleus* Linn., p. 187.

Key to Subfamilies.

Imagines.

1. Hind wing with a precostal vein and a basal cell . ... 2.
  Hind wing with basal cell almost obsolete. Precostal vein short and straight. Fore wing with vein 9 absent .. **Parnassiinæ**, p. 253.
2. Basal cell large, elongate, longer than broad. Precostal vein curved basad . **Zerynthiinæ**, p. 249.
  Basal cell small. Precostal vein directed distad. Median spur of fore wing strong. **Papilioninæ**, p. 60.

Subfamily PAPILIONINÆ Swains.

Papilioninæ, Swainson, 1840, p. 87 (part.) ; Jordan, 1909 *a*, p. 107.

Key to Tribes.

1. Fore wing with vein 11 not anastomosed with vein 12. Tarsal claws without a tooth ... 2.
  Fore wing with vein 11 anastomosed with vein 12 (except in *G. payeni* and *G. gyas*, and in *Lamproptera*, all of which have a tooth on the tarsal claw) .. ... **Graphiini**, p. 199.
2. Larva feeding on *Aristolochia*. Thorax or abdomen red below. Hind wing with an anal fold bearing a scent-organ (weak in some cases, e. g., *hector*) ... . **Troilidini**, p. 61.
  Larva not feeding on *Aristolochia*. Hind wing without a scent-organ. Thorax or abdomen not red below (except in *P. bootes*). 3.
3. Hind wing with abdominal margin curved downwards, forming a groove beneath. Frons not projecting. Palpus not long. **Papilionini**, p. 105.
  Hind wing without an abdominal fold. Frons projecting. Palpus very long **Teinopalpini**, p. 246.

Tribe I. TROIIDINI.

The species of this group are known as the *Aristolochia* Papilios on account of the larva feeding almost entirely upon plants of the family Aristolochiaceæ.

"Antenna without scales, except dorsally at the base; beneath, on both sides, with a sharply defined sensory cavity on each segment. The outer ventral row of spines of the tarsi not separated from the dorsal spines by a spineless longitudinal depression.

" Larva densely covered with very short hairs, only the head, the prothoracic sclerite, and legs shiny; each segment with a belt of fleshy tubercles or processes which bear hairs, but no strong spines.

" Pupa dorsally strongly incurved before the middle and posteriorly arched; wing-cases strongly projecting; head truncate, with distinct horns; on the abdomen dorsally a row of humps or lobes on each side " (*Jordan*, 1908).

The Troiidini comprise the genera *Troides* Hübn. and *Polydorus* Swains.

Key to Genera of Troiidini.

1. Both wings large and ample. Hind wing with well-developed scent-brushes. Vein 11 of fore wing arising from a point opposite vein 2. Head black, collar red. ♂ claspers well developed ... . [p. 61. TROIDES Hübn.,
2. Smaller species. Vein 11 of fore wing arising from a point opposite vein 3. Head red, at least in front [p. 70. POLYDORUS Swain.,

Genus **TROIDES** Hübner.

Troides, Hübner, 1819, p. 88; Rothschild, 1895, p. 182; Roths. & Jordan, 1906, p. 433; Hemming, 1934 *a*, p. 143 (type, *helena* Linn., 1758).

Ornithoptera, Boisduval, 1832, p. 33; Moore, 1881 *a*, p. 154; id., 1902, pp. 138–40; Bingham, 1907, pp. 10–11; Hemming, 1934 *a*, p. 143 (type, *priamus* Linn., 1758).

Papilio, Linnæus (part.), Jordan, 1909 *a*, p. 12.

Type, *helena* Linn.

Troides is the oldest name for a group of Papilios formerly called *Ornithoptera*, and popularly known as bird-winged butterflies. They are distinguished by their great size, being among the giants of the butterflies, and some species are remarkable for their brilliant colouring. They form a prominent feature of the butterfly fauna of the Malay islands and New Guinea, extending to Australia and the Pacific. Only three species occur in the Indian area; they are members of the black and yellow group.

Morphologically there is not a great difference between

this group and *Polydorus*. The subcostal vein of the fore wing is given off nearer the base and is longer. The claspers of the male are above the average size for the family, and the scent-brushes in the fold of the hind wing are very strongly developed.

The larva, as one would expect, grows to a much larger size than in other Papilios. It agrees with *Polydorus* in being furnished with many hairy tubercles or spines, and in feeding upon plants of the family Aristolochiaceæ.

The pupa, unlike that of other groups of the family, is sustained by separate lateral threads attached by a tubercle on each side, and not by a loop round the middle.

Key to Species of Troides.

1. Fore wing above with no prominent pale area round the end of the cell. . ..	2.
Fore wing above with a prominent yellow area (white in ♀) round end of cell.	*amphrysus ruficollis* [(Butl.), p. 69.
2. Hind wing above without any proximal black suffusion to the marginal spots in areas 2 to 4. ♀ without white area in cell of fore wing .	*helena* (Linn.), p. 62.
Hind wing above with prominent proximal black suffusion to the marginal spots in areas 2 to 4. ♂ with area 7 yellow to the marginal spot. ♀ with area 1 *b* black at the base; a white area in cell of fore wing	*æacus* (Feld.), p. 68.

Troides helena (Linnæus).

Imago.—Fore wing mostly black. Hind wing in the ♂ largely amber-yellow; in the ♀ with large black spots or with only a small amber-coloured area.

♂. Abdomen above brown, narrowly ringed with yellow, laterally and beneath entirely yellow.

♀. Abdomen black-brown, at the sides a broad yellow stripe, the posterior ventral stripes partly yellow, or the whole underside yellow with black spots. Hind wing usually without a discal yellow spot before vein 7; the cell-spot small and irregular, or longer posteriorly than anteriorly.

Early stages.—Described under *darsius* and *minos*.

Habits.—Described under *darsius*, *minos*, and *cerberus*.

Distribution.—The most widely distributed species of the genus, ranging from Hainan and NORTHERN INDIA to New Guinea.

Five subspecies occur in the Indian area.

1 *a*. **Troides helena darsius** (Gray). (Fig. 11, *a–c*, genitalia).

Papilio darsius, Gray, 1852, p. 5 (Ceylon); Bingham, 1907, pp. 17–18; Jordan, 1909 *a*, p. 18, t. 9 *b*, *c*.

Ornithoptera darsius, Horsfield & Moore, 1857, p. 87, pl. 2, figs. 2, 2 *a* (larva, pupa); Moore, 1881 *a*, p. 155, pl. 55, figs. 1, 1 *a*, 1 *b* (♂♀, larva, pupa); Gosse, 1883, p. 286, pl. 26, figs. 8–11 (genitalia); Lathy, 1902, p. 2.

Troides helena darsius, Evans, 1924, p. 23 ; id., 1927, p. 26 ; id., 1932 *a*, p. 42.
Troides darsius, Rothschild, 1895, p. 203 ; Moore, 1903, p. 140, pl. 418, fig. 1 (larva, pupa), 1, 1 *a* (♂♀) ; Poulton, 1921, p. xci ; Williams, 1927, p. 19.
Pompeoptera darsius, Rippon, 1906–12, p. 37, pl. 60, figs. 1, 2 (♂), 3, 4 (♀), 5 (♂ neuration), 6 (♀ neuration), p. 89, pl. 59, figs. 22, 26 (scales).
Ornithoptera cambyses, Ehrman, 1904, p. 215.
Papilio darsius f. *cambyses*, Jordan, 1909 *a*, p. 18 ; Evans, 1923, p. 231 ; id., 1927, p. 26 ; Holland, 1927, p. 324, pl. 26, fig. 1 (♂ type).
Ornithoptera isis, Ehrman, 1925, p. 89.

♂. *Upperside.*—Fore wing rich velvety black with indistinct pale vein-stripes. Hind wing black, with a very broad, discal,

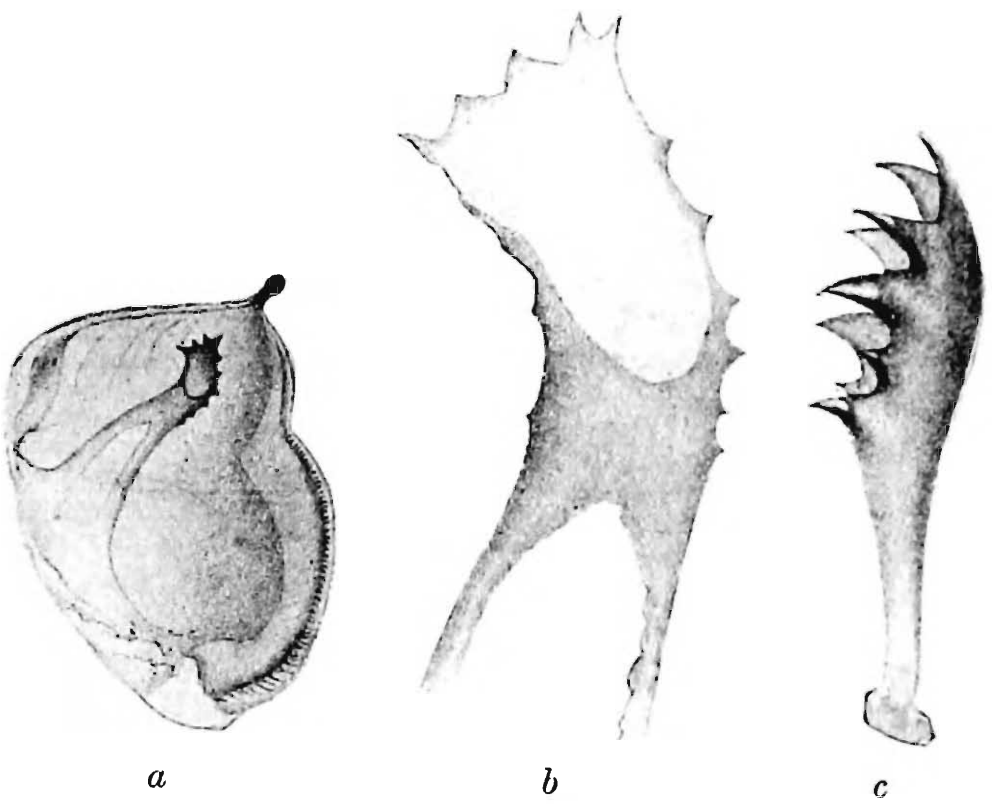


Fig. 11.—*Troides helena darsius* (Gray), genitalia (after Gosse). *a*, valve and harpe ; *b*, harpe ; *c*, harpe, lateral view.

slightly curved, silky yellow band or patch that extends beyond the cell from areas 2 to 7, and is composed of elongate, outwardly emarginate yellow markings that are divided only by the black veins. In most specimens the inner margin of this band crosses the apex of the cell, but in many the cell is entirely black.

Underside.—Fore wing with vein-stripes more distinctly marked.

♀. *Upperside.*—Fore wing with the white stripes at vein 2 far removed from the cell. Hind wing with a great extent

of black ; the black discal spots touch one another. Area 1 with a pale dusky-white patch in the middle ; area 7 with an inner and an outer yellow spot. Cell entirely black or nearly so, rarely with the yellow extended into the apex.

Expanse : ♂♀, 165–175 mm.

Genitalia.—The harpe (fig. 11, *b*, *c*) is a broad arm ending in a spatulate and toothed plate armed with 8 or 10 large marginal teeth.

Larva.—" Cylindrical, dull purple-brown, with two dorsal rows and anterior and lateral rows of fleshy tubercles, those on the eighth segment and a streak from its base to lower end of seventh segment being pale pink ; between the tubercles are dark brown streaks " (*Moore*).

Pupa.—" Pale purplish-ochreous, bent backwards anteriorly ; thorax conical, the top flattened and its sides angled ; wing-cases dilated and flattened laterally in the middle, their outer edge acute ; two middle segments of abdomen with a dorsal pair of conical prominences " (*Moore*).

Variation.—Three forms are distinguished, according to the pattern of the hind wing :—

1. Hind wing with black spots on the yellow distal area. ♂ f. **cambyses** Ehrm.

2. Cell-patch of hind wing large, reaching veins 2 and 7 ♂ f. **isis** Ehrm.

3. No cell-spot on hind wing above, though sometimes a small one below. In the ♂ the patch in area 2 of hind wing is reduced proximally, and its posterior edge is usually shorter than the anterior edge along vein 2.

Habits.—Common in hilly country, but occurs also in the plains in open and wooded districts. Imago fond of feeding at heliotrope.

Habitat.—CEYLON.

1 *b*. **Troides helena minos** (Cramer). (Pl. I, fig. 1, larva ; fig. 2, pupa).

Papilio minos, Cramer, 1779, p. 4, pl. 195, fig. A (*Patria falsa*) ; Bell, 1911, pp. 1126–30 ; Hampson, 1889, p. 363 ; Fergusson, 1891, p. 445 ; Jordan, 1909 *a*, p. 25.

Ornithoptera minos, Aitken, 1887, p. 35 ; Davidson & Aitken, 1890, p. 361 (biology) ; Moore, 1902, p. 142, pl. 419, figs. 1 (larva, pupa), 1 *a*, 1 *b* (♂♀) ; Evans, 1923, p. 231 ; id., 1927, p. 26.

Troides minos, Rothschild, 1895, pp. 203–5.

Pompeoptera minos, Rippon, 1902, p. 13 ; id., 1906–1912, pp. 39–41, pl. 47, figs. 1, 2 (♂), 3, 4 (♀), 6 (♂ neuration), 5 (♀ neuration), p. 89, pl. 59, figs. 15, 25, 29 (scales).

Troides helena minos, Evans, 1932 *a*, p. 42.

Ornithoptera nomis, Ehrman, 1921, p. 19.

♂. *Upperside.*—Fore wing with veins 2, 3, 4 distinctly edged with whitish, these stripes continued to the cell and there

united. Hind wing golden, the inner area black as far as the cell, and a broad outer marginal black border.

Underside.—Fore wing vein-stripes much more prominent than above.

♀: *Upperside.*—Fore wing with prominent grey-white vein-stripes, which extend to the cell and are there united the distal half of the cell surrounded with white also on the inside. Hind wing golden, with black inner area, and a row of large discal spots. The broad black outer border is strongly convex between the veins. Inner area grey in the centre and at the margin.

Expanse : ♂♀, 140–180 mm.

Larva.—Head black. Segment 2 with a lateral fleshy tubercle, and a shorter marginal one. Each of segments 3 to 14 with a subdorsal fleshy conically produced tubercle. A row of shorter spiracular tubercles on 2 to 14. Legs shiny black. Spiracles shiny black. Colour of body velvety rosy-black, marbled with satiny grey or black. On segments 7 and 8 is a diagonal rosy-white band reaching from base of subdorsal tubercle of segment 8 to base of spiracular tubercle of segment 7. All the pointed tubercles are of the same colour as the body, with bright red tips. Osmeterium orange. Length 90 mm. ; greatest width 15 mm. ; greatest height (dorsum to venter) 14 mm. ; length of the longest tubercle 14 mm. (from *Bell*, 1911).

Pupa.—Pink-brown or green, with saddle and back of abdomen orange or yellow, the whole surface reticulated with brown. Antennæ and wings bordered with a thin line of black and another of red or pink. Head quadrate, with a short, triangular, round-topped projection, pointing sideways. Segment 2 with a carination separating it from segment 1. Thorax convex, nearly hemispherical, with a strong dorsal carination. Segment 4 is on the same plane as the back slope of thorax. Abdominal segments 8 to 10 with a subdorsal, laterally much flattened, contorted, pointed tooth, those on 8 and 9 very large, those on 7 being hardly developed. From the base of each tooth on segment 9 a ridge runs to the base of the short cremaster. Length 50 mm. ; breadth 20–25 mm. ; height 15 mm. (from *Bell*, 1911).

Habits (*from Bell*, 1911).—Not rare, and both sexes equally common. In North Kanara common during the rainy season (from June onwards). The butterfly has a slow flight, and usually flies high above the trees ; it frequents shady walks and glades in the jungle.

The eggs are laid on the upperside of a leaf, sometimes on the stem, and only one is deposited at a time. The butterfly hovers whilst ovipositing. The young larva lives on the

underside of a leaf, and later on it is found on the stems and stalks, rarely on the upperside of leaves. It is much parasitized by a small Braconid which lays many eggs. The larva has been reared on *Aristolochia indica* Linn., also on *Bragantia wallichii* R. Br.

The pupa, when touched, makes a distinct, somewhat hissing sound, which is probably caused by the friction of the abdominal segments against each other.

Habitat.—PENINSULAR INDIA, from sea-level to 6,000 ft. and more.

1 *c*. **Troides helena cerberus** (C. & R. Felder).

Papilio cerberus, C. & R. Felder, 1865 *a*, p. 291 ; id., 1864 *b*, p. 19 ; Bingham, 1907, pp. 14, 15, pl. 11, fig. 82 (♂).
Ornithoptera cerberus, Swinhoe, 1893, p. 311 ; Moore, 1902, p. 145, pl. 420, figs. 1, 1 *a* (♂), 1 *b*, 1 *c* (♀).
Troides cerberus, Rothschild, 1895, pp. 219–21 ; Kirby, 1896, p. 264 (larva), p. 265 (pupa).
Pompeoptera cerberus, Rippon, 1906–12, pp. 55–6, pl. 57, figs. 1–4 (♂), 6, 8, 9 (♀), p. 89, pl. 59, figs. 4, 6, 11 (scales).
Papilio helena cerberus, Jordan, 1909 *a*, p. 24.
Troides helena cerberus, Evans, 1923, p. 231 ; id., 1927, p. 26 ; id., 1932 *a*, p. 42.
Ornithoptera pompeus, Wood-Mason and de Nicéville (*non* Cramer, 1775), 1887, p. 373 ; Watson, 1888, p. 26.
Papilio helena cerberus ♂ f. *eumagos*, Jordan, 1909 *a*, p. 24 ; Evans, 1932 *a*, p. 42, pl. 1, fig. A 1.
Papilio helena cerberus ♀ f. *azelia*, Jordan, 1909 *a*, p. 24.
Papilio helena cerberus ♀ f. *gypsothelia*, Jordan, 1909 *a*, p. 24.

♂. Fore wing with or without distinct vein-stripes. Typical form beneath, below the cell, with a white or yellowish stripe towards the base ; vein-stripes distinct though short, often present also above. Hind wing rich silky yellow, the inner area, the apical half obliquely of area 1, the outer margin broadly, base of cell and costal area up to and including basal half of area 7 velvety black ; veins narrowly black ; inner margin of terminal black border produced inwards into prominent cone-shaped markings between the veins. One or more post-discal black spots. Scent-fold with a dense mass of buff-white scented cottony pubescence.

♀. Resembles the ♂. Fore wing vein-stripes broader and more prominent. Hind wing basal and costal black occupies fully one-third of the cell, the area above it and above vein 7, interrupted, however, in area 7 near apex of wing, by a transverse yellow mark, which is sometimes partly obsolete ; a post-discal series of large oval black spots, those in areas 2 and 3 often joined on the upperside to the cone-shaped terminal black marks ; inner margin more broadly black.

Expanse : ♂♀, 150–180 mm.

Variation.—Both sexes occur in two forms :—

♂ f. **cerberus** Feld., as described above.

♂ f. **eumagos** Jord.—Fore wing without distinct vein-stripes, or these are submarginal ; subbasal stripe behind the cell absent. The golden subcostal patch of hind wing is reduced to a submarginal spot.

♀ f. **azelia** Jord.—Fore wing without or with weak vein-stripes.

♀ f. **gypsothelia** Jord.—Fore wing with the stripes on veins 2 and 3 reaching the cell, and the white at apex of cell extending nearly or quite to the point of origin of vein 3.

Habits.—Common up to 3,000 feet from spring till autumn. The light-striped specimens appear mostly to come from hibernated pupæ.

Habitat.—SIKKIM to ORISSA and BURMA. It occurs also in Tong-king, the Malay Peninsula, the Natuna Islands, and Borneo.

1 *d.* **Troides helena heliconoides** (Moore).

Ornithoptera heliconoides, Moore, 1877, p. 592 (Andamans).
Papilio helena heliconoides, Jordan, 1909 *a*, p. 24.
Troides helena heliconoides, Evans, 1923, p. 231 ; id., 1927, p. 26 ; id., 1932 *a*, p. 42.
Ornithoptera heliaconoides, Wood-Mason and de Nicéville, 1880, p. 237 ; Gosse, 1883, pp. 281, 290, 339, pl. xxvii. figs. 3–4 (genitalia) ; Moore, 1902, p. 147, pl. 421, figs. 1, 1 *a* (♂), 1 *b*, 1 *c* (♀).
Papilio heliaconoides, Bingham, 1907, p. 15.
Papilio helena heliconoides ♀ f. *aphnea*, Jordan, 1909 *a*, p. 24.
Papilio helena heliconoides ♀ f. *rhyparia*, Jordan, 1909 *a*, p. 24.

A smaller race than *cerberus*.

♂. Fore wing black. Hind wing yellow for the greater part. The gold spot placed before the subcostal always large, distally rather suddenly widened to the costa and here mostly enclosing a black spot, the tooth of the gold area placed before vein 4 shorter than the one below this vein. The black marginal band below, before the anal angle, bearing short yellow longitudinal stripes.

♀. *Upperside* almost pure black, or with very sharp, narrow, almost pure white vein-stripes, which do not extend so near to the margin as in *cerberus*, the stripe placed below vein 2 short or absent. The black discal spots of the hind wing separated from one another, the first one not more than twice the size of the second ; the last spot of this row (placed below vein 2) stands in or distally to the middle of vein 2 and beneath at least very little, if at all, proximally to the preceding black discal spot ; the posterior teeth of the gold area mostly continued to the fringe-spots by yellow-grey scaling.

Expanse : 130–160 mm.

Genitalia.—Harpe similar to *darsius*, thicker, of more even width, and with about fourteen teeth (*Gosse*, 1883).

Variation.—The ♀ occurs in two forms :—

♀ f. **phyparia** Jord.—Fore wing above almost pure black.

♀ f. **aphnea** Jord.—Fore wing above with sharp white vein-stripes.

Habitat.—ANDAMAN ISLANDS ; not rare.

1 *e*. **Troides helena ferrari** Tytler.

Troides ferrari, Tytler, 1926, pp. 248–9, ♀ (Gt. Nicobars).
Troides helena ferrari, Evans, 1932 *a*, p. 42 (♂♀).

♂. *Upperside* of hind wing with the marginal spot in area 2 merged with the black inner area.

♀. Fore wing vein-stripes broad and bluish-white. Hind wing with post-discal spots contiguous to one another and to the marginal spots. Yellow cell-patch oval, proximally narrowed. The yellow spot in area 6 very small and adjoins vein 6, but not vein 7 ; the yellow spot in area 1 is as long as the cell-spot. The yellow spots in 2 to 5 are less than half the distance from the end of cell to outer margin.

Expanse : 140–170 mm.

Habitat.—SOUTH NICOBAR ISLANDS. Perhaps the only ♂ at present known is in the Ferrar Collection. There are 3 ♀♀ in the British Museum.

Troides æacus (Felder).

This species is distinguished from *helena* (Linn.), by the ♂ hind wing having some black scaling in the anal area, and in the ♀ the anal third of the wing is much shaded with black.

Habits.—Common in many districts from about 800 to 3,500 feet.

Early stages.—Unknown.

Distribution.—SOUTH HIMALAYAS and Malacca to West China and Formosa. Only the nominotypical race occurs in the Indian area.

2. **Troides æacus æacus** (C. & R. Felder).

Ornithoptera æacus, C. & R. Felder, 1860, p. 225 ; Moore, 1902, p. 148, pl. 442, figs. 1 (♂), 1 *a* (♀).
Troides æacus, Rothschild, 1895, pp. 223–4 ; Evans, 1923, p. 231 ; id., 1927, p. 26 ; id., 1932 *a*, p. 43.
Pompeoptera æacus, Rippon, 1906, pp. 35–6, 41, 64, 110, 128, pl. 35 A, figs. 1, 2 (♂), figs. 3, 4 *a* (♀=type), figs. 5 (♂ neuration), fig. 6 (♀ neuration), p. 90, pl. 59, fig. 33 (scales).
Papilio æacus, Bingham, 1907, p. 15.
Papilio æacus æacus, Jordan, 1909 *a*, p. 25 ; Seitz, 1909, p. 8, t. 1 *a*, 1 *b*.
Ornithoptera rhadamanthus, Wood-Mason & de Nicéville (non *rhadamanthus* Luc.), 1887, p. 373 ; Elwes & de Nicéville, 1887, p. 438 ; Manders, 1890, p. 535 ; Watson, 1891, p. 53 ; Swinhoe, 1893, p. 311.

♂. Fore wing narrow, semitransparent at the veins; vein-stripes prominent. Hind wing golden, the last three projections of the black marginal border surrounded with black scaling placed on the golden area; sometimes a black discal spot placed behind vein 2. *Underside* of hind wing without the black scaling in areas 2, 3, and 4. Abdomen above ringed with yellow.

♀. Fore wing above black-brown with very broad and prominent grey vein-stripes extending well into the cell; the cell inside margined with white-grey at least to the half, commonly also the whole cell of this colour. Hind wing with large black wedge-shaped spots and deeply incised marginal border; anal third of wing more or less strongly shaded with black. *Underside* of fore wing with whiter and still more prominent vein-stripes. Abdomen above ringed with yellow.

Expanse: ♂♀, 119–188 mm.

Habits.—In North India the butterfly is very common in hot valleys. It sails slowly round flowering trees, but also visits flowering shrubs, and can sometimes be caught with the hand when it is hovering before a flower. In Tavoy it is common from October to June at all elevations in heavy forest.

Habitat.—GARHWAL to BURMA, as far as Mergui. It occurs also in West China.

Troidès amphrysus (Cramer).

♂. Fore wing with yellow or grey-yellow vein-stripes, the posterior ones submarginal, the anterior ones extending to the cell; apex of cell, at least beneath, with a grey-yellow spot. Hind wing golden, outer black border very narrow at the veins.

Abdomen yellow, the first segment above black, the upperside often blackened laterally and at the tip.

♀. Fore wing with vein-stripes, of which the posterior ones are submarginal. The white-grey cell-spot extends to the point of origin of vein 10. Hind wing with large black discal spots. Abdomen above black-brown or grey-yellow.

Genitalia.—Harpe a thick curved trapezoidal plate, its two inner angles being two short stout points; from its base arises a long curved filiform process (*Gosse*, 1883, p. 292, pl. xxvii, figs. 9–11).

Early stages.—These are known only from Sumatra.

Habits.—In Sumatra it flies all the year round, and is especially fond of visiting the flowers of *Poinciana pulcherrima*.

Distribution.—The species ranges from the MERGUI ARCHIPELAGO to Malacca, Sumatra and its western islands, Java, Borneo, and Banguey.

3. **Troides amphrysus ruficollis** (Butler).

Ornithoptera ruficollis, Butler, 1877, p. 552 (♂, *non* ♀); Distant, 1885, p. 328, pl. 27, fig. 1 (♂), p. 329, fig. 107 (♀), pl. 27 *a*, fig. 1 (♀ var.).
Troides amphrysus ab. *ruficollis*, Rothschild, 1895, p. 232.
Papilio amphrysus ruficollis, Jordan, 1909 *a*, p. 28.
Troides amphrysus ruficollis, Evans, 1923, p. 231; id., 1927, p. 26; id., 1932 *a*, p. 43.

♂. Fore wing upperside black with deep blue sheen; dark yellow vein-stripes over the apical post-cellular area and near the margin on veins 1 *a*, 2, and 3.

♀. Fore wing upperside with grey and prominent vein-stripes in the apical post-cellular area; the short stripes on veins 1 *a*, 2, and 3 yellow or grey. A grey patch in the end of the cell. Hind wing largely yellow, with a post-discal row of five large rounded black patches in areas 2 to 6.

Expanse: ♂♀, 130–160 mm.

"*Egg*.—Yellow.

"*Larva*.—Coffee-brown, the fleshy processes of the prothorax and the next three segments thickened at the tip and curved posteriorly, whilst the processes of the other segments are inclined forwards.

"*Pupa*.—Yellow. Makes a loud noise by rubbing the abdominal segments together when it is disturbed. The pupal stage lasts 26–29 days" (*Martin*, quoted by Jordan, 1909 *a*).

Habitat.—Southern part of the MERGUI ARCHIPELAGO; also extending to Malacca and Sumatra.

Genus **POLYDORUS** Swainson.

Polydorus, Swainson, 1833, pl. 101; Hemming, 1934 *a*, p. 144 (type, *polydorus* Linn., 1763).
Byasa, Moore, 1882, p. 258; id., 1902, p. 158.
Panosmia, Wood-Mason & de Nicéville, 1887, p. 374.
Pangerana, Moore, 1886, p. 51 (type, *varuna*).
Tros, Kirby, 1896, p. 305 (type, *hector* L.); Evans, 1932 *a*, pp. 41, 43.
Losaria, Moore, 1902, p. 184 (type, *coon*).
Balignina, Moore, 1902, p. 187 (type, *neptunus*).

Polydorus is the oldest name for the group formerly called *Tros* Kirby and *Byasa* Moore, a genus of *Aristolochia*-feeding Papilios, which resemble *Troides* in many ways. The species are always much smaller, and vein 11 of the fore wing is usually given off from the cell at a point opposite vein 3, and therefore is shorter than it is in *Troides*.

As in *Troides* both larva and imago possess distasteful qualities which cause them to be avoided by insectivorous animals and birds. In this connection it is of interest to note that some species are copied in their general facies by species of true *Papilio*, and especially is this the case with the females (e.g., *polytes* Linn.). The resemblance between *Polydorus*

hector Linn. and the ♀ of *Papilio polytes romulus* Crm. is very striking. Similar cases of resemblance occur among the American species of *Polydorus*. It is to be noted that although *Troides* is very close to *Polydorus* no mimetic form of that genus is known.

Key to Groups and Species of Polydorus.

A. Tail absent or short and pointed. Hind wing of ♂ with well-developed scent-organ in a fold of the inner margin. — Nox Group, p. 72.
1. Hind wing above without any pale area. — 2.
Hind wing above with a pale distal area. . — 3.
2. Hind wing with the fold rounded, and lower half of scent-area white. ♀ brown above . . . . — [p. 72. *aidoneus* (Doubl.),
Hind wing with the fold square, scent-area with only a small white patch. Cell above darker and without blue sheen. ♀ shining black . . . . . — [p. 73. *varuna varuna* (White),
3. Hind wing above in ♂ with submarginal white patches in areas 2 to 4. ♀ with large white discal area from inner margin to area 5 . . . . . — [p. 74. *varuna zaleucus* (Hew.),
Hind wing above with distal half blue-grey, with black spots. Abdomen yellow, black-spotted . . . — [p. 75. *sycorax* (Gr.-Sm.),
B. Tail spatulate, with very thin base. ♂ scent-fold only weakly developed. Anal claspers not touching each other above. — Coon Group, p. 75.
1. Tail black — 2.
Tail red . . . . . — *rhodifer* (Butl.), p. 79.
2. Hind wing above without a white spot. Abdomen with greyish-yellow distal half. — [(Guér.), p. 76. *neptunus neptunus*
Hind wing above with white spots. Abdomen red and black . . . . . — *coon* (Fabr.), p. 76.
C. With or without a tail. Cell of hind wing about three times as long as broad. ♂ scent-fold weakly developed or absent, without scent-wool. Anal claspers aborted. — Hector Group, p. 79.
1. Hind wing above with at least outer half of cell white. . . . . — *jophon* (Gray), p. 80.
Hind wing above with at most a small white spot in the cell . . . . . — 2.
2. Hind wing above with a discal and a submarginal row of red spots . . . — *hector* (Linn.), p. 83.
Hind wing above with white discal spots in areas 2 to 5 or some absent . . — [p. 85. *aristolochiæ* (Fabr.),
D. Hind wing elongate, with spatulate tail. ♂ scent-fold and scent-wool strongly developed. . . . . — [p. 89. Latreillei Group,
1. Hind wing above with a white discal spot or spots . . . . . — 2.
Hind wing above without white discal spots . . . . . — 7.
2. Hind wing above with a submarginal spot in area 5 . . . . . — 3.
Hind wing above without a submarginal spot in area 5 — 5.

3. Tail black ..	*adamsoni* (Gr.-Sm.),
Tail red-tipped. . .	4. [p. 90.
4. Fringe black from tornus to vein 3	*latreillei* (Don.), p. 90.
Fringe red from tornus to vein 3	*polla* (de Nicév.), p. 92.
5. Tail black .	*nevilli* (W.-M.), p. 93.
Tail red-tipped.	6.
6. Hind wing above with the submarginal spot in area 4 red	[p. 94. *philoxenus* (Gray),
Hind wing above with the submarginal spot in area 4 white for the greater part.	*dasarada* (Mre.), p. 98.
7. Upperside unmarked. Tail tipped with red below	*crassipes* (Ob.), p. 101.
Tail black. Hind wing below with submarginal red spots to area 6.	*plutonius* (Ob.), p. 102.

Nox Group.

♂♀. Fore wing elongate ; costa slightly arched, twice the length of dorsum, apex rounded ; termen straight in ♂, slightly convex in ♀, dorsum straight ; cell long, well over half the length of wing, veins 10 and 11 close together from apical half of subcostal. Hind wing elongate ; costa short, slightly curved ; termen long, convex, broadly scalloped ; dorsum with the abdominal fold in the ♂ closed, straight ; veins 4 and 5 closely approximate or from a point. ♂ sex-mark, abdominal fold very large in two out of the three Indian forms, cut square on its lower margin, its dorsal margin fringed with long hairs, beneath the fold a mass of specialized scent-scales ; anal valves short, convex, Antennæ a little less than half length of fore wing ; club long, narrow, gradual in both sexes.

4. **Polydorus aidoneus** (Doubleday).

Papilio aidoneus, Doubleday, 1845, p. 178 ; Rothschild, 1895, pp. 257–8 ; Bingham, 1907, pp. 25–6 ; Jordan, 1909 *a*, pp. 29–30, t. 17 *b*, *c* (♂♀) ; id., 1915, p. 273 ; Hannyngton, 1910, p. 361.
Pangerana aidoneus, Mackinnon & de Nicéville, 1898, p. 592 ; Moore, 1902, p. 154, pl. 424, figs. 1, 1 *a* (♂♀).
Byasa aidoneus, Evans, 1923, p. 231.
Tros aidoneus, Evans, 1932 *a*, p. 43.

♂. *Upperside* of fore wing bluish-black with indistinct vein-stripes. Hind wing unmarked. The white scent-patch in the fold is pink or red on its marginal edge, abdomen pink or red laterally.

♀. *Upperside* grey-brown, the fore wing with dark stripes between the veins. Abdomen with a broad white lateral stripe.

Expanse : ♂♀, 112–162 mm.

Habits.—Frequents the deep shadow of forest trees, which overhang rivers, and has a slow and graceful flight.

Habit.—GARHWAL to the SHAN STATES; occurring also in Tong-king, Hainan, and South China. In Sikkim it is not rare up to about 5,000 feet from April to November.

Polydorus varuna (White).

This species resembles *aidoneus*, from which it can be distinguished in the ♂ by the black-brown scent-fold that on the underside has a small pale grey spot and long fringes. The fore wing beneath is bluish-black in the basal half. ♀ with a large pale posterior patch on the fore wing, except in *zaleucus*, which is easily recognized by the white area on the hind wing. The hind wing is blue-black, with more metallic-blue than in *aidoneus*.

Distribution.—Commoner than *aidoneus*. It ranges from SIKKIM to the MERGUI ARCHIPELAGO, the Malay Peninsula, Tong-king, and Siam.

Three subspecies occur within the Indian area. Among these is here included *zaleucus* Hew., usually treated as a distinct species.

5 *a*. **Polydorus varuna astorion** (Westwood). (Pl. III, fig. 2, ♂).

Papilio astorion, Westwood, 1842*a*, p. 37 ; id., 1844, p. 69, pl. 66, fig. 1 ; de Nicéville, 1881, p. 59 ; Rothschild, 1895, p. 260 ; Bingham, 1907, pp. 25–6 ; Hannyngton, 1910, p. 361.
Pangerana astorion, Wood-Mason & de Nicéville, 1887, p. 375 ; Moore, 1902, p. 153, pl. 423, figs. 1, 1 *a* (♂♀).
Papilio varuna astorion, Jordan, 1909 *a*, p. 30, t. 19 *a*.
Byasa varuna var. *astorion*, Evans, 1923, p. 231.
Tros varuna astorion, Evans, 1932 *a*, p. 43.

♂. *Upperside* as already described under the species, except that the cell of the hind wing is without a blue sheen and is darker than the rest of the wing. *Underside* of fore wing with some whitish distal scaling in areas 1 *b* and 1 *c*.

♀. *Upperside* of fore wing with a large whitish to greenish-grey patch, sometimes indistinct, below vein 2. Hind wing with the cell dark, though less marked than in the ♂.

Underside resembles the ♂, but the white posterior patch is more prominent.

Expanse : ♂♀, 88–136 mm.

Variation.—A ♂ and 2 ♀♀ in the British Museum show a transition to *zaleucus* Hew :—

♂. Hind wing below with a narrow white post-discal band from vein 5 to 1, dusted with black, and forming three conical spots shaped as in *zaleucus*, but with only the narrow inner part defined. Ataran Valley, Tenasserim, 900 feet, March 1925 (*Archbald*).

♀. Hind wing on both sides with white markings somewhat as in *zaleucus*, but not so large and slightly dusted with black ; much more sharply defined below, the stripes on veins 2 to 4 reaching the margin. One specimen collected by Archbald at Kanbauk, in Tavoy, April 1923. A second ♀ without precise locality (*Dr. Lidderdale*, 1857).

Habits.—Commoner than *aidoneus*, and in Sikkim occurs from quite low elevations in the Terai up to 7,000 feet from March to December. Its almost uniform dark colour renders it inconspicuous in the jungle, and it is therefore difficult to account for its being further protected by a disagreeable smell and probably taste. Wood-Mason has recorded that the females have a strong and disgustingly rank musky odour.

Habitat.—KUMAON to TAVOY

5 *b*. **Polydorus varuna zaleucus** (Hewitson).

Papilio zaleucus, Hewitson, 1865, Pap. pl. 7, figs. 24 (♂), 25 (♀) (Burma); Rothschild, 1895, p. 261; Bingham, 1907, pp. 2, 27; Jordan, 1909 *a*, p. 30, t. 17 *e*; id., 1915, p. 273.
Pangerana zaleucus, Elwes & de Nicéville, 1887, p. 436; Moore, 1902, p. 155, pl. 425, pl. 1, figs. 1 *a*–1 *c* (♂).
Byasa zaleucus, Ollenbach, 1921 *a*, p. 894; Evans, 1923, p. 231, pl. i, figs. A 2.3 (♀); id., 1927, p. 26, pl. 1, fig. A 2.3 (♀).
Tros zaleucus, Evans, 1932 *a*, p. 43, pl. 1, fig. A 2.3 (♀).
Byasa zaleucus f. *punctata*, Evans, 1923, p. 231.
Tros zaleucus f. *punctata*, Evans, 1932 *a*, p. 43.

♂♀. Hind wing with a white distal band or patch; in the ♂ this is composed of two or three spots, and in the ♀ of four or five larger spots. *Underside* with the white area much more sharply defined.

Variation.—Where this race overlaps the area of *astorion* transitional forms are found (see *astorion*). Ollenbach, who collected *zaleucus* in Tavoy, describes the variation:—"The white areas on the hind wing vary considerably from four white interspaces to one, and in a single specimen there is no white at all, the wing being entirely black. This specimen is indistinguishable from *P. varuna astorion*. On the underside it has white interspaces, but so also has a specimen of *P. varuna* from Sikkim which is in my collection. I did not meet with *P. varuna* in Tavoy, so that it is probable that these two are only races of one species" (*Ollenbach*, 1921 *a*).

Form **punctata** Evans.—The white area of the hind wing bears black spots.

Habitat.—SHAN STATES to SOUTH BURMA, and extending to West Siam. Does not occur within the areas of *astorion* and *varuna*, excepting where the usual overlapping occurs. Not common.

In Tavoy the butterfly is attracted by the flowers of a species of *Ageratum*.

5 *c*. **Polydorus varuna varuna** (White).

Papilio varuna, White, 1842, p. 280 (♀); Distant, 1886, p. 334, pl. 31, figs. 3 (♂), 4 (♀); Rothschild, 1895, p. 260.
Papilio varuna varuna, Jordan, 1909 *a*, p. 30.
Byasa varuna var. *varuna*, Evans, 1923, p. 231.
Tros varuna varuna, Evans, 1932 *a*, p. 43.

♂. Fore wing below with posterior white stripes before the distal margin, more prominent than in *astorion* ; these stripes are sometimes indicated above.

♀. The posterior pale area on fore wing below more developed than in the ♂, and also well developed on the upperside.

Habitat.—The MERGUI ARCHIPELAGO, extending to Penang and the Malay Peninsula. Rare in the Mergui Archipelago.

6. **Polydorus sycorax** (Grose-Smith).

Papilio sycorax, Grose-Smith, 1885, p. 247 (Sumatra); Distant, 1886, p. 468, pl. 42, fig. 10 ; Rothschild, 1895, p. 256 ; Jordan, 1909 *a*, p. 29, t. 17 *a*, *b*.

Pangerana sycorax, de Nicéville, 1892, p. 54, pl. M, fig. 1 (♂) ; id., 1895, p. 512 ; Moore, 1902, p. 157.

Tros sycorax, Evans, 1932 *a*, p. 43 (Mergui).

♂. *Upperside* of fore wing black, with indistinct vein-stripes. Hind wing black, with a bluish-grey distal band that in areas 3 to 6 bears rounded black post-discal spots and larger marginal ones. *Underside* of hind wing with grey-white distal area and rounded black post-discal spots in areas 2 to 6.

♀. *Upperside* paler than the ♂, and hind wing with lighter bluish-grey distal area. *Underside* as in the ♂.

Head and prothorax creamy-buff; abdomen dark at the base, buff-yellow below, bluish-grey above.

Expanse : ♂♀, 110–130 mm.

Habits.—In Sumatra the butterfly flies high and quickly, and is most often taken at flowering trees in the woods.

Habitat.—The MERGUI ARCHIPELAGO, extending to the Malay Peninsula and Sumatra ; occurring in hilly country. Very rare in the Mergui Archipelago.

Coon Group.

♂♀. Wings very long and narrow. Fore wing : costa slightly arched, apex broadly rounded, termen straight in the ♂, slightly convex in the ♀, and very oblique in both sexes ; dorsum very short, less than half as long as the costa ; cell long and narrow, considerably more than half length of wing ; upper discocellular very little shorter than the middle ; vein 10 from upper third, 11 from beyond middle of subcostal. Hind wing with long spatulate tail ; costa straight, short ; termen very long, broadly scalloped ; veins 4 and 5 approximate at base. Antennæ slightly less than half the length of fore wing ; club narrow, gradual. ♂ abdominal fold narrow, abrupt at apex ; anal valves conspicuous, with a parting on the upperside.

7. Polydorus neptunus neptunus (Guérin).

Papilio neptunus Guérin, 1840, p. 43; Distant, 1885, p. 335, pl. 33, figs. 5 (♂), 6 (♀); Rothschild, 1895, p. 255.
Balignina neptunus, Moore, 1902, p. 187.
Papilio neptunus neptunus, Jordan, 1909 *a*, p. 33; Ollenbach, 1921 *a*, p. 894.
Byasa neptunus, Evans, 1923, p. 232.
Tros neptunus, Evans, 1932 *a*, p. 43 (Tavoy to S. Burma).

This species was first recorded for the Indian fauna by Ollenbach, who took 2 ♂♂ and a ♀ in Tavoy.

♂♀. The thorax below (pectus) red at the sides, and distal half of abdomen greyish-yellow. Fore wing black, with a broad light patch before the middle and a similar post-discal patch. Hind wing with a very thin tail, much widened at the end; two to four red or pale red post-discal spots.

Expanse: ♂♀, 100–120 mm.

The butterfly flies slowly, and high in the air. Very rare in the Indian area, and commoner in Sumatra.

Habitat. TAVOY to SOUTH BURMA, extending to Malacca. The species also occurs in North Borneo, Sumatra, and Nias Island.

Polydorus coon (Fabricius).

♂♀. General coloration black. Head and sides of breast red or yellow, the abdomen beneath, laterally, and at the tip of the same colour. Fore wing narrow, smoky, the margins, veins, and folds smoky-black. Hind wing with tail spatulate, one or two cell-spots, a post-cellular row of spots, and a row of white submarginal spots; at the end of veins 2 and 3 is a red or yellow marginal spot.

Habits.—A woodland species found in the plains as well as in hilly country. It is often taken at the flowers of tall trees, and has a fluttering but rapid flight.

Distribution.—A Malayan species extending from Java to CACHAR and the NICOBARS. Seven subspecies are distinguished, of which three occur in the Indian area.

8 *a*. **Polydorus coon cacharensis** (Butler).

Papilio cacharensis, Butler, 1885, p. 334 (Cachar).
Papilio doubledayi cacharensis, Rothschild, 1895, pp. 253–4; Bingham, 1907, pp. 23–4.
Papilio coon doubledayi ab. *cacharensis*, Jordan, 1909 *a*, p. 34.
Losaria cacharensis, Moore, 1902, p. 185, pl. 439, figs. 1, 1 *a*, 1 *b* (♂♀).
Byasa cacharensis, Evans, 1923, p. 232.
Tros coon cacharensis, Evans, 1932 *a*, p. 44.
Menelaides doubledayi, Wood-Mason & de Nicéville (*non* Wallace), 1887, p. 377.

♂♀. Fore wing with very conspicuous pale streaks, two in each area, that extend well into the cell, but do not reach

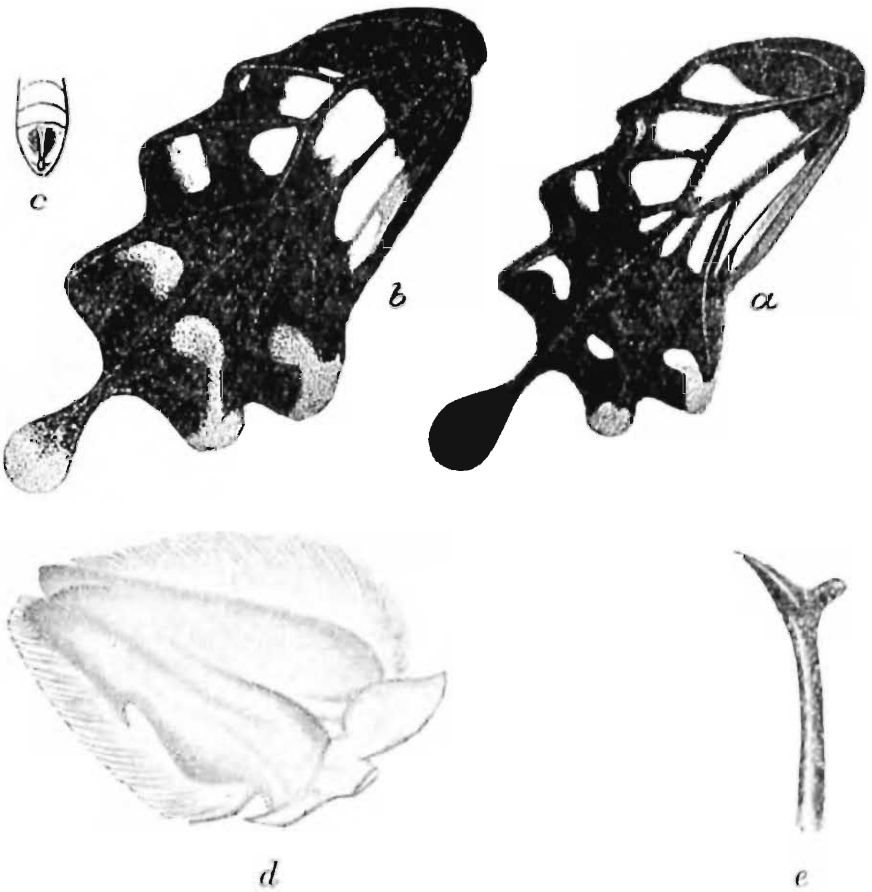


Fig. 12.—*a*, *P. coon doubledayi* (Wall.), hind wing ; *b*, *P. rhodifer* (Butl.), hind wing ; *c*, anal valves of *Coon* Group, open on upperside ; *d*, *e*, *P. coon doubledayi* (Wall.), genitalia (after Gosse) (*d*, valve and harpe ; *e*, ædeagus).

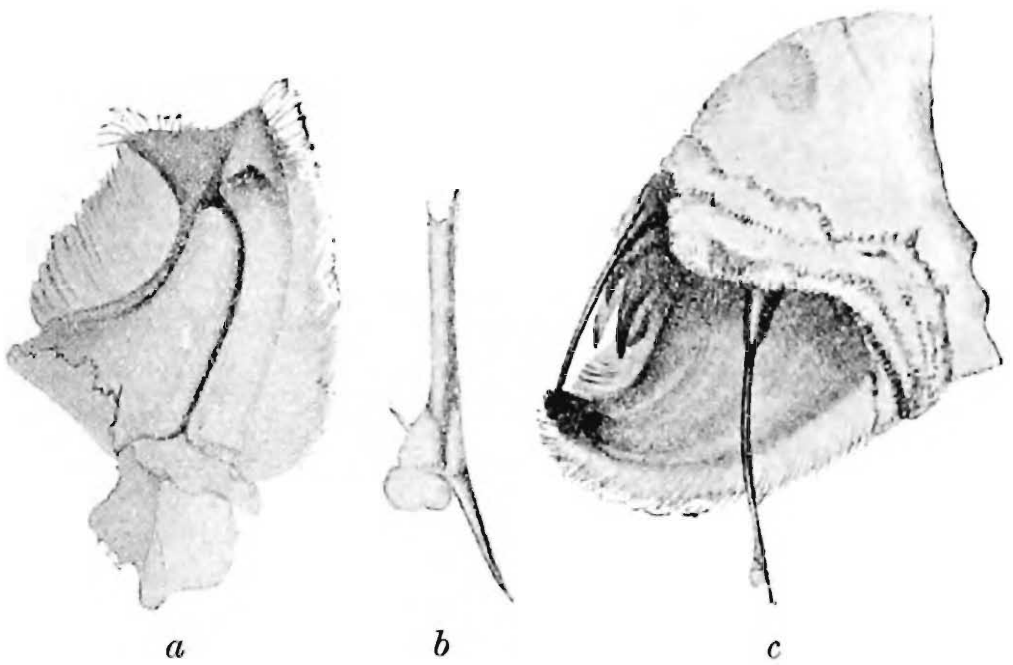


Fig. 13.—*P. rhodifer* (Butl.), genitalia. (After Gosse).

a, valve and harpe ; *b*, ædeagus, extremity ; *c*, lateral view of genitalia with right valve removed, left one shown in outline.

the outer margin, where the dull black ground-colour forms a broadish transverse band. Hind wing black, in fresh specimens, in certain lights a beautiful blue gloss. Cell with a white patch which occupies less than half the apical part. Post-cellular white spots in areas 1 to 7 small, smaller than in the two other races, the spot in area 4 more or less obsolescent. The post-discal and marginal markings are pale, often yellowish-red. Head, sides of breast, and abdomen yellowish-red.

Expanse : ♂♀, 100–120 mm.

Wood-Mason (1887) records that it has a musk-scented body.

Habitat.—CACHAR ; not rare.

8 *b*. **Polydorus coon doubledayi** (Wallace). (Fig. 12 *a*, imago ; 12 *d*, genitalia).

Papilio doubledayi, Wallace, 1865, p. 42 ; Moore, 1878 *a*, p. 840 ; Gosse, 1883, p. 323, pl. xxxii, figs. 17, 18 (genitalia) ; Distant, 1885, p. 336, pl. 33, fig. 4 (♂) ; Bingham, 1907, p. 23, fig. 4 *a* ; Lathy, 1907, p. 3.

Menelaides doubledayi, Elwes & de Nicéville, 1887, p. 435 ; Moore, 1889, p. 51.

Papilio doubledayi doubledayi, Rothschild, 1895, p. 253 ; Jordan, 1909 *a*, p. 34, t. 16 *b* ; Ollenbach, 1921 *a*, p. 894.

Losaria doubledayi, Moore, 1902, p. 185, pl. 439, figs. 1, 1 *a*, 1 *b* (♂).

Byasa coon doubledayi, Evans, 1923, p. 232.

Tros coon doubledayi, Evans, 1932 *a*, p. 44, pl. 1, fig. A 2.6 (♂).

♂♀. Only differs from *cacharensis* in the larger discal spots of the hind wing ; the cell-spot occupies more than half the apical area of cell.

Expanse : ♂♀, 118–134 mm.

Genitalia.—Harpe (fig. 12 *d*) a broad anteriorly narrowing plate which is entirely attached to the surface of the valve ; its apex bilobed ; dorsal and ventral edges upturned, the former at its middle with a sharp tooth directed basad (*Gosse*, 1883).

Habitat.—BURMA. Very plentiful in Tavoy from October till May.

8 *c*. **Polydorus coon sambilanga** (Doherty).

Papilio doubledayi sambilanga, Doherty, 1886 *b*, p. 263 (Great Nicobar).

Papilio doubledayi sambilanga, Rothschild, 1895, p. 254 ; Jordan, 1909 *a*, p. 39.

Losaria sambilanga, Moore, 1902, p. 186.

Byasa coon sambilanga, Evans, 1923, p. 232.

Tros coon sambilanga, Evans, 1932 *a*, p. 44.

♂♀. Hind wing with the spot below the cell short ; the two red marginal spots are united with the corresponding spots in areas 2 and 3, as in *P. rhodifer*.

Habitat.—GREAT NICOBAR ISLAND. Usually very rare, but Doherty found it plentiful ; it was not seen by Colonel Ferrar nor by Brigadier Evans when collecting in the island.

9. **Polydorus rhodifer** (Butler). (Fig. 12 *b*, imago ; fig. 13 *a–c*, genitalia).

Papilio rhodifer, Butler, 1876 *a*, p. 57 (Andamans) ; Wood-Mason, 1880, p. 240 ; Wood-Mason & de Nicéville, 1881 *b*, p. 253 (♀) ; Gosse, 1883, p. 323, pl. xxxii, figs. 19–21 (genitalia) ; Staudinger & Schatz, 1884, p. 6, fig. 3 (♂) ; Rothschild, 1895, p. 254 ; Bingham, 1907, pp. 23, 24, fig. 4 *b* ; Jordan, 1909 *a*, p. 34, fig. 16 *c*.
Losaria rhodifer, Moore, 1902, p. 186, pl. 440, pls. 1, 1 *a*, (♂♀).
Byasa rhodifer, Evans, 1923, p. 232.
Tros rhodifer, Evans, 1932 *a*, p. 44.

♂♀. Costal and distal margins of fore wing almost parallel ; the wing, even in the ♀, considerably narrower than in *P. coon*.

♂. Ground-colour much darker than in *coon* ; fore wing with the pale streaks extending only into the apex of the cell. Hind wing with much shorter post-cellular white markings, the spots at base of areas 4 and 5 and generally the spot in 7 absent ; the submarginal and marginal vermilion spots are much larger ; apical spatulate portion of tail vermilion. Antennæ, head, thorax, and abdomen as in *coon*, but the head entirely vermilion-red.

♀. Resembles the ♂. Fore wing broader, red markings on hind wing more crimson than vermilion-red, often dull and irrorated slightly with black scales. Hind wing discal markings more extensive ; the white mark in area 1 extends well below vein 1.

Expanse : ♂♀, 120–140 mm.

Genitalia.—Harpe (fig. 13 *a*) a broad plate, slightly narrowing anteriorly, attached entirely to the surface of the valve ; apex trilobed, the dorsal lobe, much larger, and directed much more laterally, than in *doubledayi*, stands erect ; the ventral lobe, a little below its tip, with an adventitious lamina, of conical outline, which also stands up ; the dorsal edge is deeply incurved (*Gosse*, 1883).

Habitat.—ANDAMAN ISLANDS. Not rare.

Hector Group.

♂♀. Fore wing elongate, broader in ♀ than in ♂ ; costa widely arched, apex produced, rounded ; termen oblique, straight, or in the ♂ slightly concave in the middle, in the ♀ convex ; dorsum straight, about half the length of costa ; cell elongate, more than half the length of wing ; discocellulars nearly erect, upper not much shorter than the middle ; veins 10 and 11 from upper half of subcostal vein. Hind wing elongate,

costa arched ; termen scalloped, produced into a tail at vein 4 ; tail not so long as in the *Coon* Group, nor so distinctly and widely spatulate at the tip ; dorsum long, straight ; cell about three times as long as broad ; veins 4 and 5 not approximate at the base ; scent-fold of ♂ weakly developed or absent, without scent-wool, but sometimes with narrow scent-scales ; anal claspers aborted, but the harpe is present. Antennæ about half the length of fore wing ; club long, narrow, gradual.

Polydorus jophon (Gray).

♂. *Upperside* black. Fore wing with white streaks in the cell and beyond the cell, not reaching the margin. Hind wing with apical part of cell white, and short white post-cellular streaks ; a submarginal series of crimson lunules irrorated with black scales. Palpi, sides of breast, and tip of abdomen red.

♀. Resembles the ♂. Fore wing broader ; the white and crimson markings larger and more conspicuous.

Distribution.—CEYLON to PENINSULAR INDIA ; occurring in two subspecies. Usually rare.

10 *a*. **Polydorus jophon jophon** (Gray).

Papilio jophon, Gray, 1852, p. 10, pl. 4, fig. 4 (Ceylon) ; Bingham, 1907, p. 22 ; Jordan, 1909 *a*, p. 34, t. 15 *a*.
Menelaides jophon, Moore, 1881 *a*, p. 152, pl. 58, fig. 1 (♀) ; id., 1887, pl. 210, fig. 6 (larva) ; id., 1902, p. 176, pl. 436, figs. 1, 1 *a*, 1 *b* (larva, ♂♀).
Byasa jophon jophon, Evans, 1923, p. 232.
Tros jophon jophon, Evans, 1932 *a*, p. 44.

♂♀. Fore wing with three or four broad white streaks in the cell and a variable number of similar, somewhat broader streaks, that are bifid along their apical half, in the interspaces beyond. Hind wing post-cellular streaks broad, divided only by the black veins ; a submarginal curved series of crimson lunules irrorated with black scales.

Underside markings more distinct and more sharply defined, the discal streaks and submarginal spots of hind wing each seven in number.

Antennæ, head, thorax, and abdomen above up to the preanal segment black ; head in front and beneath, thorax at sides, and apical half of abdomen crimson, the last with one or two black lateral spots.

Expanse : ♂♀, 110–130 mm.

Habits.—Most easily caught in the early morning, as after sunrise it flies high above the trees.

Egg.—Yellow-brown.

Larva.—" Dark purple-black, with crimson-coloured pointed tubercles, two on 2nd segment, eight on each of the 3rd and 6th, six on each of 8th to 10th, and four on 13th ; 7th segment with a pale cream-coloured transverse band (interrupted on the dorsal line), including four tubercles of the same colour, below which on each side is a single crimson tubercle ; on 2nd segment is a band composed of four pale tubercular spots, from the centre of which can be protruded a pair of short blunt yellow tentacles " (*E. E. Green*, as quoted by Moore).

Habitat.—CEYLON. Occurs locally in hilly country from 2,000 to 4,000 feet, and not rare where present.

10 *b*. **Polydorus jophon pandiyana** (Moore).

Papilio pandiyana, Moore, 1881 *b*, p. 313 ; Jordan, 1909 *a*, p. 35, t. 15 *a*.
Menelaides pandiana, Hampson, 1889, p. 363.
Menelaides pandiyana, Fergusson, 1891, p. 446 ; Moore, 1902, p. 177, pl. 437, figs. 1, 1 *a*, 1 *b* (♂♀).
Papilio pandiyanus, Rothschild, 1895, p. 234.
Papilio jophon pandiyana, Bingham, 1907, pp. 19, 22.
Byasa jophon pandiyana, Evans, 1923, p. 232.
Tros jophon pandiyana, Evans, 1932 *a*, p. 44.

♂♀. Compared with the nominotypical form the fore wing has more extended white, especially in the apical region, but is also more shaded with black scales ; the internervular black streaks in areas 2 to 5 extend nearly to the cell. Hind wing with the posterior discal white spot usually reaching vein 1 ; the anterior spot is very large in the ♂, small or divided into two spots, or obliterated in the ♀.

Expanse : ♂♀, 100–130 mm.

The following account of the early stages and habits is from an unpublished manuscript communicated by Mr. T. R. Bell :—

" *Larva.*—Shape of *P. aristolochiæ*. Black, with red-tipped, fleshy, elongate tubercles : segment 2 with white anterior margin tinged red dorsally between the lateral tubercles ; a white transverse band on 7, the tubercles of this segment also white ; tubercles of 11 white, with a white line in front of each dorsal one. Segment 2 black with a chocolate-brown shining shield-collar, having a fine, white, dorsal line through it, and a lateral and subspiracular, fleshy, short, conical tubercle, the front margin creamy-white tinged with vermilion. Segments 3 and 4 with dorso-lateral, lateral, supra- and subspiracular, fleshy, short conical processes ; 5 to 12 with a subdorsal and subspiracular similar tubercle process ; 7 to 10 with an additional and much smaller tubercle beneath the last ; 13 and 14 with only the dorso-lateral tubercles, situated at hind margin.

"*Coloration.*—Velvety brown-black, the tips of the tubercles tinged obscurely with red, except those on segments 7 and 11, which are creamy-white. A white transverse band on 7; a distinct white line runs diagonally forwards and down to anterior margin of 11 from the dorso-lateral tubercle; a similar obscure white line on each of segments 2, 10, 12, and 13; a dull, black, semicircular space at extremity of anal flap; venter black. Length 42 mm.

"*Pupa.*—Shape, colour, and mode of suspension almost the same as in *aristolochiæ*. Ventral line strongly convex from head to end of wings. Cremaster short, stout, wedge-shaped, with ventral extensor ridges enclosing an oval space bearing the anal clasper-scar. Surface of pupa minutely pitted, each pit with a minute, black hair. Dorsal line of thorax slightly carinate from front margin to just before apex where it bifurcates abruptly to the apex, then runs back in parallel lines to hind margin of thorax; on lateral edge of body on each shoulder there is a thin foliaceous expansion that is slightly up-curved; lateral wing expansion with an up-curved edge continued to segment 8 and up to front margin of 9; segments 7 to 10 with a laterally flattened, distally rounded, squarish, dorso-lateral expansion prominence, that on 8 the largest, that on 10 the smallest; a minute subspiracular tubercle on segments 8 to 11. Spiracles of 2 covered by a large, kidney-shaped, dark brown expansion.

"*Coloration.*—Very pale pinkish-brown bone-colour, suffused darker on the wings, sides, head and segment 2, the suffusion still darker in the spiracular region of segments 4 to 7, where the spiracles are surrounded by enamel-white broadly and irregularly; 5 to 8 faintly marbled with white dorsally; 2 with a lateral white horse-shoe mark. Length 23 mm.

"*Habits.*—The eggs are laid on the undersides of young leaves in evergreen jungles or in nalla-beds in and near evergreen jungles in wet, thick forest. The larvæ were found in May. The mature larva is sluggish, and rests on the undersides of leaves. The food-plant is *Bragantia wallichii* R. Br., family Aristolochiaceæ, a small tree found locally from Nepal southwards to Ceylon. It is also the food-plant of *T. minos*, *P. hector*, and *P. aristolochiæ*. The pupa is formed on a dead or dry stick to which it is fastened by black silk."

The butterfly frequents the evergreen jungle and appears in the early morning at flowers, before which it hovers with a fanning motion of the wings. It can be caught inside the forest, flying low. It is most common from April to May, and from September to October, but is a local insect.

Habitat.—Peninsular India. Common in the hilly country of Travancore and in the Nilgiris from 1,000 to 3,000 feet; also on the slopes of the Western Ghats, and at the foot of

the Ghats (*vide* Yates, 1931). Bell reports it as local in North Kanara, but fairly plentiful in Mahime in the Tali Palm forests; on the Garsappa Ghat; at Jog, in evergreen jungles adjacent to the Falls; at Nilkund on the crest of the Ghats in Sirsi Taluka; at Yan in Kunta and Ulvi in Supa Talaka. "Once I saw a specimen on the Hyder Ghat near Karwar."

11. **Polydorus hector** (Linnæus). (Fig. 14 *a–e*, genitalia; Pl. III, fig. 3, ♂).

Papilio hector, Linnæus, 1758, p. 459; Clerck, 1764, t. 53, fig. 1 (fig. typica); Westwood, 1845, p. 9, pl. 3, figs. 1–4 (larva, pupa); Horsfield & Moore, 1857, p. 93, pl. 2, figs. 4, 4 *a*, 4 *b* (larva, pupa) Gosse, 1883, p. 329, pl. xxxiii, figs. 27–31 (♂ genit.); Watson, 1890 *a*, p. 268; id., 1890 *b*, p. 37; Betham, 1891, p. 330; Rothschild, 1895, p. 233; Bingham, 1907, pp. 18, 19, 20, pl. 11, fig. 83 (♂); Jordan, 1909 *a*, p. 34; Bell, 1911, pp. 1130–2, pl. D 1, figs. 23 (♂), 23 *a* (♀); Williams, 1927, p. 20 (migration).

Aernauta hector, Berge, 1842, p. 108, t. 37, fig. 1 (♂).

Menelaides hector, Moore, 1881 *a*, p. 152, pl. 58, fig. 2; Swinhoe, 1885, p. 145; de Nicéville, 1885 *b*, p. 52; Hampson, 1889, p. 363; Fergusson, 1891, p. 446.

Byasa hector, Evans, 1923, p. 232.

Tros hector, Evans, 1932 *a*, p. 44.

Papilio heroicus, Fruhstorfer, 1908 *e*, p. 49 (♂, Ceylon).

♂ *Upperside* black. Fore wing with a broad white interrupted band from the subcostal vein opposite the origin of veins 10 and 11, extended obliquely to the tornus, and a second similar subapical band; both bands composed of detached irregularly indented broad streaks in the interspaces. Hind wing with a discal posteriorly strongly curved series of seven crimson spots followed by a submarginal series of crimson lunules. Cilia black alternating with white.

Head, collar, sides of the breast, and the abdomen, with the exception of the dorsal plates of the anterior segments, red.

♀. Resembles the ♂. Discal and submarginal markings duller, pale crimson irrorated with black scales; in some specimens the anterior spots and lunules almost white. Abdomen above with the black colour extending further towards the apex.

Expanse: ♂♀, 90–110 mm.

Genitalia.—Valve (fig. 14 *d*) much aborted, a slender straight rod with the point bent dorsad nearly at a right angle, and bearing a short spine; dorsal margin beset with short straight bristles, giving the whole organ the appearance of a comb; base broadly dilated, and both valves incline towards each other so that the summits are almost in contact. Scaphium represented apparently by the scaphial teeth (fig. 14 *c*). These are two pear-shaped organs each of which sends off a broad process of subtrigonal outline, horizontally, towards the middle of the cavity; the process is a sort of flat cushion, apparently of short close pile, throughout which

are set minute slender needle-like spines vertically; the end is a thickened knob, whence descends obliquely a group of very long straight bristles.

Gosse (1883, p. 332) remarks that there is a very close resemblance between all the organs (except the uncus) in *P. hector* and the corresponding organs in the Saturniid moth *Antheræa roylei* (*Gosse*, 1883).

Larva.—Head round, black and shiny, somewhat hidden

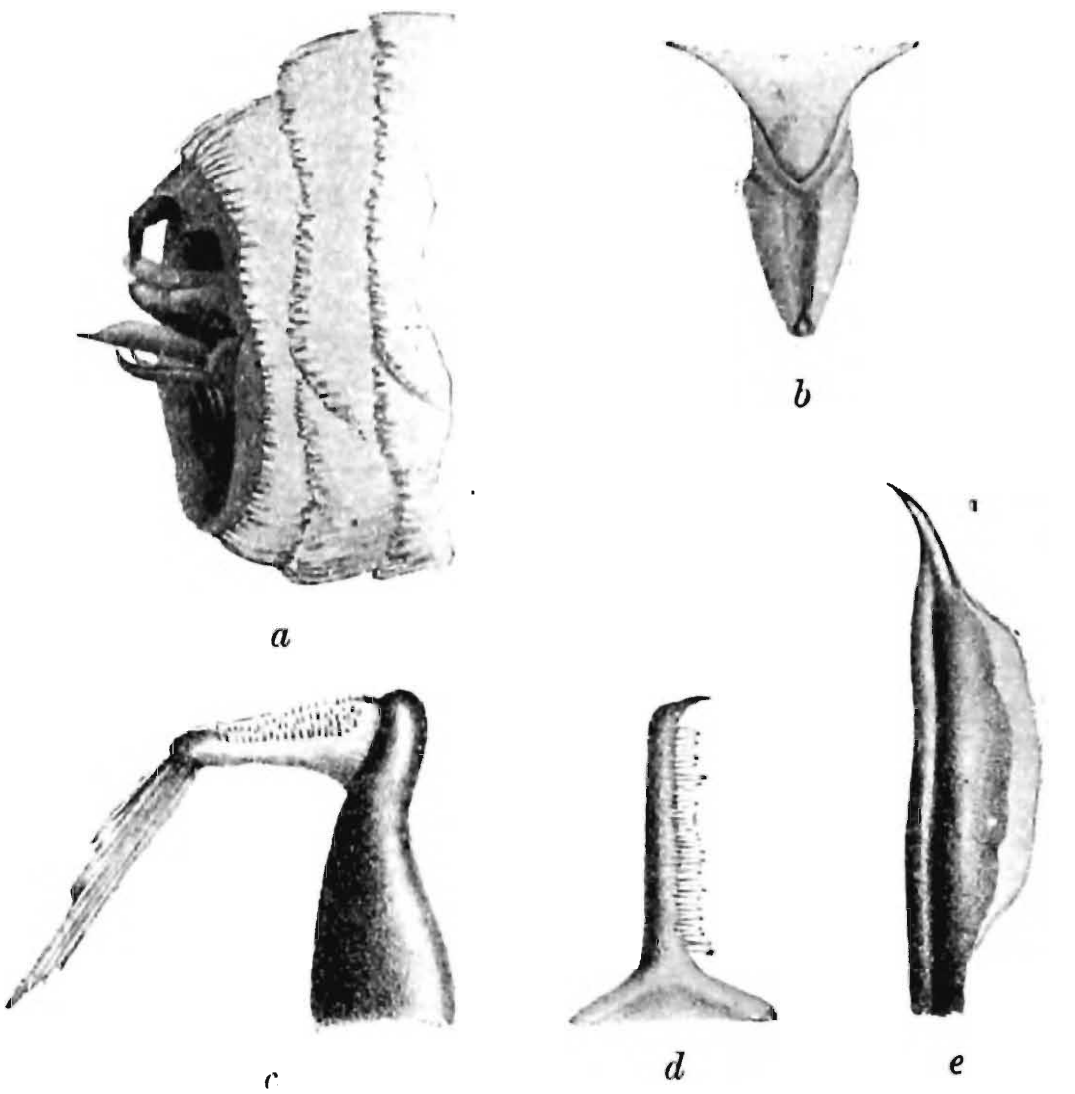


Fig. 14.—*P. hector* (Linn.), genitalia. (After Gosse).

a, lateral view; *b*, uncus, dorsal view; *c*, right scaphial tooth, ventral view; *d*, valve; *e*, ædeagus.

under segment 2. Segment 2 with four bright red, short, fleshy tubercles on front margin of dorsum, and two similar ones on the back margin. Segments 3 to 13 each with a subdorsal, longish, conical, fleshy tubercle, and a marginal row of similar tubercles. In addition segments 2 to 5 with a lateral row of similar tubercles, the one on segment 5 reduced to a spot. On the front margin of segments 8 to 12 are two

subdorsal, flesh-coloured spots, and on the 7th segment are two larger similar spots on the posterior margin. Lateral flesh-coloured spots on segments 6 to 14. All the tubercles bright red. Spiracles oval, shiny black. The two long tubercles on segment 2 are black-tipped. Colour of body rich black-brown. Osmeterium orange. Length 45 mm.; breadth 10 mm. On *Aristochia indica* Linn. (from *Bell*, 1911).

Pupa.—Head flat in front, produced in two sharp-edged, semicircular, rounded, ear-like, lateral projections connected by a ridge. Thorax carinate on dorsal line. Segments 8 and 11 each have two large ear-like projections. Cremaster short, strong, square at the end. Colour light brown, marked on the dorsum with white, looking like brown alabaster; a whitened dorsal line on segment 2, another raised line on each side of this, and another round the spiracle of the same segment. Length 30 mm.; breadth 10 mm. (from *Bell*, 1911).

Habits.—One of the commonest butterflies of the plains, but is found singly even at elevations of over 5,000 feet. It is often found on low flowering bushes and plants.

In the 'Entomologist's Monthly Magazine,' 1880, p. 276. Mr. R. S. Eaton notes that in Bombay this butterfly roosted in great numbers together. "On the Western Ghats between Vingoria and Belgaum, where this butterfly occurred in some numbers, I also noted the habit they have of roosting in company on twigs of some thorny shrub, but I never saw more than a score or so together."

Habitat.—CEYLON, PENINSULAR INDIA, and the ANDAMAN ISLANDS. Occurs in the Nilgiris from 1,000 to 7,000 feet. Very rare in the Andamans.

Polydorus aristolochiæ (Fabricius).

♂♀. *Upperside* black, the fore wing discal area paler, with black fold-stripes and well-marked pale vein-stripes. Hind wing with a spatulate tail, white discal spots, and red submarginal spots which above are more or less strongly shaded with black. The ♀ is paler, with broader wings. Abdomen red laterally and at the tip, also the margin of the ventral segments; the sides of the breast and also the head red.

Larva.—Black, with red fleshy tubercles; the tubercles are short, and there are no flesh-coloured spots; no lateral tubercle on segment 5; segment 11 with a white spot at the anterior base of the subdorsal tubercle, and an indication of one in the same position on segment 12; segment 8 with a small white spot at the posterior, and a larger one at the anterior base of subdorsal tubercle; posterior half of segment 7

pure white ; osmeterium orange. Length 30 mm. ; breadth 8 mm.

Pupa.—Abdomen with four pairs of rounded lobes, and the lateral lobes of the thorax also rounded.

Habits.—Visits flowers and is sometimes taken in crowds on flowering trees, especially in the early morning.

Distribution.—West, Central, and Eastern China to the Loo Choo Islands, extending southwards to the Lesser Sunda Islands, Philippines, Borneo, Natuna Islands, Sumatra, and Java.

The species ranges over the whole of the Indian area, where it splits up into six subspecies.

A common species which seldom ascends above 4,000 feet.

12 *a*. **Polydorus aristolochiæ aristolochiæ** (Fabricius). (Fig. 15, imago ; fig. 16 *a–c*, genitalia ; Pl. I, fig. 3, larva, fig. 4, pupa).

Papilio aristolochiæ, Fabricius, 1775, p. 443 ; de Nicéville, 1881, p. 53 ; Elwes, 1881, p. 872 ; id., 1888, p. 427 ; Davidson & Aitken, 1890, p. 362 ; Watson, 1890 *a*, p. 268 ; id., 1891, p. 53 ; Rothschild, 1895, pp. 245–9 ; Bingham, 1907, p. 20, figs. 3 *a*, 3 *c* (abdom.) ; Hannyngton, 1910, p. 361 ; Cockayne, 1911, p. 171 ; Bell, 1911, pp. 1132–3, pl. D 1, fig. 24 ; Ghosh, 1914 p. 34 (figs.).

Menelaides aristolochiæ, de Nicéville, 1885 *b*, p. 52 ; id., 1886, p. 377 ; Elwes & de Nicéville, 1887, p. 130 ; Hampson, 1889, p. 363 ; Fergusson, 1891, p. 446 ; Moore, 1903, p. 178, pl. 441, figs. 1, 1 *a*–1 *d*, pl. 442, figs. 1, 1 *a*–1 *c* (larva, pupa, ♂♀).

Papilio aristolochiæ aristolochiæ, Jordan, 1909 *a*, p. 38, t. 16 *a*.

Byasa aristolochiæ aristolochiæ, Evans, 1923, p. 232.

Tros aristolochiæ aristolochiæ, Evans, 1932 *a*, p. 44.

Papilio diphilus, Esper, 1792, p. 156, t. 40, fig. 2 ; Gosse, 1883, p. 329, pl. xxxiii, figs. 17–20 (genitalia).

Aernauta diphilus, Berge, 1842, p. 108, t. 36, fig. 1 (♀).

Menelaides diphilus, Swinhoe, 1884 *b*, p. 512 ; id., 1885 *a*, p. 145 ; id., 1886, p. 433.

Papilio aristolochiæ var. *diphilus*, Distant, 1885, p. 337, pl. 31, figs. 6, 7.

Papilio aristolochiæ f. *diphilus*, Jordan, 1909 *a*, p. 38.

♂♀. Fore wing black from the base to beyond the point of origin of vein 2, the stripes placed between vein 2 and the inner margin rarely shortened. Hind wing with white discal spots but no cell-spot ; underside with the discal spot in area 1 usually red.

Expanse : ♂♀, 80–110 mm.

Genitalia.—Harpe (fig. 16 *a*) takes the place of the claspers, which are much reduced. Shape somewhat like a bell-jar with thickened margins and a bulbous apex which is beset with minute curved spines and is inclined dorsad (*Gosse*, 1883).

Variation.—

1. Discal spots of hind wing proximally reduced and therefore remote from the cell. Form **aristolochiæ** (Fabr.)

2. Discal spots of hind wing placed close to the cell. Form **diphilus** (Esp.).

Both forms fly together, but *aristolochiæ* appears to be the commoner one during the hot rainy season.

Fig. 15.—*P. aristolochiæ aristolochiæ* (Fabr.), hind wing.

Habits.—Wood-Mason (1886) says: "The male emits a strong and slightly pungent odour resembling that of ? Batchelor's Buttons or of the rose with a trace of acetic acid."

Habitat.—The whole of INDIA, except Burma.

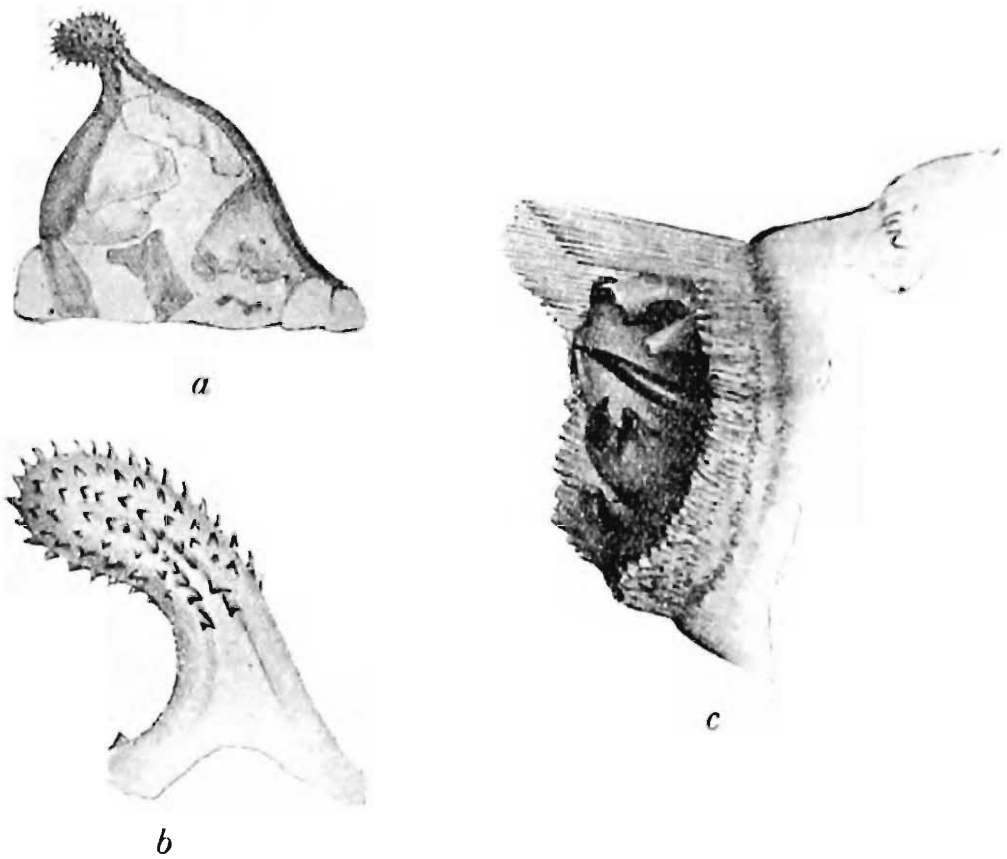


Fig. 16.—*P. aristolochiæ aristolochiæ* (Fabr.), genitalia.
(After Gosse).

a, harpe; *b*, apex of harpe, greatly magnified; *c*, lateral view with right harpe removed, showing uncus, scaphium, and ædeagus.

12 *b*. **Polydorus aristolochiæ ceylonicus** (Moore).

Menelaides ceylonica, Moore, 1881 *a*, p. 151, pl. 57, figs. 2, 2 *a*, 2 *b* (♂, larva, pupa).
Papilio aristolochiæ ceylonicus, Rothschild, 1895, p. 249 (ab.); Jordan, 1909 *a*, p. 38; Evans, 1932 *a*, p. 44.
Papilio aristolochiæ var. *ceylonica*, Bingham, 1907, p. 21.
Papilio diphilus, Gray, 1852, p. 10 (var. *c*).

♂♀. Fore wing very light beneath, the black stripe below vein 2 nearly always shortened. Hind wing discal spots prominent and placed close to the cell, the middle ones rounded off distally; cell usually with a white spot. ♀ with abdomen almost entirely black above, excepting the last segment.

Habitat.—CEYLON; very common.

12 *c*. **Polydorus aristolochiæ goniopeltis** (Rothschild).

Papilio aristolochiæ goniopeltis, Rothschild, 1908, p. 167; Jordan, 1909 *a*, p. 38.
Byasa aristolochiæ goniopeltis, Evans, 1923, p. 232.
Tros aristolochiæ goniopeltis, Evans, 1932 *a*, p. 44.

♂♀. Fore wing with the black basal area extending only to the point of origin of vein 2; between this area and the black distal margin the wing is very pale beneath. Hind wing discal spots often edged with red, placed close to the cell, and rarely reduced, the one in area 2 usually pointed and mostly very long; many specimens have a small cell-spot. Underside of hind wing with the spot in area 1 usually entirely red, also the veins separating the spots are frequently reddish, as well as the spots themselves.

Habitat.—BURMA and the ANDAMAN ISLANDS; also found in South China and Siam.

12 *d*. **Polydorus aristolochiæ sawi** (Evans).

Tros aristolochiæ sawi, Evans, 1932 *a*, p. 44 (Car Nicobar).

♂♀. Resembles *goniopeltis* Roths., but the post-cellular spots in areas 2 to 5 of the hind wing above are only half as large.

Habitat.—CAR NICOBAR; not rare.

12 *e*. **Polydorus aristolochiæ camorta** (Moore). (Fig. 17, imago).

Papilio camorta, Moore, 1877 *a*, p. 592 (♀); Wood-Mason & de Nicéville, 1881 *a*, p. 237; id., 1882, p. 18.
Papilio aristolochiæ camorta, Rothschild, 1895, p. 250 (Nicobars); Jordan, 1909 *a*, p. 38, t. 16 *a*; Bingham, 1907, pp. 20, 21, figs. 3 *b* (al. post.).
Byasa aristolochiæ camorta, Evans, 1923, p. 232.
Tros aristolochiæ camorta, Evans, 1932 *a*, p. 44.

♂♀. Hind wing with only two distinct post-cellular spots, in areas 1 *b* and 2; the spots in areas 3 and 4 sometimes

Fig. 17.—*P. aristolochiæ camorta* (Moore), hind wing.

show obscurely. Underside with two smaller spots at the apex of the cell and a third in the cell.

Habitat.—Central group of the NICOBAR ISLANDS; not rare.

12 *f*. **Polydorus aristolochiæ kondulana** (Evans).

Tros aristolochiæ kondulana, Evans, 1932, p. 45 (South Nicobars).

♂♀. Hind wing above with post-cellular spots in areas 2 to 4 or 5 very small, except for the spot in area 4.

Habitat.—SOUTH NICOBAR ISLANDS; not rare.

Latreillei Group.

Fore wing elongate, costal margin arched, more than twice as long as dorsal margin; apex broadly rounded; termen very oblique, dorsum straight; cell elongate, broad, more than half the length of the wing; upper discocellular only a little shorter than the middle one; veins 10 and 11 from apical half of subcostal and along the greater part of their length very close to vein 12, vein 9 from upper apex of cell. Hind wing very long and narrow; termen broadly scalloped, produced at vein 4 into a broad spatulate tail; cell very narrow; basal portion of subcostal between veins 7 and 8 equal to middle discocellular vein lying between veins 4 and 5; ♂ scent-fold and scent-wool strongly developed. Anal claspers of ♂ normal, without distinct tooth at the tip. Antennæ not half the length of fore wing.

The species of this group occur only on the continent and on the islands off China and Japan.

13. **Polydorus adamsoni** (Grose-Smith). (Fig. 18, genitalia).

Papilio adamsoni, Grose-Smith, 1886, p. 149 (Salween River); Smith & Kirby, 1889, *Papilio*, p. 11, pl. 5, figs. 3, 4; Rothschild, 1895, p. 262; de Nicéville, 1899 *b*, p. 334; Bingham, 1907, p. 30; Jordan, 1909 *a*, p. 31, t. 19 *c*; id., 1928, p. 167, pl. vi, fig. 15 (genit.) (Shan States and Tenasserim).

Byasa adamsoni, Moore, 1902, p. 167, pl. 431, figs. 1, 1 *a* (♂), 1 *b* (♀); Evans, 1923, p. 232.

Tros adamsoni, Evans, 1932 *a*, p. 45.

Byasa mineroides, Elwes & de Nicéville, 1887, p. 435, pl. 20, figs. 2, 2 *b* (♂), 3 (♀).

♂. Smaller than *P. latreillei*, the ground-colour darker, distinctly darker on the basal half of the fore wing. Hind wing with uniform ground-colour; an additional white elongate spot, sometimes transversely divided into two, in area 5; a submarginal series of only three lunules in areas 2, 3, and 4, that in 4 white; no terminal crimson spot at vein 3 or on the tail.

Underside similar to above, but the ground-colour paler and more opaque, the white markings more or less tinged

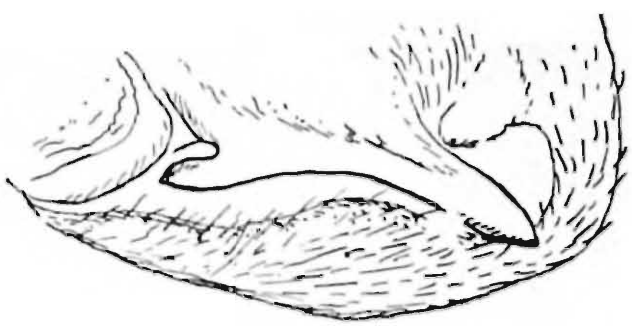


Fig. 18.—*P. adamsoni* (Gr.-Sm.), valve and harpe. (After Jordan).

with crimson, and a well-defined submarginal white spot always present in area 6.

Antennæ, head, thorax, and abdomen much as in *P. latreillei*.

♀. Resembles the ♂, but the ground-colour paler, the white markings on hind wing larger, the submarginal lunules more or less white.

Expanse: ♂♀, 90–110 mm.

Genitalia (fig. 18).—"Armature of clasper a non-dentate ridge which ends basally and distally in a pointed process, the distal one being the longer" (*Jordan*, 1928).

Habitat.—Shan States to the Dawna Hills; rare.

Polydorus latreillei (Donovan).

♂♀. Pale brownish-black. Hind wing with a broad white discal band; submarginal spots 4, rarely 5, the posterior three red, the others more or less white; tail with a red spot at the tip; ♂ scent-wool white.

Head, prothorax, sides of breast, and abdomen red. Abdomen below red with black spots.

Distribution.—NORTH-WEST INDIA to ASSAM and BURMA; usually rare. Two subspecies are distinguished.

14 *a*. **Polydorus latreillei latreillei** (Donovan). (Figs. 19 *a*, imago; 19 *b*, venation; 19 *c*, genitalia).

Papilio latreillei, Donovan, 1806, pl. 140 (Nepal); Gosse, 1883, p. 321, pl. xxxii, fig. 11 (genitalia); Elwes, 1888, p. 425; Rothschild, 1895, p. 261; de Nicéville, 1897 *a*, p. 566; Bingham, 1907, p. 29, figs. 5 *a*, 5 *b* (neuration); Hannyngton, 1910, p. 361.

Byasa latreillei, Mackinnon & de Nicéville, 1898, p. 592; Moore. 1902, p. 165, pl. 430, figs. 1, 1 *a*, 1 *b* (♂), 1 *c* (♀).

Papilio latreillei latreillei, Jordan, 1909 *a*, p. 31; id., 1928, p. 161 (N.W. India to Sikkim).

Byasa latreillei latreillei, Evans, 1923, p. 233.

Tros latreillei latreillei, Evans, 1932 *a*, p. 45.

Papilio minereus, Gray, 1831, p. 32; id., 1846, p. 5, pl. 1.

♂. *Upperside* dull brownish-black. Fore wing with streaks in the cell, the internervular streaks and the veins velvety black. Hind wing with more uniform ground-colour to apex

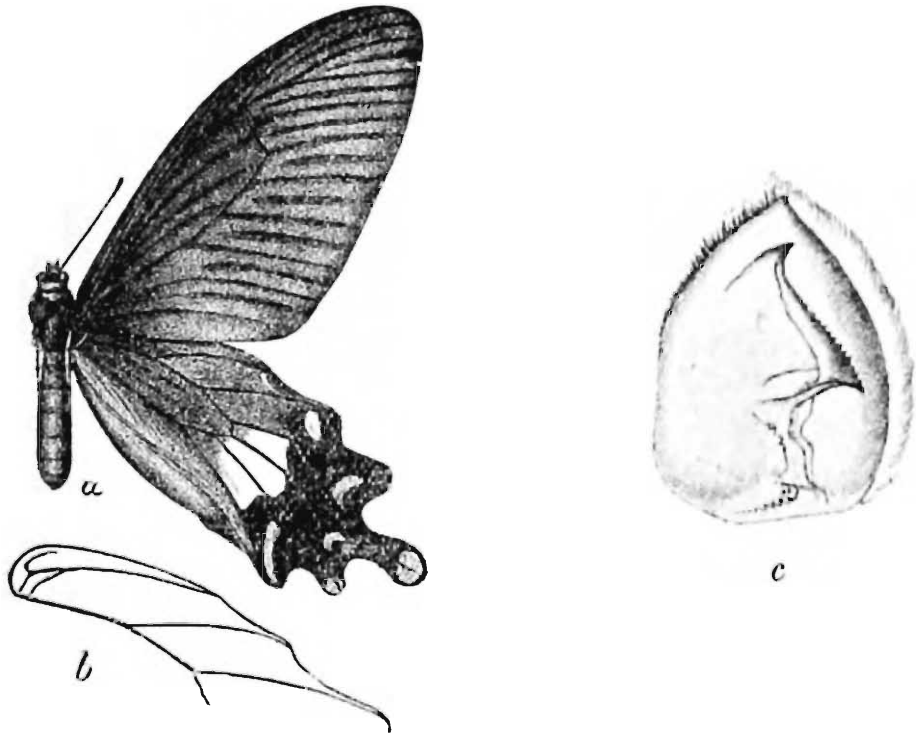


Fig. 19.—*P. latreillei latreillei* (Don.).

a, imago; *b*, venation of anterior portion of hind wing; *c*, valve and harpe (after Gosse).

of cell, and beyond this in areas 2, 3, and 4 with broad elongate white spots, the spot in area 2 slightly tinged outwardly with crimson; sometimes a white crimson-tinted spot also in

area 1 ; the patch in area 3 larger than the others. A submarginal series of crimson lunules in areas 2 to 5, that in area 5 generally more or less white ; a crimson spot at the end of vein 3, and one on the tip of the tail.

Underside with much paler ground-colour. Hind wing markings larger, the crimson spots brighter ; sometimes a small discal and adnervular spot in area 5, and a submarginal small white lunule in area 6 also present ; the crimson-tinted discal spot in area 1 always present.

♀. Resembles the ♂ ; slightly paler, with larger white and crimson markings on both sides of the hind wing ; usually a discal adnervular spot in area 5.

Expanse : ♂♀, 110–130 mm.

Genitalia (fig. 19 *c*).—"Armature of clasper a broadly rounded ridge which is strongly dentate distally and bears one or more teeth along the ventral side ; the number and size of the teeth variable ; apical process of penis slightly curved towards the left side " (*Jordan*, 1928).

Habitat.—GARHWAL to SIKKIM, more common in Mussoorie than elsewhere. Only found at high elevations between 7,000 and 9,000 feet.

14 *b*. **Polydorus latreillei kabrua** (Tytler).

Papilio kabrua, Tytler, 1915 *a*, p. 513 (♂♀) (Naga Hills).
Byasa latreillei kabrua, Evans, 1923, p. 233.
Papilio latreillei kabrua, Jordan, 1928, p. 161 (Naga Hills and Manipur) ; Evans, 1932 *a*, p. 45, pl. 1, fig. A 2.12 (♀) (Assam to N. Burma).

♂♀. This race differs from the nominotypical form by the hind wing having an additional large white spot in area 5, reaching vein 6, and the spot in area 4 completely filling the base of that area. There is no submarginal white spot in area 6 on the upperside, and it is often absent below.

Habitat.—ASSAM, MANIPUR, and the NAGA HILLS from 5,000 to 8,400 feet, in May and June ; rare.

15. **Polydorus polla** (de Nicéville). (Fig. 20, genitalia).

Byasa polla, de Nicéville, 1897 *b*, p. 633, ♂ (N. Shan States ; N. Chin Hills) ; Watson, 1897 *a*, p. 671 (N. Chin Hills) : de Nicéville, 1897 *a*, p. 565, pl. 4, fig. 28 (N. Shan States, east of Bhamo) ; Moore, 1902, p. 166, pl. 429, fig. 2 (♂) ; Evans, 1924, p. 233.
Papilio polla, Bingham, 1907, p. 30 ; Tytler, 1915 *a*, p. 513 (Naga Hills and Manipur) ; Jordan, 1928, p. 160, pl. vi, fig. 1 (genit.).
Papilio latreillei polla, Jordan, 1909 *a*, p. 31.
Tros polla, Evans, 1932 *a*, p. 45.

♂. Very closely resembles *P. latreillei* ♂, but the fore wing is proportionately rather narrower, the termen more oblique.

the tornus more rounded. Hind wing with a discal white patch composed of four elongate spots in areas 2 to 4, that in area 4 very broad, filling the area between the middle of veins 5 and 6 ; a submarginal series of lunules, larger than in *latreillei*, and all vermilion-red, not crimson, both on the upper and undersides ; cilia between the tornus and apex of vein 3, apex of tail and cilia at apex of vein 5 vermilion-red.

Underside of hind wing with the discal spot in area 1 vermilion-red, and the submarginal red lunule in area 2 is produced to the vermilion-red marginal edging below it. Antennæ, head, thorax, and abdomen as in *P. latreillei*.

♀. Resembles the ♂. *Upperside* of hind wing with the white discal patch continued posteriorly to the inner margin or nearly so, not extending to the end of the cell.

Expanse : ♂♀, 110–130 mm.

Genitalia (fig. 20).—"Armature of clasper nearly as in *P. latreillei*, but the ventral margin of the harpe distally

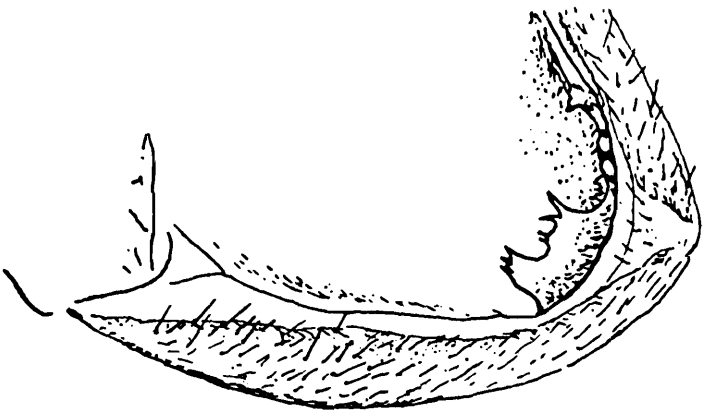


Fig. 20.—*P. polla* (de Nicév.), valve and harpe. (After Jordan).

enlarged into a fairly prominent dentate lobe ; penis and anal segment as in *P. latreillei* " (*Jordan*, 1928).

Habitat.—ASSAM to NORTH BURMA ; very rare. Recorded from the Northern Shan States ; N. Chin Hills ; Bernardmyo, 6,000 feet ; Manipur and the Naga Hills at 8,000 feet in June.

16. Polydorus nevilli (Wood-Mason). (Fig. 21, genitalia).

Papilio nevilli, Wood-Mason, 1882, p. 105 ; Elwes, 1888, p. 424 ; Rothschild, 1895, pp. 263–4 ; Bingham, 1907, p. 33 ; Seitz, 1907, p. 8, t. 1 *c* ; Jordan, 1909 *a*, p. 31 ; id., 1928, p. 168, pl. vii, figs. 1 (♂), 2 (♀), pl. vi, fig. 16 (genit.) (N.E. Assam, Yunnan, W. China).

Byasa nevilli, Wood-Mason & de Nicéville, 1887, p. 374, pl. 15, figs. 2, 2 *a* (♂) ; Moore, 1902, p. 164, pl. 429, fig. 1 (♂) ; Evans, 1923, p. 233.

Tros nevilli, Evans, 1932 *a*, p. 45.

Papilio chentsong, Oberthür, 1886, p. 13, pl. 1, fig. 1 (♂).

♂♀. Resembles *P. ravana* Moore, but is smaller, with the

markings also proportionately smaller. Hind wing with three submarginal lunules, never white or partly white as in *ravana*, the lunule in area 3 very often wanting; two large white, sometimes slightly reddish, spots in areas 5 and 6, the former reaching almost or quite to the cell; no spot on the tail; scent-wool yellowish-white.

Expanse: ♂♀, 100–120 mm.

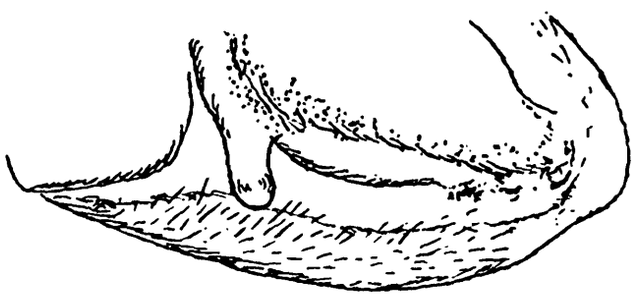


Fig. 21.—*P. nevilli* (W.-M.), valve and harpe. (After Jordan).

Genitalia (fig. 21).—"The harpe of the ♂ is very characteristic, bearing proximally a knob-like process; the teeth are restricted to the obtuse apex or to the apical third" (*Jordan*, 1928).

Habitat.—ASSAM to the SOUTHERN SHAN STATES, and extending to West China where it is very common; very rare in the Indian area.

Polydorus philoxenus (Gray). (Fig. 22 *a*, ♂; 22 *b–e*, genitalia).

♂♀. Hind wing with three submarginal red spots in areas 2, 3, and 4, sometimes a very small red admarginal spot at the end of vein 3; in area 5 usually a large white spot formed by the union of a discal and a submarginal spot; behind this patch very often a second smaller one, very rarely a spot before vein 5; tail with a double red spot. Scent-wool grey-black. In the ♀ the red anal spot, especially below, is often prolonged in band-shape to the apex of the cell.

Antennæ black; palpi, thorax, and abdomen crimson beneath, the abdomen with a line of black spots along each side; head and thorax above anteriorly crimson, rest of thorax and abdomen black.

Genitalia (fig. 22 *b–e*).—"The dorsal process inclines distad and varies somewhat in length; occasionally there is a small tubercle at each side of it. Where the anal sternite (scaphium) touches the tergite the latter bears a small longitudinal ridge on each side. The anal sternite is proximally strongly convex on the dorsal side. The setiferous ventral area on the inner side of the clasper is distally much broader than in the proximal half, the ventral margin of the harpe slanting upwards; the harpe is roughly triangular, with the basal

ventral angle produced into a large conical process, the distal angle is pointed or more or less obtuse, usually bearing one or more small teeth, the proximal process and the ventral margin dentate, the teeth small and sharp and very variable in number. Penis-sheath pale to the apex, not sharply pointed" (*Jordan*, 1928).

Larva.—" 2½ inches long; pale purple-brown; head and legs shining black; head small, corneous, sparsely covered

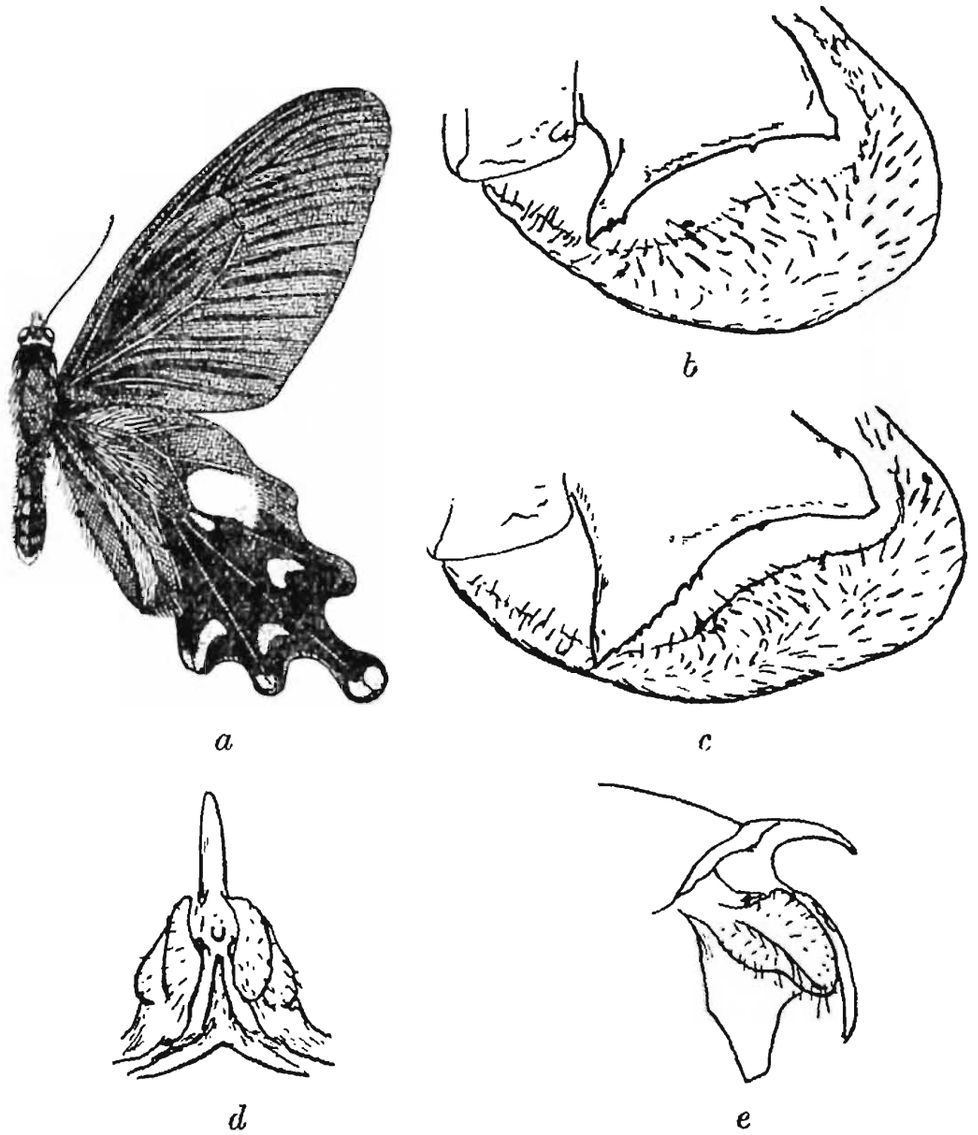


Fig. 22.—*P. philoxenus* (Gray).

a, *P. philoxenus philoxenus* (Gray) (♂, Kuijar, 6,000 feet, April); *b*, valve and harpe (after Jordan); *c*, *P. philoxenus polyeuctes* (Doubl.), valve and harpe; *d*, uncus, dorsal view; *e*, uncus lateral view (after Jordan).

with black hairs; 2nd segment with two short tubercles on each side and a nuchal, transverse, flattened, corneous, tentacular sheath in front; 3rd, 4th, 5th, and 6th segments

each with eight short tubercles, four on each side, the subdorsal series longest; 7th, 8th, 9th, and 10th segments each with six tubercles, the 11th, 12th, and 13th segments each with four shorter tubercles; each tubercle is red at the apex and purple-black streaked at the base; intervening space between the tubercles with a transverse and a dorsal series of paler purple-black spots; these latter markings all with pale borders; 7th and 8th segments each with a lateral, short, broad, oblique white band" (*Moore*). Occurs on *Nepenthes*.

Pupa.—"Reddish-ochreous, broad laterally; head broad and slightly cleft in front; thorax convex above and beneath, angular at the sides; wing-cases dilated laterally; abdominal segments with lateral foliaceous appendages" (*Moore*). Makes a squeaking sound when touched.

Distribution.—NORTH INDIA, BURMA, Siam, Annam, and Tong-king to China and Formosa. Two subspecies belong to the Indian fauna.

17 *a*. **Polydorus philoxenus philoxenus** (Gray).

Papilio philoxenus, Gray, 1831, p. 32 (Nepal); id., 1833, pl. 2; de Nicéville, 1881, p. 53; Staudinger & Schatz, 1884, p. 9, t. 5 (♂); Elwes, 1888, p. 426; de Nicéville, 1890, p. 387; Rothschild, 1895, pp. 264–5; Bingham, 1907, p. 31 (part.); Hannyngton, 1910, p. 361.

Byasa philoxenus, Moore, 1882, p. 259, pl. 12, fig. 5 (larva), 5 *a* (pupa); Doherty, 1886 *a*, p. 136; Swinhoe, 1893, p. 312; Moore, 1902, p. 159, pl. 426, figs. 1 (*l*., *p*.), 1 *a*, 1 *b* (♂).

Papilio philoxenus philoxenus, Jordan, 1909 *a*, p. 32, t. 19 *a* (♂); id., 1928, p. 162, t. vi, fig. 6 (genit.) (S. Kashmir to Nepal).

Byasa philoxenus philoxenus, Evans, 1923, p. 233, pl. 1, fig. A 2.15 (♀).

Tros philoxenus philoxenus, Evans, 1932 *a*, p. 45 pl. 1, fig. A 2.15 (♂).

Papilio philoxenus lama, Rothschild (*non* Oberth.), 1895, p. 266 ("Kashmir"); Bingham, 1907, pp. 30–1; Jordan, 1928, p. 162 ("N. Kashmir").

Papilio philoxenus letincius, Fruhstorfer, 1908, p. 72 (N.W. India)

♂. *Upperside* velvety black. Fore wing with broad pale adnervular streaks that do not extend to the outer margin and only slightly into the cell. Hind wing with a very large white quadrate spot in area 5, and usually a white spot in areas 4 or 6 or in both; a series of post-discal crimson or red lunules in areas 2, 3, and 4, followed by similarly coloured admarginal spots in areas 2 and 3 and at the tip of the tail, the lunule in area 2 nearly always, and that in area 3 very often, joined to the admarginal spots.

Underside with more opaque and duller ground-colour. Fore wing with very broad adnervular streaks. Hind wing as above, but with an additional elongate crimson spot near base of area 3, and a broad irregular transverse crimson bar below it in areas 1 and 2; the other markings somewhat

larger than on the upperside, the white margins often tinged with red along their edges.

♀. Resembles the ♂, but with duller ground-colour; markings above much duller crimson, often nearly white and much irrorated with black scales; the white quadrate spot in area 5 generally larger than in the ♂.

Expanse: ♂♀, 110–130 mm.

Variation.—A very variable form merging into *polyeuctes* Doubleday. Dark specimens, occurring in Kashmir, closely resemble the Chinese race *lama* Oberthür.

Habitat.—KASHMIR to NEPAL; not rare.

17 *b*. **Polydorus philoxenus punchi** (O. Bang-Haas).

Papilio philoxenus punchi, O. Bang-Haas, 1933 *a*, p. 261 (♂♀ West Kashmir: Punch State).

♂♀. Much smaller than the nominotypical form. Hind wing in ♂ with a larger whiter spot in front of vein 5. ♀, in addition, with a second smaller white spot and with the red anal spot on both sides of hind wing weakly defined.

Habitat.—WESTERN KASHMIR. The specimens were taken on the Jhelum River, 11,000 feet, in May.

I have not seen specimens of this form.

17 *c*. **Polydorus philoxenus polyeuctes** (Doubleday).

Papilio polyeuctes, Doubleday, 1842, p. 74; id., 1846, p. 9, pl. 2, fig. 3 (♂); Rothschild, 1895, pp. 265–6 (*P. philoxenus*, ab. ♂).

Papilio philoxenus polyeuctes, Jordan, 1909 *a*, p. 32; Evans, 1923, p. 233; Jordan, 1928, pp. 162–3, pl. vi, figs. 4, 5, 7 (genit., ♂♀) (Sikkim to Yunnan, Tong-king, S. Annam, and Tenasserim).

Tros philoxenus polyeuctes, Evans, 1932 *a*, p. 45.

Papilio philoxenus, Moore (*non* Gray), 1878 *a*, p. 840; de Nicéville, 1881, p. 53; Elwes, 1888, p. 426; Watson, 1897 *a*, p. 671; Moore, 1902, p. 159 (part.); Tytler, 1912, p. 589; South, 1913, p. 364.

Papilio philoxenus var. *polymitis*, Tytler, 1912, p. 589.

Papilio nepenthes, Ehrmann, 1920, p. 22; Holland, 1924, p. 323 (=*P. philoxenus*).

♂♀. The ♂ without any trace of a white spot above or below the large quadrate white patch in area 5. Front of head and abdomen below less black than in the nominotypical form, and hind wing darker below. The spots on the upperside are occasionally darkened.

According to de Nicéville this butterfly, especially the female, has a very strong disagreeable musky odour, which persists long after the insect is dead and dry.

Habitat.—SIKKIM to BURMA. Very common in some areas, and occurs in wooded districts at elevations of 1,000–5,000 feet all through the summer. Also occurs in Yunnan, Siam, Annam, and Tong-king.

Polydorus dasarada (Moore). (Figs. 23 *a–c*, genitalia).

♂♀. Larger than *P. philoxenus*, with broader tails to the hind wing. Body beneath more woolly than in *P. philoxenus*, at the sides of the abdomen usually pale instead of vivid red. Genitalia with the anal hook of the ♂ simple; the harpe more strongly dentate than in *P. philoxenus*, and distinctly different in the four subspecies. Hind wing narrow, the cell narrower

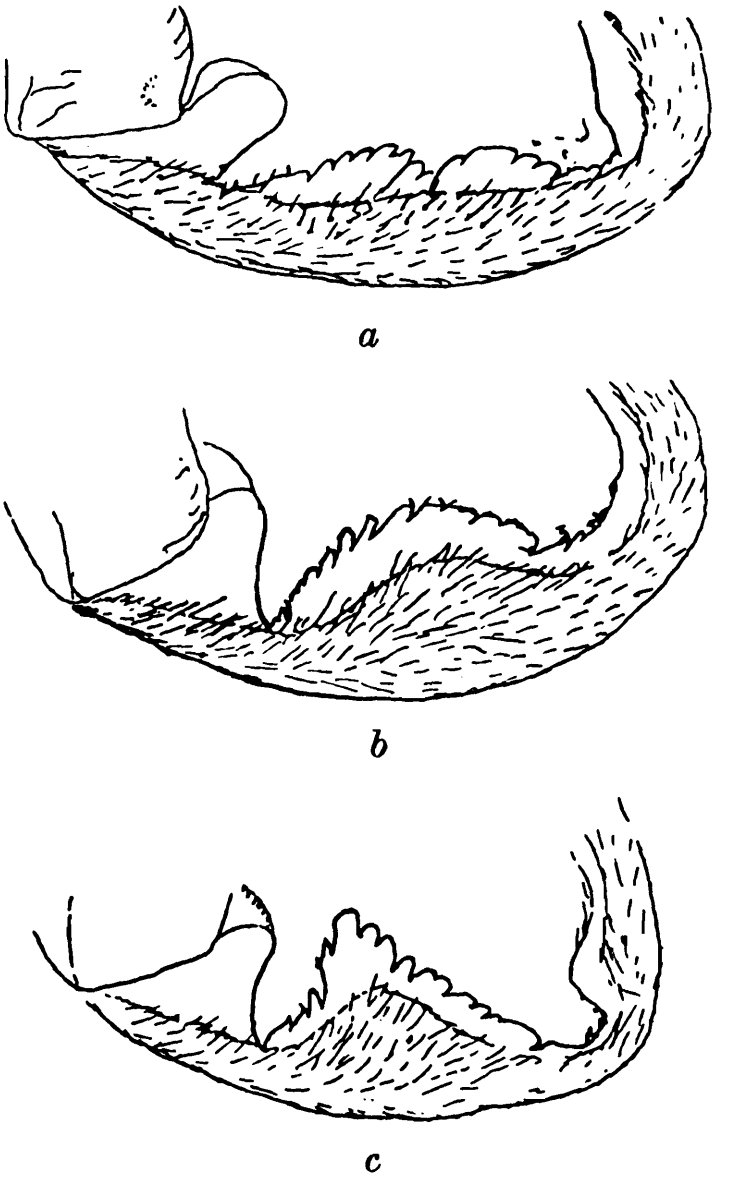


Fig. 23.—*P. dasarada* (Moore), genitalia. (After Jordan).

a, *P. dasarada ravana* (Moore), valve and harpe; *b*, *P. dasarada dasarada* (Moore), valve and harpe; *c*, *P. dasarada barata* (Roths.), valve and harpe.

than in *P. philoxenus*; a large white spot in area 5 as in *P. philoxenus*, many specimens with a small spot before this patch, rarely also a spot behind it; the submarginal spot placed before the tail white or whitish, in the ♀ often a complete discal band.

Genitalia (fig. 23).—"The anal tergite of the ♂ lacks the dorsal process always found in *P. philoxenus*; the penis-sheath ends with a gradually narrowed, sharply pointed, well-chitinized, straight process; harpe of clasper longer than in *P. philoxenus*, its teeth are larger and more numerous" (*Jordan*, 1928).

Early stages.—Described under *ravana*.

Habits.—A forest species which is usually taken in open spaces in the woods and at flowering trees, round which the butterfly sails with a slow, graceful flight. It has a very strong offensive smell.

Distribution.—North-West India to Burma, Tong-king, and Hainan. Three subspecies occur in the Indian area.

18 *a*. **Polydorus dasarada ravana** (Moore). (Fig. 23 *a*, genitalia).

Papilio ravana, Moore, 1857 *a*, p. 96; Elwes, 1888, p. 423; Rothschild, 1895, p. 262; Bingham, 1907, p. 33; Seitz, 1907, p. 8, t. 1 *b* (♂♀); Hannyngton, 1910, p. 361; id., 1911 *b*, p. 875 (early stages).

Byasa ravana, Mackinnon & de Nicéville, 1898, p. 592 (Tehri Garhwal); Moore, 1902, p. 163, pl. 428, figs. 1, 1 *a* (♂), 1 *b*, *c* (♀).

Papilio dasarada ravana, Jordan, 1909 *a*, p. 32; id., 1928, p. 164, pl. vi, fig. 8 (genit.) (Kashmir to W. Nepal).

Byasa dasarada ravana, Evans, 1923, p. 233.

Tros dasarada ravana, Evans, 1932 *a*, p. 45.

♂. *Upperside* brownish-black. Fore wing with velvety black internervular streaks that extend into the cell in many specimens; veins black. Hind wing with a submarginal series of white markings more or less tinged with crimson, the markings in areas 2, 3, and 4 lunular, in 5 and 6 elongate rectangular, in 7 a minute spot, the white rectangular marking in area 5 conspicuously larger than the others; a crimson spot on the tail on each side of vein 4.

Underside similar to above, with very much paler ground-colour; hind wing with an additional pale crimson spot near the base of areas 1 and 2.

Antennæ, thorax, and abdomen black; head crimson; underside of palpi, sides of thorax and abdomen crimson, the palpi with a mixture of black hairs, the abdomen at the base and on the sides spotted with black.

♀. Resembles the ♂. Ground-colour brown, very much paler than in the ♂; internervular, velvety black streaks on fore wing very narrow. Hind wing distal area with black ground-colour, the markings larger than in the ♂ and purer white on the upperside; in addition, a series of white discal spots near base of areas 1, 2, 3, and 4, that in area 1 tinged with crimson.

Underside markings similar to above, but both the discal and the posterior submarginal spots are more strongly tinged with crimson.

Expanse : ♂♀, 100–130 mm.

Genitalia (fig. 23 *a*).—" Teeth of harpe of ♂ smaller than in *P. d. dasarada*, the proximal process shorter and often broader, and the ventral margin more or less dilated distally of the basal process. The apical process of the penis-sheath long, and usually narrower than in *P. d. dasarada* " (*Jordan*, 1928).

Larva.—" Ground-colour varies from dark grey to creamy white marbled with oblique blackish lines. Two lateral and two subdorsal rows of fleshy tubercles, with an additional pair on segments 3 and 4, the subdorsal pair on segment 2 elongate ; all the tubercles black and tipped with red except on segments 7, 8 and 11, on which they are creamy white, which colour on segments 7 and 8 is continued obliquely over almost the entire segments, forming a jagged white patch ; segmental incisions dull brown. The black on the subdorsal tubercles forms two interrupted lines between which is a dorsal row of blackish spots. Osmeterium orange " (*Hannyngton*, 1911 *b*, p. 875).

Was found, semi-gregarious, on *Aristolochia* at 8,000 feet on Liriya Kanta, near Naini Tal, on 25th July, 1909.

Pupa.—" Carinate, stout and laterally dilated. Greenish-yellow with lilacine stripes, head truncate, an orange protuberance on back of thorax which is dorsally conical. Each abdominal segment with a pair of prominent tubercles on the back.

" The first larva to pupate was one found already spun up on a twig of *Viburnum* close to the food-plant, with little or no attempt at concealment. This remained quiescent for 48 hours before pupating, and the interval between spinning up and pupating was generally 3 days. Like all the known pupæ of this group this species attaches itself vertically with a black silken body band and an anal pad. By the 6th August, 1909, all had been spun up. The first butterfly appeared on 20th April, 1910 " (*Hannyngton*, 1911 *b*, p. 875).

Habitat.—KASHMIR to KUMAON ; not rare.

18 *b*. **Polydorus dasarada dasarada** (Moore). (Fig. 23 *b*, genitalia).

Papilio dasarada, Moore, 1857 *a*, p. 96 ; Elwes, 1888, p. 425 ; Bingham, 1907, pp. 31–2 ; Tytler, 1912, p. 589 (Naga Hills).
Panosmia dasarada, Wood-Mason & de Nicéville, 1887, p. 374.
Byasa dasarada, Swinhoe, 1893, p. 312 ; Moore, 1902, p. 161 (part.), pl. 427, fig. 1 (♂), 1 *a* (♀).
Papilio philoxenus ab. *dasarada*, Rothschild, 1895, p. 266 (part.).
Pœnasmia dasarada, Kirby, 1896, p. 266.
Papilio philoxenus dasarada, Jordan, 1909 *a*, p. 32, t. 19 *b*.
Byasa dasarada dasarada, Evans, 1923, p. 233.

Papilio dasarada dasarada, Jordan, 1928, p. 164, pl. vi, fig. 9 (genit.) (Sikkim, Assam, Burma).
Tros dasarada dasarada, Evans, 1932 *a*, p. 45.

♂♀. Hind wing above usually without a white discal spot in area 6. Underside of hind wing much darker than the fore wing. ♀ without a discal white spot in areas 1 *b* to 2 of the hind wing above.

Expanse : ♂♀, 120–140 mm.

Genitalia (fig. 23 *b*).—" The proximal process of the harpe long, dentate or simply conical ; the dentition variable, most of the teeth of the ventral margin long, the distal end of the harpe more or less broadly rounded, dentate, the teeth pointing downward " (*Jordan*, 1928).

Habitat.—SIKKIM to ASSAM ; not rare.

18 *c*. **Polydorus dasarada barata** (Rothschild). (Fig. 23 *c*, genitalia).

Papilio philoxenus ab. *barata*, Rothschild, 1895, p. 266 (part.).
Papilio dasarada barata, Rothschild, 1908, p. 168 ; Jordan, 1909 *a*, p. 32 ; id., 1928, p. 164, pl. vi, fig. 10 (genit.) (Tenasserim, Shan States, Tong-king).
Byasa dasarada barata, Evans, 1923, p. 233.
Tros dasarada barata, Evans, 1932 *a*, p. 45.

♂♀. Wings somewhat narrower than in *dasarada* Moore, and the hind wing below is paler from the costal margin to the cell ; spot in area 6 absent below.

Expanse : 120–140 mm.

Genitalia (fig. 23 *c*).—" The proximal process of the harpe of the clasper flatter than in *P. d. dasarada*, the angle between it and the ventral margin smaller, the apex of the clasper more produced distad, the teeth more numerous than in the preceding race (*dasarada*), frequently arranged in two irregular rows, the apical teeth directed distad or upward rather than downward " (*Jordan*, 1928).

Habitat.—BURMA ; recorded from the Shan States and Tenasserim ; also in Tong-king.

19. **Polydorus crassipes** (Oberthür). (Fig. 24, genitalia).

Papilio crassipes, Oberthür, 1893, p. 2, pl. 4, figs. 38, 38 *a* (♂) (Tong-king) ; Rothschild, 1895, p. 262 ; Fruhstorfer, 1901 *a*, pp. 113–14 (♀) ; id., 1903 *a*, p. 170 (♀) ; Bingham, 1907, pp. 28, 34 ; Jordan, 1909 *a*, p. 31, t. 18 *a* ; Tytler, 1915 *a*, p. 513 ; Jordan, 1928, p. 166, pl. vi, fig. 13 (genit.) (Manipur, Shan States, Tong-king).
Byasa crassipes, Moore, 1902, p. 171, pl. 434, fig. 2 (♂); Evans, 1923, p. 233.
Tros crassipes, Evans, 1932 *a*, p. 46.

♂♀. *Upperside* without markings, excepting obscure red spots on hind wing ; tail tipped with red below. Fore wing above dark fuliginous-black, with black veins, a longitudinal

streak between the veins and streaks within the cell. Hind wing proximally broader than in *P. latreillei* and the marginal teeth placed before and behind the tail less produced; tail very broad and short, a small spot at the tip. Scent-wool greyish-white.

Underside of hind wing dull black, with two anterior marginal and two subanal lunules, an irregularly-shaped anal lunule, and the tail-tip bright crimson; all the spots large.

Antennæ and legs black; thorax and abdomen above black; front of head and thorax and abdomen beneath crimson; abdomen beneath with black segmental bands. Hind tibia of ♂ broader than in any other *Papilio*.

Expanse: ♂♀, 110–120 mm.

Genitalia (fig. 24).—"At the base of the anal tergite of the ♂ there is a short process at each side; clasper with an apical sinus, below which there is a short sharp process not found in any other species of this group; harpe with a proximal,

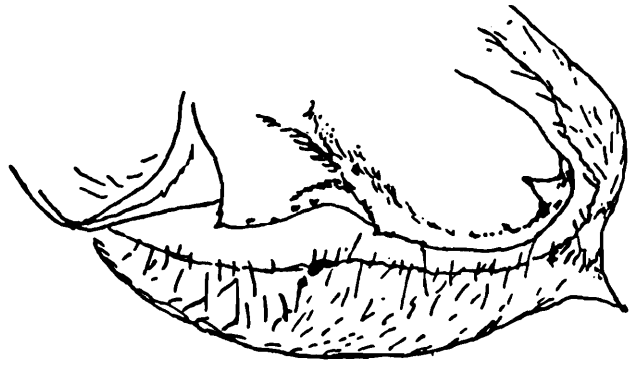


Fig. 24.—*P. crassipes* (Oberth.), valve and harpe. (After Jordan).

triangular, denticulate process, above which there is a short dentate ridge, ventral margin of harpe incrassate, gradually rounded, bearing a few small teeth, apex conical, sharply pointed, curved mesad, *i. e.*, away from the clasper, lying above the anal tergite when the claspers are closed" (*Jordan*, 1928).

Habitat.—MANIPUR to the SOUTHERN SHAN STATES, always very rare; also in Tong-king. Occurs at elevations of 1,000 and 2,500 feet.

Polydorus plutonius (Oberthür). (Figs. 25 *a*, *b*, genitalia).

♂♀. Hind wing very strongly lobed before and behind the tail; four or five red or reddish submarginal spots above, and six or seven on the underside. ♂ with brownish-black ground-colour above; ♀ blackish-brown, hind wing distal margin black. *Underside* ground-colour blackish-brown, the hind wing almost as pale as the fore wing. Scent-wool black-brown.

Head, collar, sides of thorax below, and abdomen below red mixed with black hairs; abdomen black above, below with transverse black edgings of hair to the segments.

Genitalia (fig. 25).—"Clasper large, recalling *P. dasarada*, as does also the harpe, which is proximally dilated into a process of variable size, the ventral margin usually dentate

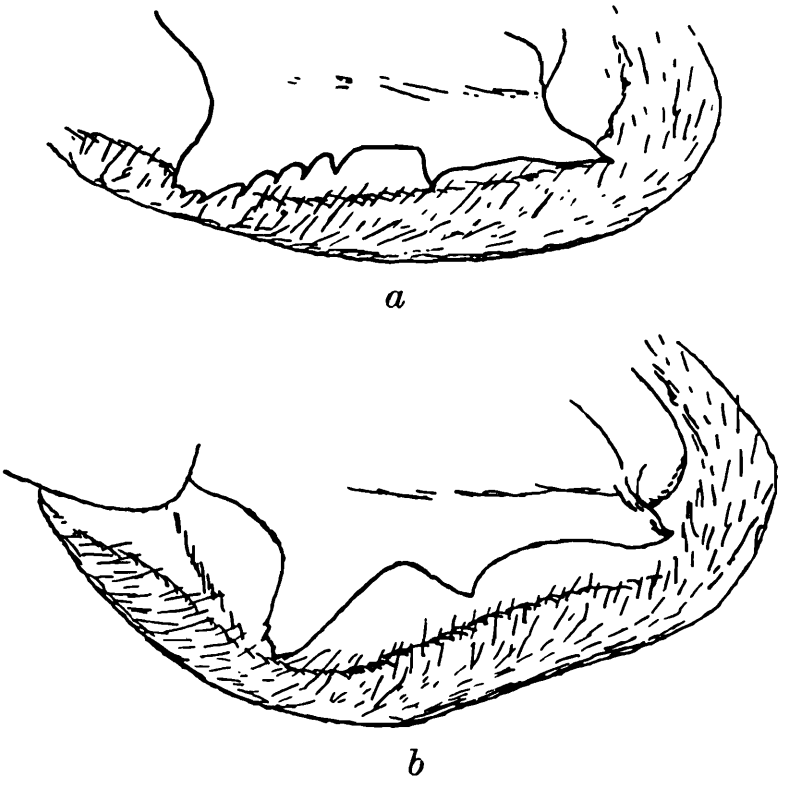


Fig. 25.—*a*, *P. plutonius pembertoni* (Moore), valve and harpe (after Jordan); *b*, *P. plutonius tytleri* (Evans), valve and harpe (after Jordan).

sometimes simple, with a large tooth in or near middle" (*Jordan*, 1928).

Distribution.—West China and EASTERN HIMALAYAS; the typical form confined to China.

20 *a*. **Polydorus plutonius pembertoni** (Moore). (Fig. 25 *a*, genitalia).

Byasa pembertoni, Moore, 1902, p. 170, pl. 434, figs. 1 (♂), 1 *b* (♀) (Bhutan).

Papilio alcinous pembertoni, Rothschild, 1895, p. 271 (part.; Bhutan); Bingham, 1907, p. 34.

Papilio plutonius pembertoni, Oberthür, 1907, p. 137 (Sikkim); Jordan, 1909 *a*, p. 33; Riley, 1927, p. 119; Jordan, 1928, p. 170, pl. vi, fig. 23 (genit.) (at high elevations in Sikkim and Bhutan).

Byasa alcinous pembertoni, Evans, 1923, p. 233.

Tros alcinous pembertoni, Evans, 1932 *a*, p. 46.

♂. *Upperside* fuliginous-black. Fore wing with broad

pale adnervular streaks extending from near the base to the outer margin, present also in the cell. Hind wing with the cell and interspaces to near the margin entirely pale, veins black ; a submarginal series of pinkish-white broad lunules in areas 2 to 6 ; tail immaculate.

Underside of hind wing resembles the upperside ; ground-colour paler, an additional submarginal pinkish-white lunule in area 1 that extends over the vein into area 2, and another very small one in area 7

♀. *Upperside* pale olivescent greyish-fuliginous. Fore wing with black veins and streaks. Hind wing with the submarginal pale flesh-coloured lunules slightly larger than in the ♂, the borders surrounding them dull black.

Underside a little paler. Hind wing with six submarginal pale flesh-coloured lunules and a similarly coloured broad anal lunule as in the ♂, the surrounding marginal border duller black.

Expanse : ♂♀, 100–120 mm.

Genitalia (fig. 25 *a*).—" Harpe nearly as in West Chinese specimens, strongly dentate " (*Jordan*, 1928).

Habitat.—SIKKIM to BHUTAN ; always very rare, and only at high elevations.

20 *b*. **Polydorus plutonius tytleri** (Evans). (Fig. 25 *b*, genitalia).

Byasa alcinous tytleri, Evans, 1923, pp. 233, 245 (Manipur).
Papilio plutonius tytleri, Jordan, 1928, p. 170, pl. vi, fig. 24 (genit.) (Naga Hills).
Tros alcinous tytleri, Evans, 1932 *a*, p. 46.
Papilio alcinous impediens, Tytler (*non* Roths.), 1915 *a*, p. 513, ♂♀ (Naga Hills, 7,000 ft.).

♂♀. A quite distinct race, which differs also in the genitalia. Hind wing above with prominent black submarginal spots and a small red submarginal spot in area 2. ♀ pale brown with obscure traces of submarginal red spots in areas 3 to 6.

Genitalia (fig. 25 *b*).—" The harpe without the numerous teeth of the other races, the two specimens examined both with a simple triangular median tooth " (*Jordan*, 1928).

Habitat.—MANIPUR and the NAGA HILLS ; rare.

Tribe II. PAPILIONINI.

The species of this group belong to the true Papilios and are known as the Fluted Papilios. They are chiefly *Citrus* feeders. The number of species is greater than in the other tribes of Papilionidæ, and their distribution is more extensive. The Oriental species may be divided into the genera *Chilasa* and *Papilio*. The species of *Chilasa* possess a very distinctive pattern, being mimetic of Danaines and Euplœines. Some species of *Papilio* resemble forms of the genus *Polydorus*.

"Antennæ without scales; the segments somewhat thinner towards their bases; the fine sensory hairs either pretty equally distributed over the ventral surface of the segment or concentrated on two large lateral, non-impressed areas The tarsi likewise without scales, the dorsal spines separated from the rows of the under surface by a lateral, impressed, spineless longitudinal stripe. The abdominal margin of the hind wing in both sexes is simply curved downwards and forms a groove beneath. The hind wing of the ♂ has no scent-organ; on the other hand there are scent-scales on the fore wing of many species. In the Indo-Australian forms the wings of both sexes are always thickly scaled, also almost all the species have at least a few metallic (grey, green, or blue) scales.

"The young larvæ resemble bird-droppings and bear on each segment more or less distinct humps or spines which, in most species, disappear later. According to the markings we have two principal types of larvæ: the spotted larvæ (*P. machaon*, *clytia*, etc.) and the oblique-banded larvæ (*P. polytes*, *memnon*, *bianor*, etc.). Very many larvæ live on species of *Citrus*, and *Xanthoxylon* is also a favourite food-tree.

"Pupa rough and leathery, usually resembling a piece of wood, the head mostly prolonged into two horns, which are rough on the innerside; wing-cases not so strongly dilated as in the *Aristolochia* Papilios (*Polydorus*), commonly scarcely projecting laterally; the dorsal protuberances of the abdomen are absent or very small" (*Jordan*, 1909 *a*).

Key to Genera of Papilionini.

1. Pattern resembling Danaines or Euplœines. Abdomen with rows of white dots. Hind wing at the base with a white dot or spot. Larva without oblique bands, but with two or three rows of spines . . . . . [p. 106. CHILASA Mre.,
2. Rarely with a Euplœine pattern. Abdomen without white dots (except in the *Castor* Group). Larva almost smooth, with oblique bands. [p. 120. PAPILIO Linn.,

Genus **CHILASA** Moore.

Chilasa, Moore, 1881 *a*, p. 153 (type, *dissimilis* L.); id., 1903, p. 81; Evans, 1927, p. 25, pl. 1; id., 1932 *a*, pp. 41, 46.
Cadugoides, Moore, 1882, p. 260; id., 1903 pp. 100–1.
Menamopsis, Elwes & de Nicéville, 1887, p. 433 (subgen.; type, *tavoyanus* Butl.).
Isamiopsis, Moore, 1888, p. 284 (type, *telearchus* Hew.).

This is a genus of entirely mimetic species resembling Danaidæ. It comprises four groups, of which only two are found in the Indian area.

" Body spotted with white, the mesothorax above at least with a couple of white dots, the abdomen beneath with three rows and at the sides with two rows of these dots, the uppermost row sometimes obsolete, in other cases with the lower lateral dots so merged together that the abdomen is ringed with black and white; hind wing at the base with a white dot or spot, usually also a spot of the same colour at the base of the fore wing.

" Larva almost cylindrical, with reddish dots, larger light longitudinal patches and two or three rows of spines.

" Pupa likewise almost cylindrical, similar to a broken-off twig; wing-cases scarcely projecting at all laterally; head truncate, not produced into horns, the thoracic horns low, directed forwards; thorax and abdomen above with four rows of small round tubercles, the abdomen flattened beneath and hollowed out, lying close to the twig on which the pupa is fastened, the pad for the cremaster very strong " (*Jordan*, 1909 *a*).

Key to Groups and Species of Chilasa.

A. Hind wing with the upper discocellular not half the length of vein 7; vein 7 at its point of origin placed farther distad than vein 2.	[p. 106. AGESTOR Group,
1. Fore wing above black with bluish-grey or white markings	2.
Fore wing above dark brown, with a blue spot in end of cell and blue discal stripes ..	[p. 110. *slateri* (Hew.),
2. Hind wing with chestnut-red ground-colour and bluish-grey markings	[p. 106. *agestor* (Gray),
Hind wing black, with white or greyish-white markings	[p. 109. *epycides* (Hew.),
B. Hind wing with the upper discocellular nearly as long as vein 7; vein 7 at its point of origin placed nearer the base than vein 2	[p. 112. CLYTIA Group,
1. Hind wing below without a row of yellow marginal spots	[p. 112. *paradoxa* (Zink.),
2. Hind wing below with a row of yellow marginal spots	[p. 114. *clytia* (Linn.),

Agestor Group.

Chilasa agestor (Gray).

This species is an excellent mimic of *Danaus tytia* Gray. Fore wing for the most part whitish-grey, the veins and distal

margin black. Hind wing chestnut-brown with grey-white markings. Abdomen with large light transverse spots.

Larva.—Blackish-brown with two subdorsal and two lateral rows of spines, each with a spot of red at its base ; anterior, middle, and posterior lateral patches of dull ochraceous, the latter two meeting on the dorsum ; the rest of the larva spotted with black and red ; beneath pale yellowish.

The young larva is at first of a reddish colour, but very soon turns black and white ; it lies on the upper surface of a leaf, where it greatly and protectively resembles a bird's dropping.

Eggs laid on the young leaves of *Machilus odoratissimus* Nees, and perhaps on other Laurineæ.

Habits.—Frequents shrubby woods ; it skims lightly over the tops of the bushes without flapping the wings, and always returns again to the resting-place it has once chosen, on a projecting twig, even when it has been more than once disturbed. Occurs in the spring, and hibernates in the pupa stage.

Distribution.—North-West India to Tong-king, Central and South China and Formosa up to 6,000–7,000 feet.

Five subspecies are known, of which three are found in the Indian area.

21 *a*. **Chilasa agestor agestor** (Gray). (Fig. 26, ♂).

Papilio agestor, Gray, 1832, p. 32.
Cadugoides agestor, Moore, 1882, p. 260 : Swinhoe, 1893, p. 315 : Moore, 1903, p. 101, pl. 508, figs. 1, 1 *a*–1 *c* (♂♀).
Papilio agestor agestor, Rothschild, 1895, p. 360 ; Bingham, 1907, pp. 70, 71, fig. 16 (♂) ; Jordan, 1909 *a*, p. 41.
Chilasa agestor agestor, Evans, 1927, p. 234, pl. 2, fig. A 3.2 ; id., 1932 *a*, p. 46, pl. 1, fig. A 3.1 (♂).
Papilio senchalus, Fruhstorfer, 1909 *a*, p. 190 (Sikkim, Bhutan).
Papilio cresconius, Fruhstorfer, 1909 *a*, p. 190 (Upper Burma).

♂♀. *Upperside* black, with the following bluish-grey markings :—A very slender line along the costal margin ; a broad stripe from the base in the cell that does not reach the apex of the same ; two subapical spots ; a long streak in area 1 *a* ; two elongate broad stripes in area 1 divided by a thin black ill-defined line ; broad rectangular patches in areas 2, 3, 4, and 6 ; a narrower inwardly obsolescent streak in area 5, and elongate spots in areas 8, 9, and 10 ; the discal patches in areas 1 to 4 are crossed transversely near their apices by a line of the ground-colour ; a complete submarginal series of small whitish spots. Hind wing rich chestnut-red ; cell filled by a trifid bluish-grey streak, followed at the bases of areas 2 to 6 by elongate bluish-grey spots ; a narrow streak of the same colour from the base in area 1 ; a post-discal series of spots in areas 5, 6, and 7, and a more or less obsolescent submarginal series of dots also bluish-grey ; the veins on the wing conspicuously paler than the ground-colour.

Underside of fore wing as above except that the ground-colour on the apical area is dull brown, not black. Hind wing as above, but the ground-colour on the disc of the wing of a darker, deeper shade of chestnut ; the post-discal series of

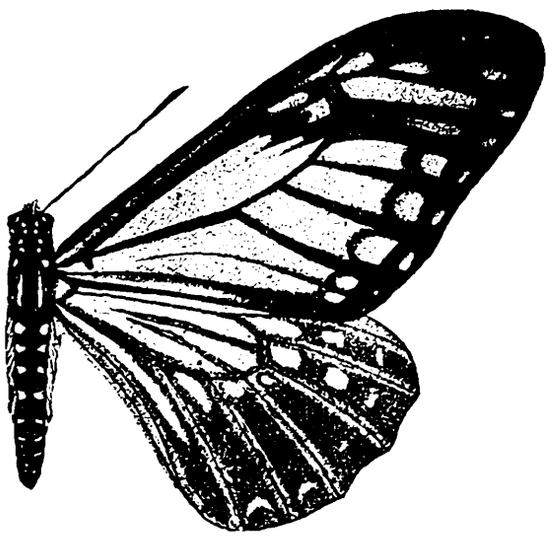


Fig. 26.—*C. agestor agestor* (Gray), ♂.

spots more or less obscurely complete from areas 1 to 7 ; a submarginal series of small lunules.

Antennæ, head, thorax, and abdomen black, the head and thorax variegated with bluish-grey spots, the abdomen with lateral transverse bars.

Expanse : ♂♀, 100–120 mm.

Habitat.—SIKKIM to the DAWNA RANGE, extending to Tong-king ; not rare.

21 *b*. **Chilasa agestor chiraghshahi** (O. Bang-Haas).

Papilio agestor chiraghshahi, O. Bang-Haas, 1933 *a*, p. 261 (♂, West Kashmir).

♂. Smaller and narrower than *govindra* (Moore). Hind wing with inner margin pale to yellow-brown ; in 2 ♂♂ of the original series the inner area is without black markings.

Habitat.—WESTERN KASHMIR : Punch State, Jhelum River, 3,600 m., May.

I have not seen specimens of this form.

21 *c*. **Chilasa agestor govindra** (Moore).

Papilio govindra, Moore, 1864, p. 101.

Cadugoides govindra, Moore, 1882, p. 261 ; id., 1903, p. 100, pl. 509, figs. 1, 1 *a*–1 *d* (♂♀).

Papilio agestor govindra, Rothschild, 1895, p. 36 ; Mackinnon & de Nicéville, 1898, p. 599, pl. 5, fig. 22 *a–d* (larva, pupa) ; Bingham, 1907, pp. 70, 71 ; Jordan 1909 *a* p. 41 ; Seitz, 1906, p. 13, t. 3 *b* ; Hannyngton, 1910, p. 361.

Chilasa agestor govindra, Evans, 1923, p. 233 ; id., 1932, p. 46.

♂♀. Very closely resembles the nominotypical form, but can always be distinguished by the presence of a complete series of post-discal bluish-grey spots on the hind wing above. It is generally also smaller in both sexes than typical *agestor*, and on the hind wing above the ground-colour in the anterior interspaces is broadly centred along the middle with very dark brown, almost black; in the ♀, on the contrary, the black sometimes all suppressed, and the hind wing frequently almost ochraceous.

Expanse: ♂♀, 83–100 mm.

Habitat.—KASHMIR to KUMAON; not rare.

Chilasa epycides (Hewitson).

♂♀. Markings grey-white with black vein-stripes, resembling some Danaine species. Hind wing with a round yellow anal spot. The ♀ more extended grey-white than the ♂.

Habits.—Occurs in the spring in sandy river-beds, and is single-brooded.

Distribution.—West China and Formosa to BURMA and SIKKIM. Two subspecies in the Indian area.

22 *a*. **Chilasa epycides epycides** (Hewitson). (Fig. 27, ♂).

Papilio epycides, Hewitson, 1862–6, *Pap.* pl. 6, fig. 16 (♂); Elwes, 1888, p. 423.

Papilio epycides epycides, Rothschild, 1895, p. 361; Bingham, 1907, pp. 71–3, fig. 17 (♂); Jordan, 1909 *a*, p. 41, t. 29 *c*.

Chilasa epycides epycides, Evans, 1923, p. 234; id., 1932 *a*, p. 46.

♂♀. *Upperside* dull black, with the following somewhat dingy white markings that resemble in their disposition the

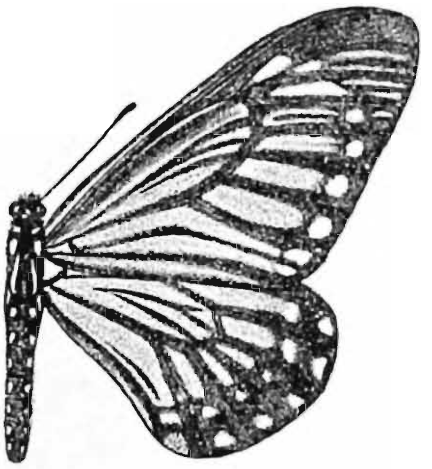


Fig. 27.—*C. epycides epycides* (Hew.), ♂.

markings in *C. agestor*:—Fore wing with two cell-streaks that diverge outwardly from the base and reach the apex, three shorter streaks between and above them at the apex; area

1 *a* with an elongate streak that does not reach the margin ; two streaks in area 1 divided by a black line as in *agestor* ; a series of more or less rectangular broad stripes in areas 2 to 6, with elongate spots in 7 and 8 ; a very slender costal streak from the base ; a series of rounded submarginal spots in areas 1 to 5, and ill-defined subapical streaks in areas 6 and 7. Hind wing with the cell white, traversed longitudinally by two short black lines, the upper one forked near the apex ; a discal series of short and broad white stripes in areas 2 to 6, a longer stripe in areas 1 and 7 ; a transverse series of post-discal and submarginal white spots beyond, the post-discal spots in areas 6 and 7 coalescent with the discal stripes in those areas ; a prominent tornal ochraceous-yellow spot.

Underside resembles the upperside, the ground-colour outwardly on the fore wing and over the whole of the hind wing more or less of a chestnut tint ; markings similar to those above but broader, and on the fore wing diffuse towards the apex ; hind wing without a discal stripe in area 7, and the yellow anal spot edged with white on the inner side. Abdomen with three lateral rows of white spots.

♀. Markings purer and more extended grey-white, the submarginal spots of the hind wing specially enlarged.

Expanse : ♂♀, 70–90 mm.

Habitat.—SIKKIM to NORTH BURMA ; rare.

22 *b*. **Chilasa epycides hypochra** (Jordan).

Papilio epycides hypochra, Jordan, 1909 *a* p. 41 (Shan States).
Chilasa epycides hypochra, Evans, 1923, p. 234 ; id., 1932 *a*, p. 46, pl. ii, fig. A 3.2 (♀).

♂. "As light as light ♀♀ from Assam and Sikkim, the three grey discal stripes on the fore wing above, which are placed between the lower angle of the cell and vein 2, distally twice as broad as the black vein-stripes ; costal margin of fore wing, especially beneath, more narrowly black than in ♂♂ of the typical form, and the under surface of the hind wing before the cell with a long, broad white-grey stripe, which extends almost to the submarginal spot, the costal margin from the base to the middle likewise white-grey " (*Jordan*, 1908).

Habitat.—SHAN STATES to the KAREN HILLS ; rare.

Chilasa slateri (Hewitson).

♂♀. Wings dark brown with entire margins which bear no fringe-spots. Fore wing above with bluish discal stripes in the Indian races, rather reduced in one. Hind wing with a yellow marginal anal spot as in *epycides*, and usually with white discal stripes.

Habits.—The flight is slow, like the Euplœines, which it resembles. Occurs usually in low situations.

Distribution.—NORTH INDIA to Sumatra and Borneo, in five subspecies, of which three occur in the Indian area.

23 *a*. **Chilasa slateri slateri** (Hewitson).

Papilio slateri, Hewitson, 1859, *Pap.* pl. 4, text (*nec* fig.) (part.); Elwes, 1888, p. 429.
Isamiopsis slateri, Swinhoe, 1893, p. 314; Moore, 1903, p. 106, pl. 513, figs. 1 *a*–1 *d* (♂♀).
Papilio slateri slateri, Rothschild, 1895, pp. 362–3; Bingham, 1907, pp. 72–3; Jordan, 1909 *a*, p. 41, t. 20 *a*.
Chilasa slateri slateri, Evans, 1923, p. 234, pl. 2, fig. A 3.3 (♂); id., 1932 *a*, p. 46, pl. ii, fig. A 3.3 (♂).
Papilio slateri f. *jaintinus*, Fruhstorfer, 1903 *a*, p. 178; Jordan, 1909 *a*, p. 41.

♂♀. *Upperside* of fore wing rich velvety black, slightly paler towards the apex and along the outer margin; two or three somewhat obscure spots or short streaks in apex of cell followed by an internervular series of slightly clavate, outwardly truncate, blue streaks that in certain lights have a violet tint; outwardly the ends of these streaks form a curve at some distance from the outer margin and inwardly they do not reach the bases of the interspaces. Hind wing dark chocolate-brown, the submarginal series of short white streaks of the underside show through very faintly; a comparatively large ochraceous tornal spot inwardly margined with black.

Underside dull chocolate-brown. Fore wing with the blue streaks of the upperside represented by diffuse white patches of scales. Hind wing with a small white spot at the extreme base; a submarginal series of inwardly diffuse white streaks in the interspaces and an ochraceous tornal spot as on the upperside.

Antennæ, head, thorax, and abdomen black; the thorax beneath sparsely speckled with white; abdomen with two lateral rows of small spots.

Expanse: ♂♀, 80–100 mm.

Variation.—Specimens with distal white streaks on the hind wing above have received the name of **jaintinus** Fruhst.

Habitat.—SIKKIM to NORTH BURMA; usually rare, especially the ♀.

23 *b*. **Chilasa slateri marginata** (Oberthür).

Papilio slateri f. *marginata*, Oberthür, 1893, p. 3, pl. 4, fig. 35 (♂) (Tong-king).
Papilio slateri marginata, Jordan, 1909 *a*, p. 41.
Chilasa slateri marginata, Evans, 1923, p. 234; id., 1932 *a*, p. 46.
Papilio slateri marginata ab. *cnephas*, Jordan, 1909 *a*, p. 41.

♂♀. Fore wing with shorter and narrower stripes than in

the nominotypical form. Hind wing on both sides with a band of white streak-spots which are sometimes obsolescent, rarely quite absent above.

Variation.—Specimens in which the white streaks of the hind wing are obsolescent or absent have received the name of **cnephas** Jord.

Habitat.—SHAN STATES to the KAREN HILLS; rare. Also extending to Tong-king and Siam.

23 *c*. **Chilasa slateri tavoyanus** (Butler).

Papilio tavoyanus, Butler, 1882, pp. 373–4.
Menamopsis tavoyanus, Elwes & de Nicéville, 1887, p. 433; Moore, 1903, p. 107, pl. 514, figs. 1, 1 *a*–1 *d* (♂).
Papilio slateri tavoyanus, Bingham, 1907, p. 73; Jordan, 1909 *a*, p. 41.
Chilasa slateri tavoyanus, Evans, 1932 *a*, p. 46.
Papilio claræ, Marshall, 1882 *a*, p. 42, pl. iv, fig. 5 (♂).

♂♀. *Upperside* of fore wing with the blue patches indistinct, sometimes only traces of the stripes present, and these reaching only half-way to the margin; outer margin broadly rich chocolate-brown. Hind wing with a very prominent submarginal series of short white streaks, longer on the underside.

Habitat.—SOUTH BURMA; rare.

Clytia Group.

Chilasa paradoxa (Zinken-Sommer).

A very interesting and variable species, of which a number of geographical races are known. Each of these races possesses two principal forms, the *paradoxa* form, resembling some of the blue Euplœines, and the *caunus* form, with a white patch on the hind wing and resembling another section of *Euplœa*. These two forms, so distinct in their facies, show no difference in their genitalia, but each subspecies presents differences in this respect.

Allied to *C. clytia* Linn., but the cell of the hind wing narrower, especially towards the base; both wings with very small white marginal and submarginal spots; the latter stand in a quite regular row, which is anteriorly curved costad. Fore wing shot with blue.

Larva.—Velvety black or green, with fleshy spines and round red lateral spots.

Pupa.—Resembling a broken-off twig, green or brown, according to the colour of the twig to which it is fastened.

Habits.—The species is rare, especially the *caunus* forms. The males are taken in woods at puddles on the road. The butterflies closely resemble the Euplœines, which they mimic, both in flight and colouring, and only when alarmed do they abandon the slow movement of a *Euplœa* and fly off at great speed like a true *Papilio*.

Distribution.—NORTHERN INDIA, BURMA, and the Malay Peninsula to Java and Palawan; more common in Borneo. Six subspecies known, only one, the largest, occurring in the Indian area.

24. **Chilasa paradoxa telearchus** (Hewitson).

Papilio telearchus, Hewitson, 1852, p. 22, pl. 6, fig. 3 (♂).
Euplœopsis telearchus, Elwes & de Nicéville, 1887, p. 433; Doherty, 1889, p. 130; de Nicéville, 1889 *b*, p. 169, pl. A, fig. 5 (♀); Moore, 1903, p. 96, pl. 511, figs. 1, 1 *a*–1 *c* (♂♀).
Isamiopsis telearchus, Moore, 1888, p. 284; Swinhoe, 1893, p. 314.
Papilio paradoxus telearchus, Bingham, 1907, p. 78, pl. xii, fig. 87 (♀); Jordan, 1909 *a*, p. 43, t. 32 *a*; Ollenbach, 1921 *a*, p. 894.
Chilasa paradoxa telearchus, Evans, 1923, p. 234; id., 1932 *a*, p. 47
Papilio danisepa, Butler, 1885, p. 343.
Isamiopsis danisepa, Swinhoe, 1893, p. 314.
Euplœopsis danisepa, de Nicéville, 1895, p. 366, pl. Q, fig. 48 (♀) (Upper Burma: Katha District, 3,000 ft.).
Papilio caunus danisepa, Rothschild, 1895, p. 377; Bingham, 1907, pp. 79–80.
Papilio paradoxa telearchus f. *danisepa*, Jordan, 1909 *a*, p. 44, t. 32 *b*; Ollenbach, 1921 *a*, p. 895.
Chilasa paradoxa telearchus f. *danisepa*, Evans, 1923, p. 234, pl. 2 (♂); id., 1932 *a*, p. 47, pl. ii, fig. A 3.4 (♂).

♂. *Upperside* of fore wing dark brown richly shot with blue, a short oval streak or large spot and a post-discal and submarginal complete series of spots bluish-white; both the series curve inwards on the wing anteriorly, the inner series of spots elongate. Hind wing rich hair-brown, with or without a submarginal series of white specks that increase in size anteriorly.

Underside rich chocolate-brown. Fore wing with an indistinct short cell-streak, the submarginal white spots smaller than above. Hind wing as above. Cilia dark brown alternated sparsely with white.

Antennæ black; head, thorax, and abdomen velvety brown, the head and anterior portion of thorax and the thorax and abdomen beneath sparsely spotted with white.

♀. *Upperside* of fore wing with basal half dull brown, apical half brown shot with brilliant blue; markings as in the ♂, but larger and whiter, the post-discal spots more elongate. Hind wing brown, with a series of comparatively broad whitish streaks in the cell and between the veins, the latter ending in a post-discal series of whitish spots. Cilia brown, white between the veins.

Underside with pale dull brown markings much as on the upperside, but larger, more diffuse, with the addition on the fore wing of whitish streaks in the cell and between the veins posteriorly. Head, thorax, and abdomen more fully spotted with white than in the ♂.

Expanse: ♂♀, 120–150 mm.

Form **danisepa** Butl.—♂. *Upperside* rich velvety brown shot with blue. Fore wing with the apical third of cell, four short streaks beyond in areas 4, 5, 6, and 9, and a submarginal series of spots curved inwards anteriorly, bluish-white. Hind wing with the cell white, and a series of discal stripes in areas 1 to 7, with an incomplete submarginal series of minute spots also white; the stripes in areas 4 and 5 short, those above and below these gradually longer.

Underside brown without blue gloss, and markings as above, the submarginal series of spots on the hind wing complete.

♀. Resembles the ♂, but the blue gloss on both wings more restricted, the ground-colour paler brown, somewhat of a rich golden-bronze, the white markings fuller and broader.

Habits.—"On the wing it appears very like *Euplœa diocletiana* and has the same habit of settling on the damp sand" (*Ollenbach*, 1921).

"I first came across this magnificent butterfly on the Tannjah Pass, 1,000 feet, over the Dawnat Mountains in Tenasserim, and until I had caught and examined it, mistook it for an extraordinarily large specimen of *Euplœa rhadamanthus*. It is apparently sometimes, notwithstanding its disguise, attacked and preyed on by the Pygmy Falcon (*Microhierax cœrulescens* Linn.), as in the nest-hole of a pair of these birds I once found the fragment of a fore wing of a butterfly which was identified by the late Mr. de Nicéville as belonging to this form" (*Bingham*, 1907).

Habitat.—ASSAM to BURMA; rare, especially the ♀. The form *danisepa* rarer than *telearchus*. Occurs also in Tong-king and Siam.

Chilasa clytia (Linnæus).

This species is probably the progenitor of *paradoxa*, which represents it in Java, Sumatra, and Borneo. It is much more common, and has two principal forms which are about equally common; its range is more extended than that of *paradoxa*. It is very variable, but the sexes are similar, and the geographical races differ somewhat in their genitalia.

The two chief forms are usually found together, but in the Andamans, Philippines, and Lesser Sunda Islands only one form occurs. The form *clytia*, with its variations, resembles species of *Euplœa*, whilst the form *dissimilis* resembles various *Danaus*.

♂♀. Both wings with light marginal spots; hind wing sinuous between the veins. Frons with two white spots. Abdomen in the light forms with the white spots merged together into longitudinal lines, in the dark forms usually

separated, and those of the subdorsal row small and partly suppressed.

Egg.—" Spherical, waxy-looking, and often somewhat uneven on the surface, orange-yellow " (*Bell*, 1912).

Larva.—Velvety black or dark green, with a dorso-lateral row of carmine circular spots. A creamy dorsal band on segments 3 to 7, narrowing at both ends and flanked by a broad, lateral, similarly coloured band ; also a broad creamy band on segments 11 to 14 externally. Two lateral rows of sharp spines on segments 1 to 4, and a single row on the other segments. Osmeterium light watery indigo-blue. Length 55 mm. (from *Bell*, 1912).

Feeds on various Laurineæ (laurels, cinnamon, etc.).

Pupa.—" Cylindrical, resembling a dead piece of stick broken off short at the top ; generally attached to a branch projecting at an angle of 45° The whole is rough and coloured to represent dead bark. Cremaster dorsally convex and trapeze-shaped, and beneath set plentifully with short, strong, red-brown suspensory hooklets. Surface dull, rugose, and pitted all over with slight tubercular risings. Colour a light pinky-brown washed with smoky-black, especially on the dorsal parts, where it obscures the ground-colour nearly completely with the exception of the subdorsal region of segments 6 and 7 ; the flat dorsal portion of segment 2 is light yellowish-brown, this colour extending to parts of the thorax and head. Length, 38 mm. ; breadth, 8 mm." (*Bell*, 1912).

Habits.—The butterfly is taken in large numbers at puddles on the sandy banks of streams, and also at flowers.

Bell (1912), writing on its occurrence in Southern India, says : " It is very plentiful in the monsoon months and spends the dry months in the pupa ; if the pupa is formed in November it very often does not produce a butterfly until the April or May following. The full-grown larva does not seem to be much attacked by enemies ; the young larva, however, is very liable to destruction, mostly, it is supposed, by spiders ; it is certainly parasitised less than any other *Papilio* larva.

" In flight it can imitate the *Euplœa* or *Danais limniace*, which it resembles, but can also fly very fast when alarmed. It is fond of circling round the tops of the hills or peaks in the jungle, well above the trees. The form *dissimilis* is occasionally present, but always in fewer numbers.

"At rest the wings are held over the back like the *Euplœa* and *Danaus*, but sometimes assumes the ordinary horizontal Papilionid position."

Distribution.—China, Formosa, and Hainan to the Malay Peninsula ; also in Palawan, the Philippines, and islands of the Timor group. Four subspecies are found in the Indian area.

5 *a*. **Chilasa clytia clytia** (Linnæus). (Figs. 28, 29; Pl. I, fig. 5, larva, fig. 6, pupa).

Papilio clytia, Linnæus, 1758, p. 479; Aitken, 1887, p. 37; Rothschild, 1895, pp. 364–7, no. 136 *a*; Mackinnon & de Nicéville, 1898, p. 584 (larva, pupa); Seitz, 1907, t. 7 *a*; Bingham, 1907, p. 75, fig. 14 *c* (neuration), fig. 18 *a* (♂); Ollenbach, 1921 *a*, p. 895.

Papilio clytia clytia, Jordan, 1909 *a*, p. 42.

Chilasa clytia, Hampson, 1889, p. 363; Moore, 1903, p. 82, pl. 501, figs. 1, 1 *a*–1 *c* (♂♀).

Chilasa clytia clytia, Evans, 1923, p. 234; id., 1932 *a*, p. 47, pl. ii, fig. A 3.5 (♂).

Papilio panope, Esper (*non* Linn.), 1798, p. 232, pl. 57, fig. 2; Elwes, 1888, p. 430; Watson, 1890 *a*, p. 268; Bethem, 1891, p. 325.

Papilio panope, Linnæus, 1758, p. 479; Cramer, 1780 *b*, p. 13, pl. 295, figs. E, F; Marshall, 1882 *a*, p. 43.

Chilasa panope, Moore, 1882, p. 261; Swinhoe, 1885 *a*, p. 145; id., 1893, p. 314; Doherty, 1886 *a*, p. 137; Moore, 1903, p. 88, pl. 505, figs. 1, 1 *a*, 1 *b* (♂♀).

Papilio clytia panope, Rothschild, 1895, p. 269; Bingham, 1907, pp. 75, 78, fig. 18 *b*.

Papilio clytia f. *panope*, Jordan, 1909 *a*, p. 42.

Papilio dissimilis, Linnæus, 1758, p. 479; Clerck, 1759, t. 16, fig. 2 (forma typica); Cramer, 1775, p. 129, pl. 82, figs. C, D; Horsfield & Moore, 1857, p. 91, pl. 2, figs. 3, 3 *a* (larva), 3 *b* (pupa); Watson, 1890 *a*, p. 268; id., 1891, p. 54.

Chilasa dissimilis, Moore, 1881 *a*, p. 153, pl. 57, figs. 1, 1 *a* (larva); id., 1882, p. 261; Swinhoe, 1885 *a*, p. 145; de Nicéville, 1885 *b*, p. 52, Doherty, 1886 *a*, p. 137; Hampson, 1889, p. 363; Swinhoe, 1893, p. 314.

Papilio clytia ab. *dissimilis*, Rothschild, 1895, p. 367.

Papilio clytia f. *dissimilis*, Jordan, 1909 *a*, p. 42, t. 20 *d*; Hannyngton, 1910, p. 361; Ollenbach, 1921 *a*, p. 895.

Chilasa clytia f. *dissimilis*, Evans, 1923, p. 234; id., 1932 *a*, p. 47, pl. ii, fig. A 3.5 (♂).

Papilio casyapa, Moore, 1879 *a*, p. 143.

Chilasa casyapa, de Nicéville, 1885 *b*, p. 52; Moore, 1903, p. 84, pl. 502, figs. 1, 1 *a*, 1 *b* (larva, pupa, ♂).

Papilio clytia ab. *casyapa*, Rothschild, 1895, p. 367.

Papilio clytia f. *casyapa*, Jordan, 1909 *a*, p. 42.

Papilio clytia ab. *commixtus*, Rothschild, 1895, p. 367.

Papilio clytia f. *commixtus*, Jordan, 1909 *a*, p. 42, t. 20 *d*.

Chilasa clytia f. *commixtus*, Evans, 1923, p. 234; id., 1932 *a*, p. 47.

Chilasa clytia f. *dissimillima*, Evans, 1923, p. 245; id., 1932 *a*, p. 47.

The subspecies *clytia* is subject to much variability, especially in the dark *clytia* form, Altogether six forms are distinguished, and many lesser forms occur, especially in the variation of the hind wing markings, where the light marginal spots are suppressed or much enlarged.

Form **clytia** Linn. (Fig. 28 *a*, ♂; 28 *b*, venation).—♂♀. *Upperside* velvety black or soft dark brown. Fore wing submarginal white spots outwardly truncate or

emarginate ; the spot in area 4 shifted inwards out of line ; those in areas 6, 7, and 8 oblique to the costa, the lowest and the upper two spots elongate ; a series of smaller marginal white spots, two in area 1, one above the other, and two in area 8 ; a single subapical spot between the marginal and submarginal series. Hind wing with a discal series of inwardly conical and outwardly emarginate, triangular, white streaks in areas 1 to 5 ; a submarginal series of four white lunules in areas 2 to 5, in 6 and 7 a transverse oblong submarginal white spot ; a prominent tornal yellow spot broadly divided across the middle by a bar of the ground-colour.

Underside with ground-colour varying from soft pale brown to rich dark velvety brown. Fore wing markings as

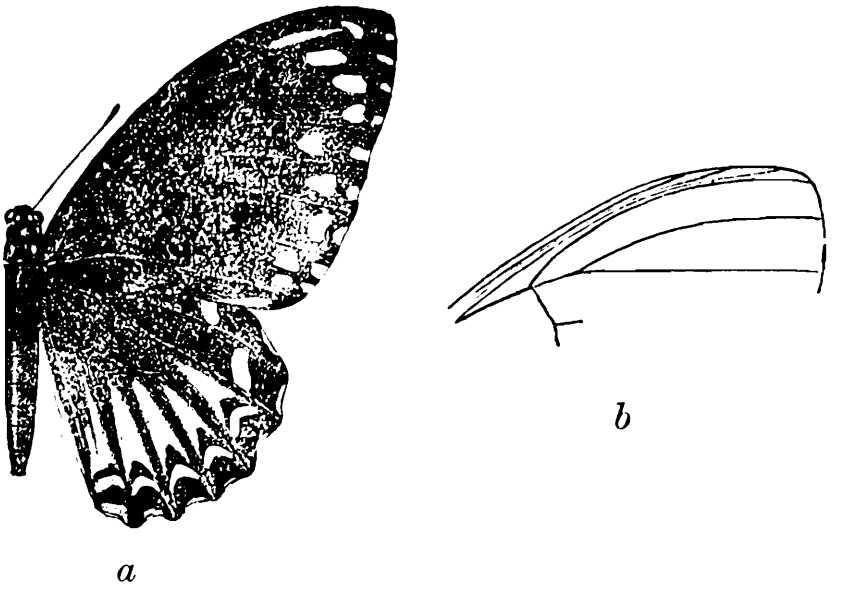


Fig. 28.—*C. clytia clytia* (Linn.).

a, ♂ ; *b*, venation of anterior portion of fore wing.

above. Hind wing with similar markings to those above, but with a marginal row of comparatively large, very conspicuous yellow spots ; these are separated from the white lunules by a series of short transverse detached spots of the ground-colour.

Form **casyapa** Moore.—♂♀. Upperside of fore wing brown-black, and beside the marginal spots has two rows of discal patches, of which the proximal ones are usually diffuse. Hind wing black-brown from the base to beyond apex of cell, post-discal sagittate spots, submarginal angular spots, and mostly yellow marginal ones.

Habitat.—NORTHERN INDIA.

Form **panope** Linn. (Fig. 29 *b*).—♂♀. Ground-colour pale brown. Fore wing with a submarginal row of spots, and

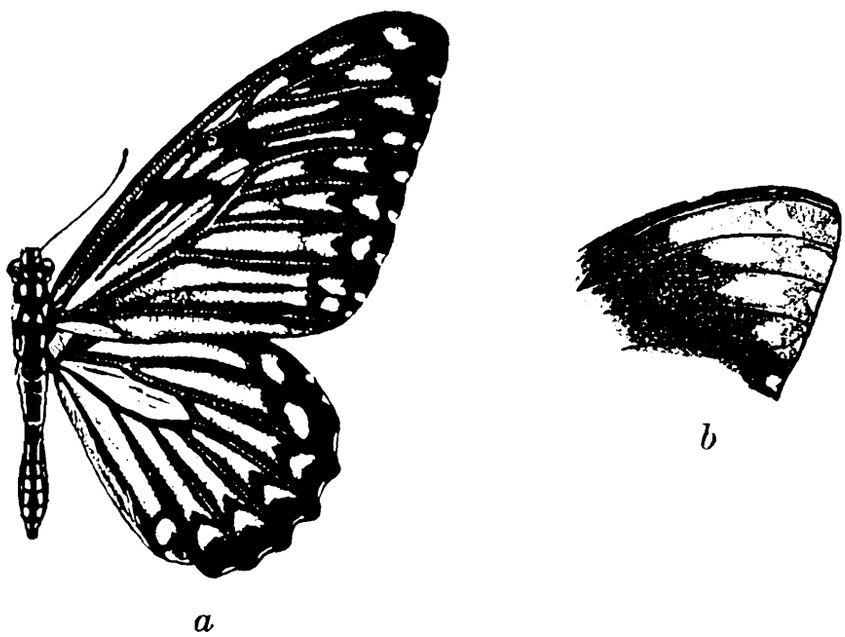
hind wing with shorter discal sagittate spots. Usually the marginal and submarginal spots of the fore wing are merged together, forming three large apical patches.

Habitat.—NORTHERN INDIA.

Form **commixtus** Roths.—♂♀. Fore wing brown-black with faint discal stripes and smaller spots before the outer margin. Hind wing with long discal internervular streaks, but the cell for the most part pure brown-black.

Habitat.—SIKKIM and ASSAM ; very rare.

Form **dissimilis** Linn. (Fig. 29 *a*, ♂).—♂♀. Ground-colour black with creamy-white stripes and spots. Upperside of fore wing with four cell-streaks coalescent at the base,



a *b*

Fig. 29.—*a*, *C. clytia* f. *dissimilis* (Linn.) (♂, Manipur, March) ; *b*, *C. clytia* f. *panope* (Linn.), apical part of fore wing.

four subapical spots, a long streak in area 1 *a*, in area 1 two streaks with, beyond them, two spots which are more or less coalescent with them, in area 2 a broad streak with an outwardly emarginate spot beyond, in area 3 a spot at the base and one beyond, in area 4 a single similar spot, in 5 and 6 elongate streaks, and in 8 and 9 much smaller elongate spots ; submarginal and marginal markings as in form *clytia*. Hind wing with the cell white ; long discal white streaks that reach quite up to the outer margin of the cell and are continued anteriorly to the costa by elongate streaks in areas 6 and 7 ; two spots in area 8 and a slender costal streak ; submarginal and marginal markings as in form *clytia*.

Underside similar to the upperside, the markings larger, and the hind wing with marginal yellow spots as in form *clytia*.

Habitat.—SOUTHERN INDIA to the NORTH-WEST HIMALAYAS; not rare.

Form **dissimillima** Evans.—♂♀. The pale markings are dusted with black and are more restricted.

Habitat.—NORTH-EAST INDIA to BURMA.

25 *b*. **Chilasa clytia lankeswara** (Moore).

Papilio lankeswara, Moore, 1879 *a*, p. 143.
Chilasa lankeswara, Moore, 1881 *a*, p. 154, pl. 56, figs. 2, 2 *a* (larva), 2 *b* (pupa); id., 1903, p. 86.
Papilio clytia lankeswara, Rothschild, 1895, p. 368; Jordan 1909 *a*, p. 43, t. 20 *b*; Bingham, 1907, p. 77.
Chilasa clytia lankeswara, Evans, 1923, p. 234; id., 1932 *a*, p. 47.
Papilio clytioides, Moore, 1881 *a*, p. 154, pl. 56, fig. 1 (♂).
Chilasa clytia lankeswara f. *dissimila*, Evans, 1923, p. 245; id 1932 *a*, p. 47.

♂♀. Ground-colour pale brown. Fore wing with the submarginal spots small.

Expanse: ♂♀, 90–120 mm.

Form **dissimila** Evans.—♂♀. Yellowish-brown with broad stripes.

Habitat.—CEYLON; not rare.

25 *c*. **Chilasa clytia papone** (Westwood).

Papilio papone, Westwood, 1872, p. 94, pl. 3, fig. 2.
Papilio clytia ab. *papone*, Rothschild, 1895, p. 367.
Papilio clytia f. *papone*, Jordan, 1909 *a*, p. 42; Ollenbach, 1921 *a*, p. 895.
Chilasa clytia onpape f. *papone*, Evans, 1923, p. 234; id., 1932 *a*, p. 47.
Papilio onpape, Moore, 1878 *a*, p. 840; Distant, 1885, p. 355, pl. 27, fig. 5; de Nicéville, 1890, p. 387; Watson, 1891 *a*, p. 53.
Chilasa onpape, Elwes & de Nicéville, 1887, p. 433; Moore, 1903, p. 86, pl. 503, figs. 1, 1 *a*–1 *c* (♂♀).
Papilio clytia f. *onpape*, Jordan, 1909 *a*, pp. 42–3.
Chilasa clytia onpape, Evans, 1923, p. 234; id., 1932 *a*, p. 47.
Papilio clytia onpape ab. *janus*, Fruhstorfer, 1901 *b*, p. 413; id., 1903 *a*, p. 181 (Tong-king).
Chilasa janus, Moore, 1903, p. 87, pl. 504, figs. 1, 1 *a*–1 *c* (♂♀).
Papilio clytia f. *janus*, Jordan, 1909 *a*, p. 42.
Chilasa clytia f. *janus*, Evans, 1923, p. 234; id., 1932 *a*, p. 47.

♂♀. Fore wing above dark indigo-blue with or without obscure dusky post-discal spots; hind wing above with prominent pale distal streaks.

Variation.—(1) Fore wing above with the white spots absent or replaced by black spots, which may be white-

centred. Hind wing above with the pale streaks sometimes as extensive as in *commixtus*. Form **janus** Fruhst.

(2) Paler brown, with one or several spots at the apex of the fore wing prolonged to the distal margin. Form **onpape** (Moore).

Habitat.—LOWER BURMA; occurring also in Siam and Tong-king.

25 *d*. **Chilasa clytia flavolimbatus** (Oberthür).

Papilio dissimilis v. *flavolimbatus*, Oberthür, 1879, p. 101.
Chilasa flavolimbatus, Wood-Mason, 1880, p. 238; Wood-Mason & de Nicéville, 1881 *b*, p. 253, pl. 14, figs. 1, 2 (♂).
Papilio clytia flavolimbatus, Rothschild, 1895, p. 370; Bingham, 1907, p. 78; Jordan, 1909 *a*, p. 43, t. 20 *d*.
Chilasa flavolimbata, Moore, 1903, p. 93, pl. 507, figs. 1, 1 *a*, 1 *b* (♂♀).
Chilasa clytia flavolimbatus, Evans, 1923, p. 234; id., 1932 *a*, p. 47.

♂♀. A *dissimilis* form, but larger, the white markings similar but proportionately larger, with the exception of the cell streaks in both wings, which are narrower and less strongly defined. Hind wing with a marginal row of ochraceous-yellow spots on both sides, those of the underside much larger than in the *dissimilis* form.

Expanse: ♂♀, 120–130 mm.

Habitat.—ANDAMAN ISLANDS; not rare.

Genus **PAPILIO** Linnæus.

Papilio, Linnæus, 1758, p. 458, no. 203; Latreille, 1805, p. 108; id., 1810, p. 440 (type, *machaon* Linn.); Rothschild, 1895, pp. 167–463; Moore, 1903, pp. 38–9; Bingham, 1907, pp. 10–11; Jordan, 1908, pp. 11–12; Evans, 1927, p. 25, pls. 2–5; id., 1932 *a*, pp. 47–53; Hemming, 1934 *a*, p. 145 (type, *machaon* Linn.).
Achillides, Hübner, 1819, p. 85; Scudder, 1875, p. 100 (type, *paris* L.).
Princeps, Hübner, 1806–19, fig. 116 (*demoleus* Linn., 1764); Hemming, 1934 *a*, p. 149 (type, *demoleus* Linn., 1764=*demodocus* Esp., 1798).
Menelaides, Hübner, 1819, p. 84; Scudder, 1875, p. 216 (type, *polytes* Linn.); Hemming, 1934 *a*, p. 151 (type, *polytes* Linn.).
Iphiclides, Hübner, 1819, p. 82; Scudder, 1872, p. 65 (type, *podalirius* Linn.); Hemming, 1934 *a*, p. 151 (type, *podalirius* Linn.).
Iliades, Hübner, 1819, p. 88; Scudder, 1875, p. 196 (type, *memnon* Linn.); Hemming, 1934 *a*, p. 149 (type, *memnon* Linn.).
Harimala, Moore, 1881 *a*, p. 145 (type, *crino* Fabr.).
Charus, Moore, 1881 *a*, p. 149 (type, *helenus* Linn.).
Sainia, Moore, 1882, p. 26 (type, *protenor* Cram.).
Sarbaria, Moore, 1882, p. 258 (type, *polyctor* Bdv.).
Araminta, Moore, 1886, p. 50 (type, *demolion* Cram.); id., 1902, pp. 218–19.
Pangeranopsis, Wood-Mason & de Nicéville, 1887, p. 374 (subgen.; type, *clephenor* Doubl.).

Tamera, Moore, 1888, p. 284 (type, *castor* Westw.).
Sadengia, Moore, 1902, p. 213 (type, *nephelus* Bdv.).
Mimbyasa, Evans, 1911, p. 972 (type, *janaka* Mre.).

The characters of this genus have been given in general with the account of the tribe. The genus differs from *Chilasa* essentially in the larva, which is comparatively smooth, being spiny only in the early stages, and generally has oblique bands.

The *castor* group of *Papilio* resembles *Chilasa* in having white dots on the body and a white spot at the base of the wings beneath. The other groups have white dots on the head and prothorax above and on the palpi, but none on the abdomen. Fore wing of the male often with woolly scent-stripes. The males are rarely mimetic, but the females of a number of species resemble species of *Polydorus*, and in some cases are polymorphic.

The genus can be divided into a number of groups, of which six are represented in the Indian area. These can be roughly divided into those which have red basal markings on the underside and those which have not.

Habits.—The flight is powerful and varies in style; they are very active and remain on the wing for a long time. Although fond of bright light they do not generally bask in the sun, but when they do the wings are spread and the fore wing covers a large part of the hind wing.

Distribution.—The genus *Papilio* contains by far a greater number of species than any other genus of the family, and includes many which are rare and others which are very common. The ♀ is often much scarcer than the ♂, but probably has different habits. The genus covers a similar range to that of the tribe. In the Indian area thirty-one species are recorded, not including subspecies.

Key to Groups and Species of Papilio.

A. Wings beneath with prominent red basal markings. ♂ with hind wing above black, never a white band, but with grey or bluish-white scaling which sometimes forms a broad band of stripes, rarely with white patches. ♀ either similar to ♂ or very different, with white, yellowish or reddish discal area on hind wing, mimicking species of *Polydorus*. [p. 124. MEMNON Group,

♂.

1. Head red, abdomen with a lateral red stripe .. .. [p. 135. *bootes* Westw.,
   Head and abdomen not marked with red. 2.
2. Fore wing above with a pale blue sub-marginal band. ... . [p. 124. *polymnestor* Cram.,
   Fore wing above without a pale blue sub-marginal band.., 3.

3. Hind wing above with a broad pale blue discal band .... *mayo* Atk., p. 134.
Hind wing above without a blue discal band 4.
4. Hind wing above without a tornal white-edged ocellus .. . . *memnon* Linn., [p. 127.
Hind wing above with a tornal white-edged ocellus *rhetenor* Westw., [p. 137.

♀.

1. Head red, abdomen with lateral red stripe .. .. *bootes* Westw., [p. 135.
Head and abdomen not marked with red. 2.
2. Fore wing above with a pale blue submarginal band. ... .. . *polymnestor* Cram., [p. 124.
Fore wing above without a blue submarginal band. .. . 3.
3. Hind wing without a tail 4.
Hind wing tailed ... . 5.
4. Hind wing above with a large white discal area... .. .. *memnon* Linn., [p. 130.
Resembles the ♂. Hind wing below with a white stripe along the inner margin. *memnon* Linn., [p. 130.
5. Abdomen yellow *memnon* Linn.,
Abdomen black .. .. 6. [p. 130.
6. Tail tipped red and white. Hind wing above with white cell-spot and discal white patch .. .. *mayo* Atk., p. 135.
Tail very broad. Hind wing above with discal white patch and submarginal red lunules *rhetenor* Westw., [p. 137.

B. Underside of both wings without red basal markings; hind wing with cell black, not sprinkled with white or yellow scales; sexes alike; no tails .. . . PROTENOR Group, [p. 140.
Hind wing above in ♂ with a subcostal white stripe . *protenor* Cram., [p. 140.

C. Sexes similar. Upperside of body and wings with glossy metallic-blue scaling, either uniformly distributed or with a metallic patch or band. Underside always dark. PARIS Group, p. 142.
1. Hind wing below with cell black, not sprinkled with yellow or white scales. Upperside without green or blue patches 2.
Hind wing below with cell and basal area sprinkled with yellow or white scales. Upperside with green or blue patches or bands . .. . 3.
2. Hind wing above without red lunules in areas 2 and 3; abdomen buff at the sides. *elephenor* Doubl., [p. 143.
Hind wing above with one to three red spots; abdomen black .. .. *dialis* Leech, p. 143.
3. Upperside without a broad green band, but usually with a broad green subapical patch on hind wing above . . .. 4.
Upperside of both wings with broad green discal band ... . 7.
4. Hind wing above with the green patch not prominent .. .. *bianor* Cram., p. 144.
Hind wing above with a prominent green or blue patch. . . . ... 5.

5. Hind wing above with inner edge of green patch more or less straight, but ragged and diffuse ... . .. [p. 145. *polyctor* Boisd.,

Hind wing above with inner edge of green patch curved and sharply defined. ♂ without woolly streaks on fore wing. .. *paris* Linn., p. 148.

Hind wing above with the blue patch longer in area 6 than in 5; red submarginal lunules prominent . .. . 6.

6. Fore wing above with a green post-discal band .. .. [p. 151. *arcturus* Westw.,

Fore wing above with narrow pale yellow discal band . . . [p. 154. *krishna* Moore,

7. Fore wing above with green band not entering cell; tail tipped with green. . *crino* Fabr., p. 155.

Fore wing above with green band entering cell; tail black . .. . 8.

8. Fore wing above with broad green band which broadly enters the cell .. [p. 156. *buddha* Westw.,

Fore wing above with narrow green band which just enters the cell [p. 157. *palinurus* Fbr.,

D. Both sexes without a tail, and entirely without a blue gloss. Both wings above and hind wing beneath thickly dusted with yellowish scales. Fore wing with a white discocellular dot. Abdomen with white subdorsal dots ... .. . [p. 159. CASTOR Group,

1. Fore wing above with a series of equal submarginal white spots in a regular row.. . [p. 159. *dravidarum* W.-M.,

Fore wing above without white submarginal spots .. .. 2.

2. Hind wing above with a series of equal submarginal white spots in areas 1 to 6, spot in 7 smaller. ♀ with these spots dusky and becoming smaller anteriorly .. ... [p. 161. *mahadeva* Moore,

Hind wing above with large discal white spots in areas 4 to 6, and a small spot in 7. ♀ with submarginal spots on fore wing above and submarginal lunules on hind wing. [p. 162. *castor* Westw.,

E. Body black, with white dots on head and pronotum and thin white lines on underside of abdomen, sometimes absent. Wings black. Hind wing tailed; an anterior discal white patch or with a yellowish or white discal band. Sexes similar except in *polytes*, some females of which resemble species of *Polydorus* . ... [p. 166. HELENUS Group,

1. Fore wing above without a prominent pale discal band from apex to inner margin. 3.

A pale discal band across both wings. 2. [p. 184.

2. Hind wing band entering apex of cell. *liomedon* Moore,

Hind wing band not entering cell.... .. *demolion* Cram.,

3. Hind wing above with a large white subapical patch. .... [p. 186. 4.

Hind wing above with discal white band of white or red spots .. .. 8.

4. Hind wing below with pale scales in the cell arranged in three prominent streaks .. 5.

Hind wing below with pale scales in the cell uniformly spread 7.

5. Hind wing below with red submarginal lunules . . .. 6.
Hind wing below with yellow submarginal lunules .. .. [p. 171. *chaon* Westw.,

6. Hind wing above with a white patch extending over areas 5 to 7 . ... .. *helenus* Linn., p. 166.
Hind wing above with discal white patch extending over areas 4 to 7 .. .. *iswara* White, p. 170.

7. Hind wing above with discal white patch extending over areas 5 to 7; below with a complete set of red lunules .. [p. 173. *noblei* de Nicév.,
Hind wing above with discal patch extending over areas 4 to 7; below with complete series of blue lunules beyond the white patch . . . . . *fuscus* Goeze, p. 174.

8. Sexes alike. Hind wing above with discal white band conspicuously wider at the middle. Fore wing below with one or more submarginal white spots . . . [p. 175. *hipponous* Feld.,
♀ usually different to the ♂, in which case with red or white discal spots on hind wing. ♂ hind wing above with discal white band of even width. Fore wing above with prominent marginal white spots *polytes* Linn., p. 176.

F. Body beneath entirely yellow, or at most with black lines. Fore wing beneath with base of cell striped with pale yellow. Hind wing for the greater part, or at least a large central area, pale yellow c [p. 187. DEMOLEUS Group, *demoleus* Linn.,

1. No tails
Tailed .. .. 2. [p. 187.

2. Upperside with veins not black; entirely yellow, with narrow black bands *alexanor* Esp., p. 191.
Upperside with veins black .. . . . . 3.

3. Fore wing above with basal fourth black, sprinkled with yellow scales . [p. 192. *machaon* Linn.,
Fore wing above with a yellow streak from the base along lower edge of cell, and basal fourth of cell yellow-streaked. *xuthus* Linn., p. 198.

Memnon Group.

Papilio polymnestor Cramer.

♂♀. *Upperside* of fore wing with a pale blue discal band which is obsolescent anteriorly. Hind wing with distal area pale blue, enclosing a row of black discal patches and a similar row of submarginal spots, some of the latter united with the black distal margin.

Underside opaque black. Fore wing with an elongate spot of dark red at base of cell; the post-discal transverse streaks as on the upperside, but grey tinged with ochraceous and extended to the costa; in some specimens similar, but narrow streaks also in the cell. Hind wing with five irregular small patches of red at base, the outer three-fourths of wing touched with ochraceous, but generally narrower than the blue on the upperside; the inner margin of the grey area crosses the wing

beyond the cell; post-discal and submarginal black spots as above. In some specimens this grey area is greatly restricted, its inner margin crossing the wing well beyond the apex of the cell; the submarginal spots merged completely with the marginal spots, forming a comparatively broad marginal black band.

Antennæ, head, thorax, and abdomen blackish-brown.

♀. Resembles the ♂, but the internervular streaks on the fore wing paler, extended into the cell on both sides of the wing. Hind wing with paler blue and grey areas. In some specimens there is a diffuse short crimson streak at the base of the cell of the fore wing above.

Egg.—" Light green when first laid, but becomes orange-yellow after some hours' exposure. It is spherical and 1·8 mm. in diameter. Surface smooth " (*Bell*, 1912).

Larva.—Rich velvety darkish grass-green on dorsal portions, with a yellowish shade above the lateral white line of segments 2 to 5. Body covered with extremely minute erect hairs. There is a small dorso-lateral, short, fleshy tubercle near hind margin of segment 13, coloured white-grey; a similarly coloured, very slightly raised line which separates the green dorsal colour of body from the hind slope, and this line is continued forward and down, still separating the dorsal green from the lateral grey, to join the whitish subspiracular line at the front margin of segment 12 (from *Bell*, 1912).

Pupa.—" The pupa is only green when it is formed amongst green leaves. If it is formed on a grey branch out of their influence, or in a cage in captivity the colour may be quite different " (*Bell*, 1912).

Habits (from *Bell*, 1912).—The eggs are laid singly on the upperside of a leaf within about 10 feet from the ground, and always on a plant bearing young leaves. The eggs are often parasitized, but the larva suffers less from these enemies.

Pupation takes place suspended from the underside of a leaf-stalk or from a thin twig, the loop being moderately long.

The imago emerges after twenty-one days, in the most favourable case; in captivity a pupa will often lie over for months.

The butterfly does not fly high as a rule, but will occasionally rise to the tops of trees; both sexes are commonly found on flowers. The males may be often seen drinking on wet mud or sand at the commencement of the monsoons. The insect is much commoner in the hills at low elevations and in jungle country than in the plains, and is not found in regions of very scanty rainfall.

Flight powerful and quick, and when alarmed the insect dodges with great alacrity. At rest the wings are spread horizontally.

Like all others of its class it will come to a decoy—a dead specimen pinned on a leaf or on the ground with its wings spread open—and even to a piece of light blue paper similarly exposed.

Food-plant, Rutaceæ. In the forests of Western India, south of Bombay, the commonest food-plant is *Paramigyna monophylla* Wgt., a large, climbing, armed shrub with a simple leaf and a round green berry.

Distribution.—CEYLON and SOUTHERN INDIA to BENGAL, Calcutta ; two subspecies.

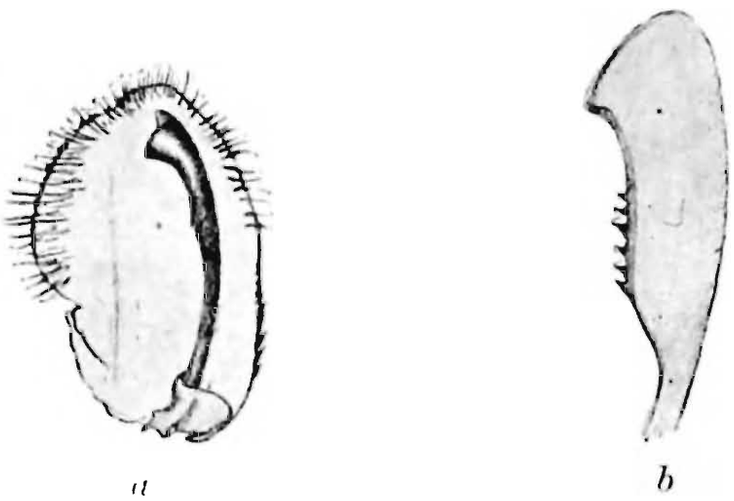
26 *a*. **Papilio polymnestor polymnestor** Cramer. (Fig. 30 *a*, *b*, genitalia ; Pl. I, fig. 10, larva, fig. 11, pupa).

Papilio polymnestor, Cramer, 1775, p. 83, pl. 53, figs. A, B ; Horsfield & Moore, 1857, p. 101, pl. 3, figs. 1, 1 *a* (larva, pupa) ; Gosse, 1883, p. 299, pl. xxviii, figs. 23, 24 (genitalia) ; de Nicéville, 1885 *b*, p. 51 ; Elwes, 1888, p. 430 ; Bingham, 1907, p. 50 ; Bell, 1911, p. 1115, pl. D 4, fig. 27 (♂), 27 *a* (♀).

Papilio polymnestor polymnestor, Rothschild, 1895, p. 329 ; Jordan, 1909 *a*, p. 70, t. 26 *a* ; Evans, 1932 *a*, p. 48, pl. ii, fig. A 4.1 (l (♂).

Iliades polymnestor, Swinhoe, 1885 *a*, p. 144 ; Hampson, 1889, p. 364 ; Fergusson, 1891, p. 446 ; Moore, 1902, p. 203, pl. 452, figs. 1, 1 *a*, 1 *b* (larva, pupa, ♂♀).

♂♀. The band of the fore wing usually narrower than in the Ceylon form. ♀ more blue than the Ceylon ♀.



a *b*

Fig. 30.—*P. polymnestor polymnestor* Cram.
a, valve and harpe ; *b*, harpe. (After Gosse).

Genitalia.—Harpe (fig. 30) resembles that of *P. mayo*, anteriorly narrower and of more even width, forming a long blade with a continuous even outline which follows the curve of the ventral margin of valve and leans considerably inward ; dorsal edge of the anterior broad part furnished with several minute teeth on the posterior half.

Larva and *Pupa*.—" We noticed this butterfly at Matheran in the month of March laying its eggs on a lime-tree in the garden. In Karwar we reared a great many in September and October on a common wild orange (*Atalantia* sp. ?). Another favourite food appears to be *Garcinia xanthochymus*. In form, colour, and markings the larva is very similar to that of the last two (*P. demoleus* and *P. polytes*), but the enlargement of the 4th and 5th segments is much exaggerated, especially after the last moult. In the pupa the head-case and its two projecting points are more elongated " (*Davidson & Aitken*, 1890, p. 366).

Habitat.—PENINSULAR INDIA to BENGAL, Calcutta ; not rare. Ascends to 7,000 feet in the Nilgiris.

26 *b*. **Papilio polymnestor parinda** (Moore).

Iliades parinda, Moore, 1881 *a*, p. 148, pl. 60, fig. 1 (♂), 1 *a* (♀), 1 *b* (larva), 1 *c* (pupa) ; id., 1902 *a*, p. 205, pl. 450, figs. 1 (larva), 1 *a* (♂), 1 *b* (♀).

Papilio polymnestor parinda, Rothschild, 1895, p. 330 ; Bingham, 1907, pp. 50–1 ; Jordan, 1909 *a*, p. 70, t. 26 *a* ; Evans, 1932 *a*, p. 48.

♂. Not constantly different from the nominotypical form, the blue band on the fore wing broader, and the blue area on the hind wing of greater extent.

♀. The band of the fore wing and the light area of hind wing yellowish, much less blue than in the ♂. On the underside both the band on the fore wing and the outer area on the hind wing are generally ochraceous-yellow, without a touch of blue ; the former much broader than in the typical form.

Expanse : ♂♀, 120–150 mm.

Larva.—" Smooth, glossy green, with a whitish lower lateral band from 6th to anal segment, a broad, similar coloured band obliquely ascending the 8th and 9th, and a similar band on the 10th segment ; anterior shield edged with white, its posterior dorsal end bordered by a transverse blackish-marked crest, a similar crest also across the 4th segment, ending on each side in a large ocellated spot. Feeds on *Citrus decumana* Murr." (*Moore*).

Pupa.—" Green or olive-brown " (*Moore*).

Habits.—Recorded by Williams (1927, p. 19) as having taken part in a migratory flight.

Habitat.—CEYLON ; not rare.

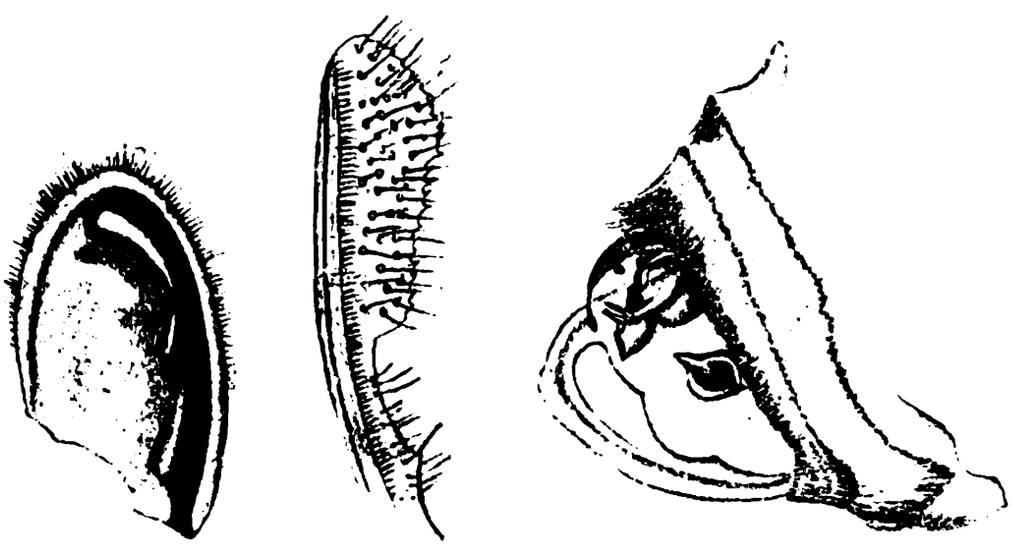
Papilio memnon Linnæus. (Fig. 31 *a–c*, genitalia).

An extremely variable species, less so in the ♂ than in the ♀, which is polymorphic and exhibits a great variety of pattern ; no less than nine forms can be recognized in the Indian area.

Upperside of wings black, with greenish or bluish sheen, with light bluish vein-stripes on the fore wing. Hind wing with indistinct grey-blue stripes and no tail.

Underside of wings with a large dull red basal spot, which on the hind wing is divided by the veins and may be also present on the fore wing above. Hind wing with two rows of black distal patches, margined by grey, grey-blue, yellowish, or yellowish-red scaling, sometimes only the submarginal black patches, or some of them, distinct. Palpi with three small white spots.

♀. The various forms can be divided into those without a tail and those which are tailed. The former are more like the ♂, the fore wing paler, the hind wing above dark, often with blue stripes as in the ♂, and with black distal patches below, or it may have white discal patches.



a *b* *c*

Fig. 31.—*P memnon* Linn., genitalia. (After Gosse).
a, valve and harpe ; *b*, harpe, terminal portion, lateral view ; *c*, genitalia with right valve removed, lateral view.

The tailed forms have on the hind wing a white cell-spot and post-cellular white patches which are yellow or red distally.

Genitalia.—" Harpe (fig. 31 *a*, *b*) a long curved stout arm, placed along the ventral side of the valve ; its anterior part broad, shaped like a knife-blade, with its free end minutely serrate " (*Gosse*, 1883, p. 294, pl. xxviii, figs. 1–3).

Larva.—" The young larva brown, anteriorly on the thorax and on each of the last two abdominal segments with a pair of light spines, which disappear later. When full grown dark velvety green, here and there bluish, the thorax swollen, with spectacle-marking and black transverse band before which a whitish-green band is placed ; at the sides of the

abdomen two whitish-green oblique bands, of which the first is dorsally united with the band of the other side, the tip of the abdomen, and a longitudinal stripe above the legs greenish-white. The scent-fork in the young larva black, afterwards red " (*Jordan*, 1909 *a*).

Pupa.—" Green or brown, above between the wing-cases yellow; horns on the head strongly projecting, the wing-cases broad, the first three abdominal segments above them rough, the third segment triangularly widened dorsally " (*Jordan*, 1909 *a*).

Habits.—The larva feeds on *Citrus*. The ♂ visits flowers and does not frequent moist places on the roads; its flight is swift and restless, whilst the sluggish ♀ sails more slowly.

Distribution.—South Japan to NORTHERN INDIA, Borneo, and the small Sunda Islands.

In the Indian area it ranges from Sikkim to Burma and the Nicobar Islands, and is replaced in Southern India and Ceylon by *P. polymnestor*.

Only one subspecies is found in the Indian area; this is usually common.

27. **Papilio memnon agenor** Linnæus. (Figs. 32, 33, 34, ♀).

Papilio agenor, Linnæus, 1758, p. 460; Clerck, 1759, t. 15, figs. 1, 2; Distant, 1885, p. 339, pl. 29, fig. 1 (♀).

Iliades agenor, Swinhoe, 1893, p. 312; Moore, 1902, p. 194, pls. 446–9.

Papilio memnon agenor, Rothschild, 1895, p. 316; Bingham, 1907, pp. 46, 47, fig. 9 (♀); Jordan, 1909 *a*, p. 72, t. 30 *a*; Evans, 1932 *a*, p. 48.

Papilio androgeos, Cramer, 1776, p. 142, pl. 91, figs. A, B (♂).

Papilio androgeus, de Nicéville, 1881, p. 53; Elwes, 1888, p. 428; de Nicéville, 1890, p. 387; Watson, 1891 *a*, p. 53.

Papilio alcanor, Cramer, 1777, p. 107, pl. 166, figs. A, B.

Papilio memnon agenor ♀ f. *alcanor*, Rothschild, 1895, p. 320; Bingham, 1907, p. 49; Jordan, 1909 *a*, p. 72; Evans, 1932 *a*, p. 48, pl. ii, fig. A 4.2.

Iliades mestor, Hübner, 1819, p. 89 (nom. nov.); Distant, 1885, p. 341, pl. 28, fig. 2 (♂).

Papilio phœnix, Distant, 1885, p. 340, pl. 27 *b*, fig. 7.

Papioio memnon agenor ♀ f. *phœnix*, Rothschild, 1895, p. 32 Jordan, 1909 *a*, p. 72.

Papilio androgeos depelchini, Robbe, 1892, p. 125.

Papilio memnon agenor ab. *depelchini*, Rothschild, 1895, p. 319; Bingham, 1907, p. 48; Jordan, 1909 *a*, p. 72.

Papilio memnon agenor ♂ ab. *primigenius*, Rothschild, 1895, p. 319; Jordan, 1909 *a*, p. 72, t. 27 *a*; Bingham, 1907, p. 48.

Papilio memnon agenor ♀ f. *butlerianus*, Rothschild, 1895, p. 320 (nom. nov.); Bingham, 1907, p. 49; Jordan, 1909 *a*, p. 72, t. 29 *b*; Evans, 1932 *a*, p. 48.

Iliades polymnestoroides, Moore, 1902, p. 202, pl. 451, figs. 1, 2 (♂ ♀).

Papilio polymnestoroides, Bingham, 1907, p. 52.

Papilio memnon agenor ab. *polymnestoroides*, Jordan, 1909 *a*, p. 72, t. 48 *b* (*non* 32 *c*).

Papilio memnon agenor ♀ f. *rhetenorina*, Jordan, 1909 *a*, p. 72 (N. India).
Papilio memnon ♀ f. *phœniciana*, Strand, 1916, p. 25, t. 13, fig. 8 (Sikkim).
Papilio memnon ♀ f. *aphrodite*, Röber, 1927 p. 97 (Naga Hills, 6,000–7,000 feet).

Key to ♂ Forms.

1. Upperside of both wings with broad grey-blue stripes	*agenor* Linn., p. 130.
2. Hind wing above with heavy pale blue scaling, resembling *polymnestor*	[p. 132. *primigenius* Roths.,
3. Fore wing above with short blue stripes	*polymnestoroides* [Moore, p. 131.
4. Hind wing above greenish, with scarcely any pale blue scaling	*depelchini* Robbe, [p. 131.

Key to ♀ Forms.

1. Hind wing tailed	*alcanor* Crm., p. 133.
Hind wing not tailed	2.
2. Hind wing without white patches	3.
Hind wing with white patches	6.
3. Fore wing above sepia, no white area posteriorly	4.
Fore wing above sepia, a white area on the inner margin	[p. 132. *butlerianus* Roths.,
4. Hind wing with a large blue discal area	*polymnestoroides*
Hind wing with or without blue scaling	5. [Moore, p. 131.
5. Hind wing above with slight blue scaling, below with a white inner marginal stripe	[p. 132. *rhetenorina* Jord.,
Hind wing above without blue scaling, and only slight traces of black patches	[p. 131. *depelchini* Robbe,
6. Abdomen mostly yellow	*aphrodite* Röber, p. 133.
Abdomen not yellow	7.
7. Hind wing with a large white patch in areas 1 to 3	[p. 132. *phœniciana* Stnd.,
Hind wing with a more extensive white area.	8.
8. Hind wing with 4 or 5 patches, the posterior ones often broadly red	*phœnix* Dist., p. 132.
Hind wing with 5 to 7 patches, white or yellowish, and no black discal spots	*agenor* Linn., p. 131.

Form **agenor** Linn.—♂. *Upperside* deep indigo-blue-black; fore wing with or without a short dark red streak at the base; both wings with more or less well-marked silvery-blue adnervular streaks that do not reach the outer margin; these are most prominent on the hind wing, where they extend into the apex of the cell; on the fore wing they are confined to the outer half and become obsolescent towards the costa.

Underside of fore wing with dull black ground-colour; the adnervular silvery-blue streaks as on the upperside, but much broader, more prominent, and extended well into the cell; a broad dark red patch at base of the latter. Hind wing dull opaque black with broad blacker streaks between the veins, each broadened towards the apex, but not extended to the outer margin; in areas 1 to 4 the apical portion of these

streaks is separate and forms a large oval spot: base of wing and tornal area red, on the former traversed by the black veins, on the latter very variable in extent, more or less formed into rings round the submarginal black spots in areas 1 and 2, sometimes in 3 also; finally, a post-discal shading of blue scales more or less lunular in each area. Antennæ, head, thorax, and abdomen black; the abdomen brownish beneath.

Fig. 32.—*P. memnon agenor* Linn., ♀ f. *agenor* Linn.

♀. *Upperside* of fore wing with sepia ground-colour more or less striped with grey-white. Cell with the basal third red, touched outwardly with white, a speck of red at the base of area 2, and the basal third of areas 1 and 2 velvety black. Hind wing black, with five to seven white or yellowish discal patches; in examples with very large patches the posterior ones are prolonged basad. No black discal spots.

Expanse: ♂♀, 120–150 mm.

Form **depelchini** Robbe.—Both sexes with more strongly dentate hind wing and with scarcely any blue scaling on the upperside of both wings; hind wing with a greenish gloss. ♀ with an open red anal ring and very slight traces of black patches. Occurs in SIKKIM.

Form **polymnestoroides** Moore.—♂. *Upperside* of fore wing with short blue stripes; on the hind wing the stripes are heavier, linear, and do not reach the distal margin nor enter the cell.

♀. *Upperside* of fore wing sepia, with distal pale grey vein-streaks; base of cell red. Hind wing dull velvety brown, with discal, submarginal, and marginal rows of black spots as in *polymnestor*, only more obscure; discal area largely blue, extending from the subcostal to the inner margin,

and distally produced into streaks. Known from ASSAM and BENGAL, Calcutta.

♂ form **primigenius** Roths.—Hind wing above with the black submarginal spots heavily margined with white-blue, and the blue vein-streaks much paler and more condensed than in the ♂ of *agenor*. Occurs in SIKKIM and ASSAM.

♀ form **phœnix** Dist.—*Upperside* with sepia ground-colour. Hind wing with four or five distal patches which are often, especially the posterior ones, broadly red; the posterior spot is frequently prolonged basad. *Underside* of hind wing often with black discal patches, rarely a white spot in the cell. Occurs in SIKKIM and BURMA.

♀ form **phœniciana** Strand.—Very close to *phœnix*. Hind wing bears a large distal white patch covering areas 1 to 3 from the cell to near the outer margin.

♀ form **rhetenorina** Jord.—Both wings dark sepia; fore wing with darker stripes between the veins. Hind wing above with slight blue scaling and often a red anal ring which is sometimes replaced by a spot without a black centre; usually a broad white stripe along the inner margin below. Occurs in SIKKIM.

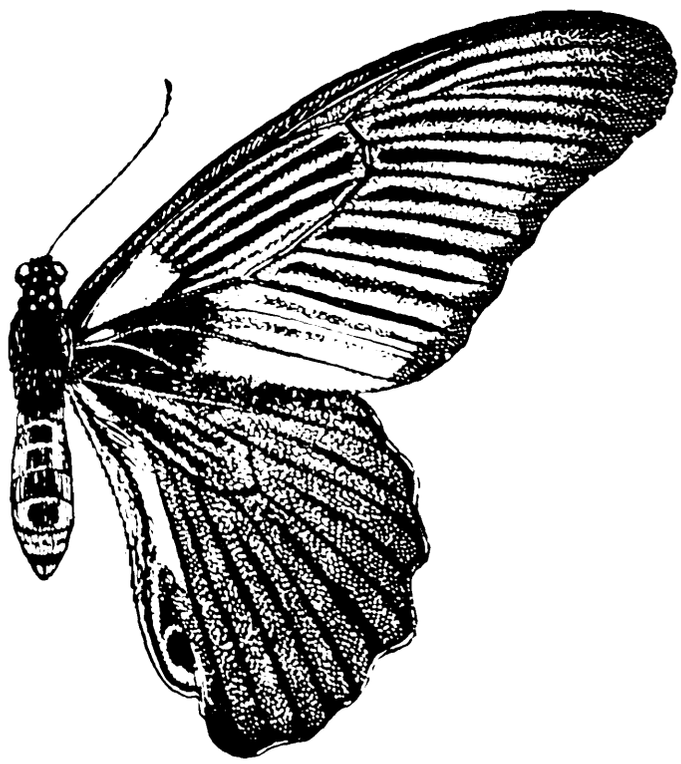
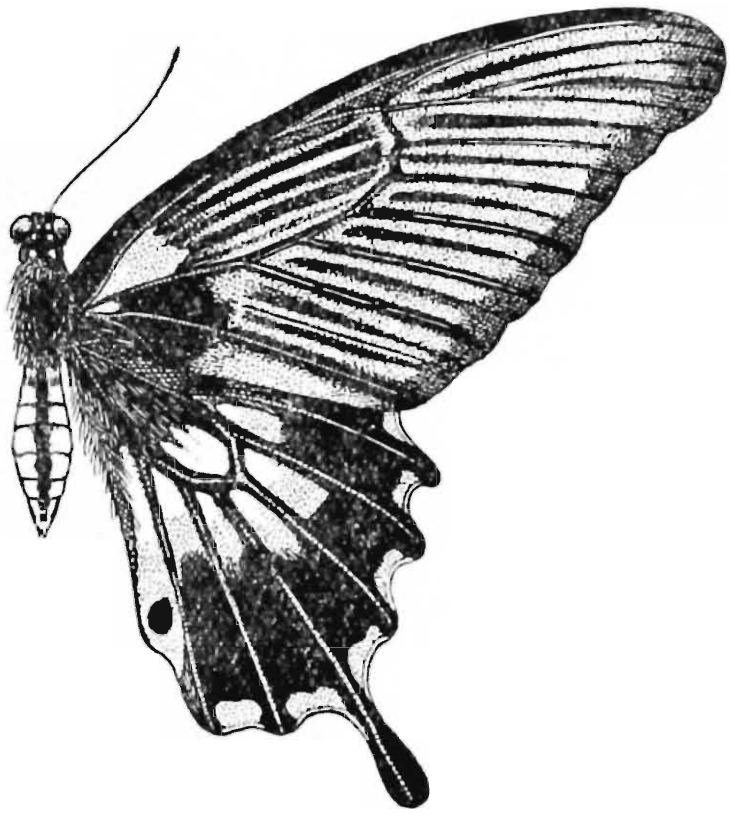


Fig. 33.—*P. memnon agenor* f. *butlerianus* Roths. (Rangoon).

♀ form **butlerianus** Roths.—*Upperside* of both wings dark sepia. Fore wing with a white posterior area. Hind wing strongly scaled with blue. SIKKIM to BURMA.

♀ form **aphrodite** Röber.—*Upperside* of hind wing anteriorly to vein 6 and including the cell black, the remainder white tinged with yellow ; a white spot in the end of the cell and a white streak before vein 6 ; four large marginal black spots and a small rounded black anal spot *Underside* with the white markings reduced. Abdomen yellow with a lateral white line, the basal part ringed with black. Apparently known only from one specimen taken in the NAGA HILLS.

♀ form **alcanor** Cram.—*Upperside* of fore wing brown or greyish-brown, with black veins and internervular black streaks. Cell red at the base ; a velvety black patch at bases of areas 1 and 2. Hind wing black, apical third to apical half of cell and broad streaks at bases of areas 1 to 6 white, the latter tinged with red distally and very variable in length, sometimes



34.—*P. memnon agenor* ♀ f. *alcanor* Cram. (Rangoon).

one or more absent ; a row of red marginal spots that decrease in size from areas 1 to 7 ; the red in 1 lengthened, occupying half the area, but it is generally interrupted by a large submarginal black spot ; cilia black, white between the veins. Abdomen brownish-black, bright ochraceous at the sides. SIKKIM to BURMA.

Habitat.—SIKKIM to SOUTH BURMA and the SOUTH NICOBAR ISLANDS. Stragglers are sometimes caught in the Andaman

Islands and on Car Nicobar. The species ascends to 7,000 feet in the Himalayas. In Tavoy it is not common, and keeps to densely wooded country at the foot of the hills.

28. **Papilio mayo** Atkinson. (Fig. 35, ♀).

Papilio mayo, Atkinson, 1873 *b*, p. 736, pl. 63, fig. 1 (♂) (Andamans); Wood-Mason & de Nicéville, 1880, p. 237; id., 1881, p. 252; Rothschild, 1895, p. 322; Bingham, 1907, pp. 49–50; Jordan, 1909 *a*, p. 71, t. 25 *b*; Evans, 1932 *a*, p. 48.
Iliades mayo, Moore, 1902, p. 201, pl. 450, figs. 1, 1 *a*, 1 *b* (♂♀).
Papilio charicles, Hewitson, 1874, p. 356 (♀); id., 1875, *Pap.*, pl. 14, fig. 45 (♀).
Papilio mayo ♂ ab. *decurio*, Niepelt, 1917, p. 104.

♂. *Upperside* rich velvety black. Fore wing with a subterminal series of greenish-yellow, irrorated, internervular

Fig. 35.—*P. mayo* Atks., ♀.

streaks, sometimes more or less obsolescent. Hind wing with a very broad discal pale blue band, composed of broad, outwardly more or less emarginate, streaks in areas 1 to 7; cilia of fore wing black, of hind wing white alternated with black at the veins.

Underside opaque blue-black. Fore wing with a dark red basal streak, and with submarginal internervular streaks as above, but grey and more prominent. Hind wing with small red basal patches, a complete dark red ocellus in areas 1 and 2, and indistinct submarginal, very variable markings of red in the other interspaces, sometimes formed into half ocelli in interspaces 3 and 4; within this line of markings there is an incomplete discal lunular series of mixed red and blue scaling. Antennæ, head, thorax, and abdomen black.

♀. This resembles *P. memnon agenor* ♀ f. *alcanor* Cram., and is also a mimic of *Polydorus rhodifer* Butl., occurring with it.

Fore wing with the broad pale internervular streaks nearly white in the discal area. Hind wing with the distal white streaks shorter and strongly tinged with red along their edges, while the dark red is more extended than in *alcanor*, especially in the tornal area, where it covers the terminal three-fourths of areas 1 and 2, interrupted in 1 by a comparatively round oval black spot and in 2 by a broad elongate black patch; apical half of tail vermilion-red, whitish at apex.

Expanse: ♂♀, 120–150 mm.

Variation.—An aberrational form of the ♂ is thus described by Mr. De Rhé-Philipe in the Journ. Bomb. Nat. Hist. Soc. xx, p. 766:—"The internervular streaks on the fore wing above and the red basal patch on the fore wing below are completely absent, the red basal patch on the hind wing below much reduced. Hind wing below with no red subterminal ocelli in areas 1 and 2 and no red discal scaling. A discal row of blue lunate markings on a deep blue-black ground, extending in a curve from costa to inner margin." Three specimens were received.

Another form of ♂ has been named **decurio** Niep. In this the discal band of hind wing below is almost obsolete, and there are no other markings but the tornal ocellus.

Habitat.—ANDAMAN ISLANDS. The ♀ is rare, but the ♂ is fairly common. It is usually difficult to obtain specimens of the ♀ which are not mutilated.

Papilio bootes Westwood. (Fig. 36).

This species is distinguished by having the head and a lateral stripe on the abdomen coloured red. Hind wing elongate with a spatulate tail. Underside with a red band which covers the base of both wings. The sexes are similar, and strongly resemble *Polydorus latreillei* (Don).

Distribution.—GARHWAL to SIKKIM, ASSAM, and Western China. Five subspecies are known, three occurring in the Indian area.

29 *a* **Papilio bootes janaka** Moore (Fig. 36 *b*, imago).

Papilio janaka, Moore, 1857 *a*, p. 97 ; Elwes, 1888, p. 426 ; Rothschild, 1895, p. 336 ; Bingham, 1907, p. 57, fig. 12 *b* (♂) ; Jordan, 1909 *a*, pp. 76–7 ; Seitz, 1907, p. 9 ; Hannyngton, 1910, p. 361.
Byasa janaka, Moore, 1902, p. 169, pl. 433, figs. 1, 1 *a*, 1 *b* (♂♀).
Papilio bootes janaka, Evans, 1927, p. 30 ; id., 1932 *a*, p. 48.
Papilio sikkimensis, Wood-Mason, 1882, p. 103.
Papilio kala, Tytler, 1915 *a*, p. 515, ♂ (Western Garhwal)

♂♀. *Upperside* with greyish-black ground-colour. Hind wing darker in the distal half, and with white discal area, larger in the ♀, formed of post-cellular patches in areas 2 to 4 and sometimes in 5 ; one to four submarginal red lunules, and one at the anal angle, which coalesces with the red marginal spot, also marginal red spot in areas 2 to 4 ; tail with a pale red double spot.

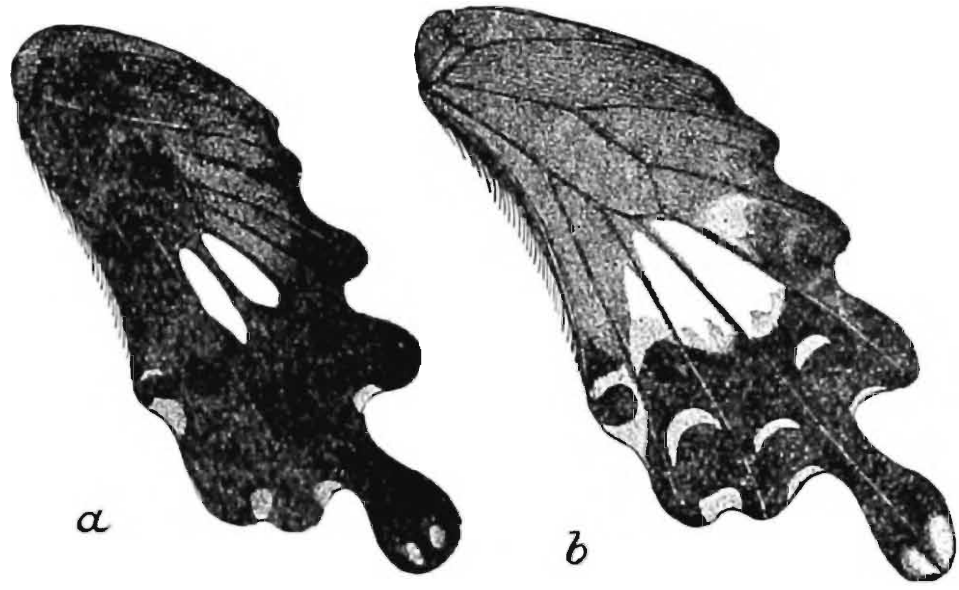


Fig. 36.—*a*, *P. bootes bootes* Westw., ♂, hind wing ; *b*, *P. bootes janaka* Moore, ♂, hind wing.

Underside with the basal red band extending along the abdominal margin of the hind wing. Fore wing more strongly grey, with usually deep black stripes. Hind wing similar to the upperside, but the discal patches are often much irrorated with red scales.

Expanse : ♂♀, 110–120 mm.

Habitat.—Garhwal to the Abor Country ; rare. A spring butterfly, ranging from 3,000 to 6,000 feet in Sikkim.

29 *b*. **Papilio bootes bootes** Westwood. (Fig. 36 *a*, imago).

Papilio bootes, Westwood, 1842 *a*, p. 36 ; id., 1843, p. 123, pl. 31 ; Bingham, 1907, p. 56, fig. 12 *a*.
Papilio bootes bootes, Rothschild, 1895, p. 335 ; Seitz, 1907, p. 9 ; Jordan, 1909 *a*, p. 77 ; Evans, 1932 *a*, p. 48, pl. iii, fig. A 4.4 (♂).

Byasa bootes, Swinhoe, 1893, p. 312 ; Moore, 1902, p. 168, pl. 432, figs. 1, 1 *a*, 1 *b* (♂♀).
Papilio echo, Ehrmann, 1909, p. 85.

♂. Very similar to the following race, but the red basal band on the underside is not continued along the inner margin. Hind wing with only two white post-cellular spots, in areas 2 and 3, elongate and somewhat oval ; no submarginal red lunules ; above the red tornal spot is a minute crescentic mark of the same colour.

Underside of hind wing similar to above, but areas 6 and 7 silky black with a slight greenish lustre ; submarginal red lunules in areas 2 and 3.

♀. *Upperside* ground-colour brownish-black ; fore wing with the internervular streaks broader and more prominent, a small red basal spot. Hind wing with an additional white spot in area 2 and submarginal lunate markings in areas 1 to 4, those in 1 and 2 red, in 3 white tinged with red, and in 4 pure white.

Underside resembles the ♂, the red at base of wings more extended, the white discal spot in area 2 very small, irrorated with red scales ; the submarginal and marginal spots larger, with a white submarginal lunule in area 4.

Habitat.—ASSAM : Khasi and Jainta Hills, Sylhet ; rare.

29 *c*. **Papilio bootes mixta** Tytler.

Papilio mixta, Tytler, 1915 *a*, p. 514 (♂, Naga Hills ; ♀, Manipur).
Papilio bootes mixta, Evans, 1932 *a*, p. 48.
Papilio janaka var. *pseudobootes*, Niepelt, 1918, p. 3, t. 18, fig. 11, ♂.

♂. Resembles *janaka* in having four white discal spots on the hind wing and a conspicuous red tornal spot. Resembles *bootes* in lacking the submarginal red lunules in areas 3 to 5 on the hind wing above, and below by the basal red area not continued along the inner margin.

♀. Resembles the ♂, but has larger white discal spots as well as additional red lunules in areas 3 and 4.

Habitat.—MANIPUR and the NAGA HILLS ; NORTH BURMA ; rare. A similar form occurs in Tong-king. The type of *pseudobootes* is in the British Museum. It is without locality and cannot be separated from specimens of *mixta*.

Papilio rhetenor Westwood.

♂♀. Body and wings bluish-black, the abdomen laterally somewhat paler. Hind wing elongate, with strongly undulate distal margin. Underside of hind wing with a broad dull red stripe extending from base of costa along the inner margin, and a characteristic dull black discal spot which corresponds

to the white patch of the ♀. The ♀ resembles *Polydorus dasarada* and *philoxenus* from the same localities. The hind wing has a broad rounded tail and a white discal area.

Distribution.—West and Central China and Hainan, and from KUMAON to SOUTH BURMA. Three subspecies are known, of which only the typical one occurs in the Indian area.

30 *a*. **Papilio rhetenor rhetenor** Westwood. (Fig. 37 *a*, imago; *b–d*, genitalia).

Papilio rhetenor, Westwood, 1841, p. 59, pl. 16, fig. 1 *a* (♂); Gosse, 1883, p. 297, pl. xxviii, figs. 14–16 (genitalia); Elwes, 1888, p. 428; Manders, 1890, p. 535; Rothschild, 1895, p. 333; Bingham, 1907, p. 54, fig. 11, pl. xii, fig. 86 (♀); Seitz, 1907, p. 10; Hannyngton, 1910, p. 361; Evans, 1932 *a*, p. 48, pl. iii, fig. A 4.5 (♀).

Panosmiopsis rhetenor, Wood-Mason & de Nicéville, 1887, p. 374; Moore, 1902, p. 191, pl. 445, figs. 1, 1 *a*, 1 *b* (♂♀).

Papilio rhetenor rhetenor, Jordan, 1909 *a*, p. 76, t. 29 *b*.

Papilio icarius, Westwood, 1848, p. 5, pl. 2 (♀).

Papilio alcmenor C. & R. Felder, 1864 *a*, p. 324; id., 1864 *b*, p. 129, t. 20, fig. *d* (♂).

Papilio rhetenor turificator, Fruhstorfer, 1909 *b*, p. 175 (Sikkim).

Papilio rhetenor f. *albolunata*, Fruhstorfer, 1909 *b*, p. 175.

Papilio rhetenor ♀ f. *leucocelis*, Jordan, 1909 *a*, p. 75; Evans, 1932 *a*, p. 48.

♂. *Upperside* of fore wing with a series of pale adnervular streaks not extended to the base nor quite to the margin, but reaching well into the apical half of the cell, and a short slender streak of red, rarely absent, at the extreme base of the subcostal vein. Hind wing with distal bluish scaling; an irregular incomplete white ring at the tornal angle that encloses a black spot bordered above by red.

Underside of fore wing more strongly grey; a basal dark red patch traversed by the black veins. Hind wing deep indigo-blue-black; the basal red band bears two black spots in area 1, and also some irregular white scaling in the same area; in area 2 the band bears three large black spots, in some specimens the two inner ones coalescent; a diffuse distal spot of blue scaling in areas 6 and 7

♀. Ground-colour duller black. Fore wing with the adnervular streaks broader, paler, and more prominent than in the ♂; the short red basal streak broader. Hind wing discal patch consisting of an elongate spot at base of area 4 and a short streak that fills the basal half of area 5, extended diffusely into apex of cell and above into area 6; beyond this white patch is a discal series of three small red crescentic marks in areas 2, 4, and 5 or in 2 and 4 only, followed by larger red lunules in areas 2 to 5, marginal large red spots in 2 and 3, and a more or less large rectangular red spot centred with black at the tornal angle; cilia touched with white between the

veins. The lunular red markings are very variable in number and are marginal in areas 4 to 6.

Underside of fore wing dull olivaceous-black, with the veins and internervular streaks velvety black, a red patch at base of cell. Hind wing similar to above, but with more extensive white and red markings, the latter so disposed as to form a patch at base and a broad inner border ; in areas 1, 2, and 3 it is interrupted by large black spots.

Expanse : ♂♀, 110–130 mm.

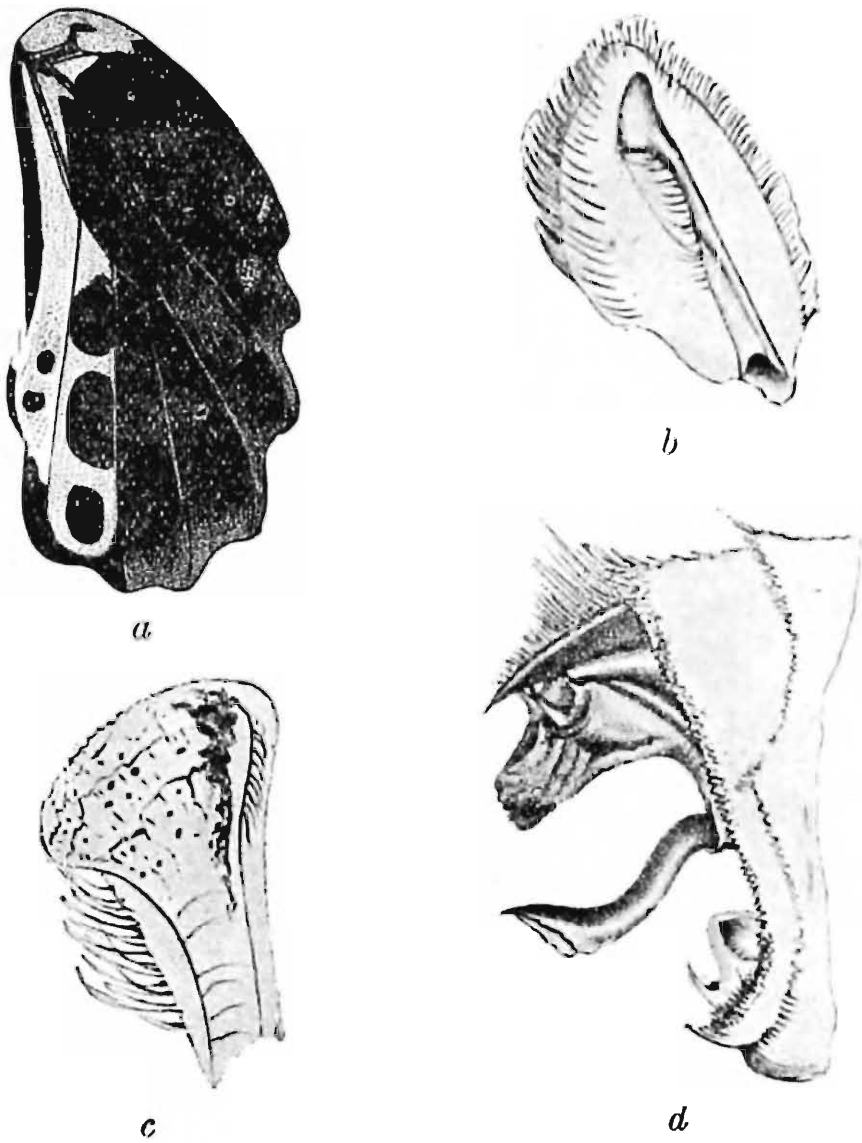


Fig. 37.—*P. rhetenor rhetenor* Westw.

a, ♂, underside of hind wing ; *b–d*, genitalia (after Gosse) ; *b*, valve and harpe ; *c*, harpe, the expanded extremity ; *d*, lateral view of genitalia.

Genitalia.—" Harpe (fig. 37, *b*, *c*) a long tubular rod terminating in an oblique hatchet-shaped head, of almost oval outline, facing the dorsal side, and set with strong bristles below ; its broad anterior edge is very minutely toothed " (*Gosse*, 1883).

Variation.—Specimens of the ♂ with a white posterior patch on the fore wing are called **leucocelis** Jord. Specimens from the Karen Hills are sometimes intermediate between the typical form and *publilius* Fruh.

Habitat.—KUMAON to LOWER BURMA (Karen Hills); not rare; ascends to about 6,000 feet in the Himalayas. Described originally from Assam.

30 *b*. **Papilio rhetenor publilius** Fruhstorfer.

Papilio rhetenor publilius, Fruhstorfer, 1909 *b*, p. 175 (♂, Lower Burma).

♂. *Upperside* of fore wing with a well-marked greyish-white patch on the inner margin. Hing wing with the anal spots in area 2 enlarged and white, also usually a large marginal spot in area 3 and one in 4, and a small white or reddish submarginal spot in 3.

Underside of fore wing with the white patch more distinct than in the other races. Hind wing with usually a small red submarginal spot in area 4.

♀. Scarcely differs from typical ones; hind wing below with less extended basal red.

Habitat.—LOWER BURMA, Karen Hills, and Dawnas Range; and south-east to Siam.

Protenor Group.

♂♀. Alike. Fore wing somewhat elongate; costa arched, apex produced but rounded; outer margin oblique, slightly concave; tornus rounded; inner margin straight, about half length of costa; cell broad and long, more than half length of wing. Hind wing with the costa and outer margin to end of vein 2 forming one long continuous curve, the outer margin broadly scalloped; inner margin to tornal angle straight, below the latter the termen emarginate; cell narrow, comparatively short; subcostal vein and upper discocellular subequal. ♂ with a white costal streak on upperside of hind wing. Antennæ not half length of fore wing, slender; club elongate, gradual, slight.

Distribution.—Japan to Formosa and China, NORTHERN INDIA and BURMA. Only one of the three species composing this group occurs in the Indian area.

Papilio protenor Cramer.

♂♀. Hind wing above with a broad white subcostal stripe, and below with a large red tornal patch and submarginal lunules formed into rings with the marginal spots.

Larva.—"Green, a spectacle-band on the thorax, a black-edged band on the 4th segment, two oblique bands on the

abdomen, and the anal segment brown mixed with white; the prolegs grey; on *Zanthophyllum*" (*Jordan*, 1909 *a*).

Pupa.—Either uniformly green or coloured like rough bark.

Habits.—Often seen in swarms on moist sand at the banks of rivers; also visits flowers, being especially fond of thistles. Has a slow and somewhat tumbling flight.

Distribution.—Formosa, Hainan, and China to Tong-king, BURMA, and INDIA. Three subspecies, two in the Indian area.

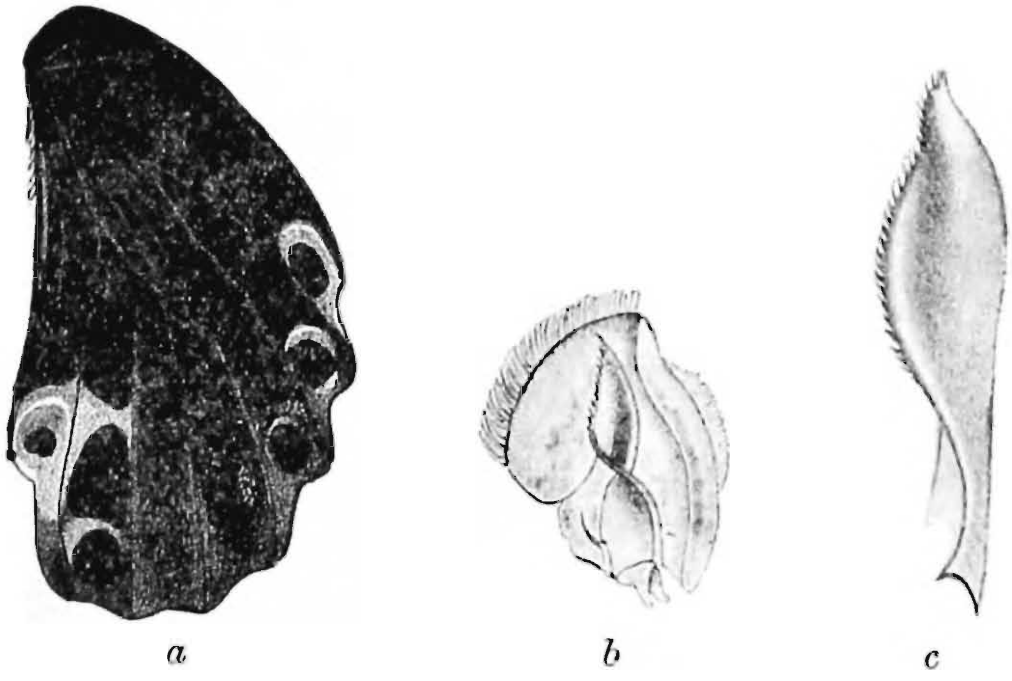
31 *a*. **Papilio protenor protenor** Cramer. (Fig. 38 *a*, imago; *b*, *c*, genitalia).

Papilio protenor, Cramer, 1775, p. 77, pl. 49, figs. A, B (♂); Gosse, 1883, p. 299, pl. xxviii, figs. 25, 26 (genitalia); Staudinger & Schatz, 1884, p. 9, t. 5 (♂); Rothschild, 1895, p. 331; Bingham, 1907, p. 53, fig. 10.

Sainia protenor, Moore, 1882, p. 260; Doherty, 1886 *a*, p. 137; Moore, 1903, p. 188, pl. 444, figs. 1, 1 *a*–1 *d* (larva, pupa, ♂♀).

Papilio protenor protenor, Jordan, 1909 *a*, pp. 75, 76; Seitz, 1907, p. 10, t. 36; Hannyngton, 1921, p. 361; Evans, 1932 *a*, p. 49.

♂. *Upperside* velvety indigo-blue-black, duller on the fore wing than on the hind wing. Fore wing with pale adnervular



a *b* *c*

Fig. 38.—*P. protenor protenor* Cram.

a, ♂, underside of hind wing; *b*–*c*, genitalia (after Gosse); *b*, valve and harpe; *c*, harpe.

streaks broadened along the outer margin and extended well into the cell. Hind wing with a broad pale yellowish-white

subcostal stripe; areas 5 and 6 irrorated with bluish scales; tornal angle marked with red.

Underside of fore wing dull black; adnervular grey streaks, which are broader than above. Hind wing ground-colour as above; a large irregularly-shaped red patch at the tornal angle that extends into area 2, and submarginal red lunules in areas 2, 6, and 7; cell irrorated more or less with a sprinkling of blue scales; the tornal patch with a black, outwardly blue-edged, round medial spot, and areas 4 and 5 with a submarginal irroration of blue scales. Antennæ black; head, thorax, and abdomen dark brownish-black.

♀. Resembles the ♂; ground-colour paler. Fore wing with yellowish adnervular streaks. Hind wing without a white subcostal stripe, distal blue scaling more dense; red patch at tornal angle large, with an oval medial black spot; a submarginal black spot in 2, posteriorly bordered by a crescent-shaped red mark.

Underside resembles the ♂. Fore wing vein-streaks broader and paler. Hind wing tornal patch paler and larger, extended broadly anteriorly and distally into area 2, where it coalesces with a broad submarginal black-centred red ocellus; the irroration of blue scales in area 5 with a small submarginal red lunule below it.

Expanse: ♂♀, 100–130 mm.

Genitalia.—"Harpe (fig. 38 *c*) a twisted broad blade which terminates anteriorly in a free point, the terminal half of the upper edge serrated as far as the tip with numerous tall, closely-set, curved teeth" (*Gosse*, 1883).

Habitat.—KASHMIR to KUMAON; not rare.

31 *b*. **Papilio protenor euprotenor** Fruhstorfer.

Papilio protenor euprotenor, Fruhstorfer, 1908 *c*, p. 46 (Sikkim); Jordan, 1909 *a*, p. 76; Evans, 1932 *a*, p. 49, pl. iii, fig. A 4.6 (♂).

♂♀. Not sharply distinguished from *P. p. protenor*. Fore wing below whiter. Hind wing above with more extensive blue scaling in the distal area.

Habitat.—SIKKIM to NORTH BURMA, extending to Tongking; not rare.

Paris Group.

The species of this group have been called the Gloss-Papilios on account of the glossy blue or green scaling of the upperside. This metallic scaling is either uniformly distributed over the whole upper surface or forms a large metallic patch or band. The underside is always dark. In some species the male has woolly scent-streaks on the veins in the distal area of the fore wing. The hind wing is tailed in most species and the outer margin is usually more or less scalloped.

Distribution.—The group has a wide range from North Japan over the whole Indo-Australian Region to the Pacific islands.

32. **Papilio elephenor** Doubleday.

Papilio elephenor, Doubleday, 1845, p. 305 ; Doherty, 1889, p. 130 ; Rothschild, 1895, p. 378 ; Bingham, 1907, p. 80 ; Jordan, 1909 *a*, p. 77, t. 34 *a*.
Pangeranopsis elephenor, Moore, 1903, p. 59, pl. 489, fig. 2 (♂).
Papilio elephenor elephenor, Evans, 1932 *a*, p. 49.

♂♀. *Upperside* of fore wing with an irroration of brilliant green scales that form cellular and internervular streaks ; ♂ with woolly scent-streaks in the posterior distal area. Hind wing not tailed, elongate ; anterior half to nearly the median vein and above vein 5 irrorated with brilliant blue scales that become gradually sparse towards and cease entirely along the costal margin ; posterior half irrorated with brilliant green scales ; tornus with a small claret-red patch, touched above with a few violet scales and also with a marginal dusky black spot. Cilia brown alternated with white.

Underside black. Fore wing with very broad and prominent cellular and internervular pale streaks, the costal margin and the basal half of areas 1 *a* and 1 distinctly black. Hind wing with a series of claret-red submarginal lunules, two side by side in each area, all more or less irrorated outwardly with violet scales ; at the tornal angle these lunules form a conspicuous oblong patch that stretches a short way along the inner margin and bears a subdorsal and a subapical black spot. Head pinkish-red ; antennæ, thorax, and abdomen narrowly along the middle black ; abdomen yellow-grey at the sides.

Expanse : ♂♀, 110–130 mm.

Habitat.—The hills of ASSAM ; very rare, especially the ♀.

Papilio dialis Leech.

♂. *Upperside* of wings dusted with green. Hind wing with a blue tinge in the costal area, but without a metallic patch, and at the anal angle a red ring. Fore wing with narrow and widely separated scent-streaks.

♀. The metallic scaling is less dense, and on the hind wing is a submarginal red spot below vein 2.

Habits.—Observed by Fruhstorfer in Tong-king near the native habitations on refuse-heaps as well as on the moist sand of a river bank. Though the butterfly is very shy, yet when driven away it frequently returns to the same place. When feeding it always keeps the wings closed.

Distribution.—SHAN STATES to Central China, Hainan, and Formosa ; always rare. Only one subspecies in the Indian area.

33. **Papilio dialis schanus** Jordan.

Papilio dialis schanus, Jordan, 1909 *a*, p. 77 (S. Shan States).
Papilio elephenor schanus, Evans, 1932 *a*, p. 49.
Papilio doddsi, Bingham (*non* Janet), 1907, p. 81, pl. xiii, fig. 88 (Upper Burma).

♂. *Upperside* of hind wing with only slight blue scaling; one to three red submarginal lunules, besides the anal eye-spot, and a very short stumpy tail.

Underside of fore wing only blackish to the base of vein 2. Hind wing submarginal spots more yellowish.

Fore wing scent-stripes very narrow, and no stripe on the submedian fold.

Expanse: ♂, 120 mm.

Habitat.—SOUTHERN SHAN STATES; very rare, the ♀ unknown.

Papilio bianor Cramer.

♂. Fore wing above with broad pilose scent-stripes, the wing dusted with green or greenish-blue. Hind wing anteriorly blue or greenish-blue, and posteriorly dusted with green, with usually a green or blue patch, a red anal spot, submarginal red spots, and some green submarginal spots, at least anteriorly.

Underside of fore wing with the black basal area extended beyond the base of vein 3. Hind wing with a complete row of red submarginal spots.

♀. *Upperside* with sparser metallic scaling. Hind wing with more prominent red spots.

Larva.—Green, with two to three light oblique bands; feeds on Aurantiaceæ.

Habits.—The males congregate on moist sand and visit flowers.

Distribution.—North Japan to Western China, Tong-king, and BURMA. Several subspecies are known, often variable in themselves, but only one occurs in the Indian area. Usually common, but becomes rare towards the southern limits of its range.

34. **Papilio bianor gladiator** Fruhstorfer.

Papilio bianor var. *gladiator*, Fruhstorfer, 1902 *b*, pp. 270, 271 (Tong-king).
Sarbaria gladiator, Moore, 1903, p. 58, pl. 489, fig. 1.
Papilio bianor ab. *gladiator*, Jordan, 1909 *a*, p. 78.
Papilio bianor gladiator, Evans, 1932 *a*, p. 49.
Papilio bianor, Bingham, 1907, p. 82.

♂. *Upperside* of fore wing with scent-stripes on veins 1 to 3, and short green internervular streaks in the discal area. Hind wing with no prominent green patch; posteriorly the basal three-fourths irrorated with green, on the anterior half with blue scales that leave a broad and uniform costal area

devoid of the irroration of blue or green scales ; a submarginal series of lunules often incomplete, the anterior ones bluish-green, the posterior ones claret-red, traversed by short inner lines of blue ; the tornal lunule the widest. Cilia on the hind wing brown alternated with white.

Underside of fore wing chocolate-brown ; the cell with a slight irroration of yellowish scales ; distal area with broad pale internervular streaks that increase in length from the tornal area to costa, but do not reach the outer margin. Hind wing deep brownish-black, the base, cell, and disc partially with thin irroration of pale yellow scales ; a conspicuous submarginal series of broad claret-red lunules traversed by short lines of violet-blue, and a series of marginal narrow transverse ochraceous spots in the interspaces. Antennæ, head, thorax, and abdomen chocolate-brown ; head, thorax, and abdomen above thinly sprinkled with green scales.

♀. Resembles the ♂, but is larger and paler, the hind wing with more prominent red markings.

Expanse : ♂♀, 110–130 mm.

Habitat.—BURMA ; very rare. Also found in Tong-king. Not always sharply separated from typical Chinese *bianor* Cram.

Papilio polyctor Boisduval.

Closely allied to *bianor* Cram. The scent-stripes on the fore wing of the male are always separated, and those on veins 2 and 3 are more strongly narrowed at both ends than in *bianor*. Fore wing above usually with an anteriorly abbreviated narrow discal band. Hind wing in both sexes with a large blue or bluish-green patch reaching from the costa to vein 5 at least, and usually prolonged into a band ; besides the anal spot there are three or four red submarginal spots.

Underside of fore wing with the grey distal area always entering the cell.

♀. Larger, and much paler on the fore wing than the ♂.

Larva.—" The young larva bears spines which disappear in the later stages, and is very dark. In the half-grown and full-grown larvæ, which are green, the thorax is thickened above like a shield ; the margins of the shield and also four oblique stripes on the abdomen are yellowish-grey, a longitudinal line above the prolegs is white. On *Xanthoxylon alatum* " (*Jordan*, 1909 *a*).

Pupa.—" Bluish-green, usually with brown markings, the lateral keel very distinct, brown or white, the horns on the head almost as long as they are broad at the base, the thoracic horns broad, low, pointed " (*Jordan*, 1909 *a*).

Distribution.—CHITRAL to BURMA, Tong-king, and Siam ; usually common. Three subspecies are found in the Indian area.

35 *a*. **Papilio polyctor polyctor** Boisduval.

Papilio polyctor, Boisduval, 1836, p. 205 ; Blanchard, 1844, p. 14, pl. 1, figs. 1, 2 ; Staudinger & Schatz, 1884, p. 8, t. 2 (neuration, palpi, tarsus) ; MacKinnon & de Nicéville, 1898, p. 594, pl. 2, figs. 24 *a–c* (larva, pupa).

Sarbaria polyctor, Moore, 1882, p. 258 ; Doherty, 1886 *a*, p. 136 ; Moore, 1903, p. 51, pl. 485, figs. 1, 1 *a*, 1 *b* (larva, pupa, ♂♀), pl. 486, figs. 1, 1 *a*, 1 *b* (♂♀).

Papilio polyctor polyctor, Rothschild, 1895, p. 381 ; Jordan, 1909 *a*, p. 79 ; Bingham, 1907, pp. 82–3 ; Evans, 1932 *a*, p. 49.

Sarbaria peeroza, Moore, 1882, p. 258.

Papilio polyctor f. vern. *peeroza*, Rothschild, 1895, p. 382 ; Jordan, 1909 *a*, p. 79.

♂♀. The sexes are very nearly alike, and the difference slight between the spring (dry season) and summer (wet season) broods. *Upperside* dull black thickly irrorated with golden-green scales. Fore wing with a broad submarginal golden-green band that varies in length, but in all specimens is more or less diffuse and obsolescent towards the costal margin ; in specimens of the wet-season broods this band is slightly broader than in those of the dry season, also broader in the ♀ than in the ♂. Hind wing with less dense golden-green irroration, turning to blue on the anterior portions of the wing ; a broad bright blue upper discal patch that stops well short of the margin, and has its outer edge uneven, occupying the base of area 4 and the outer portions of areas 5, 6, and 7 ; posteriorly this patch is continued in areas 1 to 3 by much smaller diffuse quadrate spots of brilliant golden-green scales that are prominent in wet-season forms, more obscure in the dry. The discal patch itself is variable in size ; in some specimens there is only a trace of it in area 4. Tornus with a conspicuous submarginal claret-red lunule, traversed inwardly by an obscure blue line and edged above the lunule, narrowly, by velvety black ; indications generally of a similar lunule in area 2 ; a marginal series of large velvety black markings that down the middle of the tail form broad borders to the green irroration. Cilia broadly edged with white in the interspaces.

Underside chocolate-brown, somewhat thinly irrorated with yellowish scales, which are absent, however, from a more or less triangular patch in the middle of the fore wing posteriorly, but coalesce and form an ill-defined, very short, submarginal band just above the tornal angle. Hind wing with a conspicuous submarginal series of claret-red lunules, each traversed inwardly by a line of purplish-blue, followed by velvety black spots and broad white marginal lunules. Antennæ, head, thorax, and abdomen brownish-black ; the head, thorax, and abdomen above thinly irrorated with green scales.

Expanse : ♂♀, 90–120 mm.

Variation.—The seasonal forms differ as stated above; the dry form is called **peeroza** Moore, and is usually much smaller.

Habits.—The males commonly rest in large numbers on the moist sand of river-banks.

Habitat.—CHITRAL to KUMAON; common, and ascending to 6,000 feet.

35 *b*. **Papilio polyctor ganesa** Doubleday.

Papilio ganesa, Doubleday, 1842, p. 73; Staudinger & Schatz, 1884, p. 8, t. 5 (♂); Butler, 1885 *a*, p. 344; Elwes, 1888, p. 428.
Sarbaria ganesa, Swinhoe, 1893, p. 312; Moore, 1903, p. 56, pl. 487, figs. 1, 1 *a* (♂♀).
Papilio polyctor ganesa, Rothschild, 1895, p. 383; Bingham, 1907, p. 84; Jordan, 1909 *a*, p. 79, t. 34 *b*; Evans, 1932 *a*, p. 49.
Papilio polyctor var. *triumphator*, Fruhstorfer, 1902 *d*, p. 65; Jordan, 1909 *a*, p. 79.
Sarbaria triumphator, Moore, 1903, p. 57, pl. 488, fig. 1 (♂).
Papilio polyctor ganesa, ab. *porphyria*, Jordan, 1909 *a*, p. 79, t. 48 *a*.
Papilio triumphator ab. *mai*, Tytler, 1912, p. 590.

♂♀. *Upperside* ground-colour slightly darker than in the nominotypical form, irroration of green scales not so dense. Fore wing with the submarginal bright golden-green transverse band very incomplete, often merely indicated from near the tornus to not further than area 3. Hind wing discal patch not continued to the inner margin, but more or less strongly produced distad behind the subcostal and vein 6; the red submarginal lunules on the posterior half of the wing more generally present.

Underside ground-colour darker than in the Western race. Fore wing with very prominent internervular whitish streaks on the outer half; these streaks increase in length towards the costa, but do not reach the outer margin. Hind wing with less dense and more restricted irroration of yellowish scales; submarginal red and marginal white lunules variable in width and prominence, especially the latter ones.

Expanse: ♂♀, 120–130 mm.

Variation.—A rare aberration occurs in which the hind wing below has very strongly enlarged submarginal spots; this is **porphyria** Jord.

Several specimens of the cold-weather form, with the hind wing patch brilliant green instead of blue, were taken in the Naga Hills in February and April; this is form **mai** Tytler.

Habitat.—SIKKIM to NORTH BURMA; common.

35 *c*. **Papilio polyctor significans** Fruhstorfer.

Papilio polyctor var. *significans*, Fruhstorfer, 1902 *d*, p. 65 (Tenasserim).
Sarbaria significans, Moore, 1903, p. 57, pl. 488, fig. 2 (♂).
Papilio polyctor significans, Jordan, 1909 *a*, p. 79 ; Evans, 1932 *a*, p. 49.

♂♀. Very close to *ganesa* Doubl., but on the upperside of the fore wing there is a small round white spot before the tornus.

Habitat.—South Burma, north of the Dawna Range ; not rare.

35 *d*. **Papilio polyctor stockleyi** Gabriel.

Papilio polyctor stockleyi, Gabriel, 1936, p. 282, ♂ (W. Siam ; Dawna Hills).

♂. *Upperside* of fore wing very lightly dusted with green ; two cream-coloured patches, 10 mm. in length, one on each side of vein 1 near the tornus. Hind wing lightly dusted with blue and green ; a small blue patch in area 6 extending into 7 as far as the discocellular, not entering the cell and not reaching the submarginal lunules ; a row of seven submarginal lunules, the first two blue and the others purple lined with blue.

Underside resembles *significans*, but the white marginal lunules are much more strongly marked.

Habitat.—Lower Burma ; the Dawna Range southwards to Western Siam. Only 2 ♂♂ at present known, both in the British Museum.

Papilio paris Linnæus.

Fore wing without scent-streaks, but in rare cases there is a stripe on vein 2. Upper surface of body and wings dusted with green, fore wing without a green band ; hind wing with a large patch, which is green or blue according to the fall of the light, and is always broadest behind vein 6, usually connected with the inner margin by a narrow green band ; a red ring at the anal angle.

Underside brownish-black, the fore wing with grey discal stripes which do not reach the end of cell. Hind wing with a complete row of red or yellowish-red submarginal lunules, against which are placed curved purple-blue marks.

Early stages.—These are described under *tamilana* Moore.

Habits.—Very common in wooded districts at lower elevations. The males are fond of visiting flowers, and often rest in crowds on moist sand ; their flight is very swift and, like many butterflies, they have a habit of returning again and again to the same place.

Distribution.—Central and West China, Formosa, and Hainan to Java, Sumatra, BURMA, and INDIA. Two subspecies are found in the Indian area.

36 *a*. **Papilio paris tamilana** Moore. (Pl. I, fig. 14, larva, fig. 15, pupa).

Papilio tamilana, Moore, 1881 *b*, p. 313; Bell, 1912, pp. 538–44 (early stages).
Papilio paris tamilana, Rothschild, 1895, p. 385; Seitz, 1907, p. 11; Bingham, 1907, p. 86; Jordan, 1909 *a*, p. 79, t. 34 *c*; Evans, 1932 *a*, p. 49.
Achillides tamilana, Moore, 1903, p. 65, pl. 492, figs. 1, 1 *a* (♂♀).

♂♀. Closely resembles the nominotypical form, but is much larger. Hind wing with a much larger and paler metallic blue discal patch, which extends from area 3 well into area 7, from the apex of the cell into areas 3 to 5, and from the middle of area 6 much further towards the margin than in the nominotypical form.

Underside with the transverse post-discal pale band on the fore wing conspicuously narrower than in the nominotypical form, and curved inwards towards the costa.

Expanse: ♂♀, 120–140 mm.

Egg.—Rather small and spherical, with a diameter of 1·5 mm., somewhat shiny, and superficially pitted. When first laid it is translucent light green, soon becoming more opaque and blotched with brown-red (from *Bell*, 1912).

Larva.—When young it is dark olive-green with ochreous and white markings. In the third instar there is a white subspiracular band from segment 7 to 10 which persists to the final instar. When full-grown the larva is bright grass-green, plentifully speckled with yellow; the white lateral band runs from segments 5 and 6 to the anal end, and there is an indication of a yellow diagonal line. Length 50 mm.; breadth 13 mm. (from *Bell*, 1912).

Pupa.—The curve of the ventral line very strong. Thorax rather short and convex and without apical protuberance; head-points stout and not long, and slightly separated at the base. Wing-cases dark glaucous-green, dorsal area light greenish-yellow, ventral surface of abdomen light yellowish-green; a broad yellow dorsal band from the cremaster to segments 4 and 5, continued by a pinky-brown line to segment 2; the dorso-ventral edge yellow; a dark dorso-lateral spot on the centre of segments 3, 5, and 8. Length just over 40 mm.; breadth nearly 18 mm. at the middle of segment 7 (from *Bell*, 1912).

Habits (from *Bell*, 1912).—The eggs are laid singly on the upperside or on the underside of a leaf. When about to pupate the larva ascends high up a tree, often among the flower-

stems, and the pupa is always well hidden by overhanging leaves. The imago emerges within 25 days after pupation, generally just at day-break.

The larva is common in September and October, and is much subject to attack from birds and parasites. The eggs are very largely attacked by ichneumons.

The larva was first discovered after a search of twelve years.

The ♀ is rarely seen, although in breeding rather more females than males were obtained. During some ten years of collecting only 2 ♀♀ were caught, as compared with many dozen males.

The butterfly is rarely found below 1,000 feet, and is one of the most striking of all the butterflies likely to be met with in the hill stations of the Bombay or Madras Presidencies.

Habitat.—PENINSULAR INDIA ; not rare. It is not uncommon in the Nilgiris from 3,000 to 7,000 feet in April and June.

36 *b*. **Papilio paris paris** Linnæus.

Papilio paris, Linnæus, 1758, p. 459 ; Clerck, 1759, t. 13, fig. 1.
Harimala paris, Wood-Mason & de Nicéville, 1887, p. 377.
Papilio paris paris, Rothschild, 1895, p. 384 ; Jordan, 1909 *a*, p. 79, t. 34 C ; Seitz, 1907, p. 11 ; Bingham, 1907, p. 85 ; Evans, 1932 *a*, p. 50.
Achillides paris, Moore, 1903, p. 64, pl. 491, figs. 1, 1 *a*–1 *c* (♂♀).
Papilio paris f. *decorosa*, Fruhstorfer, 1909 *a*, p. 171 (Sikkim).
Papilio paris f. vern. *splendorifer*, Fruhstorfer, 1909 *a*, p. 171 (Siam) ; Jordan, 1909 *a*, p. 79.

♂. *Upperside* black, irrorated with dark green scales, which on the outer portion of the fore wing coalesce and form an incomplete post-discal narrow band more erect than the submarginal similar band on the fore wing of *polyctor*. Hind wing with the irroration of dark green scales not extending to the costal margin and interrupted posteriorly by a broad post-discal area, on both sides of which the green scales coalesce to form narrow diffuse bands ; a conspicuous upper discal shining blue patch occupies the base of area 4 and outer portions of areas 5 and 6 , this patch is variable in size, and in many specimens extends narrowly below and above into areas 3 and 7 respectively ; its outer edge is uneven, its inner edge evenly arched ; a prominent claret-red, largely black-centred ocellus at the tornal angle, its inner edge with a transverse short violet-blue superposed line ; in many specimens an obscure claret-red submarginal lunule in area 7.

Underside opaque black ; bases of both fore and hind wings, up to basal half of cell in fore and up to apex of cell in hind wing, with an irroration of yellowish scales ; also present

more obscurely on the submarginal area in both wings. Fore wing with a very broad elongate triangular pale area that does not extend to the margin, formed of internervular broad, very pale ochraceous-white streaks, short near the tornus, gradually longer up to the costa. Hind wing with a prominent submarginal series of ochraceous-red lunules traversed by short violet-blue lines ; in areas 1 and 2, and sometimes in 3, these lunules are formed into more or less complete, largely black-centred ocelli by the addition of a marginal portion of the red ring. Cilia conspicuously white in the interspaces. Antennæ, head, thorax, and abdomen black, the latter three sprinkled with green scales above.

♀. Resembles the ♂, paler and duller. *Upperside* of fore wing with the green post-discal band shorter and still more incomplete. Hind wing with the upper discal patch smaller, often green and not blue, the red submarginal lunule in area 7 always present and more prominent than in the ♂. *Underside* with the tornal and subtornal markings generally formed into more or less complete ocelli.

Expanse : ♂♀, 90–120 mm.

Variation.—The smaller dry-season form is called **splendorifer** Fruhst.

In some cases the male has a distinct pilose stripe on vein 2 of the fore wing, and slight indications of this stripe are frequently seen.

Habitat.—ORISSA, and from KUMAON to BURMA ; common. The butterfly is also common in Sikkim, where it is found from the Terai up to 5,000 feet. It is rare in Burma and Tenasserim.

Papilio arcturus Westwood.

♂♀. *Upperside* of fore wing with a submarginal green band which fades out anteriorly. Hind wing with a large discal blue patch which behind the subcostal is produced to the outer margin ; a submarginal row of 3 to 6 red spots and a red anal ring.

Underside of fore wing distally grey and posteriorly before the outer margin broadly grey-white. Hind wing with a complete row of red submarginal spots, some of which are often united into rings with the marginal spots.

Fore wing of ♂ without scent-stripes.

Habits.—The butterfly occurs on paths and openings in the woods.

Distribution.—NORTH-WEST INDIA to TENASSERIM, West and Central China. Two subspecies occur in the Indian area.

37 *a*. **Papilio arcturus arius** Rothschild.

Papilio arcturus arius, Rothschild, 1908, p. 174 (Kashmir); Jordan, 1909 *a*, p. 80; Evans, 1932 *a*, p. 50.

♂♀. Hind wing with the blue patch extended further towards the base than in the nominotypical form, the short green band at the anal eye-spot broader, the red submarginal spots smaller on both sides. *Underside* of fore wing with less extended and less paler grey distal area than in the nominotypical form.

Expanse: ♂♀, 110–120 mm.

Habitat.—KASHMIR to KUMAON; not rare.

37 *b*. **Papilio arcturus arcturus** Westwood. (Fig. 39 *a–c*, genitalia).

Papilio arcturus, Westwood, 1842 *a*, p. 37; id., 1843 *a*, p. 101, pl. 27; Gosse, 1883, p. 303, pl. xxix, figs. 17–19 (genitalia).
Papilio arcturus arcturus, Rothschild, 1895, p. 283; Seitz, 1907, p. 11, t. 5 C; Bingham, 1907, pp. 87–8; Jordan, 1909 *a*, p. 80; Evans, 1932 *a*, p. 50, pl. iii, fig. A 4.11 (♂).
Achillides arcturus, Moore, 1903, p. 61, pl. 490, fig. 1, ♂.
Papilio arcturus ab. *privatus*, Röber, 1927, p. 400.

♂♀. *Upperside* brownish-black, somewhat paler on the fore wing. Fore wing irrorated with brilliant golden-green scales forming, on the posterior half, a broad and not well-defined submarginal band; the veins and elongate streaks between them on the outer half of the wing velvety black. Hind wing with the posterior three-fourths irrorated with brilliant golden-green scales which become blue towards the base anteriorly; a conspicuous brilliant blue patch, somewhat irregular in shape, occupies the apex of the cell and the bases of areas 5 and 6, prolonged as a broad streak in 6 up to the outer margin; below this a more or less triangular discal patch, and above it the whole of the costal margin without any irroration of green scales; a submarginal, generally incomplete series of large claret-red lunules terminates at the tornal angle in a large conspicuous black-centred red ocellus; the latter is encircled above and anteriorly by a narrow band formed by a conflux of the green irrorated scales; the lunules are bordered outwardly by spots of the ground-colour that are devoid of the green scales; the lunules and the tornal ocellus are tinged more or less with bluish-purple on their inner edges.

Underside dull black, with a somewhat sparse irroration of yellowish-white scales, confined on the fore wing to the base and apex and on the hind wing to the posterior two-thirds, not extended to the margin except along the tail. Fore wing with a broad ill-defined submarginal pale transverse area, crossed by

the black veins and the internervular streaks, and elongate pale cellular streaks. Hind wing with a large, somewhat quadrate marginal black-centred claret-red patch in areas 1 and 2, and a submarginal series of broad claret-red lunules that extends from areas 3 to 7, followed by ill-defined anteciliary red spots in each area. Cilia of both fore and hind wings white, alternated with black. Antennæ, head, thorax, and abdomen brownish-black ; the head, thorax, and abdomen at base on the upperside sprinkled with golden-green scales. ♀ with the submarginal green band of the fore wing broader,

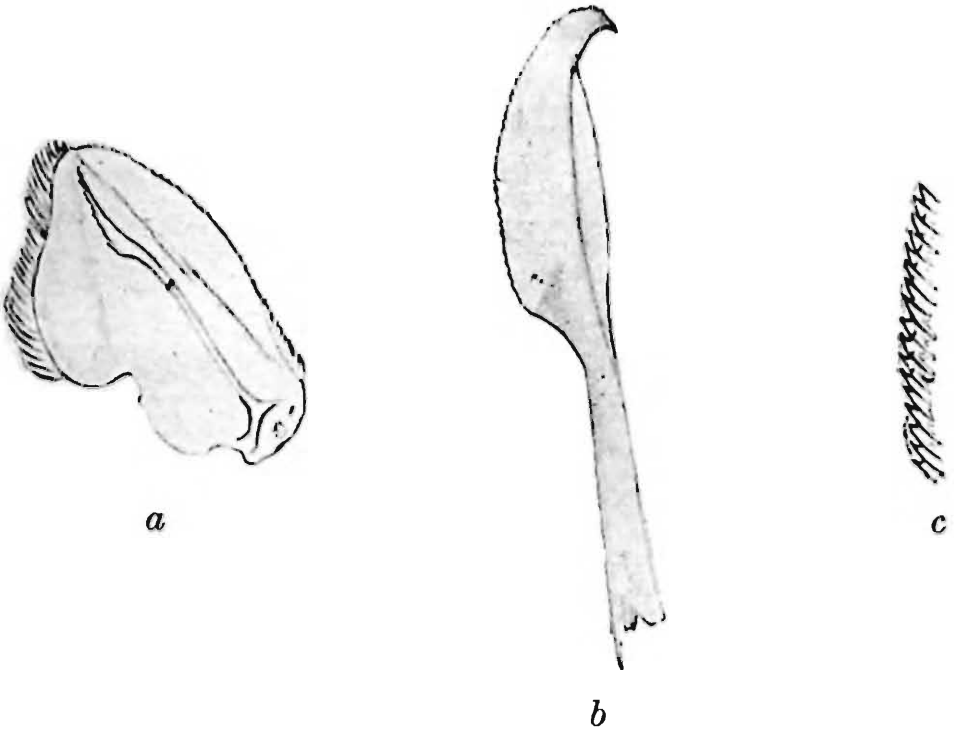


Fig. 39.—*P. arcturus arcturus* Westw., genitalia. (After Gosse).
a, valve and harpe ; *b*, harpe ; *c*, edge of harpe, showing teeth and grooves.

and the submarginal series of red lunules on the hind wing more complete.

Expanse : ♂♀, 120–130 mm.

Genitalia.—Harpe (fig. 39) placed near the middle of the valve, and connected with the lining membrane for almost its whole length ; rather slender, somewhat semi-ovate, curved at the tip into a strong hook, and minutely serrate along its dorsal edge (*Gosse*, 1883).

Variation.—The name **privatus** Röb. was given to a ♂ from the Naga Hills, 7,000 feet, October, in which on the hind wing the blue patch is much reduced and the green scaling absent on both sides.

Habitat.—Nepal to the Dawna Range ; not rare except in Tenasserim.

Papilio krishna Moore.

♂♀. *Upperside* dusted with green. The ♂ without scent-stripes. Fore wing on both sides with a sharply defined yellowish discal band. Hind wing anteriorly with a large blue spot which is connected with the inner margin by a narrow green band; four submarginal spots and a large anal eye-spot which are purple-red and placed well before the outer margin.

Underside of hind wing with a discal band of yellowish spots and a complete row of purple-red submarginal spots, the marginal spots reddish.

Habits.—Frequents bare places on mountains where the slopes are covered with forests of chestnut, oak, and magnolia.

Distribution.—NORTHERN INDIA and West China. The nominotypical form is confined to the Indian area.

38. **Papilio krishna krishna** Moore.

Papilio krishna, Moore, 1857 *a*, p. 108, pl. 2 *a*, fig. 6 (♂); Rothschild, 1895, p. 384; Bingham, 1907, p. 86; Evans, 1932 *a*, p. 50.

Papilio krishna krishna, Jordan, 1909 *a*, p. 80, t. 34 *a*, *b*.

♂♀. *Upperside* of both wings rather densely dusted with green. Fore wing with the post-discal band well defined, complete, formed of white scaling with only a thin sprinkling of green scales on its inner edge, generally erect or slightly curved, rarely slightly sinuous. Hind wing with the upper discal patch metallic greenish-blue, smaller than in *paris*, but the portions of it in areas 6 and 7 more extended towards the margin, the metallic golden-green band connecting the patch with the inner margin more conspicuous than in *paris*; above the tornal ocellus is a submarginal series of claret-red lunules in areas 2 to 5, followed by a series of ochraceous-red obscure marginal narrow lunules between the veins, with the cilia on the outer edge of each conspicuously white.

Underside of fore wing with post-discal band as above, erect and ochraceous-white; a series of internervular pale streaks in the distal area. Hind wing with a well-defined discal ochraceous-white band formed of a series of somewhat lunular marks in the interspaces, and increasing in width anteriorly; a submarginal series of claret-red lunules traversed by violet scaling on the inner edge; a marginal series of ochraceous-yellow lunular marks in the interspaces, and the cilia bordering each lunule white.

Expanse: ♂♀, 120–130 mm.

Habitat.—SIKKIM to BURMA; not rare: flies in Sikkim from 3,000 to 9,000 feet.

39. **Papilio crino** Fabricius.

Papilio crino, Fabricius, 1793, p. 5; Rothschild, 1895, p. 389; Jordan, 1909 *a*, p. 81, t. 36 *b*; Evans, 1932 *a*, p. 50, pl. iii, fig. A 4.13 (♂).
Harimala crino, Moore, 1903, p. 67, pl. 493, figs. 1, 1 *a*–1 *d* (larva, pupa, ♂♀).
Harimala montanus, Moore (*non* Felder), 1881 *a*, p. 146, pl. 61, fig. 1 (♀).
Papilio montanus, C. & R. Felder, 1864 *a*, pp. 322, 370.
Papilio crino ab. *montanus*, Rothschild, 1895, p. 389; Jordan, 1909 *a*, p. 81, t. 36 *b*, *c*; Evans, 1932 *a*, p. 50.

♂♀. *Upperside* uniformly dusted with green and with a green post-discal band on both wings. The tail is tipped with green. Fore wing of the ♂ with thin pilose scent-streaks on veins 1 to 3. The bluish-green post-discal band does not enter the cell, is slightly sinuous and curved, and distinctly decreases in width towards the costal margin; in the ♀ more sinuous than in the ♂. Hind wing with the bluish-green post-discal band very variable in width, not entering the cell, and its inner edge fairly straight; above vein 7 the band is abruptly narrowed; tornal ocellus claret-red, with a large black centre inwardly edged with blue; a dull whitish sub-apical spot; submarginal diffuse green lunules in areas 2 to 4.

Underside dull pale brown to blackish-brown irrorated with scattered yellowish scales, which, however, on the fore wing are absent from a large triangular discal patch that lies between the inner margin, the median vein, vein 5, and a line of white lunules that crosses the wing in an outward curve from the upper third of the costa to just before the tornus; these white lunules are outwardly diffuse and merge gradually into the ground-colour. Hind wing with the tornal ocellus much as on the upperside; an obscure ill-defined highly arched post-discal narrow whitish band from above the tornal ocellus to the costa, ending near the apex of area 7 in a broad white lunule; beyond this a double submarginal row of somewhat straight ochreous-white lunules, each lunule of the inner row bordered outwardly with blue, this bordering very faint in many specimens. Cilia of fore and hind wings brown alternated with white.

Expanse: ♂♀, 80–100 mm.

Variation.—Specimens occur in which the scent-streaks on the fore wing are absent; this is the ♂ form **montanus** Feld.

Larva.—"Somewhat limaciform; anterior segments convexly scutellated; furnished with a pair of short fleshy tubercles on anterior and two on anal segments" (*Moore*).

The colour of the larva is bluish-green.

Pupa.—"Curved backward anteriorly; head broad in front; green" (*Moore*).

Habits.—The larva probably feeds on *Chloroxylon swietenia* DC., the Indian satinwood tree; it has eluded all the endeavours of Bell and others to discover its haunt, and neither larva nor pupa have been recorded since Moore published his account. The butterfly is rather common in the plains, and ascends to about 6,000 feet. The flight is very swift.

An account of a migration of this species is given by Ormiston, 1917 :—"I once saw a very big flight at Galle (Ceylon) in March; the direction was south-west, viz., straight out to sea. It continued for 3 or 4 days, and enormous numbers must have perished in the sea."

Habitat.—Only found in CEYLON, PENINSULAR INDIA, and LOWER BENGAL. The species is not rare, being rather common in the plains, and ascending to about 6,000 feet. It is rare in the district of Coorg.

40. **Papilio buddha** Westwood. (Pl. I, fig. 12, larva; fig. 13, pupa).

Papilio buddha, Westwood, 1872, p. 86, pl. 3, fig. 1 (♂); Rothschild, 1895, p. 389; Davidson, Bell. & Aitken, 1897 *a*, p. 581, pl. 6, figs. 2, 2 *a* (larva, pupa); Bingham, 1907, p. 89; Jordan, 1909 *a*, p. 81, t. 35 *b*; Bell, 1912, p. 743, pl. 1, figs. 15, 15 *a* (larva, pupa); Evans, 1932 *a*, p. 50.

Harimala buddha, Moore, 1903, p. 69, pl. 494, figs. 1, 1 *a*–1 *c* (larva, pupa, ♂♀).

♂♀. *Upperside* of both wings with a broad green discal band which on the fore wing is placed anteriorly with its greater part in the cell, and on the hind wing extends far into the cell. The basal area of both wings dusted with green, the distal marginal area almost pure black. Hind wing with a yellow submarginal spot at the costal margin and a similar one at the anal angle; tail black.

Underside of fore wing with a very broad post-discal grey band which is almost straight on its inner edge. Hind wing with a pale outer marginal border and a row of narrow yellow submarginal spots which are distally bordered with black and proximally with bluish-white.

♂ without scent-streaks on the fore wing.

In the ♀ there is a second yellow spot placed behind the subcostal vein on the hind wing.

Expanse: ♂♀, 90–100 mm.

Egg.—The colour is at first pale lemon, which soon gives place to rusty markings. Diameter 1·3 mm. (from *Bell*, 1912).

Larva.—When young it is livid greenish-yellow with a very dark olive-green dorsal band, and a similarly-coloured broad lateral band. In later stages it becomes darker green and assumes grey, white, and yellow markings.

In the final and 5th instar it is very like *P. tamilana* in shape and general appearance. Surface smooth and dull, dark green, spotted finely with light yellow ; a subspiracular yellow band from segment 6 to 12 ; a distinct subdorsal row of tubercle-like yellow spots on segments 7 to 12 ; a transverse row of yellow spots near the front margin of segment 4, ending on each side in an indistinct ocellus ; on segment 5 is another transverse crest near the hind margin, with a thick spotting of light yellow continued under the ocellus forwards by a narrow yellow band or line up to base of tubercle in front margin of segment 2. Length 42 mm. ; breadth 10 mm. The osmeterium is reddish (from *Bell*, 1912).

Pupa.—Almost uniformly curved, without a thoracic horn, head produced in two long protuberances. Resembles *tamilana*. Dark green ventrally, much lighter dorsally to approximate to leaf-surface of food-plant ; dorsal line, dorso-ventral line from cremaster to shoulders, and ventral suture line of wings, all yellow ; a subdorsal jet-black spot on segment 6. Length 32 mm. ; breadth 10 mm. at the middle (chiefly from *Bell*, 1912).

Habits (from *Bell*, 1912).—The larva feeds upon *Xanthoxylon rhetsa* DC., family Rutaceæ. The young larva lies in the centre of the upperside of a leaf on a bed of silk, and its yellow speckling makes it difficult to see, as the leaves are very similarly marked with spots produced by the agency of some insect. The larva rarely protrudes the osmeteria.

The male butterfly flies fast round the tops of trees, but the ♀ is seldom seen, though it is in the majority by breeding.

According to Fraser (1930, p. 260) the species is moderately common in Malabar from May until the end of September, and quite common during the latter end of August. In Calicut it shows a predilection for *Lantana* blossom on steep hill-sides, where it can be taken after a long tiring stalk. Yates (1931) says it is " far commoner in Coorg than *P. crino*. I have never seen it at water."

Habitat.—Peninsular India ; rare in most places. It ranges from sea-level up to 2,000 feet, and is commonest in the low hills along the sea-board. It is not uncommon on the western slopes of the Nilgiris.

Papilio palinurus Fabricius.

♂♀. Similar to *P. buddha*, with a narrower discal band on both wings. Fore wing dusted with green over the outer marginal area. Hind wing with large green submarginal spots.

Underside of fore wing with the grey band basally concave and placed near the cell.

Habits.—Frequents wooded country at low elevations, and is very shy and agile; occasionally seen in gardens, and is fond of feeding at the flowers of *Ixora, Lantana,* etc.; it is also found at damp places on forest paths. It has a habit of flying close over the water like a swallow, dipping its body in and then hurrying away.

Distribution.—BURMA to Sumatra and Nias Island and eastwards to the Philippines. At least five subspecies are known, but only the nominotypical form occurs in the Indian area.

41 **Papilio palinurus palinurus** Fabricius.

Papilio palinurus, Fabricius, 1787, p. 2; Bingham, 1907, pp. 88–9, pl. xiii, fig. 91 (♂); Evans, 1932 *a*, p. 50.
Papilio palinurus palinurus, Rothschild, 1895, pp. 387–8; Jordan, 1909 *a*, p. 81, t. 35 *b*, *c*.
Harimala palinurus, Moore, 1903, p. 71, pl. 495, figs. 1, 1 *a*, 1 *b* (♂♀).
Papilio regulus, Stoll, 1790, p. 175, pl. 41, figs. 1, 1 A (♀).
Papilio brama, Guérin, 1840, pl. 1, figs. 3, 4; Distant, 1885, p. 338, pl. 32, fig. 4 (♂).

♂♀. *Upperside* black, closely irrorated with brilliant green scales. Fore wing with a slightly excurved, oblique, bright green discal band that extends from the middle of the costa to the inner margin a little before the tornal angle; anteriorly the band passes through the apical fourth of the cell and is narrowed slightly at the costa. Hind wing with the costal margin broadly, outer margin including the tail more narrowly, devoid of the irroration of green scales; a broad discal bar, elongate-oval in shape, extends from the inner margin a little above the tornus to the middle of area 6, its outer edge diffuse; this is followed by a post-discal area where the irroration of green scales is sparser than at the base, and a submarginal series of very broad lunules formed of scales of similar metallic coloration; a dark ochraceous-brown ocellus centred with black and surmounted by blue at the tornal angle, and a paler ochraceous-yellow lunule subapically in area 7

Underside velvety brownish-black; bases of both fore and hind wings somewhat thickly, the outer portions more thinly, sprinkled with pale yellow scales. Fore wing with the apical half obliquely pale brownish-white, darkening to dusky black at the apex and narrowly along the margin; the pale area very narrow at the tornal angle, gradually broadened up to the costa, traversed by the black veins. Hind wing with an outer narrow pale band traversed by a submarginal series of ochreous-brown lunules that are bordered on both inner and outer sides by velvety black, the black on the inner side crossed by diffuse short lines of bluish-white scales; the lunule in area 7 broadly and conspicuously bordered inwardly with white. Antennæ, head, thorax, and abdomen velvety

black, the head and thorax above overlaid with green. ♀ differs from the ♂ in the discal bands of both wings being conspicuously narrower, and by the brighter ochraceous colour of the tornal ocellus on the hind wing.

Expanse: ♂♀, 90–100 mm.

Habitat.—SOUTHERN BURMA; rare. Its range extends to Malacca, Sumatra, and Borneo.

Castor Group

The species of this group are entirely without a blue gloss and somewhat resemble Euplœines either in both sexes or in the ♀. Fore wing with a white dot on the middle discocellular, either on both sides or only on the underside. Hind wing without a tail, but often with a distinctly projecting tooth at vein 4. *Upperside* of both wings and below with the apex of the cell of the fore wing and the whole of the hind wing more or less thickly coated with yellowish scales. Ground-colour black or blackish-brown with white markings; the marginal spots of the hind wing thinner than those of the fore wing. Abdomen with white subdorsal dots.

In some respects this group forms a connecting link between *Chilasa* and *Papilio*.

The three species composing this group belong essentially to the Indian area, extending to Malacca, Annam, Hainan, and Formosa.

42. **Papilio dravidarum** Wood-Mason. (Pl. I, figs. 7, 8, pupa; fig. 9, larva).

Papilio dravidarum, Wood-Mason, 1880, p. 144, pl. 8, fig. 1 (♂); Rothschild, 1895, p. 359; Davidson, Bell, & Aitken, 1897 *a*, p. 583 (larva, pupa); Bingham, 1907, p. 68; Jordan, 1909 *a*, p. 45, t. 31 *d*; Evans, 1923, p. 117; id., 1932 *a*, p. 50.

Papilio pollux var. *dravidarum*, Westwood, 1881, p. 482, pl. 45, figs. 1 (♂), 2 (♀).

Tamera dravidarum, Moore, 1903, p. 79, pl. 500, figs. 1, 1 *a*–1 *c* (♂♀).

♂♀. *Upperside* velvety black. Fore wing with the outer half and four somewhat indistinct longitudinal lines in the cell irrorated with yellowish-brown scales; a small white spot across the middle discocellular; a submarginal series of inwardly conical white spots and a marginal series of large white spots that decrease in size towards the costa; most often the spots do not extend beyond area 6; following each submarginal spot are spots of the black ground-colour formed by the absence of the irroration of yellowish-brown scales. Hind wing with the posterior three-fourths irrorated with yellowish-brown scales; a very prominent discal series of inwardly conical, outwardly emarginate, elongate white spots followed by a submarginal series of white lunules with

spots of the black ground-colour that succeed them as on the fore wing. Cilia black, largely alternated with white in the interspaces.

Underside ground-colour a rich hair-brown with larger markings than above, and with the yellowish irroration of the group. Antennæ, head, thorax, and abdomen dark brownish-black, head and abdomen minutely speckled with white; beneath, the white specklings larger and more numerous.

The ♀ has a paler ground-colour with larger white markings and more conspicuous yellowish-brown irroration.

Expanse: ♂♀, 80–100 mm.

The following account of the early stages and habits is from an unpublished manuscript communicated by Mr. T. R. Bell:—

Egg.—Spherical, shining, greyish, the surface slightly roughened by a coating of some red-brown exudation that is thicker over the top than elsewhere.

Larva.—Shape and appearance as in larvæ of *helenus*, *polymnestor*, *polytes*, and *demoleus*, resembling bird-droppings when young. Segment 13 with two sharp, hard, fairly long, conical, subdorsal yellow tubercles; two much smaller tubercles on 12. The ocelli on segment 4 are composed of four blue segments of circles surrounding a blue central square, a black patch between this iris and surrounding black rim, with a yellow upper border, the ridge marked with black and yellow. Surface dull and smooth, except for minute erect hairs.

Coloration.—A much-mottled, dark, somewhat translucent green with a white subspiracular thick line on segments 7 to 12; intersegmental membrane between 5 and 6 black with some bluish spots, and between the other segments blue; segments 2 to 12 with a lateral and subdorsal blue dot. Across segments 8 and 9 a transversely oblique band which is indistinct and of a slightly darker green than the ground-colour. Length 55 mm.

Pupa.—Similar in shape to that of *demoleus* and *polytes*, but the dorsal line from head to cremaster is more or less straight, the ventral line not nearly so convex. The head processes diverge considerably, their inner edges but slightly toothed, rounded at the ends and laterally compressed. Thoracic process about 2 mm. long. Wing-cases more even than in *helenus* or *polymnestor*, and on segments 8 and 9 are very small subdorsal tubercles. Ground-colour green with a yellow dorsal saddle on the expanded part of abdomen, and a subdorsal dark green spot on each segment. When formed on bark or in a dark place the pupa may be greyish, with the outer halves of wings green and the back of head, segment 2, and thorax dark brown. Length 35 mm.; head processes nearly 5 mm. long and about 7 mm. apart at the tips.

Habits.—The food-plant is *Glycosmis pentaphylla* Correa, family Rutaceæ, a common small tree of the more or less evergreen parts of the hills along the Western Ghat range in North Kanara. The eggs are deposited one at a time on the underside of a mature leaf, within 6 feet or less of the ground. Eggs deposited on 2nd April hatched on the 6th, changed first skin on the 9th, and were still in the third stage on the 21st; further development was not noted. The larvæ, when young, rest on the uppersides of the leaves. When mature they move about very slowly and laboriously, and come to rest on the stems, where they remain extended, with the head and anterior segments tucked in.

Pupation usually takes place on some stem or branch of a neighbouring tree, sometimes, more rarely, under a leaf of its own plant, when the pupa is nearly always green, like that of *helenus* under similar conditions.

The butterflies are powerful fliers and keep to dense jungle, but at the beginning of the rains they come to damp places. The female comes rarely to water. A hot, close, damp day with cloudy weather and intervals of hot sun is the best for capturing these insects. The species is rare. We have never, in the last thirty or more years, succeeded in obtaining a satisfactory series, say ten, of imagines; especially is it difficult to get the females. Caterpillars are very scarce, and if one finds one a year one considers it lucky. In Kanara it is not often seen at flowers. It much resembles *P. clytia* on the wing, but that species frequently visits flowers, and has also the habit of soaring for hours together over the tops of trees on hills, playing with others of its species that it chases high into the sky at intervals; this habit is never followed by *dravidarum*.

Habitat.—Peninsular India, the ♂ usually common. Common on the western slopes of the Nilgiris, and fairly common in Coorg from March to May and September to October. It is never abundant at the foot of the western slopes of the Ghats, and is rare in North Travancore to the south.

43. **Papilio mahadeva** Moore. (Fig. 40, ♂).

Papilio mahadeva, Moore, 1878 *a*, p. 840, pl. 51, fig. 1 (♂, *non* ♀); Rothschild, 1895, p. 359; Bingham, 1907, pp. 67–8, fig. 15 (♂); Ollenbach, 1921 *a*, p. 895; Evans, 1923, p. 237; id., 1932 *a*, p. 50, pl. iv, fig. A 4.17 (♂).
Tamera mahadeva, Moore, 1903, p. 77, pl. 499, figs. 1, 1 *a*–1 *c* (♂♀).
Papilio castor mahadeva, Jordan, 1909 *a*, p. 45, t. 31 *d*.

♂♀. *Upperside* black, sprinkled somewhat closely with reddish-brown scales that give the whole ground-colour a rich brown tint. Fore wing uniform; a line of ciliary white

specks that do not reach the apex. Hind wing with a conspicuous post-discal complete series of inwardly conical white spots, followed by a complete series of slender well-defined white lunules and a ciliary row of linear white specks; between the latter two the ground-colour is devoid of the irroration of brown scales, giving an appearance as of a marginal row of more or less distinct black spots impressed on the wings.

Underside duller black, much more densely irrorated with reddish-brown scales. Fore wing with a small quadrate white spot across the middle discocellular and transverse series of submarginal and marginal white specks, the former series anteriorly more or less obsolete. Hind wing markings as above, but in some specimens the post-discal series of conical white spots has some of the anterior spots ill defined or absent. ♀ with paler ground-colour and larger markings. In some

Fig. 40.—*P. mahadeva* Moore, ♂.

specimens the outer half of the fore wing above is conspicuously paler than in any specimen of the ♂.

Expanse: ♂♀, 80–120 mm.

Habitat. Southern Burma, extending to Siam and the east side of the Malay Peninsula. Usually rare, but fairly plentiful in Tavoy between March and October just before and during breaks in the rains.

Papilio castor Westwood.

♂. Fore wing without submarginal spots or, if present, they are quite small. Hind wing with a white discal patch composed of four to five spots divided by the veins.

♀. Fore wing with small white marginal and submarginal spots. Hind wing with a band of broad grey or yellowish-white patches or streaks.

Habits.—The butterflies drink on moist sand. When frightened away they soon return. Their flight is slow and feeble.

Distribution.—SIKKIM and ASSAM to BURMA. Also in the Malay Peninsula, Annam, Tong-king, Hainan, and Formosa. Three subspecies occur in the Indian area.

44 *a*. **Papilio castor castor** Westwood. (Fig. 41 *a*, ♂ ; *b*, venation).

Papilio castor, Westwood, 1842 *a*, p. 37 (Assam) ; id., 1845, p. 129, pl. 80, fig. 2.
Papilio castor castor, Rothschild, 1895, p. 357 ; Bingham, 1907, p. 66, fig. 14 *a* (♂), *b* (neuration) ; Jordan, 1909 *a*, p. 45, t. 29 *c* ; Evans, 1923, p. 237 ; id., 1932 *a*, p. 51.
Tamera castor, Moore, 1903, p. 79, pl. 496, figs. 1, 1 *a*–1 *e*, pl. 497, figs. 1, 1 *a*, 1 *b* (♂♀).
Papilio castor castor ♂ ab. *mesites*, Jordan, 1909 *a*, p. 45.

♂. *Upperside* black, more or less irrorated with yellowish-brown scales that form on the fore wing somewhat indistinct

Fig. 41.—*P. castor castor* Westw.
a, ♂ ; *b*, venation of anterior portion of fore wing.

longitudinal cell-lines and internervular streaks. Hind wing with a discal cream-coloured patch composed of an oval spot in area 4, a more elongate spot broadened outwardly in area 5, a similar elongate spot in area 6, and a much smaller, broadly oval spot above it in 7 ; these markings divided by the black veins. Cilia of both wings black alternating with white.

Underside with the brownish-black apical area of fore and base of hind wing thinly sprinkled with yellowish-brown scales. Fore wing with a small white spot on the middle discocellular and a submarginal and marginal row of small white specks that do not extend to the costa. Hind wing with similar markings to those of the upperside, but smaller, more widely divided one from the other by the veins, which are edged with black ; a submarginal, more or less well-defined series of small white lunules and a marginal series of white specks. Antennæ, head, and thorax and abdomen black ; beneath with a spot behind the eyes and spots and specks on the thorax and abdomen white.

♀. *Upperside* duller and more opaque than the ♂, but more densely irrorated with yellowish or reddish-brown scales. Fore wing markings as in the ♂, and with post-discal and marginal series of small white spots that generally do not extend to the costal margin. Hind wing with a discal series of diffuse broad whitish streaks that extend into the apex of the cell, followed by a complete transverse curved submarginal series of white lunules ; the ground-colour beyond each lunule devoid of the irroration of yellowish-brown scales ; this gives the appearance of a row of terminal black spots impressed on the wing. Cilia black alternated with white.

Underside similar to above, with larger and more prominent white markings. Fore wing with diffuse whitish streaks in areas 1 *a*, 1 *b*, and 2, and the submarginal and marginal series of white spots complete. Hind wing with diffuse whitish streaks that extend up to the base of the wing.

Expanse : ♂♀, 100–130 mm.

Variation.—Specimens of the ♂ occur in which the hind wing has a complete row of white submarginal spots on both sides, and sometimes in such specimens there are five discal spots and traces of a sixth and seventh spot on the upperside. These connect *castor* with *mehala*, and have been named ♂ f. **mesites** Jord.

Habitat.—ASSAM to NORTHERN BURMA ; not rare.

44 *b*. **Papilio castor polias** Jordan.

Papilio castor polias, Jordan, 1909 *a*, p. 45 (Burma) ; Evans, 1923, p. 237, pl. 4 ; id., 1932, p. 51, pl. iv, fig. A 4.18 (♀).

♂. Brownish-black. Hind wing with four large yellowish-white discal patches as in the nominotypical form ; the marginal tooth at vein 4 distinctly projecting.

♀. Fore wing beneath and often also above with diffuse grey spots from the lower angle of the cell to the inner margin. Hind wing with broad diffuse grey streaks which extend on the upperside almost to the base and on the underside quite

to the base, the cell on this side being entirely filled up with grey.

Expanse : ♂♀, 100–130 mm.

Habitat.—SIKKIM ; not rare. Occurs all through the summ er from lower elevations to about 3,000 feet.

44 *c*. **Papilio castor mehala** Grose-Smith. (Fig. 42, ♀).

Papilio mehala, Grose-Smith, 1886, p. 150, Toungou ; Smith & Kirby, 1889, *Pap.*, pl. 2, figs. 1 (♂), 2 (♀).
Papilio castor mehala, Rothschild, 1895, p. 358 ; Bingham, 1907, p. 67 ; Jordan, 1909 *a*, p. 45 ; Ollenbach, 1921 *a*, p. 895 ; Evans, 1923, p. 237 ; id., 1932 *a*, p. 51.

♂. *Upperside* velvety dark brown. Fore wing with a minute white spot on the middle discocellular and a series of marginal

Fig. 42.—*P. castor mehala* Gr.-Sm., ♀ (Karen Hills, September).

white specks between the veins. Hind wing without a distinctly projecting tooth at vein 4. A discal series of seven elongate, more or less inwardly conical, outwardly emarginate cream-coloured spots, followed by a submarginal series of lunular small white spots. Cilia black alternated with white.

Underside brownish-black, the markings similar to above. Fore wing with the marginal series of white specks produced inwards. Hind wing markings somewhat larger.

♀. Resembles the ♂. *Upperside* of fore wing with a submarginal series of white spots, sometimes with the anterior ones enlarged, sometimes with the series incomplete. Hind wing as in the ♂.

Habitat.—SOUTHERN BURMA ; rare.

Helenus Group.

Usually tailed. The sexes similar. Body black, with white dots on the head and pronotum, and thin white lines on the underside of the abdomen, but these white markings often absent. ♀ with the abdomen sometimes yellow above and black beneath. Fore wing of ♂ black, usually with white transverse or oblique band. Hind wing black, with white, rarely greyish-blue, discal area or band. In some species the distal area of the fore wing of the ♂ above is more or less densely hairy so as to conceal the scaling.

This group is distributed throughout the range of the genus.

Papilio helenus Linnæus. (Fig. 43 *a–c*, genitalia).

♂♀. Body black; occiput, pronotum, palpi, and breast with white dots. Wings brown-black, the fore wing above in the ♂ thickly hairy on the disc, the only markings being four faintly visible stripes in the cell, and beneath with two whitish stripes on the disc between each pair of veins. Hind wing with a white discal area which in the ♀ is usually more prolonged anally than in the ♂, and in both sexes consists of three or four spots of which the third is the largest. Hind

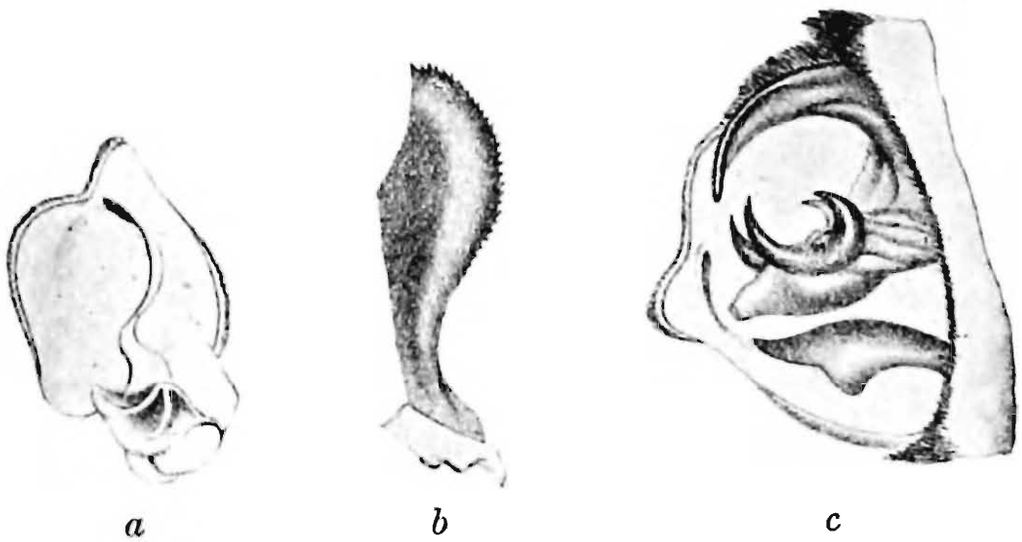


Fig. 43.—*P. helenus* Linn., genitalia. (After Gosse).
a, valve and harpe; *b*, harpe, lateral view; *c*, lateral view of genitalia, right valve removed.

wing with red submarginal lunules beneath; usually only the last one is distinct above. The ♀ is paler, with more distinct submarginal spots on the hind wing above.

Genitalia.—Harpe (fig. 43 *a*, *b*) resembles that of the *Memnon* Group; a broad crescent-shaped plate, its dorsal edge well rounded anteriorly, and minutely serrate (*Gosse*, 1883, p. 300, pl. xxix, figs. 1–3).

Early stages.—Described under *daksha* Hamps.

Habits.—A common species, occurring especially in high jungle. Flight very swift and irregular. Most plentiful at low elevations, but ascends to about 6,000 feet. It often settles at puddles on shady forest paths, and also visits flowers.

Distribution.—Occurs in a number of races from S. Japan to W. China, Formosa, Hainan, INDIA to the Malay Peninsula, the Philippines, and the Greater and Lesser Sunda Islands as far as Timor. Three subspecies are found in the Indian area.

45 *a*. **Papilio helenus helenus** Linnæus. (Fig. 44 *a*, ♂; *b*, venation).

Papilio helenus, Linnæus, 1758, p. 459; Clerck, 1759, t. 13, fig. 2 Davidson & Aitken, 1890, p. 367 (larva, pupa); Kershaw, 1907, pl. 4 *a*, fig. 7 (larva); Ollenbach, 1921, p. 895.

Papilio helenus helenus, Rothschild, 1895, pp. 284–6; Bingham, 1907, pp. 41–2, figs. 8 *a* (imago), 8 *b* (neuration); Jordan, 1909 *a*, pp. 53–4, t. 21 *b*; Rosen, 1929, p. 11; Evans, 1923, p. 237; id., 1932 *a*, p. 51.

Charus helenus, Moore, 1902, p. 208, pl. 154, figs. 1, 1 *a*, 1 *b* (♂), 1 *c* (♀).

Papilio helenus ab. *rufatus*, Rothschild, 1895, p. 286; Jordan, 1909 *a*, p. 54, t. 32 *b*.

♂♀. *Upperside* brownish-black to rich velvety black. Fore wing with four slender lines in the cell, and outer internervular brown hairy streaks that vary in width; these

Fig. 44.—*P. helenus helenus* Linn.

a, ♂; *b*, venation of anterior portion of fore wing.

latter give in many specimens a golden-brown appearance in certain lights to the outer half of the wing. Hind wing with a more or less quadrate white spot in area 7, with two

more elongate similar spots in areas 6 and 5 that form a conspicuous upper discal white patch, the outer margin of which is zigzag this is followed by a series of marginal, more or less imperfect claret-red rings in areas 1 to 5 that enclose large intense black oval spots. The number of these rings is very variable ; the tornal one is always present, the rest partially or completely obsolescent. Cilia black alternated with white.

Underside duller, more opaque black. Fore wing with the cellular and internervular streaks formed of scales, not hairs, greyish-white and more clearly defined than above, the latter anteriorly reaching the apex of the cell, but not the outer margin. Hind wing as above, but the upper spot of the discal white patch generally crescentic, the whole patch generally smaller, and the spots that compose it divided by the black veins ; marginal rings dull red, and only the tornal one and that in area 2 are more or less complete, the rest of the series reduced to a curved submarginal line of lunules that extends from areas 3 to 7 ; in addition there is an inner broad red lunular spot in area 2 in continuation of the inner portion of the red tornal ring ; both the lunule and the inner portion of the tornal ring traversed by a line of white scales.

Expanse : ♂♀, 110–120 mm.

Variation.—A form of the ♂ occurs in which the white area of the hind wing is very strongly reduced, and beneath the first patch of this area very small or entirely absent ; area 2 beneath is filled up with red from the discal to the submarginal spots. This form is called **rufatus** Roths.

Habitat.—UNITED PROVINCES, Mussoorie to BURMA ; common. Extends also to Siam and the Malay Peninsula.

45 *b*. **Papilio helenus mooreanus** Rothschild.

Papilio helenus mooreanus, Rothschild, 1895, p. 286 (Ceylon) ; Bingham, 1907, p. 43 ; Longstaff, 1908, pp. 625, 626, 640 ; Jordan, 1909 *a*, p. 54, t. 21 *e* ; Evans, 1923, p. 237 ; id., 1932 *a*, p. 51.
Charus mooreanus, Moore, 1903, p. 211.
Charus helenus, Moore (*non* Linn.), 1881 *a*, p. 149, pl. 58, fig. 3.

♂♀. *Upperside* of fore wing with conspicuous yellow internervular streaks in the distal area.

Underside of fore wing with shorter grey streaks than in *daksha* Hamps. Hind wing with a complete series of seven discal blue lunules, of which the anterior three stand at the outer edge of the white discal spots, and the posterior two are situated within the anal and subanal rufous spots.

Expanse : ♂♀, 115–130 mm.

Habitat.—CEYLON ; not rare.

45 *c*. **Papilio helenus daksha** (Hampson). (Pl. I, fig. 16, larva ; fig. 17, pupa).

Charus daksha, Hampson, 1889, p. 363 ; Moore, 1902, p. 210, pl. 455, figs. 1, 1 *a*. 1 *b* (larva, pupa, ♂♀) ; Bell, 1911, p. 1117, pl. D 3, figs. 26 (♂), 26 *a* (♀).

Papilio helenus daksha, Rothschild, 1895, p. 286 ; Bingham, 1907, pp. 41, 43 ; Jordan, 1909 *a*, p. 54 ; Evans, 1923, p. 237 ; id., 1932 *a*, p. 51.

Charus helenus, Fergusson (*non* Linn.), 1891, p. 447.

♂♀. The largest form of the species. *Upperside* of hind wing with a large white area which touches the cell or extends somewhat into it, the first patch of this area being especially broad.

Underside of fore wing with the grey internervular streaks much shorter than in the nominotypical form, formed into a broad transverse discal series, which widens considerably towards the costa, but posteriorly stops far short of the outer margin. Hind wing with all the red submarginal spots present.

Expanse : ♂♀, 118–140 mm.

Egg.—"Nearly spherical, flattened where affixed to leaf. Surface finely dented, shiny. Colour orange, blotched with red-brown pigment. Diameter 2 mm." (*Bell*, 1911).

Larva.—Resembles *P. polymnestor* in colour, shape, and markings. Rich grass-green above the subspiracular enamel-white band, which starts at base of anal claspers and runs forward to front margin of segment 7 quite straight, then getting gradually thinner, on to segment 6 where it curves up to the subspiracular region, bordering the dorsal green and leaving the ventral watery smoky-grey colour between it and the crest of segment 5 protruding upwards in a triangle into the segmental membrane between segments 5 and 6 ; this segmental membrane is black ; anal segment white, mottled black ; front margin of segment 2 and its continuation backwards to crest on segment 5 is yellow ; bases of legs and visible ventral portions of segments 2 to 6 are watery dark grey ; a dark black-mottled broad grey band running diagonally across segments 8 and 9, bordered in front by a line running from above the lower anterior corner of segment 8 up and back to dorsum in front of hind margin of segment 9, where it meets the one on the other side ; behind it is bordered by a line starting from hind margin of segment 8 up that margin and then back to hind margin of segment 9 sub-dorsally, the band narrowing on the dorsum. A black ocellus on segment 4, with a transverse brown line and a yellow-brown border ; the crest finely veined with black between the eyes as in *polymnestor*. Osmeterium deep flesh-colour. Length 75 mm. ; breadth 12 mm. (on segment 5) (from *Bell*, 1911).

Pupa.—Very similar in general shape to that of *P. polymnestor*. The surface is very much rougher, and there are prominent subdorsal tubercles on segments 8 and 9, as well as a smaller lateral one and indications of such on segments 10 and 11. Colour ordinarily green, with a similar yellow saddle to that described for *P. polymnestor*. If the pupa is against a grey bark or in a cage then it may be variegated with brown and pink, black and grey, white and green all together without a yellow saddle. Length 45 mm.; breadth at segment 7 19 mm.; length of head-points 3 mm. (from *Bell*, 1911).

Habits (from *Bell*, 1911).—The eggs are deposited one at a time on mature leaves of the food-plant in shady places in heavy jungle, choosing, as a very general rule, small saplings with foliage about 10 to 20 feet from the ground. The young larva lies along the midrib of the leaf, but when full-grown generally lives in the centre of the upperside of the leaf, or prefers the stalk or a twig. It is slow in its halting movements and sometimes wanders long distances before pupation. It feeds on species of Rutaceæ.

Pupation takes place on the underside of a twig or strong leaf-rib, and the loop is rather long, longer than in *polymnestor*. The yellow saddle adds greatly to the difficulty of seeing the pupa from below.

The butterfly frequents jungles and hills in regions of heavy rainfall, but may stray into the plains along the borders. It flies fast and is rarely seen at rest. It is fond of the big jungles, and keeps entirely to the protection of trees, often very near the ground, never seems to bask in the sun, and comes to rest in dull weather on the upper surface of some leaf, often high up in the tops of trees, with its wings held quite horizontal, the upper wing drawn down over the hind one so as to completely hide the conspicuous white patch on the latter. In this position it is not very easily seen, and is probably safeguarded from the attacks of enemies, particularly birds. It is on the wing all the year round, but is commonest during the monsoon months.

According to Yates (1931) the butterfly is sometimes abundant in the evergreen forest on the western slopes of the Ghats. It has been taken both on flowers and at water, to which it comes freely.

Habitat.—PENINSULAR INDIA; not rare.

Papilio iswara White.

♂♀. Very similar to *helenus*. Palpi entirely white. The white area of the hind wing consists of four patches, and in the ♀ with two additional white spots. Usually two large red

submarginal spots, but no red discal spot before the anal submarginal spot as in *helenus*; always three blue lunules. Upperside of the fore wing in the ♂ with pilose hairs.

Genitalia.—" Similar to *P. helenus*, the harpe of the ♂ more spoon-shaped, and the infra-anal processes shorter " (*Jordan*, 1909 *a*).

Distribution.—SOUTH TENASSERIM to the Malay Peninsula, Sumatra, and Borneo; only locally plentiful. One of the two known subspecies occurs in the Indian area.

46. **Papilio iswara iswara** White.

Papilio iswara, White, 1842, p. 280; Doubleday, 1846, p. 11, pl. 2, fig. 1; Distant, 1885, p. 344, pl. 30, figs. 1 (♂), 2 (♀); Rothschild, 1895, p. 288; Bingham, 1907, pp. 43–4; Evans, 1923, p. 237 id., 1927, p. 32; id., 1932 *a*, p. 51.
Charus iswara, Moore, 1903, p. 212, pl. 456, figs. 1, 1 *a* (♂).
Papilio iswara iswara, Jordan, 1909 *a*, p. 55.

♂♀. *Upperside* of hind wing with discal creamy-white area much larger than in *helenus*, extending into area 4; in the ♀ and in some males also there is some obscure diffuse white scaling below that again.

Underside of fore wing with short grey streaks somewhat as in *daksha*. Hind wing with the white discal area smaller than above, and distinctly divided into four by the black veins that cross it; incomplete broad orange-red marginal rings that enclose large black spots at the tornal angle and at the apex of area 2, the former connected with the discal white patch by a series of obscure bluish lunules.

Expanse: ♂♀, 130–150 mm.

Habitat.—MERGUI ARCHIPELAGO; very rare. Also extending to the Malay Peninsula, Sumatra, and Banka.

Papilio chaon Westwood.

♂♀. Fore wing of the ♂ entirely without the distal hairy coating seen in *helenus*. Palpi laterally white. Fore wing beneath with a white spot or patch at the inner margin. Hind wing above with a chalky-white area consisting of four patches, and beneath with grey-yellow submarginal spots. The ♀ paler, with larger markings.

Habits.—A forest species which does not appear to ascend to as high an elevation as *P. helenus*. Common in wooded hills.

Distribution.—China, Formosa, and Hainan to INDIA, BURMA, Tong-king, Siam, Cochin-China, and Malay Peninsula. Two subspecies are found in the Indian area.

47 *a*. **Papilio chaon chaon** Westwood.

Papilio chaon, Westwood, 1845, p. 97, pl. 72, fig. 1 ; Rothschild, 1895, p. 292 ; Bingham, 1907, pp. 58–9 ; Lathy, 1904, p. 69.
Sadengia chaon, Moore, 1902, p. 213, pl. 457, figs. 1 *a*–1 *d* (♂).
Papilio chaon chaon, Jordan, 1909 *a*, p. 53, t. 22 *b*, *c* ; Evans, 1927, p. 237, pl. 4, fig. A 4.21 (♂) ; id., 1932 *a*, p. 51, pl. iv, fig. A 4.21 (♂).
Papilio chaon ♂ ab. *paryphanta*, Jordan, 1909 *a*, p. 53, t. 32 *b*.
Papilio chaon ♀ f. *leucacantha*, Fruhstorfer, 1908 *d*, p. 73 (Sikkim) ; Jordan, 1909 *a*, p. 53.

♂. *Upperside* with black ground-colour. Fore wing with a sprinkling of yellowish-brown scales that form four longitudinal streaks in the cell and internervular distal streaks. Hind wing with the white discal area formed of elongate broad spots in areas 4 to 7 ; neither tornal nor submarginal markings.

Underside ground-colour duller brownish-black. Fore wing with the diffuse scaling so dispersed as to form grey cellular and internervular streaks, those in areas 1 *a* and 1 *b* generally white, not diffuse. Hind wing with the basal area sprinkled with yellow scales that form three longitudinal slender lines in the cell ; white discal patch as above, but the spots well divided by the black veins ; below the discal patch a small series of white spots in areas 1 to 3, the spot in 1 generally, in 2 very often, tinged with ochraceous-yellow ; a submarginal complete series of ochraceous-yellow lunules followed by marginal narrow white spots.

♀. Paler, with larger markings. Fore wing above often with an obscure diffuse whitish subcostal shading just beyond apex of cell. Fore wing below sometimes with a series of more or less conspicuous marginal white spots. Abdomen beneath with lateral white markings.

Expanse : ♂♀, 115–130 mm.

Variation.—There is a rare form of the ♂ in which the yellow submarginal spots of the hind wing are greatly enlarged, the posterior and anterior spots almost as large as the second white discal spot. This is called **paryphanta** Jord.

A rare form of ♀, in which the cell of the fore wing bears a large area of white scaling, is called **leucacantha** Fruhst.

The size of the white patches on the hind wing and of the submarginal spots, as well as the length of the wings, is very variable.

Habitat.—Nepal to Northern Burma ; common.

47 *b*. **Papilio chaon ducenarius** Fruhstorfer.

Papilio chaon ducenarius, Fruhstorfer, 1908 *d*, p. 73 (Tenasserim) ; Jordan, 1909 *a*, p. 53 ; Ollenbach, 1921 *a*, p. 895 ; Evans, 1923, p. 237 ; id., 1932 *a*, p. 51.

♂♀: The white area of the hind wing larger than in the

nominotypical form, the fourth patch anteriorly produced into a long point which projects beyond the third patch.

Habitat.—SOUTHERN BURMA; not rare. According to Ollenbach (1921) the insect in Tavoy prefers the low country, and was not seen on the hills.

Papilio noblei de Nicéville.

A peculiar and very distinct species allied to *antonio* Hew. from the Philippines, but with quite different genitalia.

Upperside of fore wing black, rarely with a white spot at the inner margin. Hind wing white discal area reaching vein 5, and this area rather narrow costally. Hind wing below with lunular dark ochraceous spots.

Distribution.—NORTHERN BURMA to the KAREN HILLS and east to Tong-king; very rare. The nominotypical form occurs in the Indian area, and a distinct race, as yet unnamed, occurs in central Tong-king. Few specimens of either are to be found in collections. Only the ♀ is known of the Tong-king race; this is the form figured by Jordan in Seitz's Macrolep., ix, 1909, t. 21 *b*.

48. **Papilio noblei noblei** de Nicéville.

Papilio noblei, de Nicéville, 1889 *a*, p. 287, pl. 13, fig. 2 (♂) (Karen Hills); Rothschild, 1895, p. 284; Bingham, 1907, pp. 60–1; Jordan, 1909 *a*, p. 52 (part.); Evans, 1923, p. 238; id., 1932 *a*, p. 51.
Sadengia noblei, Moore, 1902, p. 217, pl. 459, figs. 2, 2 *a* (♂).
Papilio henricus, Oberthür, 1893, p. 3, pl. 4, fig. 39 (♂) (Tong-king).
Papilio noblei haynei, Tytler, 1926, p. 249 (Myitkyina, N. Burma).

♂. *Upperside* black. Fore wing with four slender lines in the cell and the veins paler than the ground-colour. Hind wing with a dark ochraceous incomplete ring at the tornal angle, enclosing a deep black oval spot; above this a discal creamy-white patch that consists of a quadrate spot in area 7, an elongate rectangular spot in 6, and a trapezoidal spot in 5.

Underside of fore wing with duller and brownish-black ground-colour; lines in the cell greyish-white and prominent; a small white discal spot in area 2 followed by a marginal series of short white lines between the veins. Hind wing with the basal third dull brownish-black irrorated with greyish scales; discal white patch as above, but slightly larger; below it an elongate mark in area 1, and a submarginal complete series of broad ochraceous-orange lunules; the lower discal area, the tail, and the ground-colour before and behind the upper submarginal lunules velvety black. Antennæ,

head, thorax, and abdomen black; beneath, the palpi and thorax marked with greyish-white, the abdomen more yellowish.

Expanse: ♂, 110 mm.

Variation.—Specimens occur in which the fore wing above bears a quadrate white spot in the middle of areas 1 *a* and 1 *b*, with the vein dividing them also white in this area. This is **henricus** Ob., and is known from Muong-Mou in Tong-king. It is not unlikely that similar specimens will be found in the Indian area. The form represents a transition to the more easterly Tong-king race.

Habitat.—The nominotypical form occurs in the district of Myitkyina (pronounced "Mitchinar") in NORTHERN BURMA, extending to the Karen Hills and east to the Salwasi River area and western Tong-king. Always very rare.

Papilio fuscus Goeze.

♂♀. The body similar to that of *helenus*, the palpi laterally entirely white. Fore wing of the ♂ without scent-stripes. Hind wing with a white discal band, which is broader above than beneath, and some indistinct spots in the distal area. *Underside* of hind wing with some blue discal spots and with yellowish-red submarginal spots. ♀ paler, with larger markings.

Early stages (from *Jordan*, 1909 *a*):—

Egg.—Light green or pale yellow, laid singly upon *Citrus* leaves near their tips on the upper or under surface.

Larva.—At first a dirty green, anteriorly and posteriorly whitish, with a black V-spot in the middle of the back; at each end of the back a row of small white spines; head glossy black. When full-grown very variable in colour. Usually brown-red mixed with yellow and olive-green, the underside pale greenish or whitish; an oblique lateral band begins posteriorly at the thorax, smaller oblique lateral spots also on some other segments, the pronotum and the 11th segment with a pair of tubercles.

Pupa.—Glossy green, beneath in the middle strongly convex, dorsally only feebly incurved, with short thoracic horn, the wing-cases uniformly projecting. The contour viewed from above forms almost a parallelogram, the head truncate and produced into a point on each side.

Distribution.—The ANDAMAN ISLANDS to Australia and the Solomon Islands, but absent from Sumatra, Java, the small Sunda Islands, and the Philippines. At least eighteen subspecies are known, one of which is confined to the Andamans.

The butterflies occur in open forests with undergrowth, and are usually common.

49. **Papilio fuscus andamanicus** Rothschild.

Papilio fuscus andamanicus, Rothschild, 1908, p. 171 (Andamans); Jordan, 1909 *a*, p. 56; t. 22 *b*, Evans, 1923, p. 238; id., 1927, p. 32; id., 1932 *a*, p. 52.
Papilio prexaspes, Rothschild (*non* Felder) (part.), 1895, p. 297; Wood-Mason & de Nicéville, 1881 *b*, p. 254.
Sadengia prexaspes, Moore (*non* Felder), 1902, p. 215, pl. 458, figs. 1, 1 *a*–1 *c* (♂♀).
Papilio fuscus prexaspes, Bingham, 1907, p. 59.

♂. Smaller than *P. chaon* Westw., which it resembles, the fore wing more produced, with incurved outer margin. *Upperside* with brownish sooty-black ground-colour. Hind wing with the discal white patch extended into area 4, most usually very slightly so, often represented only by a very small spot of white scaling, a white spot also above the tornal angle.

Underside of fore wing with the internervular brownish-yellow streaks limited to the apical area. Hind wing with discal patch extended to the inner margin in a series of three pure white spots; a more or less incomplete post-discal series of lunules formed of diffuse blue scales, and the submarginal series of dark ochraceous lunules smaller and darker than in *chaon*.

♀. Fore wing with an ill-defined broad pale discal band perceptibly widened and becoming whitish opposite apex of cell. Hind wing with the discal extension into area 4 more pronounced than in the ♂, and the small white spot above the tornal angle sometimes followed by a blue ill-defined lunule and an ochraceous spot.

Underside of fore wing with white discal band which is much more prominent than above. Hind wing with the post-discal series of blue lunules generally complete and well marked.

Expanse: ♂♀, 105–115 mm.

Habitat.—Andaman Islands; rare. Not known elsewhere within the Indian area.

Papilio hipponous Felder.

Resembles *P. polytes* Linn. Fore wing with a narrow yellowish submarginal band, only represented in the Indian race by a small spot near the inner margin. Hind wing with a white post-discal band broken up into spots by the black veins and reaching the inner margin. ♀ paler than the ♂.

Habits.—The males may be taken drinking at puddles and springs.

Distribution.—Lower Burma to Siam, the Philippines, and extending to Sangir and the Talaud Islands. Always rare. A single subspecies occurs in the Indian area.

50. **Papilio hipponous pitmani** Elwes & de Nicéville.

Papilio pitmani, Elwes & de Nicéville, 1887, p. 434, pl. 20, fig. 1 (♂); Rothschild, 1895, p. 343; Bingham, 1907, p. 63.
Sadengia pitmani, Moore, 1902, p. 216, pl. 459, figs. 1, 1 *a* (♂).
Papilio hipponous pitmani, Jordan, 1909 *a*, p. 59; Evans, 1923, p. 237; id., 1927, p. 32; id., 1932 *a*, p. 52.
Papilio pitmani leptosephus, Fruhstorfer, 1909 *b*, p. 178 (Assam); Jordan, 1909 *a*, p. 60; Evans, 1932 *a*, p. 52 (=*pitmani*).

♂♀. *Upperside* more brownish-black than in *P. polytes*. Fore wing more thickly irrorated with yellowish scales; an obscure yellowish-brown spot (not always present) in areas 1 *a* and 1 *b* close to the tornal angle; no marginal spots; cilia black, with a few touches of white on the posterior half of the wing. Hind wing discal band with the posterior spot or two brownish-yellow, the band wider in the middle; the tornal ocellus generally obscure and ill defined.

Underside with duller ground-colour. Fore wing with more prominent yellowish irroration, formed into lines in the cell, and with internervular broad streaks on the anterior half of the wing; a transverse submarginal series of diffuse white spots that vary from a single spot in area 1 *a* to double spots in areas 1 *b* to 4. Hind wing with a post-discal band as above, followed by a submarginal series of yellow lunules. Cilia black, irregularly alternated with white. Antennæ, head, thorax, and abdomen dull brownish-black.

Expanse: ♂♀, 90–100 mm.

Habitat.—Southern Burma; rare. Also found in Siam. Its occurrence in Assam (Fruhstorfer, 1909) is extremely doubtful.

Papilio polytes Linnæus. (Fig. 45 *a–c*, genitalia; fig. 46, ♂; figs. 47, 48, ♀).

A very interesting species of wide distribution whose females mimic species of *Polydorus*, which occur in the same localities.

♂. Palpi white laterally. Ground-colour black. Fore wing with white marginal spots which are broader proximally. Hind wing with a white post-discal band which consists of spots of about equal size.

♀. There are three principal forms: one resembling the ♂, one with red discal patches on the hind wing, and one with white discal patches on the hind wing. In the two latter forms the fore wing is black from the base to veins 2 or 3 and along the outer margin; the posteriorly narrowed central area is lighter and traversed by black vein- and fold-stripes; distal margin distinctly undulate, with thin white fringe-spots.

Genitalia.—Harpe (fig. 45 *a*, *b*) resembles that of the *Memnon* Group; the broad distal end hatchet-shaped,

much broader than in *helenus*, the dorsal edge unevenly serrate (*Gosse*, 1883, p. 301, pl. xxix, figs. 7–9).

Egg.—" Spherical, hardly perceptibly rough on the surface. Pale orange, opaque, shiny, smudged with pale brown. Diameter 1·2 mm." (*Bell*, 1911).

Larva.—" Resembles *polymnestor*. Head yellow; crests on segments 4 and 5 yellow; ocellus black. The usual two tubercles on segments 2 and 13. Dorsally a rich glaucous green, slightly yellowish on the sides; bands and markings on segments 7 to 10 are white, blotched with red-brown or brown, with venter brownish-white suffused with red-brown or brown. Length 40 mm.; breadth 8 mm. at the middle " (*Bell*, 1911).

Pupa.—" Olive-brown, with brown, green, and yellow spots and stripes, the underside of the abdomen milk-white, or the

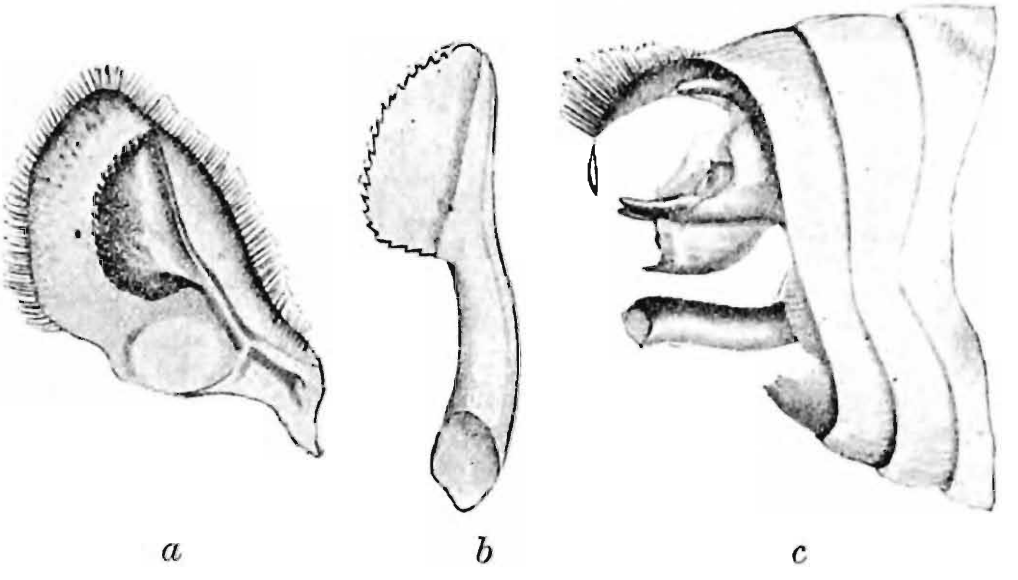


Fig. 45.—*P. polytes* Linn., genitalia. (After Gosse).

a, valve and harpe; *b*, harpe; *c*, lateral view of genitalia, both valves removed and segments denuded of scales.

whole pupa green; the horns on the head short, obtuse, rather widely separated, the thoracic horn short, the dorsum at the base of abdomen rather strongly incurved, the wing-cases moderately protruding " (*Jordan*, 1909 *a*).

Habits.—The larva feeds chiefly on species of *Citrus*, but also on *Murraya*, *Triphasia*, and *Xanthoxylon*; it is not very subject to the attacks of ichneumons.

The imago occurs everywhere in open woods and in gardens at low elevations, in the Himalayas up to 6,000 feet. It seldom rises far from the ground, preferring the shelter of bushes, thick places in the jungle, and of hedges. It is fond of visiting flowers, but does not come to wet places on the

roads. The flight of the ♂ is very swift, restless, and oscillating. The ♀ in its slow flight resembles its *Polydorus* models. The different ♀ forms fly at the same time, but are not equally common. They visit flowers, but are best caught when laying their eggs. The species is very easy to breed, but occasionally remains for a long time in the pupal stage.

Bionomics.—This species was made the subject of an important series of breeding experiments carried out in Ceylon by J. C. F Fryer. The results were published in the Phil. Trans. Roy. Soc. Lond. B, cciv, 1913, pp. 227–54. It was shown that the relationship existing between the three ♀ forms could be explained on ordinary Mendelian lines. In Ceylon this species has reached a position of Mendelian stability.

Distribution.—The Loo Choo Islands, West China, and INDIA to the Moluccas, Timor, and neighbouring islands, except Tenimber. At least nineteen subspecies may be distinguished, of which only two occur in the Indian area.

51 *a*. **Papilio polytes romulus** Cramer. (Fig. 46, ♂; figs. 47, 48, ♀; Pl. I, fig. 18 *a*, *b*, larva, fig. 19, pupa).

Papilio romulus, Cramer, 1775, p. 67, pl. 43, fig. A; Moore, 1865 *b*, p. 756; Chaumette, 1865, p. 37.

Laertias romulus, Moore, 1881 *a*, p. 150, pl. 59, figs. 1 (♂), 1 *a* (♀), 1 *c* (♀) (part.).

Papilio polytes romulus, Rothschild, 1895, p. 347; Jordan, 1909 *a*, p. 61, t. 32 *a*; Poulton, 1918, p. lxxxiv; Evans, 1923, p. 238, pl. iv, fig. A 25 (♀); id., 1927, p. 32; id., 1932 *a*, p. 52, pl. iv, figs. A 4.25 (♂♀).

Papilio cyrus, Fabricius, 1793, p. 7, ♀.

Papilio polytes ♀ f. *cyrus*, Rothschild, 1895, p. 344 (part.).

Papilio polytes romulus ♀ f. *cyrus*, Jordan, 1909 *a*, p. 61, t. 31 *a*; Evans, 1923, p. 238; id., 1927, p. 32; id., 1932 *a*, p. 52.

=*Papilio romulus*, Moore, 1881 *a*, p. 150, pl. 59, figs. 1 *b*, 1 *c* (♀).

Princeps heroicus stichius, Hübner, 1806–19, t. 112.

Papilio polytes ♀ f. *stichius*, Rothschild, 1895, p. 347; Jordan, 1909 *a*, p. 61; Evans, 1923, p. 238, pl. iv, fig. A 4.25; id., 1927, p. 32; id., 1932 *a*, p. 52, pl. iv, fig. A 4.25.

Papilio sakontala, Hewitson, 1852, p. 24, pl. 5, fig. 1; Rothschild, 1895, p. 343; Mackinnon & de Nicéville, 1898, p. 593; Bingham, 1907, p. 64; Jordan, 1909 *a*, p. 60, t. 32 *a*; Evans, 1927, p. 32 (=*romulus*); id., 1932 *a*, p. 52 (=*romulus*).

Laertias sakontala, Moore, 1903, p. 232, pl. 465, figs. 1, 1 *a* (♂).

Papilio ceylanicus, C. & R. Felder, 1864 *a*, pp. 319, 367.

Papilio walkeri, Janson, 1879, p. 433, pl. 8, fig. 2 (♂) (S. India); Rothschild, 1895, p. 338; Bingham, 1907, p. 64, pl. xvi, fig. 105 (♂); Jordan, 1909 *a*, p. 60, t. 32 *a*; Evans, 1927, p. 32 (=*romulus*); id., 1932 *a*, p. 52 (=*romulus*).

Papilio polytes, Davidson & Aitken, 1890, p. 366 (larva, pupa); Bingham, 1907, p. 61, fig. 13 (♂); Bell, 1911, p. 1117, pl. D 2, figs. 25 (♂), 25 *a*, *b* (♀).

Papilio polytes romulus ♂ ab. *astreans*, Jordan, 1909 *a*, p. 61, t. 32 *a*.

Papilio polytes pammon ♀ f. *cyroides*, Fruhstorfer, 1909 *b*, p. 178.

Papilio polytes ♀ f. *rubida*, Fruhstorfer, 1909 *b*, p. 179 (Malabar).

♂. *Upperside* black. Fore wing with not very prominent irrorated lines of pale yellowish scales in the cell and apical area; outer margin with a series of white spots which are narrower at the edge of the wing. Hind wing with a transverse discal series of elongate white spots from inner margin to area 7, these spots divided by the black veins and succeeded by diffuse ill-defined sparse blue scaling on the post-discal area; at the tornal angle an obscure spot, of a deeper black than the ground-colour, surmounted by a lunule of blue scales.

Underside similar to above, with duller and more opaque black ground-colour. Fore wing with cellular and internervular irrorated streaks more prominent. Hind wing

Fig. 46.—*P. polytes romulus* Cram., ♂.

with the discal series of white spots and blue scaling succeeded by a submarginal more or less incomplete series of dingy white lunules, and a row of small, linear, white marginal spots; the tornal spot divided from the blue scaling by an ochraceous line. Antennæ, head, thorax, and abdomen black; head and thorax anteriorly above, and head, thorax, and abdomen below spotted with white, the latter with lateral white lines.

Expanse: ♂♀, 90–100 mm.

♀ form **cyrus** Fabr.—Similar to the ♂; the submarginal series of lunules on the underside ochraceous; in spring specimens these spots are red and larger, often also red on the upperside.

♀ form **romulus** Cram. (fig. 47).—Mimics *Polydorus hector*. Fore wing crossed obliquely from the middle of the cell to the tornal angle by a broad white band somewhat as in *P. hector*, the edges of the band ill defined; this is followed

Fig. 47.—*P. polytes romulus* f. *romulus* Cram., ♀ (Ceylon).

by an ill-defined white patch beyond apex of cell. Hind wing with all the discal, submarginal, and marginal markings red, including a round red spot at the apex of the cell.

♀ form **stichius** Hubn. (fig. 48).—*Upperside* fuliginous-black on fore wing, somewhat darker and velvety on hind wing. Fore wing darker at the base and along the outer margin, and with dark internervular streaks that extend into the cell. Hind wing with from two to six discal elongate white spots, and often with one in the apex of the cell; the lower half of area 1 dark red irrorated with blue scales and with a superposed black tornal spot; the red extends into area 2 below the elongate white mark; a submarginal curved series of red lunules, and marginal paler red spots in the posterior interspaces.

Underside similar to the upperside. Hind wing with a complete series of outer marginal spots, the anterior ones white.

Variation.—This species sometimes produces in the ♂ curious departures from the normal which come under the category of aberrations as distinct from forms.

1. Ab. **sakontala** Hew.—*Upperside* dull, somewhat brownish-black. Fore wing very sparingly irrorated with yellowish scales that form ill-defined cellular and internervular streaks. Hind wing with a discal series of very diffuse greenish-white spots in areas 1 to 7 and an ill-defined tornal reddish lunule; the spots in areas 5 and 6 are the most diffuse, and beyond the whole series there is a post-discal slight irroration of whitish scales.

Underside of fore wing opaque dark brown, the internervular streaks broader, more prominent than on the upperside. Hind wing black, with a discal series of elongate dingy white spots, larger and more clearly defined than above, followed

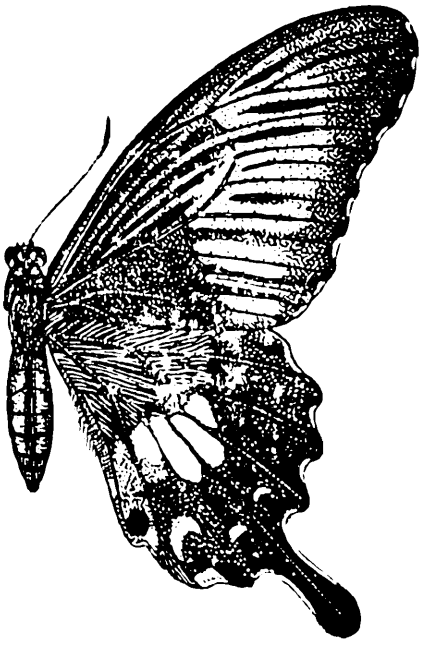


Fig. 48.—*P. polytes romulus* f. *stichius* Hübn., ♀ (Narkundâh, October).

by a large tornal, more or less vermilion-red spot with a black centre, and a submarginal series of similarly coloured lunules; the discal spot in area 2 bordered distally by an outwardly-curved lunule. Cilia black alternated with white.

Expanse: 107 mm.

Only a few specimens have been found, and these were taken at Mussoorie, Sikkim, Assam, Sylhet, and the Naga Hills.

2. Ab. **walkeri** Jans.—*Upperside* sooty-black. Fore wing with four short ochraceous lines in the cell, three similar lines in area 1, and two post-discal ones in each of areas 2 to 8; outer margin with small white spots at the end of the veins. Hind wing with a broad transverse discal band of blue scaling, somewhat diffuse at the edges, followed by a transverse post-discal series of ochraceous-white quadrate spots, those in

areas 5 and 6 more or less lunular, and a marginal series of similarly coloured very slender lunules.

Underside with duller ground-colour on the fore wing, more sooty-brown than black. Fore wing as on the upperside, but the lines or bands of the post-discal series more elongate in the anterior interspaces. Hind wing with slightly darker ground-colour, the blue discal band replaced by short, very broad streaks of inwardly ochraceous, outwardly blue scales in areas 1 to 4, and indications of similar streaks in the areas above, the ochraceous and blue scaling of the streaks separated by a black spot; the post-discal spots and marginal narrow lunules as on the upperside but larger; an intervening series of velvety black spots between the discal and post-discal markings. Antennæ, head, thorax, and abdomen sooty-black, a few white specks on the thorax below.

Expanse: 113 mm.

Since a specimen taken in Southern India received this name in 1879 no others have been found.

3. Ab. **astreans** Jord.—*Upperside* of fore wing with much larger marginal white spots which extend into area 8. Hind wing with the discal white spots replaced by a series of velvety black spots darker than the ground-colour, bordered on the inner side narrowly, on the outer side much more broadly, by ill-defined diffuse blue scaling; the black tornal spot in area 1 centred by an irregular deep ochraceous-red spot; above this a quadrate white spot, and in line with it in area 2 is a similar but narrower white spot; there is a minute white discal spot also in area 5.

Underside resembles the upperside, ground-colour duller. Fore wing with larger marginal spots. Hind wing with a discal series of extremely elongate streaks beyond the cell; these streaks are rich ochraceous-red mixed with white, but become pure white in the anterior areas; the streaks in areas 1 to 5 interrupted along their inner halves by a row of spots of a shade darker than the ground-colour and outwardly bordered by diffuse blue scaling.

A single example was taken in the Nilgiris. A second specimen, upon which the name is based, was taken at Coimbatore in South India. In this the two posterior discal spots of the hind wing above are small and white ,the others are absent or replaced by bluish nebulous spots, which are joined to a second row of bluish spots. Underside of hind wing with five white discal spots which form the proximal boundary of long red, bluish, and yellowish-grey stripes, whose distal ends correspond to the submarginal spots of normal specimens.

Two unimportant ♀ forms have been named by Fruhstorfer. ♀ f. **cyroides** Fruhst. is said to represent dry-season *cyrus* specimens from Sikkim. Fore wing with large ochre-yellow marginal spots ; hind wing on both sides with a complete row of larger pale red submarginal lunules.

The name **rubida** Fruhst. indicates specimens of *romulus* ♀ with the red markings of the hind wing much enlarged, especially the patch in area 1 and the cell-spot. The type is illustrated by fig. 1 *b* on plate 464 in Lep. Ind. vol. v.

Aberrations of the ♀ are even rarer. A remarkable specimen in which two forms are mixed is described and figured by O. C. Ollenbach in the Journ. Bombay Nat. Hist. Soc. xxxiv, p. 832, 1930. The right side is of the *romulus* form and the left side of the *cyrus* form, except for two splashes of red on the white discal band above. The left wings are smaller than those of the right. The specimen was taken at Dehra Dun in October, 1924, by Miss Floris Tarachand.

Bionomics.—The species has been closely studied on Barkuda Island in Lake Chilka, in the north-east corner of Madras (*Annandale & Dover*, 1921). It is common there, and all three forms of ♀ were taken. The *stichius* form was much the most abundant, and the *cyrus* form extremely rare ; only one *cyrus* was taken in two seasons. The *stichius* form is probably at least three times as abundant as the *romulus* form. The species bred in considerable numbers in the thickets of *Glycosma* that cover a large part of the island, and in the opinion of the observers its abundance was probably due not so much to any special freedom from attack bestowed upon it by its polymorphic and mimetic females as to the abundance of its food-plants, the scarcity of competitors, and its skill in threading its way through the dense branches and foliage of the shrubs.

The same authors (1921) give an account of the distribution of the ♀ forms. It appears from this that the commonest form is *stichius* (called *polytes* by the authors), which occurs all over Peninsular India, extending to Burma, where in the north, it is the only form found. Next comes the *romulus* form, which occupies all the area covered by its model *P hector*, and extends to Kumaon, where it occurs in the Terai ; in the districts of Dehra Dun and Lucknow it is much less common.

The form *cyrus* is the least common, and appears to be absent from Kumaon, the Konkan, and around Lucknow and Madras City. It occurs in Tavoy.

No mention is made of Ceylon, Sikkim, or Assam in the table given by Annandale and Dover. If the observations for Peninsular India are correct a more variable relationship exists there between the ♀ forms than is the case in Ceylon,

where, as stated previously, a condition of Mendelian stability has been reached.

Williams (1927, p. 19) records this species as having taken part in a migratory flight in Ceylon.

Habitat.—CEYLON, the whole of INDIA, and BURMA. Also extending to Tong-king, the Malay Peninsula, Natuna and Lingga Islands.

51 *b*. **Papilio polytes stichioides** Evans.

Papilio polytes stichioides, Evans, 1912, p. 972, ♀ (Andamans and Nicobars); id., 1923, p. 238; id., 1932 *a*, p. 52 (Andamans).

♂. Larger than *romulus*. *Upperside* of hind wing without marginal red lunules, the band broader.

♀, **cyrus** form.—Band of hind wing broader than in the ♂.

♀, **stichius** form.—Larger than mainland specimens, with very large and pure white discal area of five patches on hind wing.

The name *stichioides* was based upon a ♀ specimen of the *stichius* form; the holotype is now lost. In 1932 the name was restricted by Evans to Andaman specimens.

Habitat.—ANDAMAN ISLANDS; common. The *cyrus* ♀ appears to be rare.

51 *c*. **Papilio polytes nikobarus** Felder.

Papilio pammon var. *nikobarus*, C. Felder, 1862, p. 483 (Nicobars); Moore, 1877 *a*, p. 592; Wood-Mason, 1880, p. 237; Wood-Mason & de Nicéville, 1881 *b*, p. 253; id., 1882, p. 18.

Papilio polytes nikobarus, Jordan, 1909 *a*, p. 61; Evans, 1927, p. 32; id., 1932 *a*, p. 52.

♂. Larger than *romulus*, and the hind wing upperside with a narrower band.

♀, **cyrus** form.—Hind wing upperside with submarginal red lunules slightly developed, and band narrow as in the ♂.

♀, **stichius** form.—Apparently quite similar to mainland specimens.

Habitat.—NICOBAR ISLANDS; common. The ♀ form *stichius* is apparently rather rare.

52. **Papilio liomedon** Moore.

Papilio liomedon, Moore, 1874 *b*, p. 575 (Calicut); Hampson, 1889, p. 364; Davidson & Aitkin, 1890, p. 367, pl. D, figs. 1, 2, 3 (larva, pupa); Jordan, 1909 *a*, p. 51, t. 21 *a*.

Papilio demolion liomedon, Rothschild, 1895, p. 283; Bingham, 1907, pp. 44, 45; Evans, 1923, p. 238; id., 1927, p. 32; id., 1932 *a*, p. 52.

Araminta liomedon, Moore, 1902, p. 221, pl. 466, figs. 1 *a*–1 *c* (larva, pupa, ♂♀).

This species was considered by Jordan (1909 *a*) to be distinct from *demolion* on account of a difference in the genitalia. Both are geographically quite separated, and although one must have been derived from the other, it would appear that *liomedon* has become specifically distinct. Similar cases of distinct but closely allied species occur in the Malay islands.

♂♀. *Upperside* brownish-black. Both wings crossed by a broad, prominent, oblique, greenish-yellow band from the apex of fore wing to the middle of the inner margin of hind wing; on the fore wing the band is composed of separate spots; on the hind wing the band passes through the apex of the cell. Hind wing with a submarginal series of greenish-yellow lunules.

Underside fuliginous-black with transverse band as above, and other markings very smiilar to those in *demolion*.

Expanse: 90–100 mm.

Genitalia.—"Harpe of ♂ broad and flat, dentate at the margin, without pointed processes. ♀ armature consisting principally of two dentate and rounded-off triangular chitinous lobes, each of which is placed laterally behind the vaginal opening" (*Jordan*, 1909 *a*).

Early stages.—The following account is from Davidson and Aitken (1890):—A ♀ was observed laying its eggs on a tender shoot of a small jungle tree or shrub (*Acronychia laurifolia* Bl.). There were "ten eggs laid one on top of the other." Of the caterpillars which emerged five days after the eggs were laid, "five passed successfully through all dangers and became beautiful specimens, one female and four males. (This is one of the butterflies of which we rarely find females). All through their lives these larvæ continued gregarious, dispersing occasionally to feed, but always returning to rest side by side on the upper surface of a leaf. The following dates may be interesting. Eggs laid 2nd August, hatched 7th August; skins cast (and eaten) 12th August; again 17th August; again 20th to 22nd August. The most advanced cast its skin again on the 28th August, became a pupa on the 2nd September, and emerged on the 15th September. The others followed within two days. At first the larvæ were of an oily yellow colour and bore many pairs of spiny points, but these disappeared with age, and after the last moult there were only the short fleshy processes on the 2nd and last segment which characterize the group, and one additional curved pair on the 9th segment.

"The colour after the last moult was a clear slaty-blue, changing eventually to a greenish tint, with light brown markings very much the same as those which characterize the rest of the group. The pupa was more abruptly bent back from the middle of the thorax than that of *P. erithonius* (i. e. *P. demoleus*) and adorned on the thorax with a sword-shaped horn, fully three-eighths of an inch long, and always

bent either to the right or the left. The colour was brown or green and yellow according to situation."

Bell (in MSS.) notes:—"Many eggs are parasitized by a very small black ichneumon; in a stick of eggs none escape as a rule. The larvæ are often parasitized, but by a different species of ichneumon; if one larva of a brood suffers, then the whole lot perish as a rule. The mortality, calculated in various years, amounts to about 99 per cent. of the eggs deposited. The imago is usually local, in some years scarce. In 1901 in Karwar it was extremely numerous. Some are always to be caught in the monsoon months at the tops of hills in the jungle, where they fly along through the tree-tops in the thickest places. The female flies lower down in even thicker jungle as a rule, and is not easy to find. The butterflies visit flowers frequently in the early morning, but hardly ever come near the ground. Hannyngton says it is double-brooded, and comes to flowers of *Mussænda frondosa* Linn., family Rubiaceæ.

"Kanara specimens show a slight sprinkling of yellow scales on the upperside of fore wing in both sexes, and the hind wing underside at the base is sprinkled plentifully with grey scales inside the broad white band."

Habitat.—SOUTHERN INDIA.

According to Yates (1931) this is the rarest *Papilio* found in Coorg, where it frequents evergreen forest, and is attracted by the flowers of *Mussænda frondosa*, *Lantana*, and *Clerodendron* among others. Occasionally comes to water.

Papilio demolion Cramer.

Resembles *liomedon*, the posterior spots of the band of the fore wing always contiguous, and on the hind wing the band does not enter the cell.

Genitalia.—"Harpe of ♂ almost linear, and bears towards the base and at the tip a long spine-like process. The ♀ armature consists principally of two dentate, pointed, triangular chitinous lobes, each of which is placed laterally behind the vaginal opening" (*Jordan*, 1909 *a*).

Larva and *Pupa.*—Very similar to *liomedon*.

Habits.—Frequents wooded country and visits flowers, before which it hovers with a fluttering motion of the wing, as it sucks the honey. Ollenbach (1921 *a*), writing of this species in Tavoy, says it is "common in dense forest in the hills and occasionally along streams at the foot of the hills. It has a very rapid flight, and is difficult to catch. It has a regular beat, round and round which it goes during the warmest hours of the day."

Distribution.—BURMA to Lombok and Palawan. One of the three known subspecies is found in the Indian area.

53. **Papilio demolion demolion** Cramer.

Papilio demolion, Cramer, 1776, p. 140, pl. 89, figs. A, B ; Horsfield & Moore, 1857, p. 105, pl. 3, figs. 5 (larva), 5 *a* (pupa) ; Fountaine, 1915 *a*, p. 456, pl. 66, figs. 1 (microp.), 2 (larva), 3 (pupa), 4 (imago) ; id., 1915 *b*, p. lxxix ; Ollenbach, 1921 *a*, p. 895.

Papilio demolion demolion, Rothschild, 1895, pp. 282–3 ; Bingham, 1907, pp. 41, 44 ; Jordan, 1909 *a*, p. 51, t. 21 *a* ; Evans, 1923, p. 238, pl. iv, fig. A 4.26 (♂) ; id., 1932 *a*, p. 52, pl. iv, fig. A 4.26 (♂).

Araminta demolion, Moore, 1902, p. 219, pl. 460, figs. 1, 1 *a*–1*c* (♂♀, larva, pupa).

♂♀. *Upperside* brownish-black. Fore and hind wings crossed by a broad, prominent, oblique, pale greenish- or yellowish-white band that commences just before the middle of the inner margin of the hind wing, and is continued on the fore wing as a series of spots that diminish in size anteriorly to the apex of the wing ; on the hind wing this is followed by a submarginal series of similarly coloured lunules.

Underside fuliginous-black, with transverse band as above. Fore wing with four slender longitudinal pale lines in the cell ; the veins also picked out with pale lines ; on the veins that run to the outer margin these lines are conspicuous only at the apices ; there are besides short similar lines between the veins that extend to the outer margin. Hind wing with post-discal broad jet-black streaks reaching the submarginal lunules ; these streaks medially interrupted by a transverse line of blue scales, and succeeded in areas 1 and 7 by preapical ochraceous-yellow spots ; outer margin beyond the line of lunules black. Antennæ, head, thorax, and abdomen fuliginous-black ; beneath, the palpi and abdomen greenish-white, thorax dark grey. ♀ with anal ring of hind wing more red than in *liomedon*.

Expanse : ♂♀, 90–100 mm.

Habitat.—South Burma ; not rare.

Demoleus Group.

Body without white dots, entirely yellow beneath or at most with black lines. *Underside* of fore wing with base of cell striped with pale yellow ; the greater part of the hind wing or at least a large central area pale yellow. Hind wing with or without a short slender tail.

Papilio demoleus Linnæus. (Fig. 49 *a*, *b*, genitalia).

♂♀. Body below, head at the sides, and a stripe on each side of thorax pale yellow. Fore wing above at the base dotted with pale yellow, these dots united into transverse lines ; a large cell-patch, usually divided into two spots, at the upper angle of cell two or three spots ; a macular discal band, the upper

spots small and placed far apart, the posterior ones large and usually contiguous ; band on the hind wing not interrupted ; both wings with a row of submarginal spots and small marginal lunules ; hind wing with a red anal spot. Not tailed.

Genitalia.—Harpe (fig. 49) a cup-like plate which fills the basal half (and more) of the valve cavity ; its ventral edge is rounded and thickened, and its dorsal edge rises into a thin chitinous wall of considerable height, the summit of which is serrated with sharp teeth ; this dorsal edge consists of three parallel laminæ of various lengths and heights, of which the inmost (also the tallest) alone is serrate (*Gosse;* 1883).

Egg.—Pale yellow.

Larva.—" The young larva blackish, a large V-spot in the middle, a lateral stripe from the prothorax backwards, and

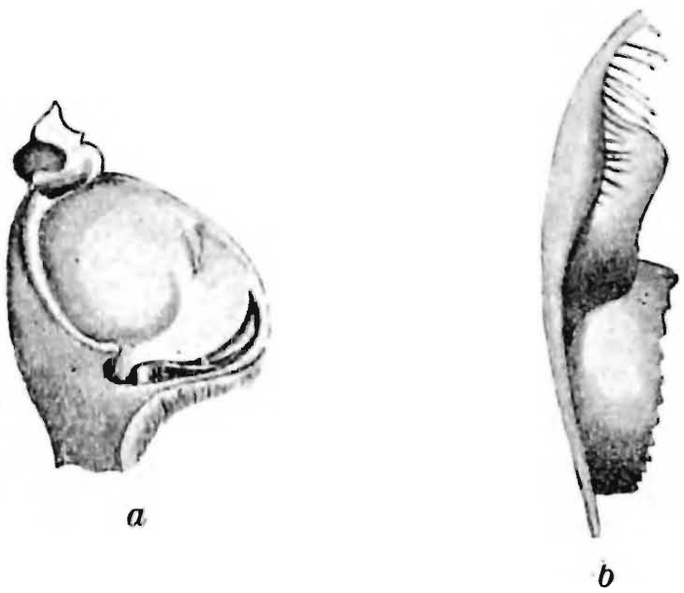


Fig. 49.—*P. demoleus* Linn., genitalia. (After Gosse).
a, valve and harpe ; *b*, harpe, dorsal view, showing the elevated triple wall.

a second stripe, running from the anal segment forwards, milky-white ; several rows of setiferous processes " (*Jordan,* 1909 *a*).

Full-grown larva :—Body above yellow-green, with a fairly broad greasy-looking white lateral band from segment 5 to the end. The perpendicular part of the anal segment is whitish. The green dorsal part of segments 2 to 5 is bordered narrowly with a curved black line, and does not reach the base of the legs, the part below, as well as abdomen and legs, being a dirty transparent white. On segments 8 and 9 is a diagonal band reaching from the centre of 9 near dorsum to the anterior margin of segment 8 ; this band is irregular in contour and is yellow-brown spotted with lighter colour. There is a similarly coloured patch at the posterior lower

margin of segment 10. Prolegs large and fleshy. The bands are sometimes obsolescent. Osmeterium flesh-coloured. Length 33 mm. ; breadth 7 mm. (from *Bell*, 1911).

Pupa.—Head with two short frontal projections which are separated widely and squarely by a sharp ridge forming the front margin of head. Abdomen, dorsally on segments 4 to 8 rather flat, the wing-expansions very slight, so that at segment 7 the pupa is very little broader than at the shoulders. Cremaster square and broad. A pair of very small tubercles at the base of each of the head-projections, and a subdorsal one on each of segments 8 to 11. Colour green, mixed with yellow on dorsum of abdomen. When a pupa is formed in a cage or not among leaves it is generally different shades of browns and greys. Length 30 mm. ; breadth 10 mm. (from *Bell*, 1911).

Habits.—The larva feeds on plants of the family Rutaceae. It is much subject to attack by parasites. The pupa is formed on the underside of a leaf, against a stalk or twig, and the supporting loop is rather short.

The butterfly has a very quick and strong flight. It does not rise much above the ground and is fond of flowers and the sun, visiting by preference the flowers of *Citrus* trees and *Raphanus* ; it also congregates at puddles, where it drinks with closed wings. It is commoner in the plains than in wooded country and hills, and may be seen on the wing throughout the year. Recorded by Williams (1927, p. 19) as having taken part in a migratory flight in Ceylon.

Distribution.—China to the Malay Peninsula, the smaller Sunda Islands to N. Australia and South New Guinea ; absent from the Philippines, the large Sunda Islands, Celebes, and the Moluccas. Its range extends to Persia, Arabia, and the whole of Africa. Only about six subspecies are known, two of which occur in the Indian area.

54 *a*. **Papilio demoleus demoleus** Linnæus. (Fig. 50, imago).

Papilio demoleus, Linnæus, 1758, p. 464 ; Clerck, 1764, t. 6, fig. 1 ; Ghosh, 1914, p. 34 (early stages) ; Bell, 1911, p. 1116 pl. D 5, fig. 27 (♂).

Papilio demoleus demoleus, Rothschild, 1895, p. 279 ; Bingham, 1907, pp. 35, 39, fig. 7 ; Seitz, 1907, p. 18, t. 6 *d* ; Jordan, 1909 *a*, p. 48 ; Evans, 1923, p. 238, pl. 5, fig. A 4.27 (♂) ; id., 1932 *a*, p. 52, pl. v, fig. A 4.27 (♂) ; id., 1932 *b*, p. 198 (Baluchistan).

Papilio erithonius, Cramer, 1780 *a*, p. 67, pl. 232, figs. A, B ; Horsfield & Moore, 1857, p. 105, pl. 3, figs. 6 (larva), 6 *a* (pupa) ; Gosse, 1883, p. 314, pl. xxxi, figs. 9–12 (genitalia) ; Davidson & Aitken, 1890, p. 366 ; Fletcher, 1925, p. 179 (migration).

Orpheides erithonius, Moore, 1881 *a*, p. 147, pl. 61, fig. 2 ; id., 1902, p. 234, pl. 466, figs. 1, 1 *a*–1 *c* (♂♀, larva, pupa).

Papilio epius, Fabricius, 1793, p. 35.

Papilio erithonius var. *demoleinus*, Oberthür, 1879, p.57.

Papilio demoleus f. *demoleinus*, Jordan, 1909 *a*, p. 48.

♂♀. *Upperside* black. Fore wing with the base below cell and basal half of latter so irrorated with yellow scales as to form more or less complete transverse dotted lines; two outwardly oblique yellow spots in the cell and a curved spot at its upper apex; a spot at the base and another beyond it in area 8; a discal transverse series of creamy-yellow spots, irregular in arrangement and size, extends from area 1 *a* to 8, interrupted in area 5, and the spot in area 7 double; this is followed by a sinuous post-discal series of spots and a marginal series of smaller spots. In many specimens between the discal and post-discal series the black ground-colour is irrorated with yellowish scales. Hind wing with the base, and an edging that decreases in width along the inner margin, irrorated with yellow scales; a broad discal irregular yellow band, its inner edge curved inwards, its outer edge very irregular and uneven; this band crosses the cell and does not reach the apex; beyond

Fig. 50.—*P. demoleus demoleus* (Linn.).

the cell a few creamy-yellow spots, and the ground-colour irrorated with yellowish scales; a sinuous post-discal series of outwardly emarginate yellow spots, and a marginal series of yellow spots as on the fore wing; at the tornal angle an oval ochraceous-red spot emarginate on its inner side in the ♀ and in both sexes surmounted by a blue lunule; in area 7 between the discal and post-discal spot is a large ocellus-like spot of the black ground-colour, more or less irrorated with blue scales.

Underside with similar ground-colour, the markings paler and much larger. Fore wing in the basal half of cell and base of wing below it with cream-coloured streaks that coalesce at the base; irregular ochraceous spots in areas 5 to 8, and the discal band not interrupted in area 5. Hind wing black at the base, and along the inner margin centred largely with pale cream-colour; the ocellus in area 7, the apex of cell,

and the black ground-colour between the discal and post-discal markings in areas 2 to 6 centred with ochraceous, margined with blue. Antennæ dark reddish-brown, touched with ochraceous on inner side towards the club ; head, thorax, and abdomen dusky black , palpi, thorax, and abdomen beneath cream-yellow, the latter with lateral longitudinal lines.

Expanse : ♂♀, 80–100 mm.

Variation.—The red spot of the hind wing is sometimes reduced proximally, and therefore separated from the blue lunule by a black spot. This is f. **demoleinus** Ob.

Many specimens have on the fore wing above a small discal spot before vein 5 ; sometimes (especially in Ceylon specimens) there are two small spots on the hind wing above, outside the cell, between veins 4 and 6.

Habitat.—CEYLON, the whole of INDIA to NORTHERN BURMA. Also extending to Persia and Arabia. Very common.

54 *b*. **Papilio demoleus malayanus** Wallace.

Papilio erithonius var. *malayanus*, Wallace, 1865, p. 59 ; Distant, 1885, p. 350, pl. 27 *b*, fig. 6.

Papilio demoleus malayanus, Rothschild, 1895, p. 281 ; Bingham, 1907, pp. 39, 40 ; Jordan, 1909 *a*, p. 48 ; Evans, 1927, p. 33 ; id., 1932 *a*, p. 52.

Orpheides malayanus, Moore, 1889, p. 50.

♂♀. *Upperside* of fore wing with the three posterior patches of the discal band broader than in the nominotypical form, and less than a fourth of the cell at the apex is black. Intermediate examples occur between the two races in parts of Burma.

Habitat.—SOUTHERN BURMA, extending to Annam, Siam, and the Malay Peninsula ; common.

55. **Papilio alexanor alexanor** Esper.

Papilio alexanor, Esper, 1799, p. 89, t. cx, cont. t. lxv, fig. 1 ; Verity, 1905–11, p. 8, pl. v, fig. 6, ♀ ; Seitz, 1907, p. 13, t. 7 *a* ; Evans, 1923, p. 238 ; id., 1927, p. 33 ; id., 1932 *a*, p. 53 ; id., 1932 *b*, p. 198 (Baluchistan).

♂♀. Pattern similar to *machaon*. *Upperside* of fore wing with the basal third not entirely black, but bordered basally and distally by a broad black band. The bands are continued across the hind wing, bordering also here the yellow basal area. Fore wing with a black bar across the cell, placed near vein 3 and more proximal than in *machaon* ; also a bar across the end of the cell. Hind wing with a black bar across end of cell, heavier than in *machaon* and reaching vein 3 or below it. Abdomen yellow, with a wide black dorsal band.

Expanse : ♂♀, 75–90 mm.

Larva.—Whitish-green, with a black band on the anterior part of each segment, and nine black and yellow dots. Feeds on *Seseli dioicum*, *S. montanum*, *Ptychotis heterophylla*, and other Umbelliferæ.

Pupa.—Differs from *machaon* in being flattened on the dorso-ventral side, the head square and not bifurcate, the three thoracic processes only slightly produced. Light or dark grey with darker patches. It is fastened upon stones and resembles a small splinter of stone.

Habitat.—A strictly Palæarctic species which enters BALUCHISTAN, where it is extremely rare. Its real home is the Mediterranean region, extending to East Persia and Turkestan.

Papilio machaon Linnæus. (Fig. 51 *a–c*, genitalia).

A very variable species, with about thirty-five subspecies in Europe and Asia, seven of these occurring in the Indian

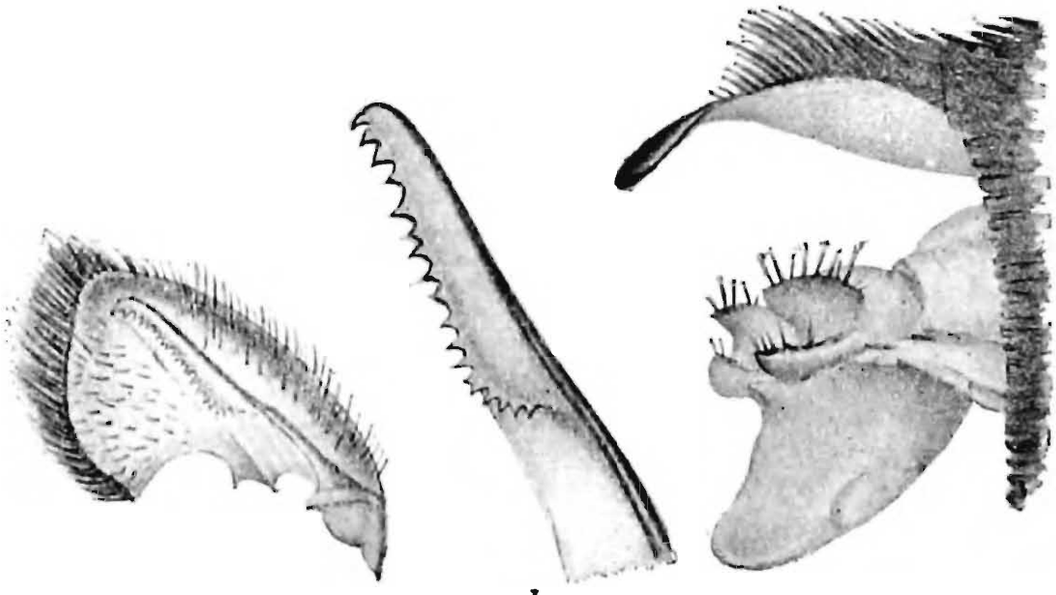


Fig. 51.—*P. machaon* Linn., genitalia. (After Gosse).
a, valve and harpe ; *b*, harpe ; *c*, lateral view of genitalia with both valves removed.

area. The Indian races mix freely with each other where they meet, and so transitional forms are found in such areas.

The species has formed the subject of detailed investigation by Eller (1936), who is still pursuing his researches. This work has been followed in the treatment of this species here.

♂♀. *Upperside* of fore wing with basal area more or less irrorated with yellow scaling ; a bar across middle of cell, and a less broader bar across end of cell ; a yellow discal band formed of somewhat oblong patches, the patch in 1 *a*

larger than the others, and those in 1 *a* to 4 placed close to the cell; anterior patches smaller and more widely separated; a submarginal row of small yellow spots, between which and the discal band is a line or band of blue scaling. Hind wing with proximal yellow area, which reaches to beyond the cell, the veins crossing it, or at least the middle discocellular, more or less darkened; inner margin usually blackish; a submarginal row of yellow spots which are larger than those on the fore wing, and between these and the yellow area is a line or band of blue scaling; a prominent red tornal spot; at vein 4 the wing produced to a slender tail.

Genitalia.—Harpe (fig. 51 *a*, *b*) a knife-like blade, its dorsal edge minutely serrate, slightly incurved and broader posteriorly (*Gosse*, 1883, p. 302, pl. xxix, figs. 14–16).

Egg.—Spherical and relatively large. At first yellow, but later with reddish markings. Deposited on young shoots or on the flowers, usually singly, but sometimes in a group of four or five.

Larva.—The young larva is black, with numerous tubercles and a white band round the middle. After the first moult it is black with orange tubercles, the band being greenish-white. After the third moult there are green bands round most of the segments. After the fourth moult these bands are larger and the tubercles are reddish. In the penultimate instar the larva is green, with a black band between and upon each segment, also each segment bears six to eight pointed orange-red tubercles. In the final instar the tubercles are reduced to red or yellow spots. The size of the black bands is very variable. The osmeterium is bright orange.

Food-plant.—Species of Umbelliferæ, especially *Daucus*. The larva is much attacked by ichneumons.

Pupa.—With two rows of dorsal tubercles; head bifurcate. Coloured green, brown or grey, according to the surface upon which it rests.

Distribution.—The whole Palæarctic Region to Siberia and Alaska, inclusive of North Africa, but not of Madeira or the Canary Islands; in NORTHERN INDIA from BALUCHISTAN to NORTHERN BURMA. A very variable species, which splits into many subspecies, four of which occur in the Indian area.

56 *a*. **Papilio machaon centralis** Staudinger.

Papilio machaon var. *centralis*, Staudinger, 1886, p. 193 (Turkestan); Seitz, 1907, p. 12; Evans, 1932 *a*, p. 53; id., 1932 *b*, p. 198 (Baluchistan).

Papilio hippocrates f. *centralis*, Verity, 1905–11, pp. 14, 295, pl. ii, fig. 9, t. lii, fig. 3, t. lxi, fig. 15 (♀).

♂♀. Characterized by the extended yellow markings. Fore wing strongly dusted with yellow at the base. Hind

wing at the base and inner margin only slightly black. Abdomen of the ♂ pale yellow without black markings, in the ♀ with a narrow stripe of reddish-brown.

Expanse: ♂♀, 75–90 mm.

Habitat.—BALUCHISTAN and the NORTH-WEST FRONTIER; not rare. Belongs strictly to Turkestan.

56 *b*. **Papilio machaon asiatica** Ménétries. (Fig. 52 *a*, imago).

Papilio machaon var. *asiatica*, Ménétries, 1855, p. 70.
Papilio asiatica, Moore, 1882, p. 258.
Papilio machaon asiatica, Jordan, 1909 *a*, p. 47; Seitz, 1907, p. 12, t. 6 *b*; Riley, 1927, p. 120; Evans, 1923, p. 239; id., 1927, p. 120; id., 1932 *a*, p. 53; Eller, 1936, p. 40.
Papilio machaon sphyrus, Bingham, 1907, p. 36, fig. 6 *a*.
Papilio machaon archias var. *sikkimensides*, Verity, 1911, p. 296, pl. lxii, fig. 1 (♀, South Kashmir).
Papilio machaon chitralensis, O. Bang-Haas, 1934, p. 175 (Chitral).
Papilio machaon sculda, Peschke, 1934, p. 430 (Kashmir).

♂♀. This race is very close to *sphyrus* Hübn., the dark form from Southern Europe. It has always very broad black bands, and differs chiefly from *sphyrus* in having the yellow-dusted discal band of the hind wing beneath much narrower at vein 4.

Upperside of fore wing dull black, irrorated on its basal third with yellow scales, which also form a transverse diffuse post-discal band and a diffuse preapical spot; a broad band across the middle of the cell, another narrower and similar band at its apex, a narrow streak at base of area 9, a quadrate spot near base of area 8, a transverse discal series of broad stripes that decrease in length towards the costa in areas 1 *a* to 7, and a submarginal series of crescentic spots creamy-yellow; the streak in area 7 with a superposed irregular diamond-shaped black spot. Hind wing with a creamy-yellow area comprising the cell and stripes beyond, divided only by the black veins. The stripes beyond the cell are variable in length and occupy fully three-fourths of the inner margin and of area 1; they decrease suddenly and considerably in areas 2 to 5 and lengthen again in the anterior areas. Distal area of wing black, with a superposed post-discal transverse series of diffuse blue spots and a submarginal series of cream-coloured lunules. An ochraceous-red tornal spot below the blue post-discal spot in area 1; base and inner margin shaded with black irrorated with yellow scales; fringes prominently yellow between the veins. The depth of the tint of the cream-coloured portions of both wings is very variable; so also is the width of the black areas, especially on the hind wing, and also the size of the blue post-discal spots on this wing.

Underside pale cream-colour. Fore wing with two transverse short bands across the cell, and one beyond its apex where it borders the discocellulars; a prominent broad transverse discal band and a marginal broad line; all these markings black; the bands across the cell and beyond its apex more or less diffuse, the discal band with its middle very broadly cream-coloured from areas 2 to 7, and thickly sprinkled with black scales. Hind wing with the veins and a marginal broad line black; the black on the upperside shows through as an irregular, transverse, sinuous, bluish discal band thickly sprinkled with black scales, and is bordered on its inner and outer edges by broken transverse black lines, the inner line margined on the outer side by a diffuse blue scaling, and on the inner side in areas 3 and 4 by an ochraceous-red spot;

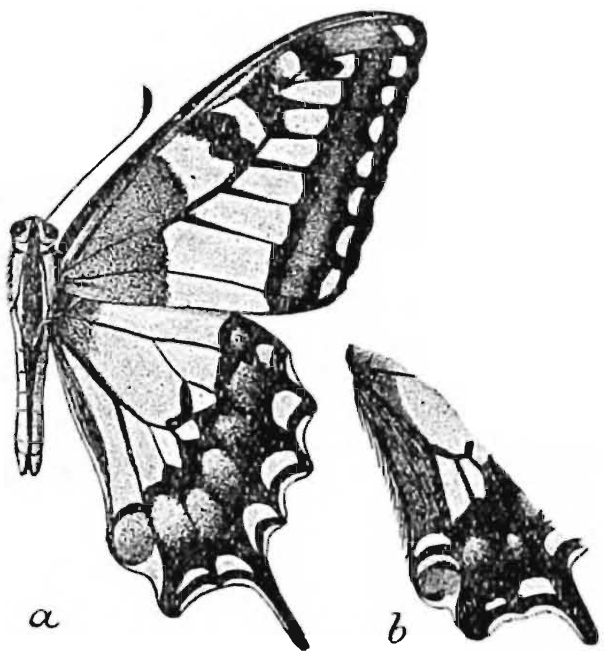


Fig. 52.—*a*, *P. machaon asiatica* Mén.; *b*, *P. machaon annæ* Gistel, tornal portion of hind wing.

tornal spot and fringes of both wings as above. Antennæ black; head, thorax, and abdomen cream-colour, on the upperside with a black mesial streak, which is narrow in the ♂ and very broad in the ♀; abdomen beneath with narrow lateral ill-defined black lines.

Expanse: ♂♀, 75–90 mm.

♂. Differs from *ladakensis* in the longer tails, in the usually narrower and more acute fore wing, in the increased black markings, and in the position and extent of the submarginal bands, which are uniformly broad, and reduced, especially in the cell. The veins on the hind wing in *ladakensis* bear few scales or none, but in *asiatica* they are entirely scaled. The inner area of hind wing and the abdomen not so strongly

hairy as in *ladakensis*, the hairs darker. *Underside* with both submarginal dark bands usually present, whilst in *ladakensis* the distal band is absent; the stripe dividing the two bands in *asiatica* is yellowish, but in *ladakensis* the greater part of this area is yellow, and the stripe appears yellowish-green.

At least two broods occur, except at the higher elevations. The summer specimens are larger than those which emerge from hibernated pupæ in the spring.

Habitat.—North of the Indus: CHITRAL and KASHMIR to Tibet as far as Everest (Rongshar Valley). Occurs in the valleys from February to October, but in the mountains not before March or April, from 2,000 to 14,000 feet.

56 *c*. **Papilio machaon ladakensis** Moore.

Papilio ladakensis, Moore, 1884, p. 46 (Ladak); id., 1903, p. 43, pl. 482, fig. 2 (♂) (Ladak).
Papilio machaon var. *ladakensis*, Verity, 1906–11, pp. 14, 298, pl. v, fig. 9 (♂), pl. lx, fig. 16 (♂, Dras), fig. 17 (♀, Ladak), pl. lxi, fig. 3 (♂, Dras).
Papilio machaon asiatica f. *ladakensis*, Jordan, 1909 *a*, p. 47.
Papilio machaon ladakensis, Evans, 1923, p. 239; id., 1927, p. 33; id., 1932 *a*, p. 53; Eller, 1936, p. 62, t. viii, fig. 30 (imago), t. xii, fig. 18 (genitalia).

♂♀. Distinguished from *asiatica* by the short tail. *Upperside* paler yellow. Fore wing dusted plentifully with yellow; cell-bars shorter and broader, the inner bar usually quadrate; discal band comparatively narrower, the veins crossing it less heavily black; submarginal spots broader. Hind wing with the outer edge of the yellow basal area incurved between the veins; submarginal spots shorter and somewhat broader; anal spot smaller and broader.

Habitat.—LADAK, at high elevations, extending to the Pamirs at over 13,000 feet.

56 *d*. **Papilio machaon penjabensis** Eimer.

Papilio machaon penjabensis, Eimer, 1895, p. 104 (Dehra Dun, Allahabad); Verity, 1911, p. 296, pl. ii, fig. 4 (♂); Eller, 1936, p. 62, pl. vi, fig. 27 (imago), pl. xii, fig. 20 (genitalia).

♂♀. A smaller form than *asiaticus*, the fore wing narrower, the tails longer, and with narrower submarginal bands.

Habitat.—PUNJAB to KUMAON.

56 *e*. **Papilio machaon emihippocrates** Verity.

Papilio machaon var. *emihippocrates*, Verity, 1911, p. 296 (Nepal), pl. lxi, figs. 8, 9 (♂♀).
Papilio asiatica, Moore (*non* Mén.), 1903, pl. 481, fig. 1 *c*.

♂♀. In this race, which is only slightly differentiated from

penjabensis, the markings of the latter are more emphasized. Fore wing marginal band black, its distal edge sinuate; submarginal band anteriorly wedge-shaped. Hind wing marginal band broad, reaching almost to the cell, the spots in areas 4 and 5 being very small; blue spots not developed anteriorly in the ♂.

Habitat.—NEPAL.

56 *f*. **Papilio machaon annæ** Gistel. (Fig. 52 *b*, imago).

Papilio annæ, Gistel, 1857, p. 603.
Papilio machaon annæ, Hemming, 1935, p. 122.
Papilio sikkimensis, Moore, 1884, p. 47; id., 1903, p. 44, pl. 482, figs. 3, 3 *a* (♂♀).
Papilio machaon sikkimensis, Rothschild, 1895, p. 276; Bingham, 1907, pp. 37–8, fig. 6 *b*; Jordan, 1909 *a*, p. 47; Seitz, 1907, p. 12; Verity, 1906–11, p. 15, pl. 3, fig. 4, pl. 52, fig. 6; Riley, 1927, p. 120; Evans, 1923, p. 239; id., 1927, p. 30; id., 1932 *a*, p. 53.

♂♀. Distinguished from *asiatica* by the still broader black bands, and by the red tornal spot on hind wing being separated from the blue crescent by a curved black mark.

Upperside of fore wing with the discal patches much shorter than in *asiatica*, and conspicuously separated from one another by the broad black edgings to the veins. Hind wing with inner margin very broadly bordered with black, which in area 1 all but merges into the black marginal area; the inner edge of this black area extends straight across the wing and is only slightly curved, not zigzag.

Underside darker than in *asiatica*.

Habitat.—SIKKIM to BHUTAN; not rare: more common in Tibetan territory.

56 *g*. **Papilio machaon verityi** Fruhstorfer.

Papilio machaon verityi, Fruhstorfer, 1907 *d*, p. 301 (Yunnan); Jordan, 1909 *a*, p. 47; Verity, 1905–11, p. 16, pl. 61, fig. 7 (♂) (*P. hippocrates* race); Rosen, 1929, p. 9; Evans, 1923, p. 239, pl. 5, fig. A 4.29 (♂); id., 1927, p. 33; id., 1932 *a*, p. 53, pl. v, fig. A 4.29 (♂).
Papilio machaon birmanicus, Rothschild, 1908, p. 168 (Shan States).

♂♀. Discal band of both wings narrower than in *sikkimensis*. Hind wing with long tail; tornal red spot very large and not black-edged below; upper and middle discocellulars broadly black; the inner margin only narrowly black, so that the area behind the cell and vein 2 remains yellow for the most part.

Habitat.—ASSAM to NORTHERN BURMA; rare: occurs also in Western Yunnan and the adjoining parts of East Tibet.

Papilio xuthus Linnæus.

♂♀. The veins broadly black. Fore wing with the basal two-thirds of cell striped with pale yellow. The yellow stripe placed behind the cell on both wings extends to the base.

Larva.— " Greenish-black, with irregular patches and bands of a milky-white colour. It has the habit of resting motionless on the upper side of the leaves, and resembles a bird-dropping " (*Graeser*, quoted by Verity, 1905–11).

Distribution.— A mainly Palæarctic species extending from Japan and Korea southwards to UPPER BURMA ; occurring also on Formosa, Luzon, the Bonin Islands, and Guam. Only the nominotypical form occurs in the Indian area.

In the Palæarctic area the spring and summer forms are rather different and possess distinctly different genitalia.

57. **Papilio xuthus xuthus** Linnæus.

Papilio xuthus, Linnæus, 1767, p. 751 ; Horsfield & Moore, 1857, p. 111, pl. 4, fig. 1 (larva) ; Rothschild, 1895, p. 503 ; Seitz, 1907, pp. 11–12, fig. 6 *a* ; Verity, 1905–11, pp. 18, 299 ; Bingham, 1907, pp. 38–9 ; Jordan, 1909 *a*, p. 48 ; Evans, 1927, p. 33 ; id., 1932 *a*, p. 53 ; Wileman, 1914, p. 250, pls. 1–4 (larva).
Papilio xanthus, Linnæus, 1767, p. 751.
Papilio xuthus ab. gen. æst. *xanthus*, Rothschild, 1895, p. 278 ; Moore, 1903, p. 45.

♂♀. *Upperside* black with cream-coloured markings. Fore wing with four or five slender, somewhat broken streaks in the cell that extend from the base for two-thirds of its length ; following these is a short transverse bar and another similar bar along the discocellulars ; a streak from the base not extended beyond the disc in areas 1 *a* and 1, the streak in the latter angulated downwards below the origin of vein 2, its apical portion double ; a discal series of elongate sub-triangular spots, that decrease in size towards the costa, in areas 2 to 7, the spots in 6 and 7 with an oval black medial spot generally dividing them in two ; a spot near base of area 8 followed by a diffuse small patch of similarly coloured scales ; a complete submarginal series of lunules. In the ♀ between the discal and submarginal series there is a complete post-discal series of transverse, somewhat diffuse pale spots. Hind wing with a broad basal cell-streak nearly filling the cell ; a basal streak in area 1 extended for three-fourths the length of this area ; shorter streaks beyond the cell ; that in area 7 interrupted by a large black spot (paler in the ♀) ; a post-discal series of diffuse spots, cream-coloured (except the tornal spot, which is blue) in the ♂, blue in the ♀, followed by a submarginal series of cream-coloured lunules, the lunule at the tornal angle centred with black in the ♂, in the ♀ also centred with black, but with its upper half ochraceous ; the

lunule in area 8 with its upper horn elongate, produced down the tail.

Underside of fore wing similar to above, the cream-coloured markings broader, the post-discal spots present also in the ♂; in both sexes that and the submarginal series form continuous bands. Hind wing with the cream-coloured markings very broad on the basal half of the wing, separated only by the black veins; a discal irregular black band composed of large black spots between the veins, these spots traversed on their inner halves by a line of diffuse blue and cream-coloured scaling, and in some of the areas margined inwardly and outwardly by a shading of ochraceous; the submarginal series as above but much larger, and formed of somewhat irregular quadrate spots.

Expanse: ♂♀, 75–90 mm.

Larva.—" Very similar to that of *P. bianor*; bright green; a grey, white-marked, transverse band on the third, fifth and twelfth somites, a similar oblique band over the seventh and eighth segments; above the prolegs large, rounded white spots " (*Seitz*, 1907).

Pupa.—Green, rarely brown; the anterior abdominal segments laterally somewhat swollen and carinate; caputal processes strongly developed, an obtuse, somewhat thorn-like process on thorax " (*Seitz*, 1907).

Habits.—In Japan the larva feeds on *Ægle sepiaria* DC., a common shrub used for hedges; also feeds on *Citrus nobilis* Lour. The butterfly has a heavier flight than *P. machaon*.

Habitat.—NORTHERN BURMA; very rare.

Tribe III. GRAPHIINI.

The members of this division are known as Kite Swallow-tails, as the long wings and long tails of the majority of species give them a kite-like appearance. They are found in all parts of the world.

Antennæ short with strong club; upperside in fresh specimens scaled like the tibiæ and tarsi; the fine sensory hairs almost uniformly distributed over the proximal part of the underside of each segment. Tarsi with the dorsal spines separated from the ventral ones by a spineless, somewhat impressed interspace. Wings in most species thinly scaled, semitransparent, especially in the costal part of fore wing. The green and bluish bands and spots on the upper surface mostly without scales, sometimes also on the under-surface. Fore wing in most species of *Graphium* with vein 11 running into 12; in some species vein 10 is also united with 12. Hind wing with inner margin bent over upwards and the edge

fringed with long hairs; ♂ with usually a patch of yellowish scent-wool inside the fold. Hind wing mostly narrow, its costal margin incurved between veins 7 and 6 (from *Jordan*, 1909 *a*).

Larva.—" The young larva with forked hairs; full-grown in the Indo-Australian forms, so far as is known, with a pair of short spines on each of the three thoracic segments and the last segment, the thorax swollen " (*Jordan*, 1909 *a*).

Pupa.—" Smooth, in the middle rounded in barrel-shape, the wing-cases not projecting, the thoracic horn four-sided, the lateral carinæ forming the prolongation of the upper edge of the wing-cases; on the dorsum two carinæ, converging anteriorly and posteriorly; anal segment longer than broad " (*Jordan*, 1909 *a*).

Habits.—" They are all good fliers and occur in wooded districts; the mimetic forms imitate the slow flight of their models. The males often rest together in crowds at wayside puddles and on the moist sand of river-banks and can mostly be attracted by urine and the like. The females are taken singly in the woods " (*Jordan*, 1909 *a*).

The Oriental species can be divided into the two genera *Graphium* Scop. and *Lamproptera* Gray. The Oriental species of *Graphium* can be divided into six groups, of which four occur in the Indian area.

Key to Genera.

1. Hind wing not folded and not produced. Antennæ not reaching beyond apex of cell of fore wing ... ... [p. 200. GRAPHIUM Scop.,
2. Hind wing folded and produced to a long tail. Antennæ reaching beyond the apex of cell of fore wing [p. 243. LAMPROPTERA Gray,

Genus **GRAPHIUM** Scopoli. (Fig. 53, venation).

Graphium, Scopoli, 1777, p. 433; Hemming, 1933, p. 199 (type, *sarpedon* Linn.); id., 1934, p. 151.

Iphiclides, Hübner, 1819 (6), p. 82; Scudder, 1872, p. 65 (type, *podalirius* Linn.); Hemming, 1934 *a*, p. 151.

Zetides, Hübner, 1819, p. 85; Scudder, 1875, p. 292 (type, *sarpedon* Linn.); Hemming, 1934 *a*, p. 151 (=*Graphium*); Evans, 1923, pp. 230, 240; id., 1927, pp. 25, 34; id., 1932 *a*, pp. 41, 54.

Chlorisses, Swainson, 1832, pl. 89 (*sarpedon* Linn.); Hemming, 1934 *a*, p. 152 (=*Graphium*).

Pathysa, Reakirt, 1864, p. 503 (type, *antiphates* Cram.); Evans, 1923, pp. 230, 239; id., 1932 *a*, pp. 41, 53.

Delchinia, Swinhoe, 1885 *a*, p. 146 (type, *thermodusa* Swinh.).

Dabasa, Moore, 1887, p. 283 (type, *gyas* Westw.).

Meandrusa, Moore, 1887, p. 284 (type, *evan* Doubl.); Evans, 1923, pp. 230, 241; id., 1927, p. 25, pl. 6; id., 1932 *a*, pp. 42, 57.

Paranticopis, de Nicéville & Wood-Mason, 1887, p. 376 (type, *macareus*); Evans, 1923, pp. 230, 241; id., 1927, pp. 25, 33; id., 1932 *a*, pp. 41, 54.

Pazala, Moore, 1888, p. 283 (type, *glycerion* Gray).
Cosmodesmus, Haase, 1892; Seitz, 1907, p. 14.
Deoris, Moore, 1903, p. 31 (type, *agetes* Westw.).

The characters for this genus are, for the most part, those

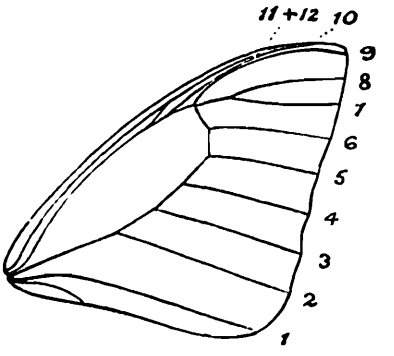


Fig. 53.—*G. agetes* (Westw.), venation.

given for the tribe. With the exception of the species *payeni* and *gyas*, in the Indian area, vein 11 of the fore wing is connected with vein 12.

Key to Groups.

1. Fore wing with vein 11 running into vein 12.	2.
Fore wing with vein 11 free; tail spatulate	Payeni Group, p. 239.
2. Tail long and gradually pointed	Antiphates Group,
Tail absent or short and obtuse	3. [p. 203.
3. Hind wing below with a red or yellow discal spot or traces of one, and one or two red or yellow subbasal spots	[p. 217. Eurypylus Group,
Hind wing below without a red or yellow discal spot	[p. 232. Macareus Group,

Key to Species.

A. Antiphates Group.

1. Fore wing above with a double discocellular bar enclosing two pale spots; four dark bars in the cell	2.
Fore wing above with a single discocellular bar	3.
2. Hind wing below with a complete discal row of pale spots	*eurous* (Leech), p. 203.
Hind wing below with three discal spots	*glycerion* (Gray), p. 204.
3. Fore wing above with three dark cell-bars	*agetes* (Westw.), p. 205.
Fore wing above with four broad dark cell-bars	4.
4. Hind wing below with a discal row of red spots	5.
Hind wing below without red discal spots	[p. 212. *antiphates* (Cram.),
5. Fore wing above with a submarginal row of pale rounded spots.	*nomius* (Esp.), p. 207.
Fore wing above with a green submarginal chain-line—not spots	*aristeus* (Cram.), p. 210.

B. Eurypylus Group.

1. Fore wing above without a submarginal row of green spots .. . . 2.
   Fore wing above with a submarginal row of green spots . . 3.
2. Tail long; fore wing above transparent green .. .. [p. 217. *cloanthus* (Westw.),
   Tail very short; wings black with a green band.. .. .. *sarpedon* (Linn.), p. 219.
3. Tail short; fore wing above with a double cell-spot. .. .. [p. 229. *agamemnon* (Linn.),
   Tail absent; fore wing above with a single cell-spot .. .. 4.
4. Hind wing below with a basal costal dark bar not continued to the origin of vein 7; discal veins not black. . 5.
   Hind wing below with a basal costal dark bar continued to the origin of vein 7; discal veins black .. 7.
5. Hind wing below with costal bar separated from basal dark band, the bar red-centred ... . *doson* (Feld.), p. 221.
   Hind wing below with costal bar united to basal dark band: . 6.
6. Fore wing above with only one submarginal spot in area 1 *b*. Abdomen above black ... . .. *evemon* (Bdv.), p. 225.
   Fore wing above with two submarginal spots in area 1 *b*. Abdomen above whitish .. .. [p. 225. *eurypylus* (Linn.),
7. Hind wing above with cell pale, below with a black costal bar, the spot internal to it pale yellow.. . .. . [p. 227. *bathycles* (Zink.),
   Hind wing below with cell dark and with two green spots; below with the costal bar red-centred *arycles* (Bdv.), p. 228.

C. Macareus Group.

1. Hind wing above with the discal streaks in areas 3 to 5 divided into small spots. ... . [p. 237. *megarus* (Westw.),
   Hind wing above with the discal streaks in areas 3 to 5 not divided .. .. . 2.
2. Hind wing below with a small yellow tornal spot. Usually a dark bar in the cell formed by the continuation of vein 4..... ... .. [p. 233. *macareus* (Godt.),
   Hind wing below with a very large tornal spot. Rarely a dark bar in cell formed by continuation of vein 4. *xenocles* (Dbl.), p. 235.

D. Payeni Group.

1. Underside with the basal quarter dark chocolate-brown .. .. *gyas* (Westw.), p. 240.
2. Underside with the basal area orange-yellow, brown-spotted ... . *payeni* (Bdv.), p. 241.

Antiphates Group.

Fore wing with vein 11 running into vein 12. Wings white with black bands; hind wing below with a sub-basal band parallel with the inner margin and a median band which approach one another at the apex of the cell or are connected there; tail long, gradually pointed. A well-marked cottony scent-organ in the abdominal fold in *agetes*, *nomius*, and *aristeus*. Six Indian species.

Graphium eurous (Leech). (Fig. 54).

♂♀. Body above black, with long grey hairs. Fore wing semitransparent, with ten black bands and the base black; the first and second band, as well as the four outer partly united ones, usually reach the inner margin. Hind wing above with black anal area spotted with grey-blue and from which the black lines run out to the costa, at the anal angle a yellow double spot; hind wing below with two parallel

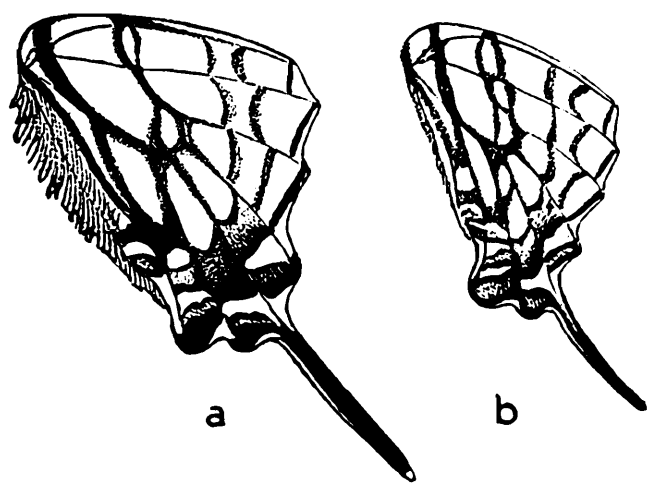


Fig. 54.—*a*, *G. eurous sikkimica* (Heron); *b*, *G. eurous caschmirensis* (Roths.): undersides of hind wings.

oblique discal lines, between which a number of yellow spots are placed. Abdominal fold of ♂ without scent-wool.

Larva.—"Green, dotted with black, the pronotum with yellow transverse band which is laterally continued to the anal segment, the three thoracic segments each with a pair of black spines, anal process yellow with black tip, curved laterad" (*Jordan*, 1909 *a*).

Pupa.—"Slender, green, with four yellow lines" (*Jordan*, 1909 *a*).

Habits.—The larva feeds on *Machilus odoratissima* Nees (family Lauraceæ). The butterfly is fond of resting on the tops of trees, round which it circles swiftly.

Distribution.—West and Central China, Formosa, NORTHERN INDIA. Two subspecies are found in India.

58 *a*. **Graphium eurous caschmirensis** (Rothschild). (Fig. 54 *b*, imago).

Papilio glycerion caschmirensis, Rothschild, 1895, pp. 407, 408 (North Kashmir).
Papilio eurous caschmirensis, Jordan, 1909 *a*, p. 86 ; Rosen, 1929, p. 14.
Pazala cashmirensis, Moore, 1903, p. 36, pl. 480, figs. 1, 1 *a–d* (♂♀, larva, pupa).
Papilio mandarina cashmirensis, Seitz, 1907, p. 15, t. 8 *b*.
Pathysa eurous cashmirensis, Evans, 1923, p. 239 ; id., 1927, p. 33 ; id., 1932 *a*, p. 53.
Papilio kashmirensis, Bingham, 1907, p. 95, fig. 19 B ; Hannyngton, 1910, p. 362.
Papilio glycerion, Robson (*non* Gray), 1895, p. 497 (larva, pupa) ; Mackinnon & de Nicéville, 1898, p. 595, pl. W, figs. 25 *a*–25 *c* (larva, pupa).

♂♀. Fore wing above whiter than in *sikkimica*, the fourth bar in the cell from the base not reaching below the median vein, and the post-discal line does not reach vein 1. Hind wing with the yellow spots on both sides paler, and the two discal lines on the underside farther apart than in *sikkimica*.

Expanse : ♂♀, 60–70 mm.

Habitat.—KASHMIR to KUMAON ; not rare.

58 *b*. **Graphium eurous sikkimica** (Heron). (Fig. 54 *a*, imago).

Papilio sikkimica, Heron, 1899, p. 120.
Pazala sikkimica, Moore, 1903, p. 35, pl. 479, figs. 2, 2 *a*, *b* (♂♀).
Papilio kashmirensis var. *sikkimica*, Bingham, 1907, p. 96, pl. 14, fig. 93 (♂).
Papilio eurous sikkimica, Jordan, 1909 *a*, p. 86; Rosen, 1929, p. 14.
Pathysa eurous sikkimica, Evans, 1923, p. 239 ; id., 1927, p. 33 ; id., 1932 *a*, p. 53.

♂♀. Fore wing above with the fourth transverse black band from the base crossing the cell and reaching beyond the median vein ; the post-discal band reaches vein 1.

Habitat.—SIKKIM to ASSAM ; not rare.

Graphium glycerion Gray.

♂♀. Hind wing below at the costal margin and at the apex of the cell with a black-edged spot, which are united into an 8. Abdominal fold of ♂ without scent-wool.

Distribution.—West and Central China to Yunnan, NEPAL, and UPPER BURMA. Occurs at higher elevations than *eurous*. Only the nominotypical form occurs in India.

59. **Graphium glycerion glycerion** (Gray).

Papilio glycerion, Gray, 1831, p. 32 ; id., 1846, p. 6, pl. 3, fig. 2 ; Rothschild, 1895, p. 407 ; Bingham, 1907, p. 95, fig. 19 A.
Pazala glycerion, Moore, 1903, p. 33, pl. 479, figs. 1, 1 *a*, 1 *b*.

Papilio glycerion glycerion, Jordan, 1909 *a*, p. 86, t. 40 *a*.
Pathysa glycerion, Evans, 1927, p. 33 ; id., 1932 *a*, p. 53, pl. v, fig. A 5.2 (♂).
Papilio paphus, de Nicéville, 1886, p. 254, pl. ii, fig. 6 (♂).

♂♀. *Upperside* dead-white or very pale cream-colour. Fore wing with the cell partially and interspaces between the dusky black outer discal markings more or less semi-transparent ; cell crossed by five black bands, the basal two reaching the inner margin, and the subapical one to a little below the median vein ; a black discocellular band, joined at costal margin and above lower angle of cell to the band traversing the cell near its apex ; a broad transverse post-discal black band from near tornal angle to costa ; thi. band, double above vein 5, forms three well-marked loops ; submarginal and marginal narrower black bands, the former united with the post-discal band near tornal angle ; the post-discal band outwardly, and the marginal band inwardly, broadly and diffusely bordered with dusky black. Hind wing with a narrow black line from base along inner margin ; a broader black line along vein 1, joined below the cell by a broad black band that crosses the latter subbasally ; a black patch on the anal area, bearing two conspicuous yellow tornal spots, below which there is a triangular white dorsal mark, and bearing also three somewhat obscure blue submarginal lunules ; tail narrowly edged with white ; a narrow black discal line from costa to median vein, crossing the cell near its apex, and at each end with loops formed of slender black lines, in the ♀ well marked, in the ♂ seen only by transparency from the underside ; discal, post-discal, and submarginal slender black lines from the costa terminate in the black anal patch.

Underside similar to above, the black markings more heavily defined ; the anterior loop on the short median line is tinged with yellow ; median vein and discocellulars broadly defined in black. Antennæ black ; head, thorax, and abdomen black, with some white pubescence, the head anteriorly tufted with black ; head, thorax, and abdomen beneath whitish-yellow.

Expanse : ♂♀, 65–75 mm.

Habitat.—Sikkim to Northern Burma ; not rare.

Graphium agetes Westwood.

♂♀. White with black bands. Hind wing with black distal margin which bears some white spots, a red anal spot, slender tail which is black tipped with white. *Underside* of hind wing with a black subbasal band parallel with the inner margin, and with a black discal band bearing red spots ; abdominal fold with a well-marked cottony scent-organ.

Habits.—Frequents wooded hills. The ♂♂ congregate at puddles and on the moist sand of river-banks.

Distribution.—NORTHERN INDIA to Sumatra and Borneo; also in Hainan. Two subspecies are found in the Indian area.

60 *a*. **Graphium agetes agetes** (Westwood). (Fig. 53, venation).

Papilio agetes, Westwood, 1843 *b*, p. 23, pl. 55, figs. 1, 2 (♂); Rothschild, 1895, p. 417; Bingham, 1907, p. 100, fig. 22 (venation), pl. 14, fig. 95 (♂); Ollenbach, 1921, p. 895.
Deoris agetes, Moore, 1903, p. 31, pl. 478, figs. 2, 2 *a*, 2 *b* (♂♀).
Papilio agetes agetes, Jordan, 1909 *a*, p. 87.
Pathysa agetes agetes, Evans, 1923, p. 239; id., 1927, p. 33; id., 1932 *a*, p. 53.

♂♀. *Upperside* white. Fore wing with the cell crossed by three comparatively broad, oblique black bands, the innermost produced across areas 1 and 1 *a* to the inner margin, the next to vein 1, sometimes a little beyond into area 1 *a*, the third to the median vein; these are followed by a triangular costal black spot above the upper apex of cell; a post-discal oblique black band from costa to just above tornus, where it joins a broad black marginal edging which lies between apex and tornus; costa edged with a black thread which widens slightly beyond the post-discal band. The white ground-colour in the anterior half of cell, beyond the apex of the latter to the post-discal black band, and in the area between the post-discal and marginal bands, is hyaline with a greenish-yellow tinge. Hind wing with a tornal spot, the anal lobe, tail, and outer margin black; above the tornal spot is a short, comparatively broad, red band edged anteriorly by a fine black line that joins the spot to the black on the anal lobe; a triangular submarginal white spot in area 3; a submarginal short white line in area 4; also the anterior edge of tail at base is touched with white.

Underside similar to above. Hind wing with two convergent transverse black bands, the outer one traversed by short transverse lines of red in areas 2, 6, 7, and 8; these two bands coalesce above the tornal area. Antennæ, head, thorax, and abdomen black, the head marked with red, the thorax on the sides with greyish pubescence; abdomen with lateral white stripes; beneath white.

Expanse: ♂♀, 75–90 mm.

Habitat.—SIKKIM to NORTHERN BURMA; not rare. Also occurs in Hainan, Tong-king, and Annam.

60 *b*. **Graphium agetes iponus** (Fruhstorfer).

Papilio agetes iponus, Fruhstorfer, 1902 *d*, p. 58; Jordan, 1909 *a*, p. 87.
Pathysa agetus iponus, Evans, 1927, p. 33; id., 1932 *a*, p. 54, pl. v, fig. A 5.3 (♂).

♂♀. Fore wing with the second black band from the base not reaching vein 1; the discal line meets the marginal line between veins 2 and 3. Hind wing above with no white submarginal line in areas 5 and 6.

Habitat.—TAVOY and SOUTHERN BURMA; not rare. Extends to the whole of the Malay Peninsula.

Graphium nomius (Esper).

♂♀. Fore wing with four dark bars in the cell; anterior submarginal spots rounded. Beneath with the first and second brown bands blackish at the costal margin. Hind wing above with well-developed black discal band; abdominal fold with a well-marked cottony scent-organ.

Larva.—" The full-grown larva above usually black with white transverse stripes, beneath green, the anterior and posterior segments yellowish, sometimes the larva entirely green; on each of the thoracic segments and the anal segment a pair of spines. On *Saccopetalum tomentosum* Hook. f., family Leguminosæ, and *Polyalthia longifolia* Benth. & Hook. f., family Anonaceæ " (*Jordan*, 1909 *a*).

Pupa.—" Not on the food-plant, but under stones, in crevices, and under the roots of trees; earth-coloured, with short thoracic horn directed forwards, and somewhat produced angles to the head. Pupal stage lasts in S. India from July to March or May " (*Jordan*, 1909 *a*).

Habits.—Common in the lowlands, sometimes abundant in certain places. The males often congregate in crowds at puddles; they also visit flowers.

Distribution.—CEYLON and SOUTHERN INDIA to SIKKIM, ASSAM, BURMA, Tong-king, Siam, Annam, and Hainan. Two subspecies known, both found in the Indian area.

61 *a*. **Graphium nomius nomius** (Esper). (Fig. 55 *a*, *b*, imago; Pl. I, fig. 22, larva, fig. 23, pupa).

Papilio nomius, Esper, 1785–98, p. 210, t. 52, fig. 3; Davidson & Aitken, 1890, p. 364, pl. E, fig. 1 (larva), fig. 1 *a* (pupa); Rothschild, 1895, pp. 421–2; Bingham, 1907, pp. 101, 102, fig. 23 A, B.

Pathysa nomius, Moore, 1881 *a*, p. 142, pl. 62, fig. 2; id., 1903, p. 26, pl. 477, figs. 1, 1 *a*–1 *e* (larva, pupa, ♂♀).

Papilio nomius nomius, Jordan, 1909 *a*, p. 87.

Pathysa nomius nomius, Evans, 1923, p. 238, pl. 5, fig. A 5.4 (♂); id., 1927, p. 34; id., 1932 *a*, p. 54, pl. v, fig. A 5.4 (♂).

♂♀. *Upperside* bluish-white. Fore wing crossed by five broad black bands; the basal and subbasal bands reach the inner margin, the discal band is generally extended into area 2, the fourth band ends on the median vein, the fifth extends from the costa on both sides of the discocellulars and terminates at lower angle of cell; beyond the fifth band is a short

macular transverse bar of the ground-colour that terminates on vein 5, followed by a very broad black marginal band that occupies about one-third of the width of the wing and is traversed by a submarginal series of small spots of the ground-colour, of which the anterior ones are rounded, the others semi-lunate. Hind wing with the ground-colour whitish along the inner margin and above vein 7; a streak along the inner margin, a subbasal and an inner discal transverse band from costa across cell, and a very broad marginal band, black; the former two joined near the tornus by transverse lunular black marks, the marginal band traversed by a series of slender whitish lunules; a small black spot in area 1 above tornus and another at base of area 4, the black at the apices of areas 2 to 4 and the lunules thereon suffused with grey: tail black, edged and tipped with white.

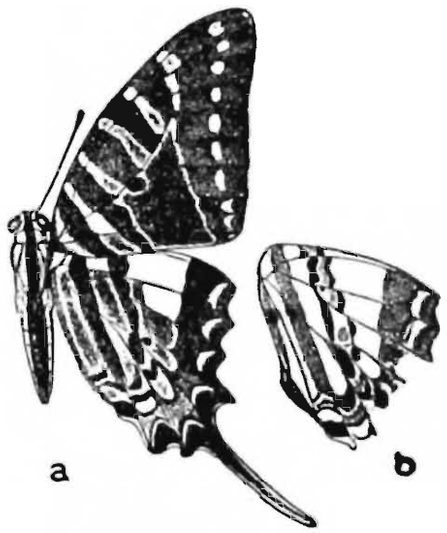


Fig. 55.—*G. nomius nomius* (Esp.).
a, ♂, upperside; *b*, anterior portion of hind wing underside.

Underside white, with the black markings similar to above but bronze-brown, with the following exceptions:—Fore wing with the parts of the basal, subbasal, and discal bands extended below the cell black, also the inner portion below vein 4 of the marginal band. Hind wing with the inner discal band broken, irregular and black, and bordered by a series of red spots outwardly edged with black; the submarginal whitish lunules are broadly edged on the outer side with black; anal area ochraceous-grey. Antennæ black; head, thorax, and abdomen creamy-white, with a medial broad longitudinal stripe; beneath, the abdomen with lateral black stripes.

Expanse: ♂♀, 75–90 mm.

Habitat.—CEYLON, SOUTHERN INDIA to the SIKKIM lowlands; not rare.

61 *b*. **Graphium nomius swinhoei** (Moore). (Fig. 56 *a*, *b*, imago).

Papilio swinhoei, Moore, 1878 *c*, p. 697 (Hainan).
Papilio nomius swinhoei, Rothschild, 1895, p. 422 ; Bingham, 1907, p. 103, fig. 24 A, B ; Jordan, 1909 *a*, p. 87, t. 41 *c*.
Pathysa nomius swinhoei, Evans, 1923, p. 239 ; id., 1927, p. 34 ; id., 1932 *a*, p. 54.
Papilio nomius f. *pernomius*, Fruhstorfer, 1903 *a*, p. 202, figs. 1, 2 (seasonal form) (Siam).
Pathysa pernomius, Moore, 1903, p. 29, pl. 478, figs. 1, 1 *a*, 1 *b* (♂).

♂♀. Differs from the nominotypical form as follows :— *Upperside* with broader black markings. Fore wing with the fifth black band generally extended beyond the cell. Hind wing with much broader marginal black band, inwardly

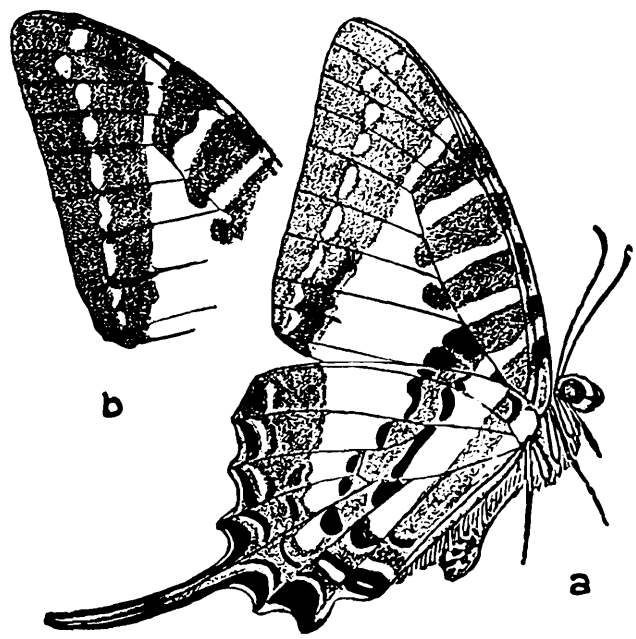


Fig. 56.—*G. nomius swinhoei* (Moore).
a, underside ; *b*, fore wing upperside, apical half.

extended to and coalescent with the black lunules that connect the subbasal and discal bands ; the grey anal patch absent or obsolescent.

Underside of fore wing with the fourth black band brown below the cell. Hind wing with the precostal spur edged narrowly on the inner side by black ; the red discal band broader and the black edging to the submarginal lunules better defined.

Habitat.—ASSAM to SOUTHERN BURMA ; not rare. Occurs also in Hainan, Tong-king, Annam, and Siam.

Graphium aristeus (Cramer).

♂♀. White, the *upperside* with black bands, the underside with brown bands. Fore wing with seven bands, of which the third to fifth are abbreviated and the fourth is sometimes absent; the fifth is commonly united with the sixth at the lower angle of cell, and the sixth and seventh form a broad marginal area enclosing a submarginal row of white spots. Hind wing with subbasal and median bands, which run parallel with the inner margin, the median band sometimes only indicated, the outer margin black with white submarginal spots, of which the posterior three or four are very thin and lunular.

Underside of hind wing with discal band bearing red spots, at the distal side of which are placed black spots. Body beneath white, above black with light lateral stripe. Abdominal fold with a well-marked cottony scent-organ.

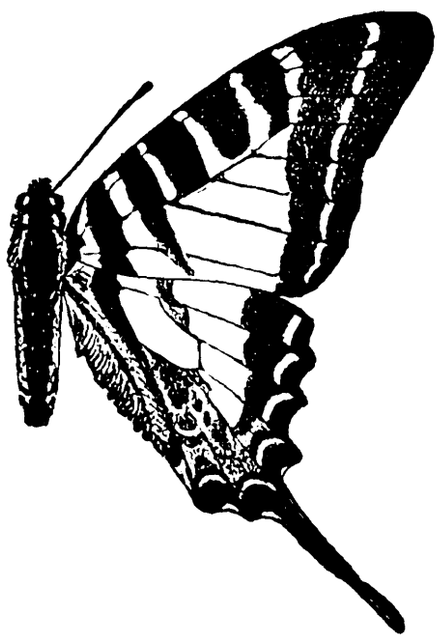


Fig. 57.—*G. aristeus anticrates* (Doubl.).

Habits.—Found in wooded districts at low elevations. The butterfly flies high and fast, but sometimes congregates at puddles and on river-banks.

Distribution.—NORTHERN INDIA to the Bismarck Islands and North Australia. Several subspecies are known, of which two occur in the Indian area.

62 *a*. **Graphium aristeus anticrates** (Doubleday). (Fig. 57, imago).

Papilio anticrates, Doubleday, 1846 *a*, p. 371 (Sylhet); Gray, 1852, p. 29, pl. 3, fig. 3 (♂); Elwes, 1888, p. 434 (♀).

Papilio aristeus anticrates, Rothschild, 1895, p. 419; Bingham, 1907, p. 104, fig. 25; Jordan, 1909 *a*, p. 88, t. 41 *a*.
Pathysa anticrates, Moore, 1903, p. 24, pl. 476, figs. 1, 1 *a*–1 *c* (♂♀).
Pathysa aristeus anticrates, Evans, 1923, p. 239; id., 1927, p. 34; id., 1932 *a*, p. 54.

♂♀. *Upperside* tinged with green in fresh specimens. Fore wing with the second (subbasal) band somewhat attenuate posteriorly; in the cell the fourth band subtriangular, sometimes not extended to the median vein; submarginal white spots in a chain, linear, the posterior ones more lunular. Hind wing with the discal black band obsolescent, only faintly defined near costa and at posterior end; a grey anal area as in *nomius*.

Underside with the black markings replaced by bronze-brown; the discal red spots are edged with black, and the outer edgings to the submarginal series of white lunules are prominently and broadly black.

Expanse: ♂♀, 70–80 mm.

Habitat.—SIKKIM to ASSAM; rare.

62 *b*. **Graphium aristeus hermocrates** (C. & R. Felder).

Papilio hermocrates, C. & R. Felder, 1864 *a*, p. 302; id., 1864 *b*, p. 57, t. 12, fig. E (♂).
Papilio aristeus hermocrates, Rothschild, 1895, p. 420; Bingham 1907, p. 104; Jordan, 1909 *a*, p. 88, t. 41 *a*.
Pathysa hermocrates, Moore, 1903, pp. 30–1.
Pathysa aristeus hermocrates, Evans, 1923, p. 239; id., 1927, p. 34; id., 1932 *a*, p. 54.
Papilio aristeoides, Eimer, 1889, p. 163, t. 3, fig. 3.
Papilio aristeus hermocrates ab. *aristeoides*, Rothschild, 1895, pp. 420–1; Jordan, 1909 *a*, p. 88.
Papilio aristeus var. *nigricans*, Eimer, 1889, p. 178, fig. R.

♂♀. The black bands are more extended than in *anticrates*. Fore wing with the fourth band narrowed posteriorly and ending on the median vein; the black marginal band very broad, covers more than the outer third of the wing, coalesces with the black band on the discocellulars, and encloses the short macular bar of ground-colour beyond the cell; the submarginal spots linear. Hind wing as in *swinhoei*, but with grey anal patch as in typical *nomius*.

Underside similar to *nomius*, with wider markings as above. The precostal spur as in *nomius* and not as in *swinhoei*.

Variation.—Connected with *anticrates* by intermediate gradations. Specimens with narrow white discal area on fore wing are called **aristeoides** Eimer. Specimens in which the cell of fore wing bears only three white bands and the white submarginal band of fore wing and the white discal band of hind wing are posteriorly abbreviated are f. **nigricans** Eimer.

Habitat.—BURMA; rare. Extends also to Siam and the Lesser Sunda Islands, Sumatra, Borneo, Palawan, and the Philippine Islands.

Graphium antiphates (Cramer).

♂♀. White, the fore wing above and beneath greenish towards the costa, as also the basal half of hind wing beneath; fore wing with seven black bands. Hind wing above with black marginal spots and a row of black submarginal spots; the posterior part of the marginal area dusted with grey-black, or the whole margin broadly grey-black.

Underside of fore wing with black markings as follows:—Before the inner margin a stripe which is anally united with a subbasal stripe; a double discal band longitudinally divided by the ground-colour, the distal half of which is broken up into spots; a row of submarginal and a row of marginal spots, the former ones shaped like the figure 3, at their proximal side yellow patches, which are for the most part indistinctly defined. Body above black with light lateral stripe, or the abdomen entirely white; underside white with black lateral stripe. Abdominal fold of ♂ without scent-wool.

Early stages.—Described under *naira* Moore.

Habits.—The males congregate in crowds at puddles and the edges of brooks, where they drink in company with Pierids. The females are taken singly in the woods. On the wing *antiphates* gives the impression of a Pierid, as the long tails are scarcely noticeable during its swift flight.

Distribution.—China to CEYLON, North Borneo, and the Lesser Sunda Islands. Several subspecies are distinguished, of which four occur in the Indian area.

63 *a*. **Graphium antiphates ceylonicus** (Eimer).

Papilio antiphates var. *ceylonicus*, Eimer, 1889, p. 149.
Papilio antiphates alcibiades ab. *ceylonicus*, Rothschild, 1895, p. 412; Bingham, 1907, p. 99.
Papilio antiphates ceylonicus, Jordan, 1909 *a*, p. 89.
Pathysa antiphates ceylonicus, Evans, 1923, p. 240; id., 1927, p. 34; 1932 *a*, p. 54.
Pathysa antiphates, Moore (*non* Cram.), 1881 *a*, p. 142, pl. 63, figs. 1, 1 *a*.

♂♀. Fore wing with the marginal band reaching vein 1, the submarginal band reaching vein 2, these two bands not united; subbasal band of uniform width and reaching inner margin; second band from the base extends to vein 1; hind wing above with no grey anal area.

Expanse: ♂♀, 80–95 mm.

Habitat.—CEYLON; very rare.

63 *b*. **Graphium antiphates naira** (Moore). (Fig. 58, imago ; Pl. I, fig. 24, larva, fig. 25, pupa).

Pathysa naira, Moore, 1903, p. 22, pl. 475, figs. 1, 1 *a* (♂) (S. India).
Papilio antiphates naira, Jordan, 1909 *a*, p. 89.
Pathysa antiphates naira, Evans, 1923, p. 250 ; id., 1927, p. 34 ; id., 1932 *a*, p. 54.
Papilio antiphates, Davidson, Bell, & Aitken (*non* Cram.), 1897 *a*, p. 579, pl. 6, figs. 1, 1 *a* (larva, pupa) ; Bingham (*non* Cram.), 1907, p. 97, fig. 20.

Wet-season form.—♂♀. *Upperside* with fore wing cell crossed by five short black bands, of which the basal extends to inner margin, the subbasal into area 1, the third and fourth to the edge of cell ; the fifth band extends broadly on both sides of the discocellulars and terminates at the lower angle of cell ; beyond these are broad post-discal and marginal

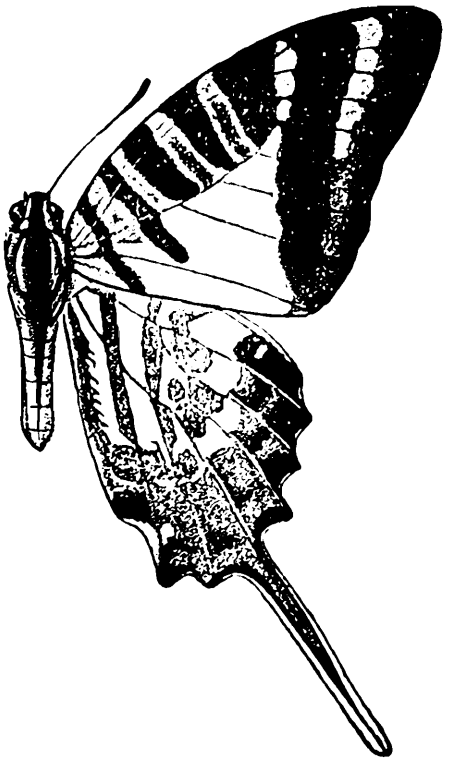


Fig. 58.—*G. antiphates naira* (Moore).

black bands from costa to tornal angle ; the two bands coalesce below vein 4 and terminate in a point at the tornus ; the white portions of the cell anteriorly overlaid with pale green ; short, macular, hyaline green bands between the black cellular apical band and discal band, and anteriorly between the latter and the marginal band. Hind wing with basal three-fourths uniform white, the black markings showing through from below ; the distal fourth dark grey traversed by a curved irregular submarginal series of black lunules that ends in a black tornal spot, and a marginal black band that follows the indentations of the wing ; the emargination below the

black tornal spot edged with ochraceous; tail blackish-grey, edged and tipped with white.

Underside of fore wing similar to above, but the green shading over the white portions in the basal half of cell more decided; discal and marginal black bands separate, not joined posteriorly, the former edged posteriorly on both sides by dark grey due to the black on the upperside showing through. Hind wing with basal half green, distal half white; a large black tornal spot; a black line along inner margin that curves above tornal spot outwards to vein 2; a straight subbasal black band from costa across cell and ending on vein 2, where it joins the inner black line; a broader black band from costa across apex of cell extended into base of area 3; an irregular discal series of black markings curved inwards posteriorly towards the tornal spot; a submarginal series of very small slender black lunules in pairs, the ground-colour on the inner side of these darkened to rich ochreous-yellow; a series of short marginal black bars; tail dusky black edged with white.

Dry-season form.—♂♀. *Upperside* of fore wing with the black bands generally narrower and shorter; the basal band becomes faint posteriorly and barely touches the inner margin; subbasal band very short; post-discal and marginal bands coalesce at vein 4 and do not reach the tornus, ending in a point between veins 1 and 2. Hind wing white, with the chrome colouring showing through from below; the marginal black edging narrow, and the submarginal black lunules only just traceable.

Variation.—The nominotypical form is that of the wet season. The typical dry form is rare, and the British Museum possesses only 2 ♂♂ and 1 ♀. "From December until mid-March the butterfly passes through changes from an extreme dry-season form, in which the characteristic broad grey band is completely absent, through intermediate forms, in which the grey tornal area spreads and widens from the neighbourhood of the tail, until the full wet-season form arrives" (*Yates*, 1930*a*, p. 589).

Larva.—Surface covered with hardly perceptible semi-appressed white hairs. Colour a darkish transparent-looking olive-green, speckled thinly with white on the dorsum of segments 5 to 14, forming a white dorsal line and a darkish dorso-lateral line; a dark diagonal stripe on segments 5 to 11; a broad, spiracular, white-yellow band, below which there is a deep green subspiracular one followed by a whitish band bordered below by a green one; the flattened deep green dorsum of segments 3 and 4 is surrounded completely anteriorly, laterally, and posteriorly by a yellow-white band, and the lateral parts of these segments are suffused with reddish-black.

Length 40 mm.; breadth 9 mm. on segment 4 (from *Bell*, 1912).

Pupa.—Bright green, with a yellow dorso-lateral line on segments 4 to 8, where it merges into the lateral line of abdomen; other markings brown, the ventral middle line yellow. The body-string is unusually long. Length 30 mm.; breadth 10 mm.; thoracic point 1 mm. long (from *Bell*, 1912).

Habits.—The egg is laid singly on the upperside of a fresh leaf or shoot. The larva feeds on *Unona lawii* Hook., a climbing shrub belonging to the Anonaceæ. In the last stage the larva never lies out in the sun; it is sluggish and walks with a halting motion. The butterfly is most plentiful in the monsoon months, and may be seen circling in graceful flight around the tops of trees in the evergreen jungle. During the hot hours it descends from the trees in search of water, its fondness for this being thus described by Yates:—"Its thirst appears to be considerable; once it has settled it is not easily driven away; thus it may settle among a crowd of Pierids which, on the approach of a human being with a net, rise and scatter, leaving *P. antiphates naira*, which remains unmoved, greedily sucking moisture, an easy prey" (Journ. Bomb. Nat. Hist. Soc. xxxiv, 1931).

Habitat.—PENINSULAR INDIA; fairly common in the wet season, the ♀ rare.

63 *c*. **Graphium antiphates pompilius** (Fabricius).

Papilio pompilius, Fabricius, 1787, p. 8.
Papilio antiphates pompilius, Jordan, 1909 *a*, p. 89.
Pathysa antiphates pompilius, Evans, 1923, p. 240, pl. 5, fig. A 5.6 (♂); id., 1927, p. 34; id., 1932 *a*, p. 54, pl. v, fig. A 5.6 (♂).
Papilio nebulosus, Butler, 1881 *a*, p. 33, pl. 4, fig. 3.
Papilio alcibiades ab. *nebulosus*, Rothschild, 1895, p. 412.
Papilio antiphates ab. *nebulosus*, Bingham, 1907, pp. 97, 99; Jordan, 1909 *a*, p. 89, t. 40 *d*.
Papilio antiphates continentalis, Eimer, 1889, p. 137.
Papilio antiphates alcibiades ab. *continentalis*, Rothschild, 1895, p. 412.
Papilio antiphates alcibiades, Bingham (*non* Fabr.), 1907, p. 99.

♂♀. All the black markings shorter and narrower. Fore wing with the second band from base reaching vein 1; the post-discal and marginal bands usually separate, but if the former extends below vein 2 it unites with the marginal band; the marginal band does not reach the inner margin. Hind wing with the grey anal area reduced to a small patch of grey at the apices of areas 2 to 4; submarginal black markings rarely present anteriorly, generally confined to the limits of the grey patch. Very variable.

Variation.—The rare melanic form **nebulosus** Butl. occurs

in Northern India. In this the fore wing above and beneath and underside of hind wing, as well as distal margin of hind wing above, are more or less completely dusted with black, with the exception of the greenish-white bands in the anterior part of fore wing.

Habitat.—SIKKIM to BURMA, common; also occurring in Hainan, Annam, and Siam.

63 *d*. **Graphium antiphates epaminondas** (Oberthür). (Fig. 59, imago).

Papilio epaminondas, Oberthür, 1879, p. 62, pl. 4, fig. 1 (Andamans); Staudinger & Schatz, 1886, p. 9, t. 6 (♂); Eimer, 1889, p. 121, t. 2, fig. 6; Rothschild, 1895, p. 414; Jordan, 1909 *a*, p. 90, t. 40 *d*.

Pathysa epaminondas, Moore, 1903, p. 23, pl. 475, figs. 2, 2 *a*, *b* (♂♀).

Papilio antiphates epaminondas, Bingham, 1907, p. 97, fig. 21.

Pathysa antiphates epaminondas, Evans, 1923, p. 240; id., 1927, p. 34; id., 1932 *a*, p. 54.

Papilio læstrygonum, Wood-Mason, 1880, pp. 102, 178, pl. 6, figs. 1, 1 *a* (♂); Wood-Mason & de Nicéville, 1881 *b*, p. 253 (♀).

♂♀. Larger than most specimens occurring on the mainland, and the black markings, especially on the upperside, much

Fig. 59.—*G. antiphates epaminondas* (Oberth.).

wider. Fore wing with broad basal and subbasal bands which reach the inner margin. Hind wing with the black markings of the underside partially represented by black scaling;

marginal dark grey area wider than in other forms, with a tendency to turn to dusky black anteriorly, so that the submarginal black lunules are obscured anteriorly.

Underside of hind wing with the yellow patches more sharply defined than in the other races, the light submarginal spots and also the ground-colour at the distal side of the discal band and inside it white.

Habitat.—ANDAMAN ISLANDS ; not rare.

Eurypylus Group.

♂♀. Black, with green (or yellowish) markings which are scaleless. Hind wing below with red or yellow discal spots from the apex of cell to the anal angle, or at least traces of such spots, and usually one or two red or yellow subbasal spots, which are never absent even when the red discal spots are suppressed. Tail, when present, short and obtuse. Scent-fold in the ♂ rather broad, with a well-marked elongate tuft of scent-hairs. Body above dark, with a light stripe at each side.

Freshly emerged specimens and those killed too soon have the markings whitish or yellowish instead of green ; decayed, as well as worn specimens, are likewise yellowish. The normally red spots on the hind wing below are sometimes replaced by yellow ones.

This group in the Indian area comprises eight species.

Graphium cloanthus (Westwood).

♂♀. Black, with green bands. Fore wing with two large cell-patches and a broad discal band, which is continued on the hind wing in the form of a triangle ; hind wing also with four submarginal patches.

Underside of hind wing with a red line at the base and small red linear spots from end of cell to anal angle.

Larva.—" Widest at the 5th segment, from which it tapers gradually to the 13th segment. The ridge over the head is furnished with two tubercles, black in front, white posteriorly. The 5th segment has a yellow bar which projects on each side beyond the body and has the appearance of a yoke. The points of the yoke are black. Colour green. The 13th segment is of a pale transparent blue-green. A pale yellow subdorsal line and an almost white spiracular line are the only markings. Head of a greenish-yellow. Legs claspers, and abdomen of the same colour as the 13th segment. The 13th segment ends in two sharp points which join at the end, so that the division between them is visible only on a close examination " (*Robson*, 1895).

Pupa.—Bright green, with yellow carinæ.

Habits.—Occurs throughout the summer. The spring specimens have larger green markings. Larva on *Machilus odoratissima* Nees, family Lauraceæ. The butterfly flies with a dancing motion round the tops of trees; its flight is very rapid. The ♂ comes down to drink at wet sand, keeping the wings closed.

Distribution.—Formosa and China to NORTHERN INDIA; also in Sumatra. Only the nominotypical form is found in the Indian area.

64. **Graphium cloanthus cloanthus** (Westwood).

Papilio cloanthus, Westwood, 1841, p. 42, pl. 11, fig. 2; Staudinger & Schatz, 1884, p. 9, t. 6 (♂); Rothschild, 1895, p. 445; Robson, 1895, p. 497 (larva); Mackinnon & de Nicéville, 1898, p. 595, pl. W, figs. 27 *a*–27 *c* (larva, pupa); Bingham, 1907, pp. 110–11, pl. 14, fig. 97 (♂).

Dalchina cloanthus, Moore, 1903, p. 16, p. 473, figs. 1, 1 *a*–1 *c* (larva, pupa, ♂♀).

Papilio cloanthus cloanthus, Jordan, 1909 *a*, p. 94.

Zetides cloanthus cloanthus, Evans, 1923, p. 24, pl. 5, fig. A 6.1 (♂); id., 1927, p. 34; id., 1932 *a*, p. 54, pl. v, fig. A 6.1 (♂).

Papilio cloanthus f. *cloanthulus*, Fruhstorfer, 1902 *e*, p. 168; Jordan, 1909 *a*, p. 94.

♂♀. *Upperside* of fore wing with costal margin up to a line through anterior half of cell to apex of wing and the outer margin broadly black; discal area pale green, interrupted anteriorly by the following irregular black bands that join the black on the costa to the marginal black: a band across middle of cell and along vein 4, another at apex of cell and along vein 5, and two shorter and more oblique ones nearer apex of wing; the hyaline spot left close to apex much smaller than those below; a pale submarginal, somewhat obscure broad line. Hind wing with an even black band along inner margin in continuation of the costal black, and joined below to a very broad black marginal band; the remaining triangular middle area and a submarginal series of large spots pale green; inner margin with long soft pale hairs and touches of grey scaling on the tornal area.

Underside of hind wing with a series of slender crimson markings at the base along vein 1, broadened at tornus and in areas 2 to 5; admarginal white slender lines at tornal angle and in areas 2 and 3. Antennæ, head, thorax, and abdomen dark brownish-black, thorax with lateral dark grey pubescence; underside of palpi, thorax, and abdomen touched with dingy white, the abdomen with three lateral whitish stripes. ♂ hind wing with the fold grey on the inside and fringed with a brush of long white hairs.

Expanse: ♂♀, 85–95 mm.

Variation.—The wet-season form is called **cloanthulus** Fruhst., and is larger, with more extended black areas.

Habitat.—KASHMIR to BURMA ; not rare.

Graphium sarpedon (Linnæus).

♂♀. *Upperside* brownish-black, with a green or greenish-blue discal band ; fore wing with the band anteriorly strongly narrowed and separated into spots, on the hind wing narrowed posteriorly and ending in a point on vein 2 near the anal angle ; hind wing with the costal part of the band scaled with white, as also partly the veins intersecting the band ; a row of green submarginal lunules ; scent-fold grey on the inside, furnished with a tuft of long, somewhat stiff white hairs ; ♀ paler, with slightly broader wings.

Underside with paler ground-colour, the discal band scaled with transparent whitish. Fore wing with slight indications of submarginal spots before the tornus. Hind wing near base with a red transverse bar, which extends from the costal margin to the cell and is separated from the discal band ; five red discal spots, of which the anterior one encircles the apex of the cell. Body above brownish-black with dark grey hairs, beneath for the most part grey-white.

Larva.—" The young larva is black or dark green with numerous spines, of which those on the metathorax are long and bristly ; when full-grown green, beneath lighter, with a pair of short spines on each of the three thoracic segments and on the last segment ; on the metathorax a yellow transverse band, and from the metathorax to the anal segment a yellowish stripe above the legs " (*Jordan*, 1909 *a*).

Pupa.—" Green, the thoracic horn slenderer, more pointed, and straighter than in the allied species, the lateral ridges extending straight downwards from the horn, between this carina and the frontal one a very slight, somewhat curved vertical ridge " (*Jordan*, 1909 *a*).

For more detailed descriptions of larva and pupa see *Bell* (1911).

Habits.—The larva feeds on various Lauraceæ such as *Machilus odoratissisma* Nees, *Cinnamomum*, *Alseodaphne*, *Litsæa*, and especially *Camphora officinalis* Steud. where this tree has been imported. It lies in the centre of a leaf on the upper surface, is very sluggish, and does not wander far to pupate. The butterfly occurs in wooded districts and is very common in gardens and woods. It flies very rapidly round the tops of trees and frequents flowers. The males also congregate in large numbers at wet and damp places. It occurs up to 7,000 feet, but is more common in the lower hills.

Distribution.—South Japan and China as far as the Solomon Islands in numerous geographical forms. Two subspecies occur in the Indian area, where it is absent from the Andaman and Nicobar Islands.

65 *a*. **Graphium sarpedon teredon** (C. & R. Felder).

Papilio teredon, C. & R. Felder, 1864 *a*, p. 305 ; Bell, 1911, p. 1116, pl. D 5, figs. 30 (♂), 30 *a* (♀), pl. C, fig. 16 (larva), pl. 1, fig. 13 *a* (pupa).
Dalchina teredon, Moore, 1881 *a*, p. 143, pl. 62, figs. 1, 1 *a*, 1 *b* (larva, pupa, imago) ; id., 1903, p. 14, pl. 472, figs. 1, 1 *a*–1 *c* (larva, pupa, ♂♀).
Papilio sarpedon teredon, Rothschild, 1895, p. 442 ; Bingham, 1907, p. 112, pl. 15, fig. 98 (♂) ; Jordan, 1909 *a*, p. 95, t. 45 *a*.
Zetides sarpedon teredon, Evans, 1923, p. 240 ; id., 1927, p. 34 ; id., 1932 *a*, p. 55.
Dalchina thermodusa, Swinhoe, 1885 *a*, p. 146.
Papilio sarpedon teredon ab. *thermodusa*, Rothschild, 1895, p. 442.

♂♀. Distinguished from the nominotypical form by the narrower discal band on both wings. Fore wing with the discal band anteriorly yellowish-green and posteriorly bluish-green. Hind wing more produced posteriorly at apex of vein 4, where it forms a strong tooth ; median vein black where it crosses the discal band.

Expanse : ♂♀, 80–90 mm.

Variation.—On the fore wing the spot near the apex is sometimes absent. This form was named **thermodusa** Swinhoe.

Habitat.—CEYLON and PENINSULAR INDIA ; common.

65 *b*. **Graphium sarpedon sarpedon** (Linnæus). (Fig. 60, imago).

Papilio sarpedon, Linnæus, 1758, p. 461 ; Horsfield & Moore, 1857, p. 113, pl. 3, figs. 8, 8 *a* (larva, pupa) ; de Nicéville, 1892, p. 54, pl. L, fig. 11 (♂) ; Rothschild, 1895, pp. 440–1 ; de Nicéville, 1896, p. 186, pl. T, fig. 46 (dark aberr. of ♂, Sikkim) ; Mackinnon & de Nicéville, 1898, pl. W, fig. 26 *a*, *b* (pupa) ; Bingham, 1907, pp. 111–12, fig. 27 ; Kershaw, 1907, p. 113, pl. 13, fig. 5 ; Ollenbach, 1921, p. 896.
Dalchina sarpedon, Moore, 1903, p. 12, pl. 471, figs. 1, 1 *a*–1 *c* (larva, pupa, ♂♀).
Papilio sarpedon sarpedon, Jordan, 1909 *a*, p. 95, t. 44 *d* ; Rosen, 1929, p. 15.
Cosmodesmus sarpedon, Wileman, 1914, pp. 252–5, pl. 1, figs. 5, 6 (larva), 7 (pupa).
Zetides sarpedon sarpedon, Evans, 1923, p. 240, pl. 5, fig. A 6.2 (♂) ; id., 1927, p. 34 ; id., 1932 *a*, p. 55, pl. v, fig. A 6.2 (♂).
Papilio sarpedon f. *melas*, Fruhstorfer, 1907 *e*, p. 183 (Tong-king, Tenasserim) ; Jordan, 1909 *a*, p. 75.

♂♀. Discal bands broader than in the preceding race, and of uniform green. Hind wing with the median vein mostly white where it crosses the discal band ; tail shorter.

Variation.—In the northern districts a spring and summer form occurs. In the broad-banded spring form veins 1 to 3 are more or less white where they cross the discal band. In the summer form, called **melas** Fruhst., the band is narrower and the veins are black.

A dark aberration of the ♂ from Sikkim is figured and described by de Nicéville (1896). The discal band of fore wing above is reduced to the anterior and posterior spots; the posterior spot is represented by an irregular small irrorated patch of blue scales heavily oversprinkled with black scales.

Habitat.—KASHMIR to BURMA; common. Also on Hainan, and extending to Tong-king, the Philippines, and Lombok.

Fig. 60.—*G. sarpedon sarpedon* (Linn.).

Graphium doson (C. & R. Felder).

♂♀. *Upperside* white, with green or greyish-white markings which are scaleless for the most part. Fore wing with five cell-spots, of which the basal one is streak-like and the fourth comma-shaped; a posteriorly widened discal macular band, a row of submarginal spots, and a single subcostal spot between the submarginal and discal spots. Hind wing with a discal elongate-triangular band, which is anteriorly divided by a short, narrow black band; a submarginal row of spots; ♂ with yellow scent-wool which reaches to the inner marginal stripe.

Underside markings mostly larger and silver-scaled. Hind wing with red (rarely yellow) markings; a spot before the costa in the short black costal band, this band never united with the black subbasal stripe; a row of spots from apex of

cell to inner margin, of which the posterior one is usually produced basad into a long stripe. ♀ paler, with smaller markings.

Body above black, with bluish-grey hairs, abdomen with white lateral line, white below.

Larva.—" Black or green, the spines of the mesonotum absent and those of the third pair reduced to tubercles " (*Jordan*, 1909 *a*).

Pupa.—" Varies in colour according to its environment; angles of the head distinctly projecting, thoracic horn bent forwards, gradually pointed, the tip itself rounded, the carinæ of the horn sharp and straight " (*Jordan*, 1909 *a*).

Habits.—Common in wooded districts, especially near river-beds. The males congregate in crowds at wet and moist places, in company with other butterflies. Occurs throughout the summer. Larva feeds on *Cinnamomum*, *Polyalthia*, and other Anonaceæ.

Distribution.—South Japan to South China and CEYLON, southwards and eastwards to the Sunda Islands. Several subspecies are known, of which three occur in the Indian area.

66 *a*. **Graphium doson doson** (C. & R. Felder).

Papilio doson, C. & R. Felder, 1864 *a*, p. 305.
Zetides doson, Moore, 1881 *a*, p. 145, pl. 61, fig. 3.
Papilio doson doson, Jordan, 1909 *a*, pp. 96–7, t. 43 *c*.
Zetides doson doson, Evans, 1923, p. 240; id., 1927, p. 34; id., 1932 *a*, p. 55.
Papilio jason, Esper (*non* Linn.), 1785–1801, t. 58, fig. 5 (=fig. typ.).

♂♀. *Upperside* black. Fore wing with three slender, oblique, short, pale green streaks in basal half of cell and two irregular, small, similarly-coloured spots near its apex; a discal band composed of pale green spots that gradually diminish in size anteriorly, the spot in area 5 the smallest, those in 6 and 7 slightly larger; a spot at the base of area 7 and a sinuous complete submarginal series. Hind wing discal band reaching area 2 posteriorly, anteriorly white; a sinuous submarginal series of small pale green spots as on the fore wing; the subbasal costal stripe indistinct, not united with discal band, the latter interrupted by a black vein-streak at lower angle.

Underside brownish-fulvous black; markings similar, larger, their edges diffuse and all of a silvery-white, slightly tinted with pale green. Hind wing with a white basal streak that extends half-way down the inner margin; another shorter white subbasal streak from costa to vein 7, coalescent with the white of the discal band in the cell, the streak of ground-colour that lies between this subbasal streak and the discal band jet-black, interrupted where it crosses vein 8 by a crimson

spot; quadrate black spots near apex of cell and at bases of areas 1 to 3, all outwardly margined with crimson.

Expanse : ♂♀, 70–80 mm.

Habitat.—CEYLON ; common.

66 *b*. **Graphium doson eleius** (Fruhstorfer). (Pl. I, fig. 20, larva, fig. 21, pupa).

Papilio doson eleius, Fruhstorfer, 1908 *a*, p. 209 (Malabar); Jordan, 1909 *a*, p. 97.
Zetides doson eleius, Evans, 1923, p. 240; id., 1927, p. 34; id., 1932 *a*, p. 54.
Papilio doson, Davidson & Aitken (*non* Feld.), 1890, p. 364, E, figs. 2, 2 *a* (larva, pupa).
Papilio jason, Bingham (*non* Linn.), 1907, pp. 106–7, pl. 14, fig. 96 (♂).

♂♀. Differs only slightly from the nominotypical form from Ceylon. *Upperside* of fore wing with the green spots in the apical half somewhat more yellowish ; discal band somewhat broader ; subbasal green line prominent. Hind wing with the median vein less black on the inner part of discal band.

Larva.—" Very like that of *G. agamemnon* (Linn.), but the second pair of spines is entirely wanting and the third pair, which in *agamemnon* is rather long, curved, and sharp, is reduced in this species to mere knobs encircled with a black ring. The colour is generally black or smoky until the last moult and then dull green, inclining to rusty brown on the sides, but some of our specimens remained quite black to the end " (*Davidson & Aitken*, 1890).

Pupa.—" The distinguishing mark of the pupa is again in the frontal horn, which is straight as in *agamemnon*, but directed forward instead of being almost erect. Its colour is normally green, but varies with that of the object to which it is attached " (*Davidson & Aitken*, 1890).

Habits.—" Not so abundant in Coorg as *teredon*, but still very common. Habits similar to those of *teredon* ; often settles on mud among *teredon*, also in serried rows separately " (*Yates*, 1931).

Habitat.—SOUTHERN INDIA to BENGAL ; common.

66 *c*. **Graphium doson axion** (C. & R. Felder). (Fig. 61, genitalia).

Papilio axion, C. & R. Felder, 1864 *a*, p. 305 ; Gosse, 1883, p. 311, pl. xxx, fig. 20 (genitalia).
Papilio eurypylus axion, Rothschild, 1895, pp. 433–4 ; Bingham, 1907, p. 107.
Zetides axion, Moore, 1903, p. 4, pl. 468, figs. 1, 1 *a*–1 *c* (larva, pupa, ♂♀).
Papilio doson axion, Jordan, 1909 *a*, p. 97, t. 43 *c*.
Zetides doson axion, Evans, 1927, p. 34 ; id., 1932 *a*, p. 55, pl. v, fig. A 6.3 (♂).

Zetides eurypylus, Hübner (*non* Linn.), 1806–19, t. 107, figs. 1, 2.
Papilio acheron, Moore, 1885, p. 120 (N. Bengal).
Papilio eurypylus ab. *acheron*, Rothschild, 1895, p. 434.
Papilio doson f. *acheron*, Jordan, 1909 *a*, p. 97.
Papilio jason præstabilis, Fruhstorfer, 1909 *a*, p. 170 (Tong-king, Hong Kong).
Papilio axion f. *præstabilis*, Jordan, 1909 *a*, p. 97, t. 43 *c* (♂ underside).

♂♀. Differs from the nominotypical form in the broader discal band; all the spots and markings of pale green and white conspicuously larger, especially in the spring broods. Fore wing with the second submarginal spot in area 1 nearly always present. Hind wing with the costal bar separate from the basal dark band.

Underside of hind wing with the red spots more conspicuous, a red line along the posterior part of inner margin; in most specimens the short subbasal narrow band of white that runs from the costa to vein 7 does not coalesce with the white of the discal band where it crosses the cell.

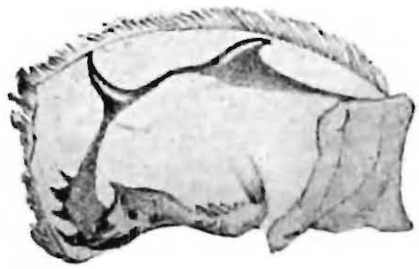


Fig. 61.—*G. doson axion* (Feld.), valve and harpe. (After Gosse).

Genitalia.—Harpe (fig. 61) a broad thin plate which closely lines the greater part of the valve-cavity; its edge is well sclerotized and on the ventral side furnished with two long, tapering, curved, acute spines, much resembling the prickles of a rose, both curved basad; dorsal edge produced to a thin sclerotized wall cut into three or four small and irregular teeth (*Gosse*, 1883).

Variation.—The spring brood, form **acheron** Moore, is small, the discal band broad, and the submarginal spots below are large; this form, from hibernated pupæ, is most strongly pronounced in the mountain districts of Northern India.

The summer brood, form **præstabilis** Fruhst., has smaller submarginal spots on the under surface. *Upperside* with vein 1 of fore wing and median of hind wing less black where they cross the discal band.

The spots of the hind wing below are sometimes yellow instead of red.

Habitat.—KUMAON to BURMA; common. Also occurs in South China, Hainan, Tong-king, Siam, Annam, and Cochin-China.

Graphium evemon (Boisduval).

♂♀. Resembles *eurypylus* Linn., but has distinctly different genitalia, the harpe having a long and more basally placed ventral process. The ♂ scent-wool forms a narrow stripe hidden in the fold. The abdomen above never dusted with white in large males. Fore wing above with the last submarginal spot absent or vestigial.

Habits.—The butterfly congregates with the allied species at wet or damp places. When such a swarm is disturbed, the butterflies fly up and down the forest paths one behind the other, like *Catopsilia*.

Distribution.—ASSAM and Tong-king to Java, Nias, and Borneo. Two subspecies in the Indian area.

67 *a*. **Graphium evemon albociliatis** (Fruhstorfer).

Papilio evemon albociliatis, Fruhstorfer, 1901 *a*, p. 106 ; Jordan, 1909 *a*, pp. 97–8.
Zetides evemon albociliatis, Evans, 1920, p. 88 ; id., 1923, p. 240 ; id., 1927, p. 35 ; id., 1932 *a*, p. 55.

♂♀. Distinguished from the *eurypylus* inhabiting the same locality by the underside markings. Fore wing with the last submarginal spot absent, hind wing with the costal bar centred with red as in *eurypylus*. Fore wing above with a spot near the base of area 5. Hind wing with narrow scent-stripe. Spring specimens have a broader discal band and beneath larger submarginal spots.

Expanse : ♂♀, 75–90 mm.

Habitat.—ASSAM to TAVOY ; rare. Found also in Tong-king.

67 *b*. **Graphium evemon orthia** (Jordan).

Papilio evemon orthia, Jordan, 1909 *a*, p. 88 (Malay Peninsula).
Zetides evemon orthia, Evans, 1923, p. 240 ; id., 1927, p. 35 ; id., 1932 *a*, p. 55.

♂♀. Similar to the summer specimens of the preceding race, but much smaller. Fore wing without a spot near base of area 5. *Underside* of hind wing without a red costal spot. Submarginal spots of both wings much larger beneath than above.

Habitat.—MERGUI ARCHIPELAGO to SOUTHERN BURMA ; rare. Extends to Penang, the Malay Peninsula, Sumatra, Banka, and Borneo.

Graphium eurypylus (Linnæus).

♂♀. Very closely resembles *doson* Feld. *Underside* of hind wing with the short dark costal band, which bears the red spot, united posteriorly with the dark subbasal band ;

in *doson* it terminates inside the silver band. In specimens where the bands are not united the basal margin of the silver band is notched at the subcostal vein. The yellow scent-wool of the ♂ forms a broad patch, as in *doson*, which extends to the black band parallel with inner margin.

"The harpe (on the inner side of the anal claspers) is distally narrower than in *doson* and bears longer processes" (*Jordan*, 1909 *a*).

Larva and *pupa* very similar to *doson*. The larva at first black or brown, in the middle stages brown, yellowish, reddish or green, and when full-grown dark green. On Anonaceæ.

Habits.—The same habits as *doson*, with which it flies together in India.

Distribution.—EASTERN INDIA to Malay Peninsula, Hainan, and Tong-king; the Greater and Lesser Sunda Islands, Philippines, Celebes, Moluccas, the whole Papuan region, Bismarck Islands, and Australia.

68 *a*. **Graphium eurypylus cheronus** (Fruhstorfer).

Papilio eurypylus acheron f. *cheronus*, Fruhstorfer, 1903 *a*, p. 204.
Papilio eurypylus cheronus, Jordan, 1909 *a*, p. 98; Ollenbach, 1921, p. 896.
Zetides eurypylus cheronus, Evans, 1923, p. 241; id., 1927, p. 35; id., 1932 *a*, p. 55.
Papilio eurypylus cheronus f. *petina*, Jordan, 1909 *a*, p. 98.

Wet-season form.—♂♀. *Upperside* of hind wing with the green band incised at the anterior and posterior margins of the cell. *Underside* of fore wing with the two submarginal spots in area 7 united, but sometimes separated by a thin brownish streak; subapical spot well developed; hind wing without a pale spot in the base of area 3. Abdomen for the most part dusted with white.

Dry-season form **petina** Jord.—Smaller, discal bands broader, submarginal spots below very much larger.

Expanse: 75–90 mm.

Habitat.—SIKKIM to BURMA; not rare. Also extended to Hainan, Tong-king, and Siam.

68 *b*. **Graphium eurypylus macronius** (Jordan).

Papilio eurypylus macronius, Jordan, 1909 *a*, p. 98 (Andamans).
Zetides eurypylus macronius, Evans, 1923, p. 241; id., 1927, p. 35; id., 1932 *a*, p. 55.

♂♀. Larger than the preceding race, abdomen for the most part white. Discal bands broad, that of the hind wing dusted with white, at the anterior and posterior margins of cell not or only feebly incised; submarginal spots small, the last on the fore wing and the first on the hind wing usually only indicated.

Underside of fore wing with the two spots in area 7 separated. Hind wing with the red spots entirely or almost entirely without white edging ; a pale spot in the base of area 3.

Habitat.—ANDAMAN ISLANDS ; rare.

Graphium bathycles (Zinken-Sommer). (Fig. 62 *a–e*, genitalia).

♂♀. *Upperside* black with pale green markings. Fore wing with five cell-spots, a posteriorly much widened discal band, a row of submarginal spots, and a single spot in area 7

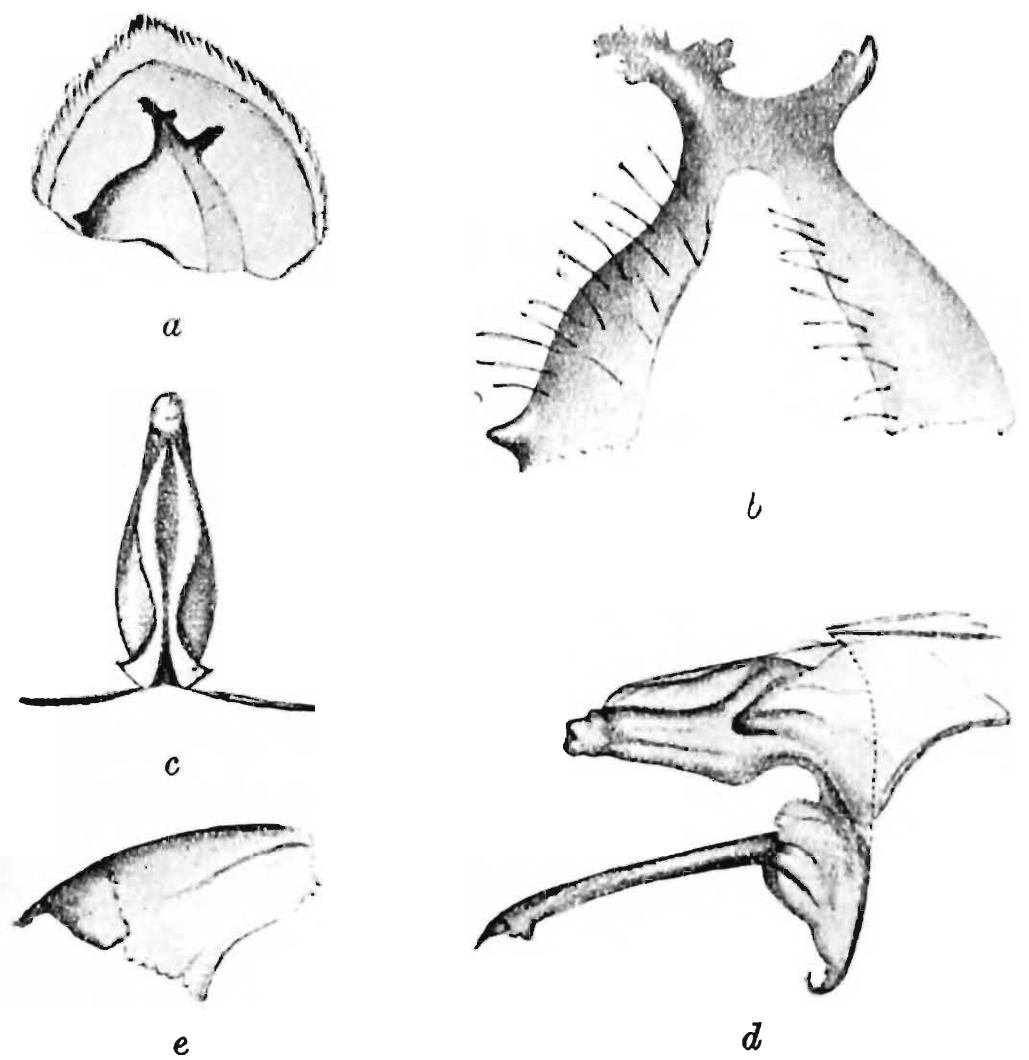


Fig. 62.—*G. bathycles* (Zink.) ; genitalia. (After Gosse).

a, valve and harpo ; *b*, harpe ; *c*, scaphium, vertical view ; *d*, lateral view of genitalia ; *e*, ædeagus, lateral view of tip.

at the proximal side of the submarginal spot. Hind wing with two large white costal patches, an oblong spot in area 6 near cell, a long spot in the cell and one in area 2, a row of submarginal spots.

Underside with the spots silvery-white, at base of hind wing often yellowish; cell-spots of fore wing and submarginal spots of hind wing larger than above. Hind wing with the brownish-black costal margin of cell prolonged to the costal margin in the form of a narrow, curved band; inside this band before the costa usually a yellow spot; a row of yellow discal spots. ♂ without scent-wool in the fold. Body above black, with ashy-grey hairs at sides of head and thorax; beneath grey-white, abdomen laterally with a grey-white stripe.

Genitalia.—Harpe (fig. 62 *a*, *b*) a broad segment of a sphere, the margins thickened, and dividing anteriorly into two strongly sclerotized processes, each of which, the dorsal especially, is studded with short, stiff blunt teeth; dorsal edge with a short, conical process (*Gosse*, 1883, p. 313, pl. xxxi, figs. 1–5).

Habits.—Frequents wooded districts of the lowlands and hills, the males often in large numbers at wayside puddles and on sandy river-banks.

Distribution.—NORTHERN INDIA to the Malay Peninsula, Sumatra, Borneo, Java, and Palawan. Only one subspecies occurs in the Indian area.

69. **Graphium bathycles chiron** (Wallace).

Papilio chiron, Wallace, 1865, p. 66 (nota); Moore, 1865 *b*, p. 757.
Papilio bathycles chiron, Rothschild, 1895, p. 438; Bingham, 1907, p. 108; Jordan, 1909 *a*, p. 100; Ollenbach, 1921, p. 896.
Zetides chiron, Moore, 1903, p. 6, pl. 469, figs. 1, 1 *a*, 1 *c* (♂♀).
Zetides bathycles chiron, Evans, 1923, p. 241; id., 1927, p. 35; id., 1932 *a*, p. 56.
Papilio bathycles chiron f. vern. *ligyra*, Jordan, 1909 *a*, p. 100.

♂♀. The hind wing bears, at least beneath, always a white stripe behind the cell.

The nominotypical *wet-season* form is large, with smaller light patches.

The *dry-season form*, **ligyra** Jord., has the discal spots, and beneath the submarginal ones, large; fore wing with veins 2 and 3 narrowly black; hind wing with a small discal spot in area 2.

Expanse: ♂♀, 75–100 mm.

Habitat.—SIKKIM to BURMA; not rare. Occurs also in Tongking and Annam.

Graphium arycles (Boisduval).

♂♀. *Upperside* with pale green patches. Fore wing with an indistinct basal band, a subbasal band, three transverse spots and a smaller apical spot in the cell, a discal row of patches, a submarginal row of small spots, in area 7 an isolated

discal spot. Hind wing with a tripartite subbasal band parallel with inner margin ; a discal row of four spots, of which the first is large and white ; a submarginal row of six spots.

Underside patches with silvery scaling. Hind wing with a small costal spot between the subbasal band and the large costal discal spot ; three red spots between vein 4 and anal angle.

Distribution.—The SHAN STATES and Siam to Java and Palawan. Not much subject to variation, and only two subspecies distinguished.

70. **Graphium arycles arycles** (Boisduval).

Papilio arycles, Boisduval, 1836, p. 231 ; Distant, 1885, p. 362, pl. 32, fig. 5 ; Rothschild, 1895, p. 446 (part.).
Zetides arycles, Moore, 1903, p. 11.
Papilio arycles arycles, Jordan, 1909 *a*, p. 102, t. 45 *c*, *d*.
Zetides arycles, Evans, 1927, p. 35 ; id., 1932 *a*, p. 56.

♂♀. The large central costal spot of the hind wing is always somewhat longer than broad. Other characters as already described.

Expanse : 70–80 mm.

Habitat.—ASSAM to SOUTHERN BURMA ; rare. Extends to the Malay Peninsula, Sumatra, Java, Banka, Borneo, and Palawan.

Graphium agamemnon (Linnæus). (Fig. 63 *a–c*, genitalia).

♂♀. *Upperside* brownish-black with blue-green patches, of which those placed towards the base are band-like and those below the cell of the fore wing large and elliptical. Hind wing with tail, which is longer in the ♀.

Underside paler, the green patches partly covered with white or brownish scales, both wings clouded with violet-grey. Hind wing with a black crescent, basally margined with red between vein 8 and cell ; beneath this spot usually a distinct second arc ; often a red anal spot and sometimes a row of red discal spots. Body brown-black above, beneath grey, with a grey-green lateral stripe.

Genitalia.—Harpe (fig. 63 *a*) a broad saucer-like plate with thickened edges and slightly free ; dorsal edge produced to a tooth-like lobe of somewhat rounded triangular form, its edge not serrate (*Gosse*, 1883).

Larva.—" The young larva almost black, with a large light area on the middle of the back, the three thoracic segments and the anal segment each with a pair of processes with forked hairs, the other segments likewise with some forked hairs arranged in longitudinal rows ; these hairs disappear later. The full-grown larva either ochre-yellow, with greenish tinge, or dark green ; larvæ bred indoors sometimes

light yellow; the thoracic segments each with a pair of black spines, the spines of the third pair in a small orange-yellow spot; the anal spines light with dark tips" (*Jordan*, 1909 *a*).

Pupa.—"Thoracic horn laterally compressed, obtuse when viewed from the side, bent forwards and about twice as long as broad, the tip and the lateral carina brown, the latter undulate; behind the stigma of the prothorax a short brown ridge" (*Jordan*, 1909 *a*).

Habits.—The larva feeds on trees belonging to the Anonaceæ as *Anona*, *Saccopetalum*, *Gualteria*, *Polyalthia*, and *Michelia*.

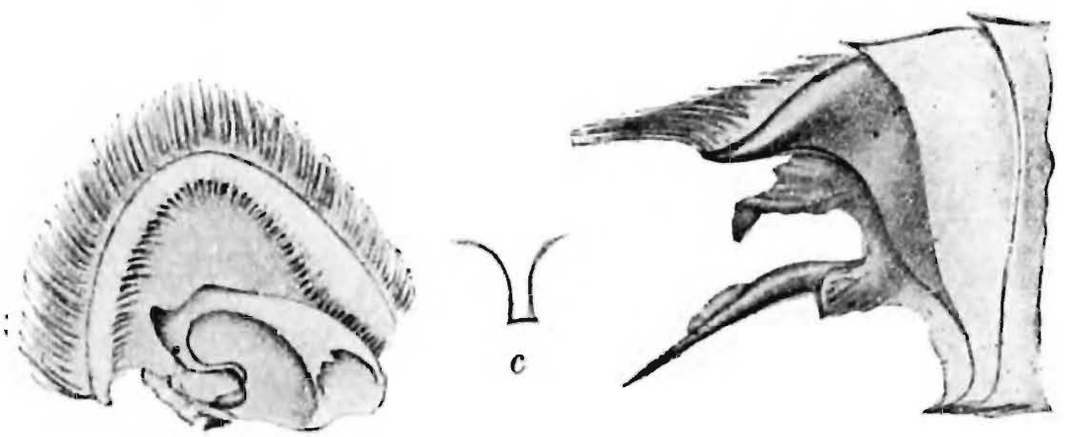


Fig. 63.—*G. agamemnon* (Linn.), genitalia. (After Gosse).
a, valve and harpe; *b*, lateral view of uncus, scaphium, and ædeagus; *c*, uncus, vertical view.

It prefers young trees or bushes, and remains by day motionless on the midrib of a leaf. The butterfly is very common in woods, plains, and hills, and is fond of visiting the flowers of *Lantana*. The females are more usually taken when ovipositing.

Distribution.—South China and NORTHERN INDIA to Queensland, the Solomon Islands, and Bismarck Islands. A number of geographical races are known, of which five occur in the Indian area.

71 *a*. **Graphium agamemnon agamemnon** (Linnæus). (Fig. 64, imago).

Papilio agamemnon, Linnæus, 1758, p. 462; Horsfield & Moore, 1857, p. 114, pl. 3, figs. 9 (larva), 9 *a* (pupa); Gosse, 1883, pp. 314, 317, pl. xxxi, figs. 6–8 (genitalia); Staudinger & Schatz, 1884, p. 9, t. 6 (♂); Distant, 1885, p. 363, pl. 32, fig. 7; Davidson & Aitken, 1890, p. 363 (early stages); Rothschild, 1895, pp. 447–50; Bingham, 1907, pp. 108–10, fig. 26; Bell, 1911, p. 1117, pl. D 5, fig. 29 (♂).

Zetides agamemnon, Moore, 1903, p. 7, pl. 470, figs. 1, 1 *a*–1 *c* (larva, pupa, ♂♀).

Papilio agamemnon agamemnon, Jordan, 1909 *a*, p. 101, t. 45 *d*; Ollenbach, 1921, p. 896.

Zetides agamemnon agamemnon, Evans, 1923, p. 241, pl. 5, fig. A 6.8(♂); id., 1927, p. 35; id., 1932 *a*, p. 56, pl. v, fig. A 6.8(♂).
Papilio ægisthus, Linnæus, 1763, p. 401.
Papilio agamemnon ab. *ægisthus*, Rothschild, 1895, p. 449; Jordan, 1909 *a*, p. 100.

♂♀. *Upperside* of fore wing with a spot at extreme base of costa, a transverse short bar near base of cell, and seven spots beyond, two and two except the apical spot, which is single; two spots beyond apex of cell; a spot at base of areas 1 *a* and 1, followed by two oblique short macular bands; a discal series of spots decreasing in size towards the costa, and a post-discal series of smaller spots that begins with two in area 1; the spots in area 7 are placed more distad than the others. Hind wing with a basal stripe, ending in a point in area 1;

Fig. 64.—*G. agamemnon agamemnon* (Linn.).

a discal stripe, interrupted at lower edge of cell and not reaching beyond the middle of area 2; two post-discal series of spots; these markings are white in area 7; tail shorter than in the preceding race.

Underside fuliginous-brown or brownish-black, more or less suffused with pink along the costal margin, over the apical area, and along the outer edge of the discal markings on fore wing, broadly along the inner and outer margins and at base of areas 6 and 7 on hind wing; markings similar to those above, but less clearly defined and more greyish. Hind wing black; the spots on the pink area in areas 6 and 7 edged with red on the inside. Cilia very narrow, pale pink.

Specimens with a short stumpy tail are form **ægisthus** Linn.

Habitat.—KUMAON to BURMA; common.

71 *b*. **Graphium agamemnon menides** (Fruhstorfer).

Papilio agamemnon menides, Fruhstorfer, 1904 *a*, p. 181 (Ceylon); Jordan, 1909 *a*, p. 101.
Zetides agamemnon menides, Evans, 1923, p. 241; id., 1927, p. 35; id., 1932 *a*, p. 56.
Zetides agamemnon, Moore, 1881 *a*, p. 145, pl. 63, figs. 2, 2 *a* (♂, larva).

♂♀. Distinguished from the nominotypical race by the longer tail.

Habitat.—CEYLON and PENINSULAR INDIA; common. Ascends to 7,000 feet in the Nilgiris.

71 *c*. **Graphium agamemnon andamana** (Lathy).

Papilio agamemnon andamana, Lathy, 1907, p. 5; Jordan, 1909 *a*, p. 101.
Zetides agamemnon andamanica, Evans, 1923, p. 241; id., 1927, p. 35; id., 1932 *a*, p. 56.

♂♀. This race only differs in the much greyer green colour of the markings on the upperside.

Habitat.—ANDAMAN ISLANDS; not rare.

71 *d*. **Graphium agamemnon decoratus** (Rothschild).

Papilio agamemnon decoratus, Rothschild, 1895, p. 452 (part.) (Nicobars); Bingham, 1907, pp. 108, 110; Jordan, 1909 *a*, p. 101.
Zetides agamemnon decoratus, Evans, 1923, p. 241; id., 1927, p. 35; id. 1932 *a*, p. 56.

♂♀. *Upperside* as in *andamana* Lathy. *Underside* of hind wing with at least five, usually seven, light red spots.

Habitat.—CAR NICOBAR and Central group of NICOBAR ISLANDS; not rare.

71 *e*. **Graphium agamemnon pulo** (Evans).

Zetides agamemnon pulo, Evans, 1932 *a*, p. 56 (S. Nicobars).

♂♀. Resembles *decoratus* Roths., but the tails are absent or are very short.

Habitat.—SOUTH NICOBAR ISLANDS; not rare.

Macareus Group.

Ground-colour white or with a greenish tinge, veins striped with black, internervular, light longitudinal stripes as in Danaines. Hind wing beneath without red or yellow spots, except that an anal spot is often present. Hind wing rounded, no tail in the Indian species.

The species are all mimetic, those of the Indian area strongly resembling the Danaines which fly with them.

The group is connected with the *Antiphates* Group by a single tailed species—the rare *G. phidias* Oberthür—found in Annam and Tong-king.

Graphium macareus (Godart).

♂♀. Abdomen beneath with a black median line. *Upperside* of wings black or brownish-black, with white or greenish-white markings.

♂. Fore wing with three cell-stripes, which are sometimes broken up into small spots; two apical spots; outside end of cell a row of four dots, and distally to them, between vein 4 and inner margin, are five stripes, of which the two in area 1 are sometimes confluent. Hind wing with white stripes, the cell entirely or for the most part white with a black transverse line before the apex; scent-organ strongly developed. Both wings with a row of submarginal spots.

Underside brownish, the light markings in the distal third of hind wing mostly less distinct than above.

♀. Either resembling the ♂ or is much darker.

Habits.—Common in most districts. The males congregate in swarms at wet places, whilst the females are taken singly in the woods on flowers, where they rest with closed wings.

Distribution.—Northern India to Hainan, Bali, and the Philippines. A number of subspecies are distinguished, of which four occur in the Indian area.

72 *a*. **Graphium macareus indicus** (Rothschild). (Fig. 65, imago).

Papilio macareus indicus, Rothschild, 1895, p. 457 (Sikkim); Bingham, 1907, pp. 114–15 (part.), fig. 29; Jordan, 1909 *a*, p. 104, t. 46 *c*.

Paranticopis indicus, Moore, 1903, p. 110, pl. 515, figs. 2, 2 *a*, 2 *b* (♂♀).

Paranticopis macareus indicus, Evans, 1923, p. 241; id., 1927, p. 35; id., 1932 *a*, p. 56.

Paranticopis polynices, de Nicéville, 1897 *a*, p. 568; Moore, 1903, p. 109, pl. 515, figs. 1, 1 *a* (♂♀).

Papilio macareus, de Nicéville, 1892, p. 345, pl. 1, fig. 1 (♂) (aberration, Sikkim).

♂. *Upperside* of fore wing with broad white stripes, those in the cell not divided, and the two in area 1 not confluent. Hind wing with broad stripes, the cell entirely white, the oblique subapical line weakly developed.

♀. Similar to the ♂. Fore wing with the white discal stripes broader than the black vein-stripes which separate them.

Expanse: ♂♀, 80–100 mm.

Variation.—Not variable as a rule. A striated aberration of the ♂ is described and figured by de Nicéville (1892). The discal streaks of both wings are extended to include the marginal spots, and they are also joined on the fore wing to the four rounded spots beyond end of cell. The cell of

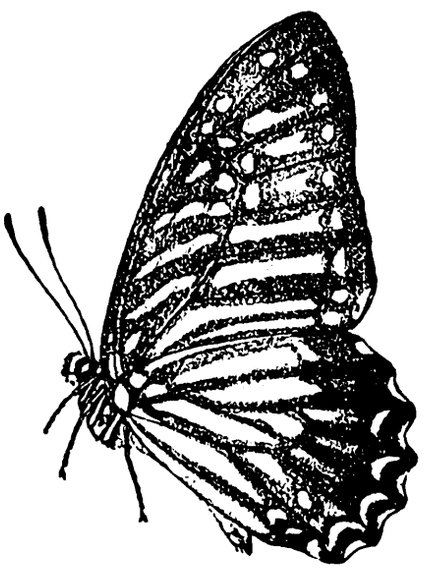


Fig. 65.—*G. macareus indicus* (Roths.).

the fore wing has a basal patch and a tripartite patch in the middle. Underside markings much the same as above, but are larger and more suffused.

Habitat.—SIKKIM. The ♂ not rare.

72 *b*. **Graphium macareus lioneli** (Fruhstorfer).

Papilio macareus lioneli, Fruhstorfer, 1902 *c*, p. 74 (Assam); Jordan, 1909 *a*, p. 104.

Paranticopis macareus lioneli, Evans, 1923, p. 241; id., 1927, p. 35; id., 1932 *a*, p. 56.

♂. Not distinguishable from *indicus* except in specimens with narrower white stripes.

♀. Fore wing brown-black with white submarginal spots, the light discal stripes scarcely indicated. Hind wing with a white spot in apex of cell and white stripes round the cell, these stripes narrower than in *indicus*, the posterior ones not reaching the base, the submarginal spots well developed.

Variation.—There is a ♂ in the Tring Museum, from the Khasi Hills, in which the submarginal spots of the hind wing above and beneath are enlarged; beneath they form a band which commences behind the subcostal with a specially strongly enlarged spot; the costal margin is broadly edged with brown.

Habitat.—ASSAM. The ♂ not rare.

72 *c*. **Graphium macareus gyndes** (Jordan).

Papilio macareus gyndes, Jordan, 1909 *a*, p. 104; Ollenbach, 1921, p. 896.
Paranticopis macareus gyndes, Evans, 1923, p. 241; id., 1927, p. 35; id., 1932 *a*, p. 56.

♂. Resembles *lioneli*, the white stripes mostly somewhat narrower than in *indicus*.

♀. Resembles *indicus* ♀, but the white spots in the apical half of fore wing and the distal half of hind wing smaller.

Variation.—Tenasserim males have narrower white stripes than the preceding forms, but the cell of hind wing is still almost entirely filled up with white; moreover, the three cell-stripes on the fore wing above are not, or not distinctly, interrupted.

Habitat.—Northern Burma to Tavoy; rare.

72 *d*. **Graphium macareus perakensis** (Fruhstorfer).

Papilio macareus perakensis, Fruhstorfer, 1899 *c*, pp. 283–4 (♂) (Perak); Jordan, 1909 *a*, p. 104.
Paranticopis macareus perakensis, Evans, 1923, p. 241; id., 1927, p. 35; id., 1932 *a*, p. 56.

♂. White markings very broad, the upper discal streak joined to the spots beyond the cell. Fore wing cell-stripes broad and complete on *upperside*, and broken into three spots on *underside*.

♀. As in *lioneli*, but the apical area of fore wing much darker and the spots thereon quite white, while the others are sullied. Fore wing discal streaks in areas 2 and 3 short, not nearly reaching the base; cell-stripes much reduced.

Habitat.—Mergui Archipelago to Southern Burma; rare: less rare in the Malay Peninsula.

Graphium xenocles (Doubleday).

♂♀. Much larger than *macareus*, the wings broader, the white stripes larger than in *macareus* from the same districts, hind wing with a yellow anal spot.

Distribution.—Northern India to Hainan and Siam, occurring together with *macareus*. Three out of five subspecies occur in the Indian area.

73 *a*. **Graphium xenocles phrontis** (de Nicéville). (Fig. 66, imago).

Paranticopis phrontis, de Nicéville, 1897 *a*, p. 568 (♂♀) (Sikkim); Moore, 1903, p. 112, pl. 516, figs. 1, 1 *a* (♂♀).
Papilio xenocles phrontis, Jordan, 1909 *a*, p. 104.
Parantiocpis xenocles phrontis, Evans, 1923, p. 241; id., 1927, p. 35; id., 1932 *a*, p. 56; Tytler, 1926, p. 249 (melanic ♂ from Sikkim).

Papilio xenocles f. *xenokrates*, Fruhstorfer, 1902 *a*, p. 146.
Papilio xenocles phrontis f. æst. *xenocrates*, Fruhstorfer, 1903 *a*, p. 229 (♀, Sikkim, wet-season form); Jordan, 1909 *a*, p. 104.

♂♀. *Upperside* black, with greenish or bluish-white markings. Fore wing cell with three transverse, very oblique, broad streaks and two elongate spots near apex; broad stripes from base in areas 1 *a* to 3; a series of four rounded spots beyond end of cell in areas 4, 5, 6, and 8, followed by five short streaks, that are outwardly truncate or emarginate, in areas 4 to 8; a submarginal series of large rounded spots. Hind wing with a broad curved cell-stripe; broad stripes from base in areas 1 to 7, variable in length, the stripe in area 7 white a prominent yellow anal spot, which sometimes extends into

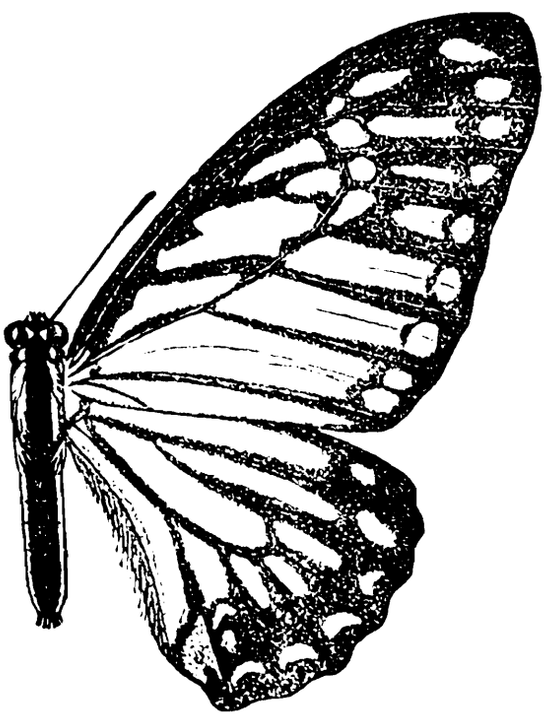


Fig. 66.—*G. xenocles phrontis* (de Nicév.).

area 2; a submarginal series of spots, some or all of which may be absent but, when present, the posterior three always somewhat lunate.

Underside fuliginous-brown, paler towards the apical area of fore wing; markings as above, but duller and less clearly defined; the yellow anal spot very large. Antennæ, head, thorax, and abdomen black; two spots on the head, the thorax and abdomen laterally white; underside of thorax and abdomen white, the latter with a medial and a lateral narrow stripe.

Expanse: ♂♀, 85–120 mm.

Variation.—Specimens in which the distal margin of the hind wing beneath is narrow and black-brown are named **xenocrates** Fruhst.

Habitat.—SIKKIM and BHUTAN; not rare.

73 *b*. Graphium xenocles xenocles (Doubleday).

Papilio xenocles, Doubleday, 1842, p. 74 (Assam); id., 1846 *b*, p. 20, pl. 10, fig. 2 (♂); Rothschild, 1895, p. 458 (part.); Bingham, 1907, pp. 113–14, fig. 28 (part.).
Paranticopis xenocles, Moore, 1903, p. 112, pl. 516, figs. 2, 2 *a* (♂♀).
Papilio xenocles xenocles, Jordan, 1909 *a*, pp. 103–5, t. 47 *a*.
Paranticopis xenocles xenocles, Evans, 1923, p. 241; id., 1927, p. 37; id., 1932 *a*, p. 57, pl. vi, fig. A 7.2 (♂).
Papilio xenocles f. vern. *theronus*, Fruhstorfer, 1903 *a*, p. 227; Jordan, 1909 *a*, p. 105.

♂. As in *phrontis*.

♀. Much darker than *phrontis*, the light stripes very strongly reduced; fore wing usually lighter brown basally than distally, the cell-spots thin and, towards the costa, indistinct or suppressed, the light discal stripes much narrower than the dark vein-stripes; hind wing with small yellow anal spot, often only just indicated.

Variation.—Males with light brown marginal area on the hind wing below are named **theronus** Fruhst.

Habitat.—ASSAM; not rare.

73 *c*. Graphium xenocles kephisos (Fruhstorfer).

Papilio xenocles kephisos, Fruhstorfer, 1902 *b* (*b*), p. 346 (♀, Tong-king; Jordan, 1909 *a*, p. 105; Ollenbach, 1921, p. 896.
Paranticopis kephisos, Moore, 1904, p. 117.
Paranticopis xenocles kephisos, Evans, 1923, p. 241; id., 1927, p. 36; id., 1932 *a*, p. 57.
Papilio xenocles kephisos f. vern. *neronus*, Fruhstorfer, 1902 *c*, p. 74 (Upper Tong-king); Jordan, 1909 *a*, p. 105.
Paranticopis neronus, Moore, 1904, p. 114, pl. 517, figs. 1, 1 *a* (♂).

♂. Hind wing with the light discal stripes on the whole somewhat narrower than in the preceding forms.

♀. Resembles the ♂, but the light stripes narrower.

Variation.—Males with broader and lighter brown distal margin to the hind wing beneath are named **neronus** Fruhst. and are thought to be a dry-season form.

Habitat.—BURMA; rare, especially the ♀. Occurs also in Tong-king and Siam.

Graphium megarus (Westwood).

♂♀. Abdomen below without black median lines. ♂ scent-organ strongly developed. Markings greenish-white. Fore wing with three rows of spots between the cell and outer margin, the spots of the two inner rows in areas 1 and 2 united into three stripes. Hind wing with long stripes in the basal half, short streaks round apex of cell, and between these and outer margin three rows of spots, of which the submarginal ones are lunular. The light markings vary individually in size.

Habits.—The males are common on moist sand, and the females are taken singly in the woods.

Distribution.—NORTHERN INDIA to Hainan, Sumatra, Borneo, and Banguey Island. Two of the four subspecies occur in the Indian area.

74 *a*. **Graphium megarus megarus** (Westwood). (Fig. 67, imago).

Papilio megarus, Westwood, 1845, p. 98, pl. 72, fig. 2 (Assam); Rothschild, 1895, p. 460 (part.); Bingham, 1907, pp. 115–16, fig. 30 (part.).
Paranticopis megarus, Moore, 1904, p. 114, pl. 57, figs. 2, 2 *a* (♂♀).
Papilio megarus megarus, Jordan, 1909 *a*, p. 106, t. 46 *d*.
Paranticopis megarus megarus, Evans, 1923, p. 242, pl. vi, fig. A 7.3; id., 1927, p. 36; id., 1932 *a*, p. 57, pl. vi, fig. A 7.3 (♂).

♂. *Upperside* of fore wing with a small basal cell-spot followed by three obliquely transverse streaks in middle of

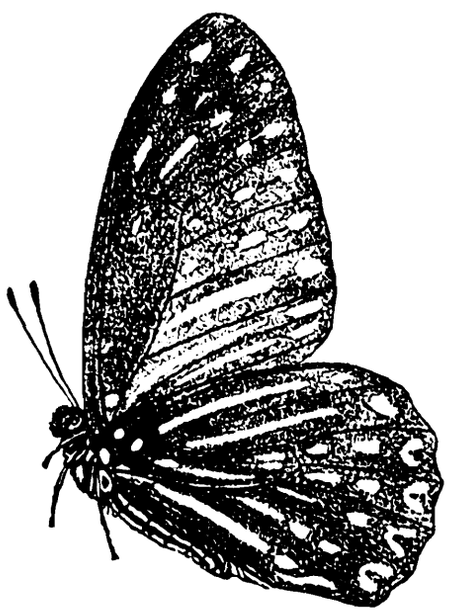


Fig. 67.—*G. megarus megarus* (Westw.).

cell, none extended to either the subcostal or median veins, and two spots near apex of cell; single slender, narrow stripes in areas 1 *a* and 2, and two streaks in area 1; above these a spot at base followed by a streak in each of areas 3, 4, 6, and 8, an outer spot only in area 5, and a basal spot in area 7; a complete series of small submarginal spots. Hind wing with a cell-streak and a spot near the upper angle; a streak followed by a spot in each of areas 1, 6, and 7; three elongate spots in areas 2 and 3 and two in areas 4 and 5; a series of four slender submarginal lunules in areas 2 to 5.

Underside markings slightly broader, the cell-spots of fore wing obsolete.

♀. Ground colour more fuliginous-black, markings similar to ♂, on the fore wing slightly broader, on the hind wing slightly narrower, than in the ♂.

Expanse : ♂♀, 65–90 mm.

Habitat.—ASSAM to NORTHERN BURMA ; rare.

74 *b*. **Graphium megarus megapenthes** (Fruhst.).

Papilio meagrus (sic) *megapenthes*, Fruhstorfer, 1902 *e*, p. 161 (♂♀, Annam).
Papilio similis, Lathy, 1899, p. 149 (Siam).
Paranticopis similis, Moore, 1904, p. 118.
Papilio megarus similis, Jordan, 1909 *a*, p. 106.
Paranticopis megarus similis, Evans, 1933, p. 242 ; id., 1927 p. 36 ; id., 1932 *a*, p. 57.
Papilio megarus megarus, Ollenbach (*non* Westw.), 1921, p. 896.

The name *similis* Lathy is a primary homonym of *Papilio similis* Linnæus, 1758, and so cannot be used.

♂♀. Differs from the nominotypical race in the more strongly developed cell-spots of the fore wing on both sides.

Habitat.—SHAN STATES to SOUTHERN BURMA; rare. Also found in Hainan, Tong-king, Siam, the Malay Peninsula, and North-East Sumatra.

Recorded by Ollenbach (1921) as a very uncommon species in Tavoy. " On the wing it looks very like *Danais septentrionis* and may easily be overlooked."

There is a melanic specimen of the ♀ in the British Museum, presented by Brigadier Evans, and taken at Victoria Point, February 1924. The white markings on both sides of the fore wing are largely obscured.

Payeni Group.

This group comprises only three species, and is sufficiently distinct to have received the generic name of *Meandrusa* Moore.

Fore wing with veins 10 and 11 free, 9 arising before apex of cell, middle discocellular deeply incurved. Tarsal claw with a tooth in or behind the middle. ♂ scent-fold of hind wing weakly developed. The wings are densely scaled and for the most part are yellow-brown or black-brown. Fore wing more or less strongly falcate. Hind wing with a long spatulate tail. Antennæ comparatively short, not half length of fore wing.

The group is distributed from China to the large Sunda Islands, and two species occur in the Indian area.

Graphium gyas (Westwood).

♂. Body greenish, the head and underside of thorax chestnut-brown. *Upperside* of wings dark brown with a broad dark outer border bearing a row of yellowish spots; similar spots also on the disc of fore wing.

Underside with a large chestnut-brown basal area, both wings with an apical cell-spot; discal area of both wings white-grey with dark crescents, the hind wing with light, dark-edged, submarginal spots, which are only indicated on the fore wing.

♀. A broad white discal band, which on the fore wing becomes yellow near the costa and is here more or less distinctly broken up into patches, whilst it has a bluish tone on the hind wing; submarginal spots larger than in the ♂; tail broadly margined with light chestnut-brown.

Habits.—Occurs in wooded mountain districts from 6,000 to 7,000 feet; commonest in the Khasi Hills.

Distribution.—SIKKIM to BURMA.

75 *a*. **Graphium gyas gyas** (Westwood).

Papilio gyas, Westwood, 1841, p. 41, pl. 11, fig. 1 (♂); Rothschild, 1895, p. 401; Bingham, 1907, pp. 92–3.
Dabasa gyas, Moore, 1903, p. 49, pl. 484, figs. 1, 1 *a*, 1 *b* (♂♀).
Papilio gyas gyas, Jordan, 1909 *a*, p. 91, t. 39 *c*.
Meandrusa gyas gyas, Evans, 1923, p. 242, pl. 6, fig. A 8.1; id., 1927, p. 36; id., 1932 *a*, p. 57, pl. vi, fig. A 8.1 (♂).
Papilio lachinus, Fruhstorfer, 1902 *b* (*b*), p. 342 (Sikkim).

♂. *Upperside* opaque brown, the basal area and distal third of both wings of a darker shade than the broad discal area; both wings with a submarginal series of yellow lunules that curve upwards posteriorly on the hind wing and end in a diffuse transverse bluish-white mark across area 1.

Underside of fore wing with the basal third and a large discocellular spot, that is widened anteriorly, rich dark cinnamon-brown; discal third lilacine, pale posteriorly, widened anteriorly and extended into the apex of cell, and on costa from discocellulars to near apex of wing; areas 2 to 4 with paler lilacine lunules; distal third of wing dull brown, with a post-discal and a submarginal series of somewhat obscure olivaceous-yellow lunules. Hind wing with the basal third rich dark cinnamon-brown, the remainder lilacine, with a large posterior discal patch of cinnamon brown, edged inwardly by a diffuse broad irregular white band, and outwardly by a series of white lunules; a submarginal, somewhat obscure row of olivaceous-yellow markings; tail and outer margin dark cinnamon-brown.

♀. *Upperside* ground-colour similar to that in the ♂. Both wings with a very broad discal lilacine white band that extends

from vein 5 and from within apex of cell of fore wing to inner margin of hind wing. Fore wing with a yellowish-white costal spot in upper third of cell, a larger spot beyond that turns to yellow at base of area 6, an anterior post-discal transverse series of yellow, more or less lunular spots, and a similar series of submarginal spots. Hind wing with the discal band thickly irrorated with brownish scales where it extends to the base, and also its outer edge posteriorly; remainder of the wing dark brown, with the margins of the tornus and of the tail broadly bright cinnamon-brown; a submarginal series of large, yellow, well-defined, more or less lunular spots.

Underside as in the ♂, the ground-colour and markings on the outer two-thirds of both wings paler.

Expanse: ♂♀, 105–115 mm.

Habitat.—SIKKIM to ASSAM; rare.

75 *b*. **Graphium gyas aribbas** (Fruhstorfer).

Papilio gyas aribbas, Fruhstorfer, 1909 *b*, p. 177 (Upper Burma); Jordan, 1909 *a*, p. 91.

Meandrusa gyas aribbas, Evans, 1923, p. 242; id., 1927, p. 36; 1932 *a*, p. 57.

♂. Distinguished from the nominotypical race by the smaller spots on the fore wing above and the lighter discal area of the underside.

Habitat.—UPPER BURMA to the Dawna Range; very rare. The ♀ does not appear to be known.

Graphium payeni (Boisduval).

♂. Body ochreous-yellow, the vertex and collar yellow-brown; tooth of claws large. Ground-colour of wings ochreous-yellow with slightly greenish tone. *Upperside* of fore wing with the greater part of the cell yellow-brown; a discocellular patch and a transverse cell-spot brown-black. Hind wing narrower and more triangular than in *gyas*, without distinctly marked anal angle.

Underside lighter, the basal area of both wings with a brown band broken up into spots, the distal third commonly darker than the middle of the wing, always with brown lines and rows of spots, which are often confluent; hind wing with a number of silver spots on the disc.

♀ paler than the ♂, with broader wings and smaller dark markings.

Distribution.—SIKKIM and Hainan to Java and Borneo; found at medium elevations in the mountains. Two of the seven subspecies occur in the Indian area.

76 *a*. Graphium payeni evan (Doubleday).

Papilio evan, Doubleday, 1845, p. 235; id., 1846 *b*, p. 14, pl. 2, fig. 2 (♀); Bingham, 1907, pp. 91–2, pl. 14, fig. 92 (♂).
Meandrusa evan, Moore, 1903, p. 47, pl. 483, figs. 1, 1 *a*–1 *c* (♂♀).
Papilio payeni evan, Rothschild, 1895, p. 401; Jordan, 1909 *a*, p. 91, t. 39 *b*.
Meandrusa payeni evan, Evans, 1923, p. 242, pl. 6, fig. A 8.2; id., 1927, p. 36; id., 1932 *a*, p. 57, pl. vi, fig. A 8.2 (♂).
Papilio evan evanides, Fruhstorfer, 1902 *d*, p. 65; id., 1903 *a*, p. 193 (Sikkim).

♂. *Upperside* bright ochraceous, basally with a darker shade. Fore wing with two or three oblique cell-spots, and a larger one at its upper angle; the costal margin from base and the outer margin very broadly dark brown, with an incomplete discal series of dark brown spots on its inner side; a series of brown lunules which anteriorly and posteriorly merge into the marginal brown; a more or less complete submarginal row of lunules of the ochraceous ground-colour, reduced in some specimens to only two or three lunules above the tornus. Hind wing with the distal half or more dark brown, with an inner post-discal and an outer submarginal series of more or less lunular spots of the ochraceous ground-colour; the post-discal series consists of only four spots in areas 1 to 4; the submarginal series is complete to area 7, the spots larger, that in area 3 elongate, outwardly conical; tail tipped with ochraceous.

Underside ground-colour a deeper rich ochraceous. Fore wing with a number of irregular cinnamon-brown spots over the cell and basal area; distal area with three transverse series of more or less irregular and incomplete lunular cinnamon-brown markings and a narrow brown marginal edging. Hind wing with a transverse series of three basal spots, a large spot at apex of cell, the bases of areas 1 to 3, followed by three more or less complete but irregular series of lunular markings, cinnamon-brown; the inner discal row of brown lunules bearing a series of snow-white crescents, conspicuous only in areas 1 and 2, but barely indicated anteriorly.

♀. Ground-colour paler. *Upperside* of fore wing with base and cell shaded with bright, very pale cinnamon; costal margin ochraceous almost to the apex. Hind wing with very large submarginal ochraceous lunules, separated from one another only by the brown along the veins.

Expanse: ♂♀, 110–130 mm.

Habitat.—SIKKIM to ASSAM; not rare.

76 *b*. Graphium payeni amphis (Jordan).

Papilio payeni amphis, Jordan, 1909 *a*, p. 91 (Tenasserim, Burma); Ollenbach, 1921, p. 896.
Meandrusa payeni amphis, Evans, 1923, p. 242; id., 1927, p. 36; id., 1932 *a*, p. 57.

♂♀. *Upperside* of fore wing with a well-defined dark brown line from vein 3 to vein 7 along the inner edge of the dark marginal area, separating off some small yellow spots. Hind wing with a discal yellow spot in area 5 in addition to the other four; the anterior discal spot is lunular, and there is a distinct yellow spot at the proximal side of the spot in area 3.

Underside ground-colour darker than in *evan*, the dark markings in the distal area of both wings sharper and narrower, the submarginal line almost without interruption, the silver spots larger than in *evan*, and the brown subbasal transverse patch behind vein 8 is placed nearer to the corresponding costal spot than to the precostal vein.

Habitat.—SOUTHERN BURMA; rare.

Genus **LAMPROPTERA** Gray.

Lamproptera, Gray, 1832, pl. 102, fig. 4, ♂ (non *curius* Fabr. =*meges* Zink.); Hemming, 1934 *a*, p. 153 (type, *P. curius* Fabr., 1787); Roepke, 1935, p. 42 (type, *meges* Zink.).

Leptocircus, Swainson, 1933, pl. 106 (*meges* Z.); Doubleday, 1843, p. 109; Moore, 1902, p. 132; Wytsman, 1902, p. 112; Bingham, 1907, p. 5; Jordan, 1909 *a*, pp. 11, 107.

Lamprosura, Boisduval, 1836, p. 380.

Type, *L. meges* Zink.

This genus is better known as *Leptocircus*, but, like many other well-known names, *Leptocircus* must be superseded according to the rules of priority. *Lamproptera* is a very distinct genus with sharply-defined facies; especially characteristic are the long, narrow tails and comparatively long antennæ. It differs from most other Graphiini in having veins 11 and 12 of the fore wing free; one species has a scent-fold on the hind wing, as in most others of the tribe, and has also, as in the *Payeni* Group, a tooth on each of the tarsal claws. Besides this, the strongly-built body, the markings of body and wings, and the scaled greenish legs recall the species of *Graphium*. The fore wing has a strong median spur which connects with the thickened basal part of the fold and not with vein 1 *b*.

"Head broad, thorax thick, abdomen scarcely longer than the thorax. The antennæ extend beyond the apex of the cell of fore wing; above scaled, the fine sensory hairs almost uniformly distributed over the scaleless underside; club short and broad. Legs scaled. Fore wing with veins 11 and 12 from the cell, 8 and 9 long-stalked, 7 from this stalk nearer to the cell than to branch 8, anterior angle of cell pointed; in the hind wing cell very small.

"Fore wing triangular, the hind margin much shorter than the distal margin; before the middle a light oblique band,

which is continued on the hind wing and is in part scaleless; between cell and distal margin a large, transparent, scaleless triangular area, which is divided by thin black vein-stripes into six to eight spots. Hind wing narrow and long, folded, produced into a very long tail, which is distally edged with white. ♂ and ♀ similar; ♀ with a large ventral copulation-groove before the tip of the abdomen" (*Jordan*, 1909 *a*).

Habits.—"The butterflies are common in most parts of their range. They occur near the water in open places, over which they dart backwards and forwards near the ground, their rapid flight resembling that of dragonflies; they are immoderate water drinkers, and often squirt the water out again rhythmically at the anus. They are also commonly met with at flowers, before which they hang with the wings vibrating rapidly and the tails quivering and raised high, without resting on the flower" (*Jordan*, 1909 *a*).

Distribution.—South-East China to Java, Celebes, and the Philippines.

The two species comprising this genus both occur in the Indian area.

Key to Species.

1. Upperside with band white, on the fore wing constricted towards the centre. ♂ hind wing with white scent-organ . . . *curius* (Fabr.), p. 244.
2. Upperside with band green. The black band of nearly even width. ♂ hind wing without scent-organ *meges* (Zink.), p. 245.

Lamproptera curius (Fabricius).

♂♀. The tarsal claw with a long tooth. Hind wing of ♂ with a white scent-organ on the abdominal fold. Both wings with the oblique band white.

Distribution.—North-East China to ASSAM, south and east to Java and Palawan. The nominotypical form occurs in the Indian area.

77 **Lamproptera curius curius** (Fabricius).

Papilio curius, Fabricius, 1787, p. 9; Donovan, 1800, pl. 47, fig. 1.
Leptocircus curius, Distant, 1886, p. 366, pl. 42, fig. 1; Swinhoe, 1893, p. 315; Moore, 1902, pp. 134, 135, pl. 417, figs. 1 (♂), 1 *a*, *b* (♀); Wytsman, 1902, p. 2, tab. fig. 1 (♂), fig. 7 (venation), fig. 8 (tarsus), fig. 11 (palpus); Bingham, 1907, p. 6; Jordan, 1909 *a*, p. 108; Ollenbach, 1921, p. 896; Evans, 1927, p. 36; id., 1932 *a*, p. 58.

♂♀. *Upperside* dull brownish-black. Fore wing with a broad outwardly oblique white transverse band that crosses from a little beyond the basal third of costal margin to inner margin, its outer half hyaline, followed by a hyaline triangular

area that does not reach the costa or margin, but is traversed by conspicuously black veins. Between the semihyaline transverse band and the hyaline area the black forms a more or less even band slightly narrower in the middle ; the black edging to the costa and outer margin broad, broadened towards the apex ; cilia black. Hind wing with the white band of the fore wing continued straight across and ending in a point on the outer half of vein 3, but is not hyaline along its outer margin ; posterior half of wing dull dark brown, irrorated towards the base of the long narrow tail at vein 4 with white scales ; cilia black, white below vein 5 and along outer side of basal half of tail, the latter tipped white.

Underside similar, but the ground-colour opaque brownish-black ; a broad, outwardly ill-defined earthy-grey streak along the base of the wings produced slightly down the inner margin of hind and along costa of fore wing. Hind wing with the white band joined by a sinuous short white cross-line from inner margin to apex ; below this latter a number of irregular white spots on the tornal area.

Antennæ, head, and thorax black, abdomen dark brownish-black ; beneath, the palpi, thorax, and abdomen greyish ; claws of tarsi bifid. Hind wing of ♂ with white tuft of scent-hairs on the fold.

Expanse : ♂♀, 40–50 mm.

Distribution.—ASSAM to BURMA ; not rare. Extends to Java and Palawan.

Lamproptera meges (Zinken-Sommer).

♂♀. Tarsal claws simple. Hind wing of ♂ without scent-organ. The oblique band of both wings green, this area without scales.

Distribution.—Hainan, Tong-king, and BURMA, south to Java, the Philippines, and Celebes. Two subspecies occur in the Indian area.

78 *a*. **Lamproptera meges indistincta** (Tytler).

Leptocircus meges indistincta, Tytler, 1912, p. 588 (Naga Hills) ; Evans, 1923, p. 242 ; id., 1927, p. 36 ; id., 1932 *a*, p. 58.

♂♀. Hind wing below with the tornal area much greyer ; the three white transverse bands are blurred and not clearly defined.

Expanse : 40–55 mm.

Habitat.—ASSAM to NORTHERN BURMA. Taken not uncommonly in the Naga Hills at 4,000–5,000 feet, from April to October ; a single ♂ was also taken at Gaspani, 1,700 feet, in July.

78 *b*. Lamproptera meges virescens (Butler). (Pl. III, fig. 4, imago).

Leptocircus virescens, Butler, 1869 *a*, p. 259; Staudinger, 1884, p. 21, t. 14 (♂).
Leptocircus meges virescens, Jordan, 1909 *a*, p. 108; Ollenbach, 1921, p. 896; Evans, 1924, p. 42, pl. 6, fig. A 10.2 (♂); id., 1927, p. 36; id., 1932 *a*, p. 58, pl. vi, fig. A 10.2 (♂).
Leptocircus meges, Moore, 1902, p. 136 (part.); Bingham, 1907, p. 6 (part.), pl. xi, fig. 81 (imago).

♂♀. Fore wing with the black median band never twice as broad in the middle as the green band. Hind wing below with grey basal scaling rather sharply defined, the white band along inner margin placed closer to the tornus than in *indistincta*.

Habits.—In October 1892, in the Dawna Range in Tenasserim, Col. Bingham and Mr. de Nicéville found a ♀ ovipositing on the underside of the leaves of *Illigera burmanica* King, a creeper belonging to the family Combretaceæ. The eggs, of which two or three were collected, were spherical, smooth, pale green, almost transparent, and of the usual papilionid form.

Habitat.—KAREN HILLS to SOUTHERN BURMA; common. Also in Hainan, Tong-king, Annam, Siam, and the Malay Peninsula

Tribe IV. TEINOPALPINI.

Teinopalpidæ, Grote, 1892, pp. 17, 20.

"Frons projecting conically; palpi very long, pointed, porrect; antenna short, with strong, obtuse, curved club, scaleless except at the base, the segments almost cylindrical, the sensory hairs almost uniformly distributed over the underside. Neuration similar to that of *Papilio*, the median spur of the fore wing only indicated, the upper transverse vein of the fore wing short, the 2nd long and incurved; apex of fore wing pointed, hind wing with one (♂) or two (♀) long tails" (*Jordan*, 1909 *a*).

Comprises the single genus *Teinopalpus* Hope.

Genus **TEINOPALPUS** Hope.

Teinopalpus, Hope, 1843, p. 131; Moore, 1902, p. 127; Stichel, 1907 *b*, pp. 21–3, t. 2, fig. 7 (venation), fig. 8 (palpus), fig. 9 (tarsus); Jordan, 1909 *a*, p. 108; Evans, 1932 *a*, p. 57; Hemming, 1934 *a*, p. 152 (type, *imperialis* Hope).
Teinoprosopos C. & R. Felder, 1864 *a*, pp. 289, 331.

Distribution.—SIKKIM to SOUTHERN BURMA, South China. Two species are known, one of which is confined to the mountains of Kwantung in South China.

Teinopalpus imperialis Hope.

♂. *Upperside* black, with green markings; fore wing before the middle with a black, gently curved line and two post-discal, broad, blackish, indistinctly defined shadowy bands; outer margin black with white fringes. Hind wing with a black discal line, at the distal side of which there is a yellow area, the space from here to inner margin edged with white, before the outer margin green-yellow submarginal lunules, tail yellow at tip.

Underside brownish-yellow with black bands; fore wing with green discal line.

♀. Larger than ♂, paler. *Upperside* of fore wing with two grey bands; hind wing with large grey central area, which is narrower and yellow before inner margin; marginal teeth longer than in ♂, the tooth at vein 6 developed into a tail which is shorter than the tail at vein 4 and is yellowish-grey at the apex.

Underside of fore wing with green basal area, remainder grey with black bands. Hind wing almost as above, sometimes entirely without yellow.

Early stages.—As yet imperfectly known. A note on the larva was published by O. Lindgren in the Journ. Bomb. Nat. Hist. Soc. xxvii, 1921, p. 177:—"The caterpillar was green, with a large, thick head, Papilio-shaped. The pupa was oval, greenish, with a strange horn." The larva pupated at the end of September, and the butterfly emerged the following April. The larva was fairly full-grown, and was found on the road near Sukia in Sikkim, at 6,050 feet elevation. The food-plant is said to be a species of *Daphne*.

Habits.—"The butterfly is very local, and only occurs at medium and higher elevations in the mountains (6,000–10,000 feet) in wooded districts. It usually remains in the tops of trees, from which it only comes down from about 8 to 11 o'clock in the morning when the sun is shining, and can then be attracted by baiting. Its flight is exceedingly fast. The best localities are open places on the tops of mountains surrounded by timber forests" (*Jordan*, 1909 *a*).

Distribution.—SIKKIM to SOUTHERN BURMA. Two subspecies are known.

79 *a*. **Teinopalpus imperialis imperialis** Hope. (Pl. III, fig. 5, ♂).

Teinopalpus imperialis, Hope, 1843, p. 131, pl. 14, figs. 1, 2 (♂); Doubleday, Westwood & Hewitson, 1846, p. 2, pl. 1, fig. 1 (♀); Moore, 1902, p. 128, pl. 415, figs. 1, 1 *a*: Stichel, 1907, p. 23, t. 2, fig. 12 (♀); Bingham, 1907, p. 8, pl. xi, fig. 80; Lindgren, 1921, p. 177 (larva).

Teinopalpus imperialis imperialis, Jordan, 1909 *a*, p. 108, t. 49 *c*; Evans, 1927, p. 57; id., 1932, p. 57, pl. vi, fig. A 9.1 (♂).
Teinopalpus paryiæ (♀), Hope, 1843, p. 131, pl. 11, figs. 3, 4.
Teinopalpus imperialis himalaicus, Rothschild, 1898, p. 602; Moore, 1902, pl. 415, figs. 1, 1 *a*; Jordan, 1909 *a*, p. 188; Rothschild, 1918, p. 69.

♂. *Upperside* black, densely irrorated with green scales. Fore wing with an outwardly oblique, slightly concave subbasal band and a narrow marginal edging jet-black, due to the ground-colour there being devoid of the green scaling; beyond the subbasal band the irroration of scales is a much brighter green, especially along the outer edge of the subbasal band itself, but it thins out to leave shadowy, broad, convergent discal and post-discal bands and a narrower submarginal band; in some specimens, owing to the transparency of the wings, the rich ochraceous-brown colour of the underside gives the black on these bands a reddish tint. Hind wing with the basal area margined outwardly by a narrow, irregularly sinuous band devoid of green scaling, followed by an anterior discal bright chrome-yellow patch that spreads from base of area 3 across the apex of cell and bases of areas 4 and 5 to the costa; this patch is bluntly angulated outwards in area 5, stained with orange anteriorly, and bordered outwardly by black, which is widest above; below the patch a white line extends to the inner margin; the post-discal area is deep dark green, margined inwardly by diffuse dark grey, and followed outwardly by a submarginal series of lunular markings, the tornal and upper two or three of which are yellow, the rest bright green; tail tipped with yellow.

Underside of both wings with basal area densely covered with green scales. Fore wing with marginal two-thirds rich ochraceous-brown, the green of the basal area bordered by black; discal and post-discal bands also black, widened and diffusely coalescent posteriorly; an incomplete, very slender submarginal black line and broader black marginal edging, neither of which reaches to the apex. Hind wing much as on upperside, but the yellow markings broader. Antennæ dark red; head, thorax, and abdomen black, covered somewhat densely with green hairs and scales.

♀. *Upperside* of fore wing with the irroration of green scales on the distal two-thirds restricted to a submarginal moderately broad band diffuse along its inner edge, and a discal, somewhat ill-defined similar band that is bordered both on the inner and outer sides by diffuse dusky black; this is succeeded by two broad diffuse dark grey bands, the outer of the two edged on its distal side narrowly with black, followed by a submarginal green band and outer velvety black margin.

Hind wing with a large dark grey discal patch, below which comparatively narrow markings of yellow extend to the inner margin; a post-discal sinuous lunular narrow black band and a submarginal series of green lunules as in the ♂, but the apical lunule dark grey, not yellow; the tail-like extensions of the margin at apices of veins 3 to 6 are black shaded with green, those at the apices of veins 4 and 6 tipped, the former with yellow, the latter with greenish-white.

Underside for the most part grey, with markings much as in the ♂; fore wing with a well-marked moderately broad submarginal band which is of a dull ochraceous colour; hind wing grey discal area extending to the apical lunule of the submarginal series.

Expanse: ♂♀, 90–120 mm.

Habitat.—SIKKIM to ASSAM; rare.

79 *b*. **Teinopalpus imperialis imperatrix** de Nicéville.

Teinopalpus imperatrix, de Nicéville, 1899 *b*, p. 335, pl. BB (♂♀) (Toungoo Hills, 4,000 feet); Moore, 1902, p. 131, pl. 416, figs. 1, 1 *a* (♂♀); Bingham, 1907, p. 9; Jordan, 1909 *a*, p. 108; Evans, 1932 *a*, p. 57.

♂. *Upperside* less densely scaled with green than the preceding race. Hind wing with the yellow area not entering the cell, and on the underside reaching to vein 2; marginal teeth longer than in the preceding race.

Underside of fore wing with broader black bands; on hind wing the discal patch broader.

♀. Much larger than the ♀ of the preceding race and with more prominent black coloration on *upperside*. Hind wing with grey area above anteriorly densely dusted with black, posteriorly broader than in *imperialis*, yellow to vein 4 and beyond, marginal teeth longer.

Habitat.—NORTHERN BURMA, and southwards to Ataran River; rare.

Subfamily ZERYNTHIINÆ.

Zerynthiinæ, Kirby, 1902, p. 86.
Thaidinæ, Kirby, 1896, p. 242.

Hind wing tailed or with toothed margin; the basal cell large, elongate, longer than broad; precostal vein curved basad. Antennæ rather short. Palpus long and strongly projecting. Larva (where known) short and thick, with a short, fleshy fork behind the head; on *Aristolochia*. Pupa slender.

This is essentially a Palæarctic group, of which *Armandia* is the only representative found in the Indian region.

Genus **ARMANDIA** Blanchard.

Armandia, Blanchard, 1871, p. 809; Moore, 1902, p. 124; Seitz, 1907, p. 16; Stichel, 1907 *b*, pp. 16, 17; Jordan, 1909 *a*, p. 109; Verity, 1911, pp. lxxvii, lxxix, lxxxi; Bingham, 1907, p. 2, fig. 1 *c* (venation).
Bhutanitis, Atkinson, 1873 *a*, p. 570.

"Body with rough hairs, weak in proportion to the size of the wings; head small; palpi pointed, projecting; antennæ scaleless, thin, short, with weak club, the sensory hairs dense at the base of the segments on the underside; abdomen long, thickest in the posterior half; legs short. Wings long, fore wing rounded, veins 10 and 11 free, 7, 8, and 9 stalked together, 6 arising from upper angle of cell, median spur very weakly indicated. Hind wing long-toothed, with long tail at vein 4, and a shorter one at each of the median veins; precostal vein directed basad, basal cell large" (*Jordan*, 1909).

Distribution.—Northern India and West China. Two species are known.

Armandia lidderdalei (Atkinson).

♂♀. Wings black marked with grey lines. Hind wing from vein 5 to inner margin with a large bright-coloured area, which is proximally rose-red and distally black, and is bordered by yellow patches; tail obtusely pointed.

Early stages unknown.

Habits.—"The butterfly has a feeble flight and allows itself to be driven backwards and forwards by the wind between the tops of trees like a dry leaf. It also visits flowers, and during a shower it sits on a leaf and pushes the fore wing over the hind wing, so that the brilliant colours of the latter are concealed" (*Doherty*, quoted by *Jordan*, 1909 *a*).

Distribution.—Northern India and West China, the Chinese specimens constituting a distinct subspecies.

80. **Armandia lidderdalei lidderdalei** (Atkinson). (Fig. 68, ♂).

Bhutanitis lidderdalii, Atkinson, 1873 *a*, p. 570, pl. 50 (♂) (Bhutan); Elwes, 1891, p. 251.
Armandia lidderdalii, Doherty, 1891, p. 251; Jordan, 1898, p. 384 (antenna); Moore, 1902, p. 125, pl. 413, figs. 1 (♂), 1 *a* (♀); Stichel, 1907 *b*, p. 17, t. 2, fig. 4 (venation), fig. 5 (palpus), fig. 6 *a*, *b* (tibia and tarsus); Bingham, 1907, pp. 3, 4, fig. 2 (♂); Jordan, 1909 *a*, p. 109, t. 49 *c*; Verity, 1911, pp. lxxix & lxxxii, pl. A, fig. 9; Evans, 1932 *a*, p. 58, pl. vi, fig. A 11.1 (♂).

♂♀. *Upperside* dull black crossed by eight ochraceous-white lines; the basal, subbasal, and first discal lines are continued in a series of more or less diffuse curves to the inner margin; the second discal line terminates on vein 3; beyond apex of cell a somewhat broken post-discal line from costa to vein 3,

followed by a second post-discal line from costa to inner margin ; a third post-discal line is short, somewhat ill-defined, and terminates on vein 4 ; a complete submarginal line ; all the lines except those that cross the cell formed of a series of short curved lines separated by the veins. Hind wing with similar ochraceous-white lines more or less in continuation of those on the fore wing, with the addition of a broad line along vein 1 and the median vein ; these two lines do not reach much beyond the base of vein 4 ; a large posterior patch, the proximal half scarlet, the distal half velvety black, followed by broad submarginal bright yellow lunules in areas 1 to 4 ; distal half of posterior patch in areas 1 and 2

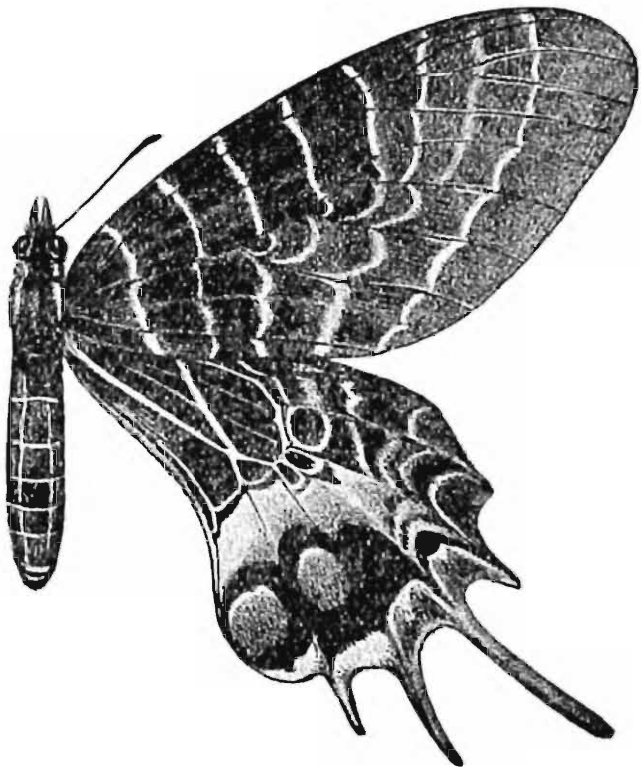


Fig. 68.—*Armandia lidderdalei lidderdalei* (Atk.), ♂.

with very large, ill-defined, superposed white spots thickly shaded with brownish-grey except along their inner margins ; tails edged very narrowly with ochraceous-white.

Underside similar to above, all the markings broader. Hind wing with base of cell crossed by a short ochraceous-white bar, and the edges of the precostal cell with narrow lines of the same colour. Antennæ black ; head, thorax, and abdomen dull black ; thorax greenish-grey laterally, sides of abdomen with cross-lines of ochraceous-white.

Expanse : ♂♀, 90–110 mm.

Historical.—A. lidderdalei was first discovered by Dr. Lidderdale in 1868 in Bhutan, at about 6,000 feet, near Buxa. Between 1886 and 1890 the late H. J. Elwes sent three parties of native collectors from Darjeeling to procure

the insect. The first was plundered by the Bhotias, the second was attacked by fever and one of its members died, the third had a man killed by a tiger, and all returned unsuccessful. Specimens were later procured by Mr. A. V Knyvett, then Inspector of Police, who gave them to Mr. Elwes. The late W Doherty visited the Naga Hills in 1890 and found this butterfly more abundant in the neighbourhood of Mas, Manipur, at 6,000 to 8,000 feet. His description of its habits was published by Elwes in the Proc. Zool. Soc. 1891, p. 249. While chasing one of the butterflies Doherty nearly lost his life by falling into one of the pits dug by the Nagas to catch tigers.

Habits.—" It generally keeps to the ridges, occasionally descending into the valley, once almost down to 5,000 feet. Afterwards I found it on the western side of Japoo at 7,000–8,000 feet, and between the two places we got one or two every day. At Mas, in Manipur, I have taken worn specimens at 7,500–9,000 feet. My Lepchas, who collected at Buxa in Bhutan, say there is no chance of another brood. . The butterfly drifts about among the tree-tops, rarely descending to the ground ; the crimson of the hind wings is not so conspicuous as one might think, and if one loses sight of it for an instant it is very hard to make out again, its transparent dark grey wings being hardly distinguishable among the shadows, and it is blown about by the wind more like a dead leaf than a living insect. Its flight is much like that of *Hestia*, but less buoyant and circling, as might be expected from its angular wings ; nevertheless its resemblance strikes one. Seen from above it must be much more conspicuous and is no doubt a protected insect ; at the same time its weak flight may even add to its chance of escape, as it certainly does with *Hestia*, for it is impossible to calculate the direction in which it is making. The whole body and wings give out a delicious odour, which remains for some days after death. In some patterns and at some distance *Armandia* looks like *Danais tytia* Gray, which is very common in the same places. *Armandia* hovers about flowers like other *Papilios*. During rain it alights on a leaf and droops its fore wings over the hind ones, thus covering the bright colours " (*Doherty*, l. c.).

This butterfly is also recorded from the Naga Hills by Tytler (1912, p. 588). He found the males not uncommon, the females rare, at 5,500 to 7,000 feet, during the latter half of August, September, and the first half of October. Many specimens were captured on a white-flowering tree which comes into blossom towards the middle of September. Two females, after capture, laid eggs which were yellow, and very small for the size of the insect.

Habitat.—Bhutan, the Naga and Chin Hills ; rare.

Subfamily PARNASSIINÆ.

Parnassiinæ, Kirby, 1896, p. 236 (part.).
Parnassiidæ, Elwes, 1886, p. 17.

Wings broad and rounded, the hind wing almost ovate, with incurved inner margin and no anal fold. Fore wing without the small transverse vein between 1 *b* and cell (=median spur); vein 9 absent. Hind wing with the precostal cell almost obsolete and no precostal spur. Antenna short, more or less club-shaped, the shaft being often ringed with black and white. Head small; frons rough-hairy; eye large; palpus short, acute, not projecting above the head. Thorax normal, densely hairy. Abdomen strongly hairy in the ♂, in the ♀ sparsely hairy or with scarcely any hairs; in *Parnassius* with a horny pouch at the apex below.

Wings white, rarely yellow; distally with black spots and grey or blackish bands; hind wing often with red-spotted ocelli. Very variable in colour and pattern.

Distribution.—Mountainous regions of Europe (except Great Britain), Asia, and North America. The genera *Hypermnestra* and *Parnassius* occur in the Indian Region, the former reaching only to Baluchistan, whilst *Parnassius* ranges throughout the Himalayas.

Key to Genera.

1. Fore wing with veins 10 and 7 from the same point. Hind wing with vein 8 shorter than 1 *b* of the fore wing. Antennal club short, abrupt, and flattened. ♀ without horny pouch . ... [Ménétr., p. 253. HYPERMNESTRA
2. Fore wing with veins 10 and 7 separate at origin. Hind wing with vein 8 longer than 1 *b* of fore wing. Antennal club gradually elongate and rounded. ♀ with horny pouch [p. 256. PARNASSIUS Latr.,

Genus **HYPERMNESTRA** Ménétries.

Hypermnestra, Ménétries, 1848, explic. pl. 6, fig. 1 (*helios* Nick.); Verity, 1905, pp. 1, 2, 36; Seitz, 1907, p. 18; Stichel, 1907 *b*, pp. 45–6; Bingham, 1907, p. 131; Evans, 1932 *a*, p. 42; Hemming, 1934 *a*, p. 154 (type, *Ismene helios* Nick., 1846).

♂♀. Fore wing: costa almost straight for three-fourths of its length from base, the apical fourth arched; apex blunt; outer margin straight or very slightly convex; tornus broadly rounded; inner margin straight; cell slightly longer than half length of costa; veins 6 and 7 closely approximate at base, upper discocellular therefore very short, barely indicated; middle discocellular concave, long; veins 4 and 5 also closely approximate, lower discocellular therefore very short; vein 9

absent; vein 8 from apical half of 7, terminating below apex of wing; veins 10 and 11 free, 10 from just below upper angle of cell, 11 from upper third of subcostal; vein 12 terminates on costa well beyond upper angle of cell; veins 12, 11, and 10 run very close together towards their apical halves, but neither anastomose nor touch. Hind wing elongate, irregularly pear-shaped; costa slightly arched, the curve continued abruptly and strongly along outer margin, tornal angle distinct; inner margin widely emarginate; cell somewhat longer than half the wing; veins 4 and 5 more or less approximate, but not closely so, the discocellular between their bases erect; precostal vein curved outwards. Antenna short, about one-third length of costa of fore wing; club short, abrupt, spatulate; head hairy in front, eyes smooth; palpi suberect, with a thick fringe of hair anteriorly; thorax and abdomen moderately stout.

The genus contains a single species.

Distribution.—Western China.

Hypermnestra helios (Nickerl). (Fig. 69, structure of imago).

♂♀. Wings light straw-yellow. Fore wing marked with black in the cell and at apex, bearing a red, black-bordered, transverse patch beyond apex of cell. Hind wing below

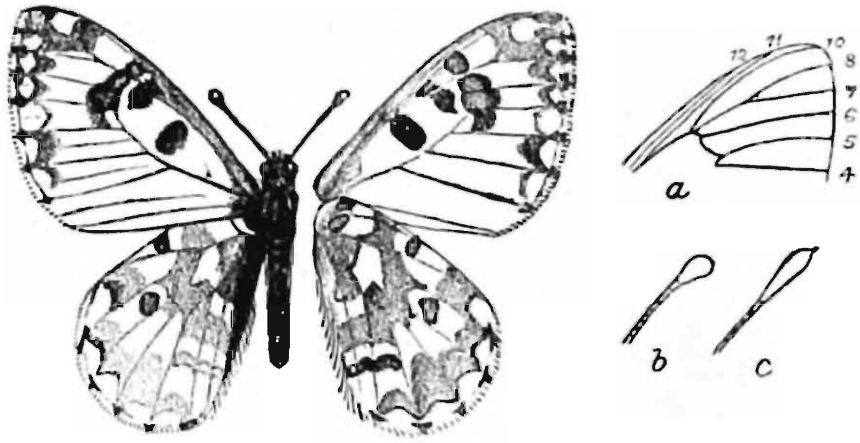


Fig. 69.—*Hypermnestra helios* (Nick.).

a, venation of apex of fore wing; *b*, club of antenna of *Hypermnestra*; *c*, club of antenna of *Parnassius*.

with yellowish-grey bands which show through on the upperside.

Egg.—Pale green, deposited singly on the underside of a leaf.

Larva.—Thick-set, with yellow ground-colour upon which are pale green bands between and on the segments. Towards the middle each segment is whitish with a yellow ring just behind, and upon which are some separated black dots

resembling small tubercles and each surmounted with very short hair. On *Zygophyllum turcomanicum* Fisch., family Zygophyllaceæ.

Pupa.—Short, thick, and obtuse, brownish or greyish-green.

Habits.—The butterflies are found on sunny slopes, where they suck at flowers. The pupa is formed underground.

Distribution.—Turkestan and Persia to BALUCHISTAN. The specimens from Baluchistan constitute a slightly differentiated subspecies.

81. **Hypermnestra helios balucha** (Moore).

Parnassius balucha, Moore, 1906 *a*, p. 47 (Baluchistan).
Hypermnestra balucha, Stichel, 1907 *b*, p. 47.
Hypermnestra helios balucha, Evans, 1932 *a*, p. 58, pl. vi, fig. A 12.1 (♂); id., 1932 *b*, p. 198.
Hypermnestra helios, Bingham (*non* Nick.), 1907, p. 131, figs. 35, 35 *a* (part.).

♂. *Upperside* white with a slight cream-yellow tint. Fore wing at the base densely, and on the costal margin lightly, irrorated with black scales; cell with a transverse black median band and a black apical spot, the latter extending from the costa along the discocellulars almost to the lower angle of cell; beyond the cell an oblique short black bar, widened posteriorly and with three superposed red spots, the middle spot minute, sometimes absent; this is followed by an irregular submarginal black band, widened at the veins, widest near the costa, and gradually narrowed to a faint line posteriorly. Beyond this band the apex is marked with a small diffuse black patch, and the apices of the veins with black spots that are extended inwards to the submarginal band. Hind wing with base and dorsal margin broadly irrorated with black scales; a black upper discal and a subcostal spot, both generally centred with red; a submarginal series of slender black lunules, followed by a marginal row of transversely linear black spots; the discal and post-discal areas of wing darkened by the markings of the underside showing through. Cilia of both wings white alternated with black.

Underside with similar ground-colour. Fore wing markings as above, but the cell-spots, the spot in area 3, and the short bar beyond apex of cell larger, more intensely black, the red spots on the latter also larger; submarginal and marginal markings paler, more diffuse. Hind wing with basal, median, and submarginal broad transverse bands of irrorated black scales, all the bands with their margins uneven and zigzag; outer margin of basal band with four transversely placed red spots, and transverse red discal spots, edged with black,

in areas 1, 2, 5, and 7 ; a fine, more or less interrupted, black marginal line. Antennæ pale yellowish-white, the shafts obscurely ringed with black ; head, thorax, and abdomen black, the head and thorax anteriorly with long greyish-white hairs ; underside of palpi, thorax, legs, and basal portion of abdomen similarly clothed.

♀ (nominotypical form).—*Upperside* markings larger and more conspicuous than in the ♂ ; an additional large black spot in the middle of area 1. Underside similar to that of the ♂, but with the additional black spot as noted above.

Expanse : ♂♀, 45–55 mm.

The above description of the ♂ is taken from Moore's type. The ♀ appears to be still unknown from Baluchistan.

Habitat.—BALUCHISTAN ; very rare. The type and a paratype are in the British Museum, the latter (from Coll. Evans) marked " Nushki, April, 1905 " ; both were received from Mr. O. C. Ollenbach. There is a specimen labelled " Kach " in the Indian Museum. Evans (1932, p. 198) did not meet with the species.

Genus **PARNASSIUS** Latreille.

(Fig. 70, pouches of the ♀).

Parnassius, Latreille, 1804, pp. 185, 199 (*apollo*) ; id., 1805, p. 110 ; id., 1810, p. 440 ; Moore, 1902, p. 104 ; Verity, 1906, pp. 40, 102 ; Stichel, 1907 *a*, p. 19 ; id., 1907 *b*, pp. 5–8 ; Bingham, 1907, p. 116 ; Fruhstorfer, 1908 *b*, p. 109 ; Rothschild, 1918, p. 22 ; Bryk, 1922, p. 68 ; Evans, 1932 *a*, pp. 42, 58 ; Hemming, 1934 *a*, p. 155 (type, *Papilio apollo* Linn., 1758).
Tadumia, Moore, 1902, p. 116 ; Bryk, 1913, p. 119.
Kailasius, Moore, 1902, p. 118 ; Bryk, 1913, p. 120, fig. 2 (venation).
Koramius, Moore, 1902, p. 120.

♂♀. Wings broad, semi-diaphanous ; character of markings very similar throughout the forms. Fore wing a rectangular triangle, the hind wing almost ovate. Fore wing with costa very slightly arched, apex broadly rounded ; outer margin very convex ; inner margin straight ; cell generally about half length of wing or a little shorter ; upper discocellular short or obsolete, middle concave, more than twice length of lower, lower one sloped obliquely inwards ; veins 6 and 7 from apex of cell or very close together at base ; 9 absent ; 8 out of 7, closer to apex of cell than to apex of wing ; 10 from just before or from apex, or out of 7 from just beyond apex of cell, typically free, but in some forms anastomosed with 11 ; 11 from apical half of subcostal vein. Hind wing with costal and outer margins in a continuous curve, apex therefore not well marked ; tornus prominent, obtusely angular ; inner margin concave or slightly excavate. Antenna short, robust,

about a third of the length of the fore wing, the shaft often ringed with white and black; club stout, gradual; palpus short, acute, not projecting above the head, thickly fringed with hair anteriorly; eye large and smooth. Thorax densely hairy. Abdomen strongly hairy in the ♂, sparsely covered with hairs or almost without hairs in the ♀. The ♀, after fertilization, with an extended corneous anal pouch that varies in shape. This pouch originates from a quickly hardening substance discharged by the ♂ during copulation. The differences in the shape of the pouch are of great help in distinguishing a species or characterizing a group of species.

Larva.—" Cylindrical, exceptionally tapering at both ends, diversely developed, but mostly of black colour and variously ornamented; head small, almost globular, in the neck a reversible fleshy fork (osmeterium); body covered with short hairy warts; apparently living gregariously when young; some species show a great liking for sunshine, whilst others are concealed in daytime " (*Stichel*, 1907 *a*).

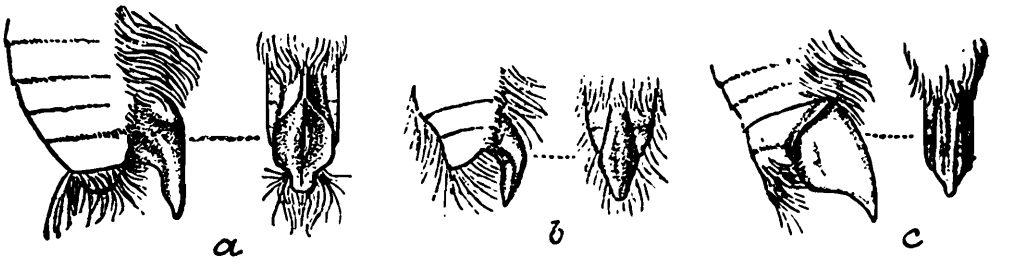


Fig. 70.—Anal pouches of fertilized females of *Parnassius*.
a, *P. jacquemontii* Boisd.; *b*, *P. epaphus* Oberth.; *c*, *P. hardwickei* Gray.

Pupa.—Obtuse, thick, more or less cylindrical, light or dark brown, dusted with glaucous blue. Enclosed in a slight cocoon, to which it is attached by a few threads; pupation underground.

Habits.—" These insects inhabit medium and high altitudes, certain species ascending as high as 20,000 feet. The flight is generally clumsy and fluttering. The Parnassii are visitors of flowers; they sit on the blossom with the wings expanded and are not difficult to catch while sucking the honey, being occasionally, when the weather is unfavourable, or towards evening, so benumbed that they are easily caught with the fingers or even taken off the flowers with the killing-bottle. The butterflies are very tenacious of life " (*Stichel*, 1907 *a*).

Distribution.—As already noted. Thirteen species occur in the HIMALAYAS, and these comprise a number of subspecies and forms. The species of *Parnassius* are mostly very variable.

Key to Species.

1. Fore wing with vein 7 from 6, 10 and 11 free. Antennæ white-ringed* . . . . . 2.
   Fore wing with vein 7 not from 6. Antennæ black, not white-ringed . . . 5.
2. ♀ pouch posteriorly keeled. Fore wing above with fringe not or hardly chequered. 3.
   ♀ pouch not keeled. Fringe of fore wing above prominently chequered . . *epaphus* Oberth., [p. 266.
3. Large species, with fore wing 33 mm., and with large red spots . . . . *tianschanica* Oberth., [p. 259.
   Small species, with fore wing 30 mm., red spots less prominent . . . . . 4.
4. Fore wing with post-discal dark band absent or faint. Hind wing rarely with a red basal spot . . . . . *actius* Eversm., p. 262.
   Fore wing with post-discal dark band prominent. Hind wing above usually with a red basal spot . . . . . *jacquemontii* Boisd., [p. 263.
5. Fore wing with veins 10 and 11 not anastomosing, but may touch . 6.
   Fore wing with veins 10 and 11 anastomosing. 9.
6. Fore wing with veins 6 and 7 from a point, and the origin of vein 10 far removed; upperside with spots at end of cell and middle of vein 1 *b* not joined by a dark band . . . . . *hardwickei* Gray, [p. 269.
   Fore wing with veins 6 and 7 separate at the base, usually the bases of 6, 7, and 10 equidistant; upperside with two spots at end of cell, middle of vein 1 *b* black and joined to the former by a dark band. . 7.
7. Comparatively small species. Hind wing below with red basal spots obsolete. Fore wing above with no red spot at base of 7 . 8.
   Large species. Hind wing below with red basal spots prominent. Hind wing above with a red spot at base of 7 . . *imperator augustus* [Fruhst., p. 286.
8. Hind wing with two anal ocelli, no antemarginal ones; discal ocellus placed away from the submarginal line. . . . . *delphius* Eversm., [p. 277.
   Hind wing with five antemarginal ocelli; discal ocellus placed nearer the marginal border than to the cell . . . . *stoliczkanus* Feld., [p. 272.
9. Fore wing with veins 10 and 7 well separated at the base, 7 and 6 approximate. Comparatively small species. Hind wing above with the submarginal spots black, and discal band more or less complete, no red spots . . . . . 10.
   Very large species. Fore wing with vein 10 from 7, 6 and 7 well separated at origin. Hind wing above with no spot at base of 7; a very large red spot between veins 4 and 6, usually white-centred, and a red or black basal bar in areas 1 and 2 . *charltonius* Gray, [p. 297.

* In *P. epaphus* f. *bashahrecus* the antennæ are black.

10. Fore wing above with fringe black. . . .	11.
Fore wing above with fringe pale yellow or white	12.
11. Small species, with fore wing less than 30 mm. Hind wing above with small red discal spots in 5 and 7, no spot at base of 7. Hind wing below with red basal spots	*simo* Gray, p. 288.
Large species, with fore wing 30 mm. No red spots. Fore wing with the post-discal band of separate small spots. Hind wing with elongate ocellus in area 4	[p. 287. *maharaja* Avin.,
12. Upperside white, without red spots. Very small species .	[p. 293. *hannyngtoni* Avin.,
Hind wing above with red spots.	*acco* Gray, p. 294.

The classification of a number of the Indian forms is still in a state of uncertainty, owing chiefly to the lack of material. In the present volume several forms are treated as races upon a consideration of the distribution; such treatment is provisional, and the acquisition of more material is much to be desired in order to obtain a more accurate conception of these forms.

It is also as yet uncertain whether *maharaja* Avin. and *stoliczkanus* Feld. represent distinct species; some authorities regard the latter as a form of *delphius* Eversm.

Parnassius tianschanica Oberthür.

♂♀. Ground-colour white to yellowish, sparsely irrorated with blackish scales; fore wing costal spots with small red centres, the spot on the inner margin very large, feebly dusted with red internally; vitreous margin of moderate width, the submarginal band not sharply defined. Hind wing with deep red centres to the ocelli and with feeble submarginal wedge-shaped spots. ♀ with keeled pouch.

Distribution.—Turkestan, the Pamirs, Afghanistan, CHITRAL, and NORTH-WEST INDIA. Three subspecies in the Indian region.

This species is better known as *discobolus* Alph.

82 *a*. **Parnassius tianschanica binghami** Bryk.

Parnassius tianschanica binghami, Bryk, 1934, p. 28 (♂♀, Chitral, 11,000 feet).

Parnassius thianscharica (sic) *insignis*, Evans, (*non* Staudinger), 1932 *a*, p. 58.

This represents a slightly differentiated subspecies closely allied to the form found in Afghanistan. This latter is called *superba* Groum-Grshimaïlo (1890), and is represented in

fig. 71. This figure is taken from Verity, 1906–11, pl. xii, fig. 7 (*P. discobolus* var. *insignis* Staudinger).

♂. Differs from most specimens of *superba* by the much narrower inner vitreous border to the white submarginal band of the fore wing. Hind wing with the submarginal triangular black spots narrower than in *superba* and as in *insignis* Stgr. ; the white cell-spot is prominent within the black proximal scaling, and is, on the whole, larger than in *superba*.

♀. Fore wing with the submarginal white band narrower than in the ♂ ; the proximal vitreous border of this band is

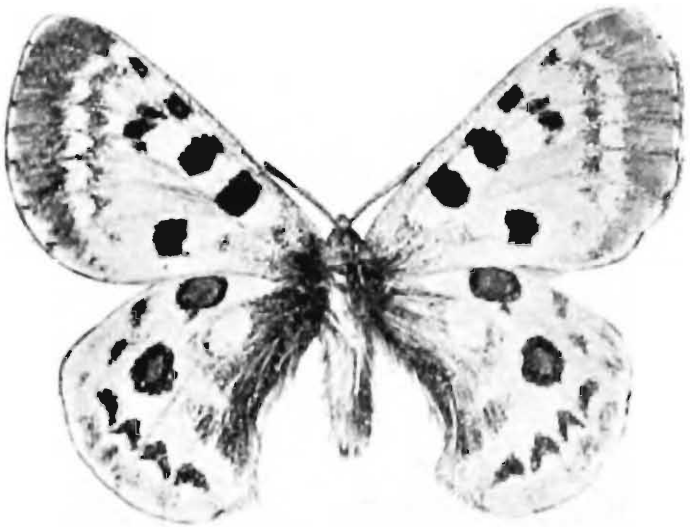


Fig. 71.—*P. tianschanica superba* Gr.-Grsh., ♂ (Afghanistan). (After Verity).

as narrow as in the ♂, being much narrower than in the females of *superba* and *insignis* ; other markings as in the ♂.

Expanse: ♂♀, 70–80 mm.

Habitat.—CHITRAL ; rare. The British Museum contains specimens, from elevations of from 12,000 to 13,500 feet, from Shandur, Baroghil, Yarkhun, the Turicho Valley, and Mirocham, chiefly from the collection of W H. Evans.

Should no. 82 *b*, *baroghila* Tytler, be proved to belong to the same race as *binghami*, the former name would be used, the latter representing a ♀ form only.

82 *b*. **Parnassius tianschanica baroghila** Tytler. (Fig. 72, ♀).

Parnassius discobolus baroghila, Tytler, 1926, p. 250, pl. iv, fig. 1 (♀) (Chitral).

Parnassius jacquemonti baroghila, Bollow, 1929, p. 75.

♂♀. "This form is smaller than *P. discobolus* from the Shandun Pass and not so dark. The females have no red tornal spots on the hind wing and agree with *P. discobolus* from the Shandun Pass in this respect" (*Tytler*, l. c.).

Expanse : ♂♀, 64–70 mm.

Habitat.—CHITRAL ; rare. Taken on the Baroghila Pass at the extreme north-east corner of Chitral.

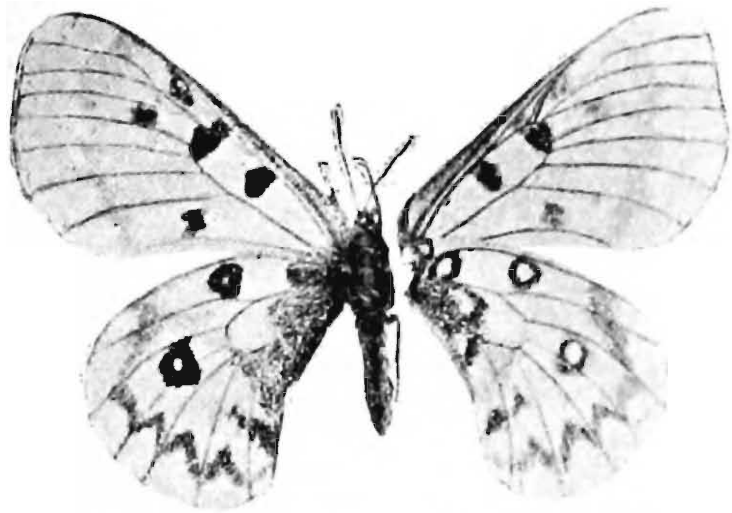


Fig. 72.—*P. tianschanica baroghila* Tytl., ♀. (After Tytler).

82 *c*. **Parnassius tianschanica hunzaica** Tytler. (Fig. 73, ♀).

Parnassius discobolus hunzaica, Tytler, 1926, p. 250, pl. iv, fig. 2 (♀) (Hunza : Misgar).
Parnassius jacquemonti hunzaica, Bollow, 1929, p. 75.
? *Parnassius rhodius*, Honrath, auct. (part.).

♂♀. " This form is very like *P. d. baroghila*, but averages smaller and is much darker, especially in the females, which are as dark as the females of *P. discobolus* from the Shandun

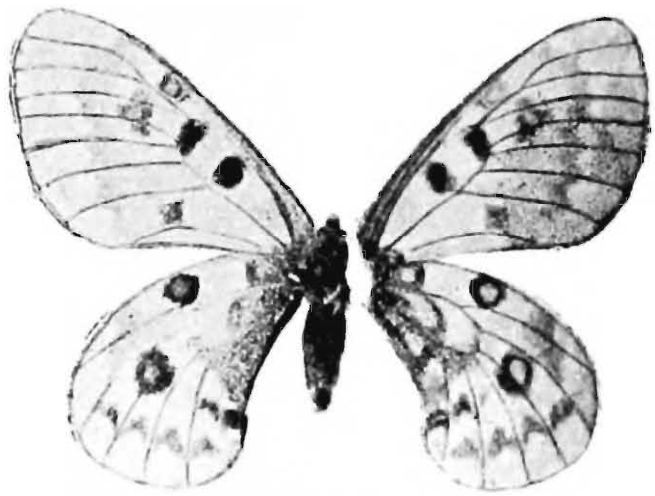


Fig. 73.—*P. tianschanica hunzaica* Tytl., ♀. (After Tytler).

Pass. It is very near, if not identical with, an unnamed form in the British Museum from the Hindu Kush, and which is the *rhodius* of other authors.

" *Expanse* : ♂, 64 mm. ; ♀, 64–70 mm " (*Tytler*, l. c.).

Habitat.—HUNZA : Misgar, August ; rare.

Parnassius actius Eversmann.

♂♀. Allied to *tianschanica* Oberth. and *jacquemontii* Boisd., the ♀ having a carinate pouch. Fore wing with a narrow vitreous margin and with the submarginal spots not well developed. ♂ usually with only the anterior costal spot centred with red ; in the ♀ both spots are red-centred. ♀ with submarginal markings more strongly developed ; hind wing with grey basal area, and red basal spot rarely developed on upperside.

Distribution.—Turkestan to the Transalai, CHITRAL, and KASHMIR. Three subspecies have been described recently from NORTH-WEST INDIA.

83 *a*. **Parnassius actius sulla** Bryk & Eisner.

Parnassius actius sulla, Bryk & Eisner, 1934 *c*, p. 42.

♂♀. Ground-colour well developed, in the ♀ much more strongly darkened. Fore wing with vitreous band broad to the inner margin, the submarginal band reaching the anal fold, and strongly curved as in *jacquemontii* Boisd. Hind wing with broad vitreous band, and with pronounced and extended inner black area ; submarginal band of defined lunules touches the vitreous band ; an anal band below the cell ; only the anterior costal spot is red-centred ; ocelli of normal size, brick-red, and broadly ringed with black.

Habitat.—CHITRAL : Baroghil Pass. Described from a single pair.

83 *b*. **Parnassius actius catalina** Eisner & Peschke.

Parnassius actius catalina, Eisner & Peschke, 1934, p. 41 (Gilgit).

♂♀. A well differentiated race, allied to *minuta* Verity. All markings less clearly defined. Fore wing with only faint red markings, which tend also to disappear on the hind wing of ♂. ♂ with very small vitreous band, fore wing submarginal band shortened ; costal spots small, and spot on inner margin very small ; cell-spot of normal size ; ocelli small ; inner black area of hind wing moderate, and proximally with only anal spots. ♀ resembles the ♂, is larger and has relatively broader marginal and submarginal bands, also somewhat larger ocelli.

Habitat.—GILGIT : Doubounni Mountains.

83 *c*. **Parnassius actius yelyangi** O. Bang-Haas.

Parnassius actius yelyangi, O. Bang-Haas, 1934 *b*, p. 135 (S. Kashmir).

♀. Ground-colour pure white with deep black markings. Fore wing with four black costal spots, a smaller cell-spot,

a reduced spot at end of cell, and a large spot on inner margin; submarginal and marginal bands weakly suffused with black; fringes and veins of both wings black. Hind wing with a marginal band of small spots; below with three indistinct red basal and two anal spots.

Expanse: 60 mm.

It occurs with *P. epaphus* Oberth. on the same ground, and contrasts with this by reason of its larger size and bright red ocelli bearing no trace of white centres.

Habitat.—SOUTH KASHMIR: Zanskar, Yelyang Pass, 13,500 feet, August. The most southerly point known for the species.

Parnassius jacquemontii Boisduval.

♂♀. A comparatively small species. Fore wing with large costal spots and large inner marginal spot, all with red centres well developed; submarginal macular band sharply marked, extending to inner margin; fringe not or hardly chequered. Hind wing with large ocelli bearing a white pupil; submarginal lunules broad; a red anal spot; black inner area narrow, without a projecting tooth at apex of cell. Antenna with white rings. ♀ with carinate pouch.

Distribution.—WESTERN HIMALAYAS to Turkestan, Tibet, and China. Three subspecies occur in the Indian area.

84 *a*. **Parnassius jacquemontii chitralensis** Moore.

Parnassius chitralensis, Moore, 1902, p. 107, pl. 406, figs. 2, 2 *a* (Chitral); Stichel, 1907 *a*, p. 29; Bingham, 1907, p. 119; Fruhstorfer, 1908 *b*, p. 111.
Parnassius jacquemonti chitralensis, Evans, 1932 *a*, p. 59.

♂♀. *Upperside* pale creamy-white, both wings only slightly irrorated with diffuse black scales; body, base of the wings, and inner area of hind wing clothed with long white hairs. Fringes of both wings more or less speckled with black. Fore wing with a short bar across middle of cell, another along the discocellulars, and a diffuse post-discal series of lunules, black; in many specimens this series is incomplete and does not extend clearly across the wing; three or four crimson spots encircled with black, arranged as follows: one mid-way in area 1, two, sometimes three, beyond apex of cell in an oblique line from the costa; outer margin broadly hyaline, with minute black specks at the apices of the veins; cilia white. Hind wing with basal and inner area beneath the white hairs densely and broadly irrorated with black scales, the inner edge of this border irregular, rest of the wing with more diffuse black scaling; five or six black-ringed crimson spots as follows: two, sometimes three, obliquely above the

tornus, these, or one of them, occasionally white-centred; one in the middle of areas 5 and 7 respectively, these generally centred with white; one pure crimson spot at extreme base of wing; a post-discal series of black lunules as on fore wing, but the lunules not so well defined and generally separate from one another; a distinct hyaline outer marginal border, but the cream-white scaling extending to the margin; marginal black specks on the veins and white cilia as on fore wing.

Underside shining, with more or less of a glazed appearance; markings much as on the upperside, but indicated as much by those of the upperside, which show through as by actual scaling; hind wing with a subbasal transverse series of four dull crimson spots, while the crimson spots beyond are all more or less white-centred. Antennæ deep brownish-black, rarely with a few white specks on the underside; head, thorax, and abdomen, beneath the covering of white hair, black. ♀ usually with more black irroration, and with larger and more brilliant crimson spots. Pouch with a sharp, high, posterior carina.

Expanse: ♂♀, 55–70 mm.

Habitat.—CHITRAL; not rare.

84 *b*. **Parnassius jacquemontii shandura** Tytler. (Fig. 74, ♂♀).

Parnassius jacquemontii shandura, Tytler, 1926, p. 250, pl. iv, figs. 3 (♂), 4 (♀) (Chitral); Bollow, 1929, p. 75.

Fig. 74.—*P. jacquemontii shandura* Tytl., ♂♀. (After Tytler).

♂♀. "This is the smallest and palest form of *P. jacquemontii* in the north-west of India; the males are very white-looking and both sexes either entirely lack or have very little dusky powdering on the wings. The females have red tornal spots on both sides of the hind wing.

"*Expanse*: ♂♀, 60–64 mm." (*Tytler*, l. c.).

Habitat.—CHITRAL: Shandur Pass, not rare.

84 *c*. **Parnassius jacquemontii jacquemontii** Boisduval.

Parnassius jacquemontii, Boisduval, 1836, p. 400 (♂, *non* ♀); Oberthür, 1879, p. 23, pl. 11, fig. 5 (♂); id., 1891, pp. 10, 17, pl. 11, fig. 11 (♂); Mackinnon & de Nicéville, 1898, p. 596; Moore, 1902, p. 105, pl. 406, figs. 1–1 *e*; Verity, 1906, p. 62, pl. xiii, figs. 16 (♂), 17 (♀); Stichel, 1907 *a*, p. 29; Bingham, 1907, p. 118, pl. 15, fig. 99 (♀); Fruhstorfer, 1908 *b*, p. 110, t. 50 *b*.

Parnassius jacquemontii jacquemontii, Evans, 1932 *a*, p. 59.

Parnassius actius var. *himalayensis*, Elwes, 1886, p. 30.

Parnassius jacquemontii himalayensis, Stichel, 1907 *a*, p. 29, t. 15 *b*.

Parnassius actius var. *rhodius*, Honrath, 1882, p. 178, t. 2, fig. 6 (♂) (Kashmir).

Parnassius rhodius, Verity, 1906, p. 60, pl. xiii, figs. 10 (♂), 11 (♀).

Parnassius jacquemontii var. *rhodius*, Stichel, 1907 *a*, p. 29; Fruhstorfer, 1908 *b*, p. 111.

Parnassius jacquemontii var. *impunctata*, Austaut, 1899, p. 154; Bingham, 1907, p. 119; Fruhstorfer, 1908 *b*, t. 50 *b* (♂).

Parnassius himalayensis ab. *impunctata*, Stichel, 1909 *a*, p. 29.

Parnassius jacquemontii f. *archonis*, Bryk, 1911, p. 54 (fig. ♂); id., 1914, p. 177, t. 3, fig. 15 (♂).

♂♀. Larger than *chitralensis*, more strongly irrorated with black, sometimes yellowish in colour.

Expanse: ♂♀, 65–75 mm.

Variation.—There are three of the named forms which are worth noting:—

(1) **rhodius** Honrath.—Distinguished by the sharper and more distinct marginal bands, fore wing costal spots without a red pupil, also the spot on inner margin plain black. Hind wing ocelli small and completely filled in with red.

(2) **impunctata** Austaut.—Ground-colour almost white. Fore wing with the costal and inner marginal spots black and submarginal markings reduced. Hind wing without red basal spots, ocelli smaller and red strongly edged with black.

(3) **archonis** Bryk.—Underside with red scales in the submarginal band, which in some cases extend to the hyaline margin.

Habitat.—KASHMIR to KUMAON; rare.

Parnassius epaphus Oberthür.

♂♀. A smaller species than *jacquemontii* Boisd. Ground-colour pure white, with the vitreous marginal bands much narrower than in *jacquemontii*. Hind wing with the red ocelli rarely pupilled, and then only in the ♀; anal spots only slightly dusted with red. Fringes of both wings distinctly chequered. Antennæ ringed with black and white (rarely quite black), which easily distinguishes the species from *jacquemontii*. ♀ pouch not carinate, but bearing transverse folds at the broader end.

Distribution.—CHITRAL to BHUTAN, Turkestan to Amdo and South-East China. In the Indian area four subspecies may be distinguished.

85 *a*. **Parnassius epaphus cachemiriensis** Oberthür. (Fig. 75, ♂).

Parnassius epaphus var. *cachemiriensis*, Oberthür, 1891, pp. 14, 17, 19, pl. 1, figs. 6, 7 (Kashmir); Verity, 1906, 1909, pp. 72, 315, pl. xvii, figs. 3 (♂), 4 (♀); Stichel, 1907 *a*, p. 30, t. 15 *c* (♂♀); Bingham, 1907, p. 121, fig. 31 *b* (sphragis); Fruhstorfer, 1908 *b*, p. 111; O. Bang-Haas, 1915, p. 175, t. v, fig. 29.
Parnassius nirius, Moore, 1902, p. 108, pl. 407, figs. 1, 1 *a*, (Ladak).
Parnassius jacquemontii f. *nirius*, Stichel, 1907 *a*, p. 29, t. 15 *b*.
Parnassius epaphus nirius, Verity, 1911, p. 315, pl. xliv, figs. 4 (♂), 5 (♀); Bingham, 1907, p. 121; Evans, 1932 *a*, p. 59, pl. vi, fig. A 13.3 (♂).
Parnassius epaphus epicus, Bryk & Eisner, 1934 *b*, p. 41 (Gilgit).
Parnassius epaphus nirius ab. *exoculata*, O. Bang-Haas, 1937, pp. 329–30, fig. 2 (Baltistan : Skardo, 3,500 m., July).

♂♀. Averages a little larger size. The deeper black markings are slightly reduced. The red basal spot on hind wing is

Fig. 75.—*P. epaphus cachemiriensis* Oberth., ♂ (Chonging Valley, 4,500–5,000 m.). (After Verity).

absent. The ocelli are more widely bordered with black, and are orange-red or yellow.

In the form **exoculata** O. B.-H. the markings in the distal areas are absent from both wings on the upperside; on the underside these markings are absent from the fore wing, and are barely visible on the hind wing.

Expanse: ♂♀, 50–60 mm.

Habitat.—CHITRAL to KUMAON; not rare.

85 *b*. **Parnassius epaphus hinducucica** Bang-Haas.

Parnassius epaphus hinducucica, O. Bang-Haas, 1934*b*, p. 7 (Hindukush).

♂♀. Distinguished from *cachemiriensis* by the much reduced submarginal spots on both wings; these spots are often quite absent in the male. The ocelli are very small, and the costal spots of fore wing are rarely centred with red.

Expanse: ♂♀, 50–55 mm.

Habitat.—N. KASHMIR; CHITRAL; Hindukush: Karambar Pass, 18,566 feet (36° 55′ N. lat., 73° 45′ E. long), in September.

85 *c*. **Parnassius epaphus hillensis** Bang-Haas. (Figs. 76, ♂; 77, ♂ form).

Parnassius epaphus hillensis, O. Bang-Haas, 1915, p. 175 (Bashahr: Spiti); id., 1927, p. 21, t. 3, figs. 7 (♂), 8 (♀); Bollow, 1929, p. 75.

Parnassius bashahrecus, O. Bang-Haas, 1915, p. 175, pl. v, figs. 22, 27 (♂); id., 1927, p. 21, pl. 3, fig. 11 (♂).

Parnassius epaphus hillensis f. *bashahrecus*, Bollow, 1929, p. 76.

♂♀. The author of this name considered it to represent a variable race resembling *cachemiriensis*. The wing-contour

Fig. 76.—*P. epaphus hillensis* O. B.-H., ♂. (After Bang-Haas).

is more truncate, and the ocelli and all red markings are larger, the latter more numerous.

A curious ♂ specimen (called *bashahrecus*, fig. 77) from the same locality was at first thought to represent another species, and afterwards to be a hybrid between *epaphus* Oberth. and

jacquemontii Boisd. It may be regarded as an individual form. The antennæ are entirely black. Compared with *cachemiriensis* the black markings are still further reduced,

Fig. 77.—*P. epaphus hillensis* f. *bashahrecus* O. B.-H., ♂. (After Bang-Haas).

and there is no black discal dusting in areas 2 and 3 of fore wing. Compared with *hillensis*, on the fore wing the four posterior submarginal spots are smaller. The ocellus in 1 *b* is larger and more rounded, as in *sikkimensis*.

Habitat.—The Spiti district of BASHAHR ; rare.

85 *d*. **Parnassius epaphus sikkimensis** Elwes.

Parnassius epaphus var. *sikkimensis*, Elwes, 1882, p. 399, 401, pl. 25, figs. 4 (♀), 5 (♂) (Sikkim) ; Verity, 1906, pp. 73, 74, pl. xvii, figs. 10, 12, 13 (♂), 11 (♀) ; Stichel, 1907 *a*, p. 30 ; Bingham, 1907, p. 121, pl. 15, fig. 100 ; Stichel, 1907 *b*, t. 3, fig. 1 (♂) ; Evans, 1932 *a*, p. 59.

♂♀. Smaller than *cachemiriensis*, averaging an expanse of only 44–50 mm. as against 60 mm. in the former. Distinguished also by its heavier black markings, the ground-colour also often sprinkled with black scales. Red scaling of the ocelli reduced, and no red scaling elsewhere. Antennæ conspicuously ringed with white.

Habitat.—SIKKIM ; common, at and above 16,000 feet.

85 *e*. **Parnassius epaphus phariensis** Avinoff. (Fig. 78, ♂).

Parnassius epaphus phariensis, Avinoff, 1915, p. 360, pl. liv, figs. 8 (♂), 9 (♀) (Phari-Jong) ; Bollow, 1929, p. 76.

Distinguished from *sikkimensis* by the very greatly increased development of all the black markings. The red centres of the spots and ocelli are very marked on both pairs of wings ; ocelli of hind wing usually united by a dark bar.

Habitat.—BHUTAN : Phari-Jong.

Parnassius hardwickei Gray.

♂♀. Fore wing with veins 6 and 7 from a point and origin of vein 10 far removed. *Upperside* of fore wing with the spots at the end of the cell and middle of area 1 usually red, but not joined by a dark band ; the submarginal band a row of contiguous spots. Hind wing above usually without a red

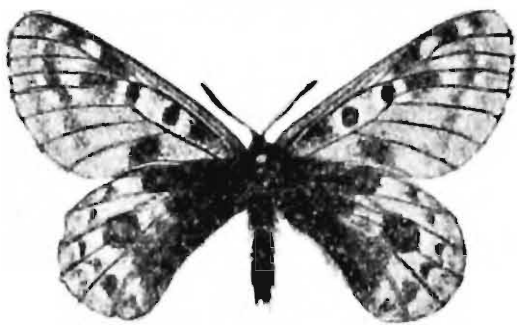


Fig. 78.—*P. epaphus phariensis* Avin., ♂. (After Avinoff).

spot at base of area 7 ; marginal spots strongly developed, shaded with blue and centred with white. Hind wing below with prominent red basal spots, the submarginal spots greenish.

♀ more abundantly marked with black and red than the ♂. Pouch bladder-like and produced backwards ; it is laterally flattened, and provided beneath with a longitudinal groove.

There are two broods, a pale dry-season and a dark wet-season form.

Distribution.—CHITRAL to SIKKIM, being restricted to the Himalayas ; two subspecies may be distinguished.

86 *a*. **Parnassius hardwickei hardwickei** Gray.

Parnassius hardwickei, Gray, 1831, p. 32 (Kashmir) ; id., 1846, p. 7, pl. 4, figs. 1, 1 *a* (♂) ; id., 1852, p. 76, pl. 12, figs. 8, 11 (♀), 10 (♂) ; Staudinger & Schatz, 1884, p. 22, t. 14 (♂) ; Moore, 1902, p. 111 (part.), pl. 408, figs. 1 *d–g*, pl. 409, figs. 1 *c* (trans.), 1 *d–g* ; Stichel, 1907 *a*, p. 31, t. 15 *b* (♂) ; id., 1907 *b*, pp. 36–37 ; Bingham, 1907, pp. 117, 121, 122, pl. 15, fig. 101 (♂) ; Verity, 1907, p. 39, pl. xxi, fig. 17 (♂) ; Fruhstorfer, 1908 *b*, p. 111.

Parnassius hardwickei hardwickei, Evans, 1932 *a*, p. 59, pl. vi, fig. A 13.4 (♀).

Parnassius hardwickei f. *charino*, Gray, 1852, p. 76, pl. 12, figs. 12, 13, 14 (♂), 15 (♀) ; Stichel, 1907 *a*, p. 31 ; Verity, 1907, p. 90 ; Stichel, 1907 *b*, p. 37 ; Fruhstorfer, 1908 *b*, p. 111, t. 50 *d* (♂).

Parnassius hardwickei var. *otos*, Fruhstorfer, 1903 *b*, p. 46 ; Stichel, 1907 *a*, p. 31 ; id., 1907 *b*, p. 37 ; Fruhstorfer, 1908 *b*, p. 111, t. 50 C ; Evans, 1914 *a*, p. 766.

Parnassius hardwickei ab. *natuposterior*, O. Bang-Haas, 1927, p. 35, t. 2, fig. 14 (♂) (Simla) ; Bollow, 1929, p. 76.

Parnassius hardwickei punjabensis, O. Bang-Haas, 1934 *b*, p. 8 (Punjab).

Parnassius hardwickei baltistani, O. Bang-Haas, 1934 *b*, p. 8.

♂. *Upperside* creamy-white. Fore wing with base and costal

margin densely irrorated with black scales; a broad, short, velvety black bar across middle of cell, another along the discocellulars, and a third beyond apex of cell, this latter with superposed spots of crimson where the bar crosses the bases of areas 5 and 8; a crimson-centred black spot in middle of area 1; an irregularly curved prominent post-discal series of dusky black spots, so arranged as to leave a narrow edging of the creamy-white ground-colour beyond, which is traversed by the black veins; the four anterior spots of the post-discal series fused to form a broad, continuous, but short curved band; outer margin broadly dusky black; cilia white. Both the dusky black band and the post-discal dusky black markings subhyaline. Hind wing with base and inner margin broadly dusky black, the inner edge of the black coloration on the latter deeply but irregularly bi-emarginate; a crimson-centred black spot near base of area 5, another just beyond middle of area 7, followed by a very conspicuous curved post-discal series of five dull blue ocelli ringed with black and centred with white, and a narrow, diffuse, dusky black marginal band; cilia white.

Underside similar, with a glassy appearance. Fore wing with markings of upperside visible by transparency; the white scaling of the upperside replaced by scale-like hairs of the same colour; the only scaled markings are the black cell-bars, three small crimson spots beyond, and the black-ringed crimson spot in area 1. Hind wing with the white scaling along the basal half of the costal margin nearly as on upperside, the rest hair-like as on underside of fore wing; a broad basal band of four red spots followed by a discal irregular series of five similarly-coloured spots, the lower three formed into a short oblique band above the tornal angle; all the crimson spots ringed more or less obsoletely by black, and the following prominently centred with white: the spot in areas 2 and 5 and the basal and median spots in area 7.

♀. Similar; the dusky black irroration on upperside of fore wing more extensive and formed into a narrow irregular band below the cell, which runs between the crimson spots beyond apex of cell and the crimson spot in area 1; the crimson spots larger, with an additional spot in area 6 of fore wing and a pretornal spot on hind wing.

Underside similar to that of ♂, but all the red spots much larger and centred with white. Antennæ nearly black, with only a few white specks; head with brownish-yellow pubescence; rest of thorax and abdomen covered densely with long white hair which also clothes, more or less narrowly, the inner margin of hind wing.

Expanse: ♂♀, 55–65 mm.

Variation.—The nominotypical form described above repre-

sents the dry form. Very light specimens have received the name of **otos** Fruhst. The pattern is much reduced, partly diffuse, especially the submarginal band of the fore wing; upperside red spots absent. Hind wing with only a small anterior ocellus, the submarginal spots intensely black, without blue shading. Represents an extreme dry form.

Wet-season form **charino** Gray.—♂♀. *Upperside* more or less completely and densely irrorated with dusky black, from which, on the fore wing, two bars that cross the cell, a short oblique bar beyond its apex, a post-discal spot near costa beyond the crimson spots, and a submarginal series of spots stand out conspicuously white; on the hind wing the interval between the basal and post-medial crimson spots in area 7 is also prominently white.

Underside with markings showing through from above, fore wing apical area and outer margin, and hind wing entirely, conspicuously suffused with greenish-yellow.

The name *natuposterior* O. B.-H. is a synonym of *charino*.

Habits.—The larva feeds on Saxifrage. The species occurs in Kashmir and Simla all the year round. The wet-season or autumn form, occurring from July to October, appears to hibernate, and hibernation also takes place in the pupal stage. The butterfly prefers grassy mountain-peaks near the snow-line. The lighter forms fly between 7,500 and 9,000 feet, the dark ones from 10,000 to 15,000 feet.

Habitat.—CHITRAL to KUMAON; common.

Whether specimens from the Punjab and Baltistan can be considered as forming distinct races is a question which may be left to the student who can compare large material.

86 *b*. **Parnassius hardwickei albicans** Fruhstorfer.

Parnassius hardwickei ab. *albicans*, Fruhstorfer, 1898, p. 147 (Sikkim: Lochung Valley and Donika Pass); Austaut, 1899, p. 154; Stichel, 1907 *a*, pl. 3; Fruhstorfer, 1908 *b*, p. 111; Verity, 1907, p. 90, pl. xix, figs. 19 (♂), 20 (♀) (types).

Parnassius hardwickei, Moore (part.), 1902, p. 111, pl. 408, figs. 1 *a*–1 *c*.

Parnassius hardwickei ab. *afer*, Fruhstorfer, 1899 *b*, p. 354; Moore, 1902, p. 112, pl. 409, figs. 1 *a*, 1 *b*.

Parnassius hardwickei ab. *parva*, Verity, 1907, p. 90, pl. xxi, figs. 19 (♂), 20 (♀); Fruhstorfer, 1908 *b*, p. 111; Evans, 1914 *a*, p. 766.

Parnassius hardwickei viridicans, Fruhstorfer, 1908 *b*, p. 111, t. 50 *c* (♂), *d* (♀) (Sikkim); Evans, 1914 *a*, p. 766; id., 1932 *a*, p. 59.

Parnassius hardwickei f. *charino*, Verity (*non* Gray), 1907, pl. xxi, figs. 17 (♂), 18 (♀) (Sikkim).

♂♀. All bands and spots small with very little red on the fore wing; the submarginal lunules on fore wing all small and usually entirely free within the dark marginal border.

Hind wing with reduced blue spots, the anal ocellus without red, the anterior one with a red dot only. ♀ with red spots above, and below with blackish scaling in place of the red basal spots. Smaller than the nominotypical race. Represents the dry spring form occurring from April to June.

Wet-season form **afer** Fruhst.—Wings much dusted with black, especially at the base and on disc of fore wing, as well as over the basal and inner areas of hind wing. Fore wing costal spots with red centres, and the submarginal spots all intensified and contiguous.

A second wet form is **viridicans** Fruhst., in which the underside is much more strongly green.

The name **parva** Verity refers to specimens intermediate between *albicans* and *afer*.

Habitat.—SIKKIM ; common.

Parnassius stoliczkanus Felder.

P. stoliczkanus Feld. has often been associated with *delphius* Eversm., but is here considered as distinct, as was done by Felder, Elwes, Bang-Haas, and Bollow (in Seitz's 'Macrolepidoptera'). Like *delphius* Eversm., it is split up into a number of forms which appear to represent races. The two species appear to occur together in Ladak, but whether upon the same ground is not certain.

♂♀. Distinguished by the pattern of the hind wing. There is a row of five antemarginal ocelli or spots, and these are placed on the edge of the black marginal border, or are within this border ; they are usually dark blue to black with a light blue centre. The discal ocellus has a red centre and lies nearer the marginal border than to the cell. The subcostal ocellus is often absent. ♀ pouch small, with the two lobes more truncate than in *delphius*.

Distribution.—NORTH KASHMIR to LADAK, south and east to KULU and KUMAON. Seven subspecies or forms, as one may regard them, are to be distinguished.

87 *a*. **Parnassius stoliczkanus rileyi** Tytler. (Fig. 79, ♂).

Parnassius delphius rileyi, Tytler, 1926, p. 251, pl. iv, figs. 6 (♂), 7 (♀).

Parnassius stoliczkanus rileyi, O. Bang-Haas, 1927, p. 32 ; Bollow, 1929, p. 79.

Parnassius stoliczkanus tytlerianus, Bryk & Eisner, 1934 *a*, p. 40, ♂ (Yasin).

♂♀. " Very near to *nicevillei* from the Burzil Pass, Gurais, which again is very close to *P. atkinsoni* from the Pir Panjal and from Haramosh Mountain in Gilgit ; it differs from the latter in the smaller marginal spots of the hind wing ; these spots are about the same size in *rileyi* as in *nicevillei*, the

former, however, differs from *P. atkinsoni* in not having the red spot in area 2 of the hind wing nearly so well developed. In both *P. nicevillei* and *P. atkinsoni* this spot is very large

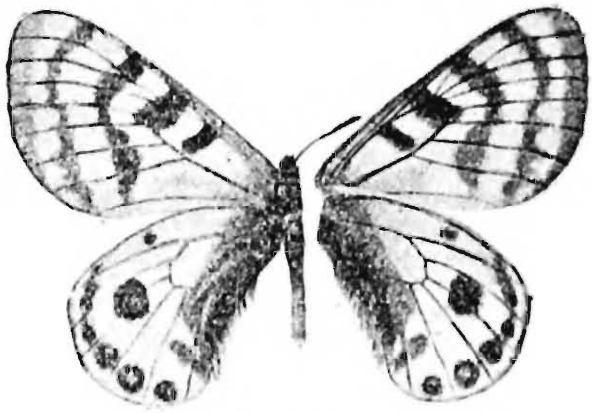


Fig. 79.—*P. stoliczkanus rileyi* Tytl., ♂. (After Tytler).

and bright; in some specimens of *P. rileyi* this spot is very small and inconspicuous, and in one it is completely absent and is replaced by a very large black spot" (*Tytler*, l. c.).

Habitat.—RUPAL VALLEY; ASTOR; FARSAT PASS*, leading into Chilas. In July and August; not rare.

87 *b*. **Parnassius stoliczkanus nicevillei** Avinoff. (Fig. 80, ♂).

Parnassius delphius nicevillei, Avinoff, 1916, pp. 355, 356, pl. liii, figs. 1 (♂), 2 (♀) (Burzil Pass); Tytler, 1926, p. 251; Evans, 1932 *a*, p. 60.

Parnassius stoliczkanus nicevillei, O. Bang-Haas, 1927, p. 33; Bollow, 1929, p. 79.

♂♀. May be considered as a transition from *atkinsoni*

Fig. 80.—*P. stoliczkanus nicevillei* Avin., ♂. (After Avinoff).

Moore to *stoliczkanus* Feld., and is smaller than the former. Differs chiefly in the darker markings, especially in the discal

* The Farsat Pass is a continuation of the range of mountains on the south side of the Rupal Valley.

area of fore wing, also the black bands appear narrower. Hind wing with the median ocellus large and pale red, sometimes narrowly surrounded with black; it is much larger than the subcostal ocellus, which seldom has a red centre and which is sometimes quite absent. The blue ocelli are placed in a darker submarginal zone than in *atkinsoni*, the paler intermediate areas narrower or absent.

Habitat.—KASHMIR: Burzil Pass. Described from about seventy specimens which were found to be rather constant.

87 *c*. **Parnassius stoliczkanus atkinsoni** (Moore). (Fig. 81, ♂).

Koramius atkinsoni, Moore, 1902, p. 121, pl. 412, fig. 2 (Kashmir: Pir Panjal).

Parnassius stoliczkanus f. *atkinsoni*, Verity, 1907–11, p. 82, pl. x, fig. 13 (♀), pl. lxiv, figs. 13, 14 (♀), p. 317.

Parnassius delphius atkinsoni, Bingham, 1907, p. 125; Avinoff, 1916, pp. 355, 356, pl. 53, fig. 4 (♂); Evans, 1932 *a*, p. 60; Tytler, 1926, p. 251 (E. Gilgit: Haramosh Mt.).

Tadumia delphius var. *atkinsoni*, Bryk, 1922, p. 55; O. Bang-Haas, 1927, p. 32.

♂♀. Fore wing with broader bands, all three complete. Hind wing with distinctly blue marginal band; two ocelli,

Fig. 81.—*P. stoliczkanus atkinsoni* Moore, ♂. (After Avinoff).

red, ringed with black, the posterior one enlarged; two red-centred inner marginal spots.

The ♂ is figured by Avinoff (1916). This figure, reproduced above, has the large post-discal spot on the right hind wing absent.

Habitat.—KASHMIR: Pir Panjal; EAST GILGIT: Haramosh Mt.

87 *d*. **Parnassius stoliczkanus zogilaica** Tytler. (Fig. 82, ♀).

Parnassius delphius zogilaica, Tytler, 1926, p. 251, pl. iv, fig. 5 (♀) (N. Kashmir: Zogila Pass).

Parnassius stoliczkanus zogilaica, O. Bang-Haas, 1927, p. 33, t. 4, fig. 14 (♀); Bollow, 1929, p. 79.

♀. "Differs from the allied *nicevillei* and *rileyi* in being

much paler on both wings, and the marginal spots are rather smaller and largely centred with blue; these spots do not

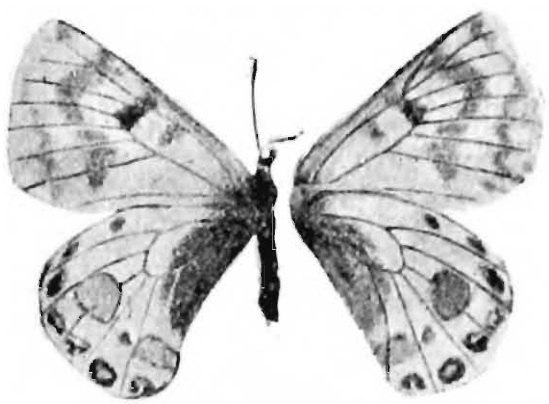


Fig. 82.—*P. stoliczkanus zogilaica* Tytl., ♀. (After Tytler).

touch one another and are placed on a white ground with no dusky scales between them" (*Tytler*, l. c.).

Habitat.—N: KASHMIR: Zogila Pass.

87 *e*. **Parnassius stoliczkanus stoliczkanus** C. & R. Felder. (Fig. 83, ♂♀).

Parnassius stoliczkanus, C. & R. Felder, 1865, p. 138, t. 69, figs. 2, 3; Elwes, 1886, pp. 40-1, pl. iii, figs. 1, 2 (sphragis).
Koramius stoliczkanus, Moore, 1902, p. 120, pl. 142, figs. 1; 1 *a*, *b*.
Parnassius delphius stoliczkanus, Stichel, 1907 *a*, p. 33, t. 16 *c*; id., 1907 *b*, p. 41; Vérity, 1907, p. 82, pl. x, figs. 11 (♂), 12 (♀); Bingham, 1907, p. 123; Fruhstorfer, 1908 *b*, p. 110; Avinoff, 1916, p. 355; Tytler, 1926, p. 250 (♀, Ladak); Evans, 1932 *a*, p. 60.
Parnassius stoliczkanus stoliczkanus, O. Bang-Haas, 1927, pp. 31, 32.
Parnassius delphius var. *stenosemus*, Honrath, 1890, p. 127; id., 1892, p. 431, t. 15, fig. 3 (Ladak); Bingham, 1907, p. 125.
Parnassius stoliczkanus stenosemus, O. Bang-Haas, 1927, p. 32.
Parnassius delphius var. *stoliczkanus* ab. *obliterata*, Verity, 1911, p. 317, pl. lix, fig. 1 (♀).
Parnassius stoliczkanus zanskarica, O. Bang-Haas, 1934 *b*, p. 152 (♂♀, South Kashmir: Nira, Zanskar Mts., 4,500 m., August).

♂♀. *Upperside* of fore wing with the post-discal dark band

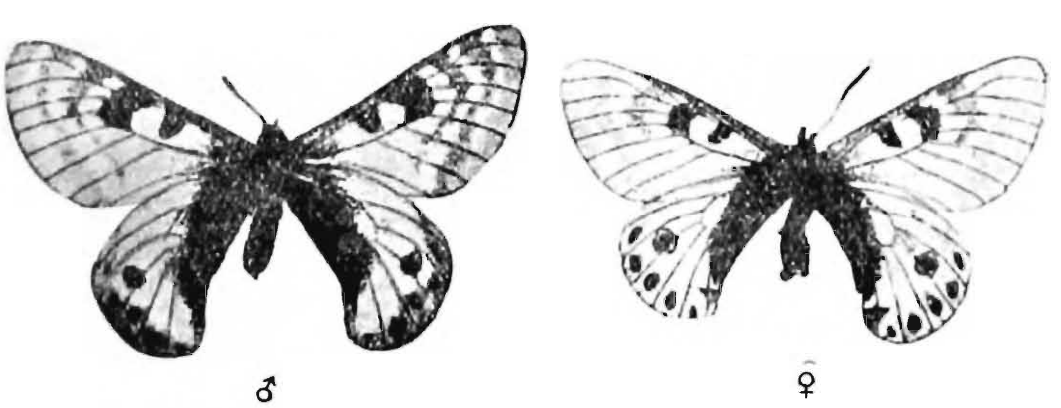


Fig. 83.—*P. stoliczkanus stoliczkanus* Feld. (♂♀ types, from Rupshu; after Verity).

very broad, as broad as the marginal dark band ; submarginal white spots small, not continued below vein 2 ; discal band often incomplete posteriorly. Hind wing with the discal spot in area 5 variable ; spot in 7 usually absent ; a broad marginal band in which stand four or five submarginal dark spots, blue in the ♀ ; the posterior ocellus usually present, but sometimes reduced to a dot ; often a red dot on the inner margin.

Expanse : ♂♀, 50–59 mm.

Variation.—An individual or seasonal form is represented by **stenosemus** Honr. This is larger, with the markings less well defined ; fore wing with complete bands, the discal one posteriorly sometimes separated into spots. Hind wing with narrow marginal band ; two to four submarginal spots centred with blue, being preceded by a narrowly shaded band ; anterior ocellus sometimes absent, or reduced to a black dot.

A form figured by Verity under the name of **obliterata** has no discal and no subcostal ocellus on the hind wing. The specimen is without locality.

The form described as **zanskarica** O. Bang-Haas is said to have smaller ocelli, the submarginal ones being centred with blue.

Habitat.—LADAK to KULU ; very rare.

87*f*. **Parnassius stoliczkanus spitiensis** Bang-Haas. (Fig. 84, ♂).

Parnassius stoliczkanus spitiensis, O. Bang-Haas, 1927, p. 33, t. iv, figs. 17 (♂), 18 (♀) (Spiti) ; Bollow, 1929, p. 79.

♂♀. Fore wing with wide marginal and submarginal bands, the subcostal band either absent or faintly indicated ; spot on the inner margin often obsolete. Hind wing with very

Fig. 84.—*P. stoliczkanus spitiensis* O. B.-H., ♂. (After Bang-Haas).

wide marginal band bearing five marginal ocelli, generally with blue centres. In fresh specimens the median ocellus and anal spot are iridescent red with faint black rings. In the ♂ the anal ocellus often reduced, and the subcostal ocellus either entirely absent or reduced to a faint spot.

Habitat.—SPITI : Tum Tum Thang Mts., at 15,000 feet.

87 *g*. **Parnassius stoliczkanus florenciæ** Tytler. (Fig. 85, ♂).

Parnassius delphius florenciæ, Tytler, 1926, p. 251, pl. iv, fig. 9 (♂) (Garhwal).

Parnassius stoliczkanus florenciæ, O. Bang-Haas, 1927, p. 33, t. iv, figs. 15 (♂), 16 (♀).

Parnassius delphius kumaonensis, Riley, 1926, p. 277, pl. ii, fig. 3 (N. Kumaon : Shillong, 12,500 feet).

♂♀. *Upperside* differs from the nominotypical form in the wings being whiter. Fore wing with no dusky scaling in areas 1, 2, and 3, except a very small and clear dark spot in area 1. Marginal area very dark and broad, bearing a row

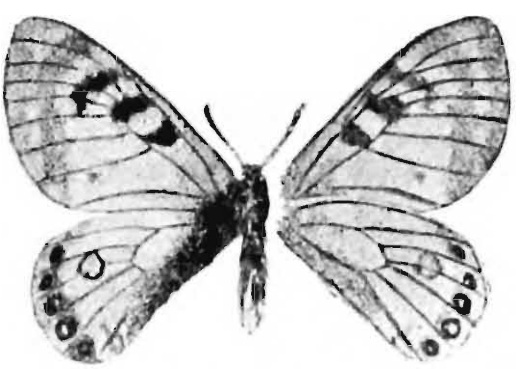


Fig. 85.—*P. stoliczkanus florenciæ* Tytl., ♂. (After Tytler).

of small and clear white spots, not so disjointed in area 4 as in *s. stoliczkanus*. Hind wing with the marginal area completely dusky, bearing three complete dark spots with blue centres, and two small dark spots without blue scales ; spots in areas 2, 3, and 4 are in line ; a clear small red discal spot and a very small tornal spot.

Habitat.—GARHWAL : Phup, Hundes, north of Tehri ; in June ; very rare. Also in NORTH KUMAON.

Parnassius delphius Eversmann.

This species has a wide distribution and is split up into many forms and a number of subspecies. The first-described form came from the southern foothills of the Altai. The forms found in Sikkim and Bhutan are more nearly allied to the West Chinese ones, and are classed by some authorities with *acdestis* Gr.-Grsh. as a distinct species ; the forms found in the North-West Himalayas are closer to the nominotypical *delphius*.

♂♀. Distinguished by the hind wing pattern. Two anal ocelli are present, but no antemarginal ones. There is a dark heavy submarginal line or band which is separated from a black marginal border, although sometimes only by a thin line ; marginal border narrow. The discal ocellus is not placed near the submarginal line, but either mid-way between it and the cell or nearer the cell. The subcostal ocellus is usually present. The ♀ pouch forms a belt round the abdomen, and

is prolonged below to a bifid lobe, and provided beneath with a deep longitudinal groove.

Larva (*P. delphius illustris* Gr.-Grsh.).—Unlike the larvæ of other *Parnassius*, and more nearly resembles a *Papilio*. Ground-colour a dirty olive. Above, each segment with two small bands, the anterior band larger, of a velvety black, bearing two light dots and interrupted at the middle; the posterior band is olive-black, edged behind by a faint velvety black stripe which is scarcely visible on all the segments. A light stripe on each side, traversed at the middle of each segment by a small and faint darker line. On the underside of each segment are two velvety black dots. Length 36–40 mm. (From *Groum-Grshimaïlo*, quoted by Verity).

The larvæ were found full-fed under stones.

Distribution.—Turkestan and Pamirs to South-West China and Amdo. In the Indian area in the NORTH-WEST HIMALAYAS to the KARAKORAM, south to LADAK and RUPSHU, reappearing in SIKKIM and BHUTAN. The Indian forms may be divided into twelve subspecies, but some of these may turn out to be only individual or seasonal forms when more material becomes available for study.

88 *a*. **Parnassius delphius kafir** Avinoff. (Figs. 86, ♂, 86 *a*, ♀).

Parnassius delphius kafir, Avinoff, 1916, p. 357, pl. 53, figs. 8(♂), 9 (♀) (Kila-Drosh: Kafiristan); Evans, 1932 *a*, p. 59; Bollow, 1929, p. 79.

Tadumia delphius var. *kafir*, Bryk, 1922, p. 59.

♂♀. Close to *chitralica* Verity, but the fore wing has the discal band obsolete, and in the ♂ the post-discal dark band

Fig. 86.—*P. delphius kafir* Avin., ♂. (After Avinoff).

does not reach the inner margin. Hind wing narrow, with a sharp angle at vein 2; the discal spots in areas 5 and 7 prominently red and of equal size; spots in 1 *b* and 2 obsolete; blue-centred submarginal spots in 2 and 3. The brownish submarginal band bears a few pale spots. In the ♂ there is a deep black anal spot and dark median ocelli. In the ♀ the

anal spots are faintly indicated by a few scales, and the median ocelli show pale blood-red centres. The subcostal ocelli are black in both sexes.

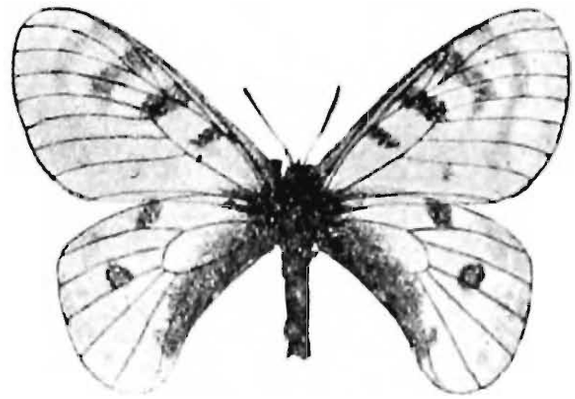


Fig. 86*a*.—*P. delphius kafir* Avin., ♀. (After Avinoff).

Expanse: ♂♀, 55–65 mm.

Habitat.—Safed Koh (Afghanistan) to KAFIRISTAN; very rare.

88*b*. **Parnassius delphius chitralica** Verity. (Fig. 87, ♀; *a*, *b*, anal pouch).

Parnassius delphius var. *hunza* race *chitralica*, Verity, 1911, p. 317, pl. lxiv, figs. 11 (♂), 12 (♀) (Baroghil Valley, 3,600 m.).
Tadumia delphius f. *chitralica*, Bryk, 1922, p. 56.
Parnassius delphius chitralica, Bollow, 1929, p. 79; Evans, 1932 *a*, p. 60.
Parnassius chitralensis, Avinoff, 1916, p. 357.
Parnassius delphius chitralica, Tytler, 1926, p. 250 (W. Gilgit: Yasin; Hunza: Misgar).
Parnassius delphius hunza, Bingham (*non* Gr.-Grsh.), 1907, p. 124, fig. 32.

♂♀. Allied to *hunza* Gr.-Grsh., from which it differs in its

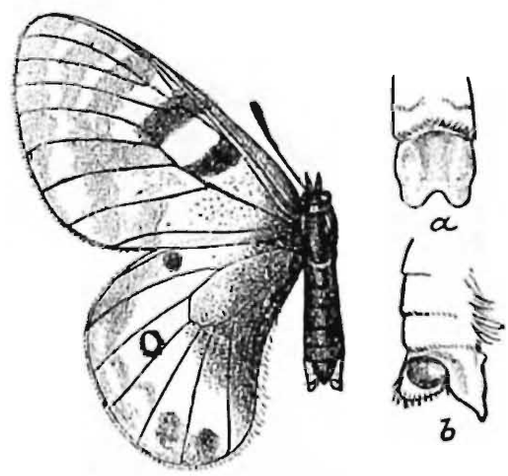


Fig. 87.—*P. delphius chitralica* Verity, ♀; *a*, *b*, anal pouch.

generally smaller size and darker appearance. Fore wing with black markings more copious, the bands wider and diffuse;

the post-discal and discal bands are conjoined in area 3. Hind wing with submarginal band heavier than in *hunza*, and distinctly separated from the hyaline margin by a band of the ground-colour ; the discal red spot in area 5 prominent, the spot in 7 smaller, black or red, in 2 and 3 only blue spots.

Expanse : ♂♀, 68–72 mm.

Habitat.—CHITRAL ; rare.

88 *c*. **Parnassius delphius hunza** Groum-Grshimaïlo. (Fig. 88, ♂♀).

Parnassius stoliczkanus var. *hunza*, Groum-Grshimaïlo, 1888, p. 303 (Kanjut).

Parnassius delphius var. *hunza*, Groum-Grshimaïlo, 1890, p. 205, pl. 10, fig. 1 *a*, *b* ; Stichel, 1907 *a*, p. 33, t. 16 *b* (♀) ; Verity, 1907–10, pp. 83, 317, pl. x, figs. 9 (♂), 10 (♀), pl. lxiv, figs. 9 (♂, type), 10 (♀, type) ; Fruhstorfer, 1908 *b*, p. 110.

Koramius hunza, Moore, 1902, p. 123.

Tadumia delphius var. *hunza*, Bryk, 1922, p. 57.

♂♀. A pale form with reduced markings, having a washed-out appearance. Fore wing without discal band, the short costal band not prolonged ; sometimes increased grey discal scaling ; no spot in area 1 *b*. Hind wing with very narrow grey margin, but a strong submarginal band which terminates in two black spots ; ocelli all black, reduced or punctiform ;

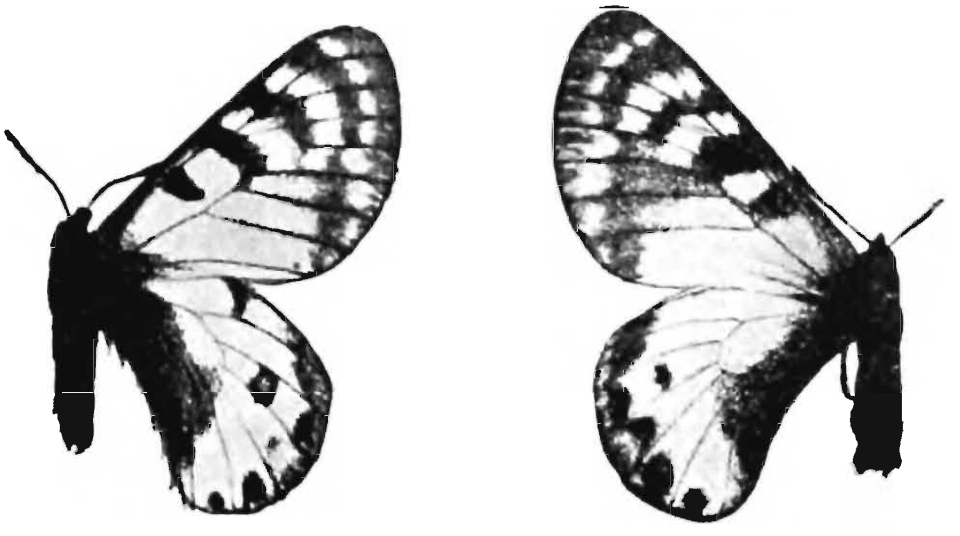


Fig. 88.—*P. delphius hunza* Gr.-Grsh. (♂♀, types, after Verity).

no discal spot in 7, spot in 1 *b* small and black ; discal ocellus placed about mid-way between the submarginal band and the cell.

This form is rather more distinct than other *delphius* races. It shows, perhaps, the beginning of the *stoliczkanus* hind wing whilst still retaining the *delphius* type of pattern.

Habitat.—EASTERN HINDU KUSH : Hunza district, the mountains of Kunjut, above 5,000 feet ; taken in July ; very rare.

88 *d*. **Parnassius delphius affinis** Peschke & Eisner.

Parnassius delphius affinis, Peschke & Eisner, 1934, p. 40, fig. (Gilgit).

♂♀. Connects *chitralica* Vty. and *mamaievi* O. Bang-Haas, and is larger than either. Fringes black as in *chitralica*, with the wing strongly scaled as in this race. All markings large and well defined, the wings glossy as in *mamaievi* ; the ocelli average smaller than in this race, and the anterior ones tend to be less brightly coloured.

Expanse : ♂♀, 30–33 mm.

Habitat.—GILGIT : Doubounni Mts., 13,500 feet, in July.

The description given of this form is not very satisfying ; it is provisionally placed here as a race.

88 *e*. **Parnassius delphius workmani** Avinoff. (Fig. 89, ♀).

Parnassius delphius var. *workmani*, Avinoff, 1916, p. 357, pl. liii, fig. 7 (♀) (Baltistan) ; O. Bang-Haas, 1927, p. 31 ; Bollow, 1929, p. 79.

Parnassius delphius workmanni (sic), O. Bang-Haas, 1935, pp. 111–12 (♂♀, Baltistan : Haldi, Pharo River, Saltoro Mts., and Saltoro River, July).

♂♀. Wings covered with dark scales along the veins. The submarginal bands resemble those of *mamaievi* O. Bang-Haas,

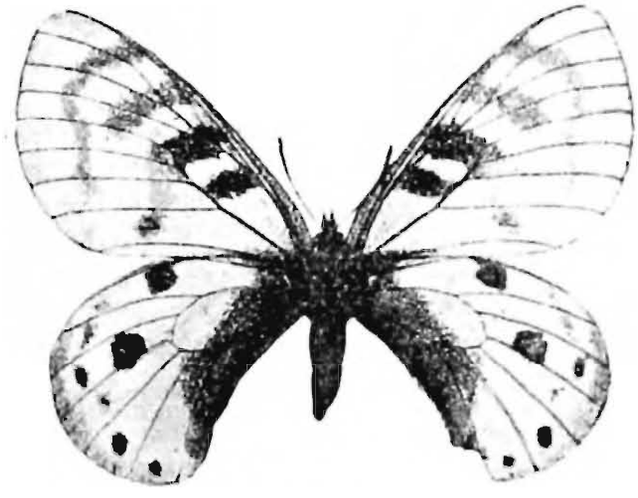


Fig. 89.—*P. delphius workmani* Avin., ♀. (After Avinoff).

but are very reduced and dissolved into single dark spots. Discal area of fore wing similar to *hunza* Gr.-Grsh. The subcostal ocellus is black. This form is larger and paler than *mamaievi*.

Expanse : ♂, 55 mm. ; ♀, 56–58 mm.

Habitat.—BALTISTAN : Saltoro Glacier ; described from a single ♀, but recently both sexes were taken by O. Bang-Haas's collectors.

88 *f*. **Parnassius delphius shigarensis** Bang-Haas.-

Parnassius delphius shigarensis, O. Bang-Haas, 1935, p. 111 (♂♀, Baltistan : Baltora Mts., north-east of the Ortes Shigar, 5,000 m., July).

♂♀. Ground-colour chalky white, all markings deep black, the marginal and submarginal bands broad. Hind wing with very distinct submarginal band.

Habitat.—BALTISTAN : Baltora Mts., 15,000 feet.

88 *g*. **Parnassius delphius cardinalina** Avinoff.

Parnassius delphius nicevillei ab. *cardinalina*, Avinoff, 1916, pp. 355, 356, pl. liii, fig. 3 (♂) (Burzil Pass); Bollow, 1929, p. 79.

♂. Larger than *nicevillei* Avin., but with the *delphius* pattern of hind wing. Fore wing with broad discal and submarginal bands somewhat as in *atkinsoni* Moore. Hind wing with the three red ocelli well developed, surrounded by heavy black rings and joined by black bars.

Habitat.—KASHMIR : Burzil Pass ; very rare, only one specimen known.

This insect appears to represent *P. delphius* Eversm. rather than *P. stoliczkanus* Feld. It is said by Avinoff to be very close to *cardinal* Gr.-Grsh., and to be distinguished from it only by the character of the dark margin of the hind wing and by the absence of white scales in the red ocelli on the underside.

88 *h*. **Parnassius delphius ladakensis** Avinoff. (Fig. 90, ♀).

Parnassius acdestis ladakensis, Avinoff, 1916, p. 354, pl. lii, fig. 7 (♀) (Shera-la) ; Bollow, 1929, p. 80.
Tadumia acdestis var. *ladakensis*, Bryk, 1922, p. 48.

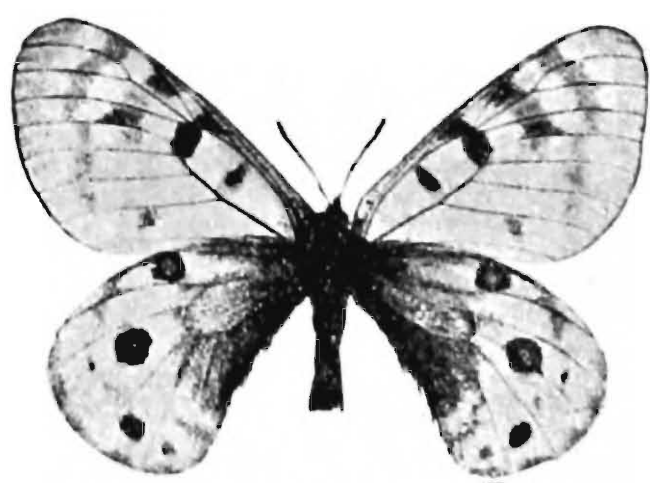


Fig. 90.—*P. delphius ladakensis* Avin., ♀. (After Avinoff).

♀. A large and very pale race. Wings more truncate than in *rupshuana* Avin., the marginal spots of hind wing larger,

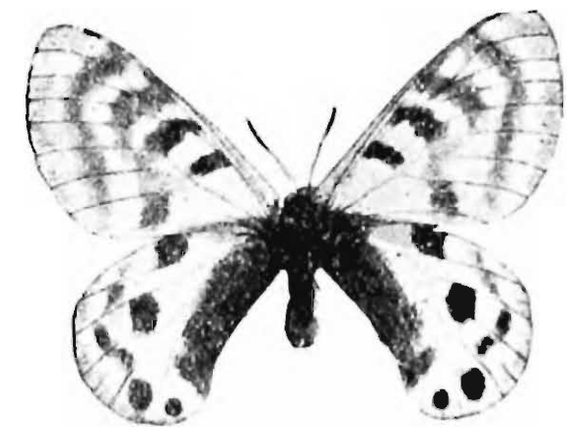
the other black markings very reduced. Fore wing with middle cell-spot little larger than the faint spot on inner margin..

Habitat.—LADAK : Shera-la.

88 *i*. **Parnassius delphius mamaievi** O. Bang-Haas. (Fig. 91, ♂♀).

Parnassius delphius stenosemus f. *mamaievi*, O. Bang-Haas, 1915, pp. 98, 166, t. 5, fig. 17 (♂) (S. Ladak).
Parnassius delphius mamaievi, Avinoff, 1916 p. 357, pl. liii, figs. 5 (♂), 6 (♀) (West Ladak); O. Bang-Haas 1927, pp. 31, 105, t. 5, fig. 12; Bollow, 1929, p. 79.

♂♀. Ground-colour white. Submarginal band of both wings very heavy and widely separated from the hyaline margin



♂

♀

Fig. 91.—*P. delphius mamaievi* O. B.-H., ♂♀. (After Avinoff).

by a band of ground-colour. Fore wing with spot on inner margin rectangular or oblong. Ocelli mostly filled with red or yellow, sometimes, however, quite black ; two distinct anal ocelli with blue centres.

Habitat.—SOUTH and WEST LADAK.

88*j*. **Parnassius delphius rupshuana** Avinoff. (Fig. 92, ♂).

Parnassius acdestis rupshuana, Avinoff, 1916, p. 354, pl. lii, figs. 5 (♂), 6 (♀), p. 355 (sphragis) (South-West Ladak : Tagalang-la) ; O. Bang-Haas, 1927, p. 34.
Tadumia acdestis var. *rupshuana*, Bryk, 1922, p. 49.

♂♀. Larger than *lampidius* Fruhst., with more reduced submarginal band on hind wing. The hind wing marginal

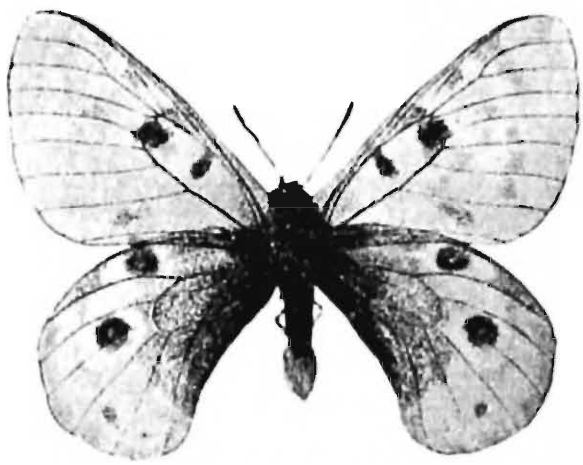


Fig. 92.—*P. delphius rupshuana* Avin., ♂. (After Avinoff).

spots almost absent, only the second one faintly retained. Fore wing markings weak in the distal area.

Habitat.—South-West Ladak : Rupshu. Taken at 17,500 feet flying over loose stony areas at the top of the Tagalang-la Pass ; the butterfly almost touched the ground, and its flight resembled that of a bat.

88 *k*. **Parnassius delphius lampidius** Fruhstorfer. (Fig. 93, ♂).

Parnassius delphius lampidius, Fruhstorfer, 1903 *b* (*a*), p. 44, t. 1, fig. 2 (*non* 1) ; Stichel, 1907 *a*, p. 34 ; Verity, 1907, p. 80, pl. xix, figs. 1 (♂), 2 (♀) ; Fruhstorfer, 1908 *b*, p. 110, t. 50 *e* ; Evans, 1932 *a*, p. 60.
Parnassius acdestis lampidius, O. Bang-Haas, 1927, p. 35.
Parnassius delphius whitei, Bingham, 1907, pp. 125–6, fig. 33 (♂) (Sikkim).
Parnassius acdestis whitei, Bollow, 1929, p. 80, t. 5 *f* ; O. Bang-Haas, 1927, p. 34, t. 4, figs. 12 (♀), 13 (♂ ab.).
Parnassius delphius macdonaldi, Rothschild, 1918, p. 256 (Tibet : Yatung).
Parnassius acdestis var. *pundit*, Avinoff, 1922, pp. 55, 57, 62, 196, pl. dxlvii, fig. 4626 (♀), pl. dxlviii, fig. 4627 (♀) (Bhutan).
Parnassius delphius f. *centripuncta*, O. Bang-Haas, 1927, p. 34, t. 4, fig. 13 (♂).

♂♀. Ground-colour pure white. Fore wing with cell-spot and marginal band narrowed, also the discal band narrower, being obtusely angulate behind the cell. Hind wing black from base to the ocelli, and to near anal angle ; ocelli with heavy black borders and with distinct red centres ; at anal

angle two blackish dots, a narrow grey submarginal band. Hind wing below with a pale red spot at base of area 7. ♀ with lighter vitreous bands on fore wing and with larger, light, carmine ocelli on hind wing.

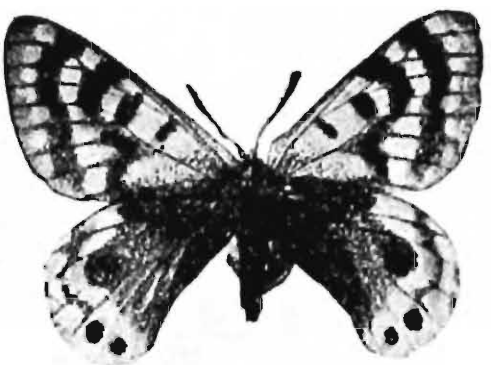


Fig. 93.—*P. delphius lampidius* Fruhst., ♂. (Paratype, after Verity).

Habitat.—SIKKIM ; very rare. Also in Bhutan and Tibet.

It seems probable that the names *whitei* Bingh., *macdonaldi* Roths., *pundit* Avin., and *centripuncta* O. B.-H. cannot be sustained.

88 *l.* **Parnassius delphius lathonius** Bryk. (Fig. 94, ♀).

Parnassius lathonius, Bryk, 1913 *a*, pp. 123, 124 (Gyantse) ; id., 1914, t. 29, fig. 139 (♀).
Parnassius latonius (sic), Avinoff, 1916, p. 354, pl. 52, fig. 8 (♀).
Tadumia delphius lathonius, Bryk, 1922, p. 49.
Parnassius delphius latonius (sic), Evans, 1932 *a*, p. 60.
Parnassius acdestis lathonius, O. Bang-Haas, 1927, p. 34, t. 4, fig. 19 (♀) ; Bollow, 1929, p. 80.

♂♀. Antennæ ochreous-brown at the base, otherwise black. Wings much larger than in *lampidius* Fruhst. and very dark.

Fig. 94.—*P. delphius lathonius* Bryk, ♀. (After Avinoff).

Fore wing above almost completely black-scaled ; middle cell-spot oblong and not extending to the lower edge of the cell ; the first subcostal spot in the distinct subcostal band occurs

with reddish scales. Hind wing black-scaled to outer edge of discal spots, which are small and equal; ocelli red without pupils, and widely black-ringed, the second red basal spot shows through from below; both marginal ocelli are without blue centres; the margin faintly hyaline to vein 3.

Underside with the outer margin and the fringe of both wings with white scales. Fore wing without markings except for the cell-spot, which is faint; the vein-endings up to the glassy submarginal band are faintly powdered whitish; red ocelli as on upperside.

Expanse: ♂♀, 55–65 mm.

Habitat.—SIKKIM to the Phari Jong; very rare.

Parnassius imperator Oberthür.

♂♀. A large species. Fore wing broad and strongly dusted with grey, more or less denser behind the cell, forming a prolongation of the short costal band. Submarginal band more strongly marked than the marginal band, and separated from it by a series of white lunate spots. Hind wing with large ocelli which are usually mostly white; two large anal spots, shaded with blue; a shadowy posterior discal band. The ♀ is much darker than the ♂.

♀ pouch similar to that of *delphius* Eversm., only more robust, darker, below sledge-shaped, and posteriorly produced into two pointed lobes.

Larva.—" Deep slate colour, covered with short grey hair; along each side are ten orange spots ringed with black. When touched it curls up in a ring " (*Verity*, 1907).

Pupa.—" Brown. Attached to the underside of stones by a slight silk cocoon " (*Verity*, 1907).

Distribution.—Nan Chan to SIKKIM and South-East China. Only one subspecies enters the Indian area. The ♂ is usually very rare.

89. **Parnassius imperator augustus** Fruhstorfer.

Parnassius imperator augustus, Fruhstorfer, 1903 *c*, p. 113 (Sikkim border); Verity, 1907–11, p. 87, pl. xix, fig. 15 (♂); Bingham, 1907, pp. 118, 127, pl. 15, fig. 102 (♀); Fruhstorfer, 1908 *b*, p. 111, t. 50 *b* (♂); Evans, 1932 *a*, p. 61.

♂♀. Differs in the yellowish, sometimes even canary-yellow ground-colour and the more sharply defined and narrower black bands of both wings, the very large red, transparent basal patch, and the red tear-shaped spots (resembling those of *P. jacquemontii* Boisd., *epaphus* Oberth., and *hardwickei* Gray, but even larger) in the cell and the subanal area of the hind wing. The red ocelli of the hind wing remain smaller, but are more broadly margined with black, and, as well as the blue anal ocelli, have more white in the

centre. Although *i. augustus* is not so large as *i. imperator*, the submarginal band of the fore wing is almost twice as broad; moreover, all the yellowish bands on the fore wing have a tendency to increase in width.

Expanse: ♂♀, 80–90 mm.

Habitat.—SIKKIM; very rare, especially the ♂. Taken originally at Khambajong, 40 miles north of the Sikkim border, at about 15,000 feet.

90. **Parnassius maharaja** Avinoff. (Fig. 95, ♂♀).

Parnassius maharaja, Avinoff, 1916, p. 353, pl. liv, figs. 1 (♂), 2 (♀); id., 1920, p. 80.

Parnassius cephalus maharaja, Bryk, 1922, p. 50; Bollow, 1929, p. 77.

Parnassius acco maharaja, Hering, 1932, Mitt. Zool. Mus. Berl. xviii, pp. 295, 303; O. Bang-Haas, 1933 *b*, pp. 90–1.

♂. *Upperside* white. Fore wing with a fuscous marginal band and a submarginal row of small dark lunules; discal

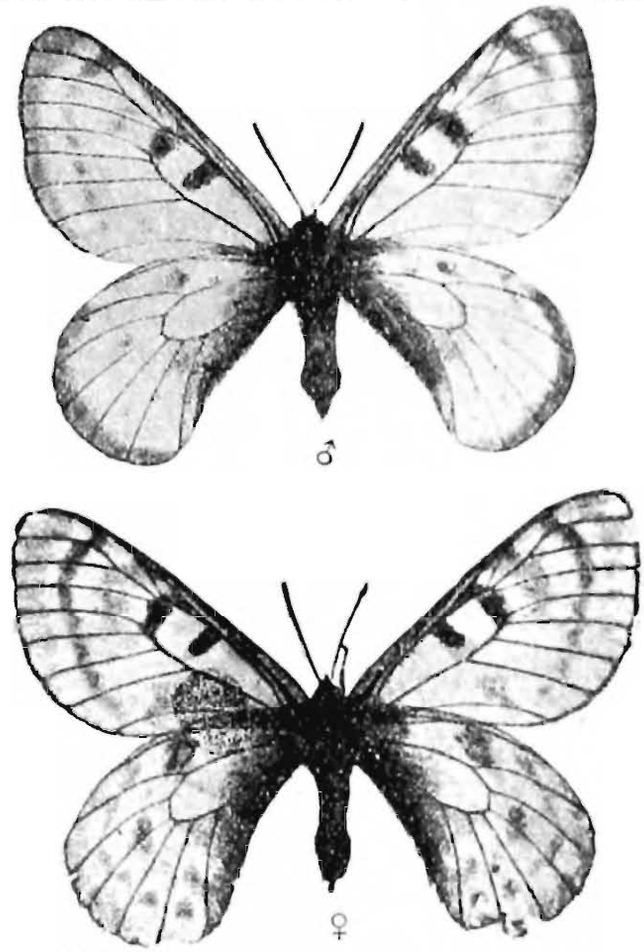


Fig. 95.—*P. maharaja* Avin., ♂♀. (After Avinoff).

band broadly but faintly marked from costa to vein 4, and by an indistinct grey patch near the inner margin; black discocellular bar and bar in the cell well developed. Hind wing with a narrow dark marginal border and indistinct submarginal

dots; in place of ocelli there is a small dark spot in area 5 and a larger rounded spot in 7; between the subcostal spot and the basal black there is a black dot placed at the edge of the cell in area 7. *Underside* of hind wing and of apex of fore wing with a reddish tinge; veins not scaled with white. Fringes black.

♀. Dark markings more developed, especially on hind wing, which bears a complete submarginal row of lunules, those in areas 2 and 3 being larger and more triangular. Discal ocelli larger than in the ♂, though diffuse, with some pale reddish scales in the anterior one.

The size of this species is that of large *delphius* forms. The ♀ pouch indicates, according to Avinoff, a close affinity with *cephalus* Gr.-Grsh. and *szechenyi* Friv., but as veins 10 and 11 of the fore wing anastomose, the affinity is, perhaps, with *simo* Gray. According to Hering (1932) the insect belongs to *acco* Gray.

Habitat.—RUPSHU: Tagalang-la Pass, 18,000 feet. Taken on desolate stony slopes near the crest of the Pass. Avinoff mentions having seen a specimen on the Depsang Plateau, 17,000 feet, in the Karakoram region. The species also occurs in the vicinity of Sugetdavan in Chinese Turkestan. There are 2 ♂♂ in the British Museum from the Tagalang-la Pass, 15th to 30th July. The butterfly was rediscovered in 1931 and 1932 by O. Bang-Haas's collectors, who found it flying over rocky slopes near a glacier.

Parnassius simo Gray.

This species, together with *maharaja* Avinoff and *acco* Gray, form a group in which the first and second subcostals of the fore wing are partly or entirely anastomosed.

♂♀. A small species with rather pointed wings. Fringe of fore wing black, of hind wing white. Hind wing with an indistinct red basal spot; antemarginal band formed of a series of small black dots separated from one another; ocelli generally washed with pale red or yellow; inner margin widely bordered with black. ♀ pouch resembles that of *acco* Gray, but is narrower and more tubular.

Distribution.—Central Asia (Issyk-kul) to the HINDU KUSH, Amdo, and SIKKIM. In the Indian area ten subspecies may be distinguished provisionally, but more material is required for their study.

91 *a*. **Parnassius simo simo** Gray. (Fig. 96, ♂).

Parnassius simo, Gray, 1852, p. 76, pl. 12, figs. 3 (♂), 4 (♀); Moore, 1902, p. 117, pl. 411, fig. 2; Stichel, 1907 *a*, p. 34; Verity, 1907–11, pp. 74, 315, pl. x, figs. 6 (♂), 7 (♀), pl. xvii, fig. 22 (♀?), pl. lxiv, fig. 6 (♂); Bingham, 1907, p. 129; Fruhstorfer, 1908 *b*, p. 110; Avinoff, 1916, p. 353; Evans, 1932 *a*, p. 61.

♂♀. *Upperside* dull white, the veins black. Fore wing at base and along costal margin lightly irrorated with black scales; a black medial transverse bar with even parallel sides across the cell, and a broader black bar on the discocellulars, this latter with a more or less outwardly curved outer edge; beyond this a bisinuate discal and an outwardly curved post-discal black band, both extended from the costa to vein 1; the discal band generally more or less obsolescent and ill defined below veins 3 or 4, but well marked between veins 1 and 2; outer edge of post-discal band with a tendency to be very narrowly continued outwards along the veins; outer margin dusky subhyaline black, bounded by an ancillary jet-black slender line; cilia dusky black. Hind wing with base and inner margin broadly and heavily shaded with black, sparsely covered with long recumbent white hairs that become fuscous along the extreme edge of the inner margin; the black occupies the basal half of cell and extends along the lower margin of its outer half to base of vein 4, from whence it

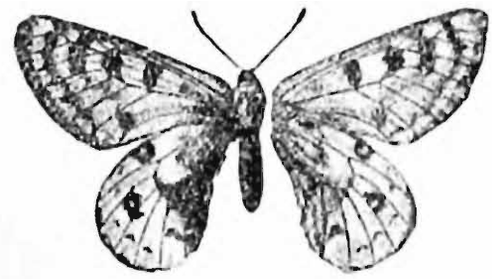


Fig. 96.—*P. simo simo* Gray, ♂. (After Verity).

narrows and is carried obliquely down to near the tornal angle; beyond the cell are two black-ringed red spots, one in area 5 and one in 7; a post-discal, generally complete, curved series of black lunular marks and a narrow marginal dusky black band, bounded by an ancillary jet-black line as on the fore wing; cilia yellowish-white.

Underside with the usual glassy appearance, the markings of the upperside showing through; the following, however, are marked more or less by actual scaling: the medial and apical black cell-bars on fore wing; the red black-ringed spots on hind wing, with three additional basal red spots outwardly edged with black, the posterior two large and somewhat pear-shaped. Antennæ, head, thorax, and abdomen black; head above fuscous; beneath, the palpi, thorax, and abdomen with dusky fuscous pubescence, mixed on thorax and abdomen with long white hair.

Expanse: ♂♀, 45–55 mm.

Habitat.—NEPAL to TIBET; very rare. Originally thought to have come from Ladak, but this was an error.

91 *b*. Parnassius simo avinoffi Verity. (Fig. 97, ♂).

Parnassius simo avinoffi, Verity, 1911, p. 319; O. Bang-Haas, 1927, p. 26, t. 5, fig. 9 (♂).

♂. Characterized by the somewhat pointed lancet-like wings and yellowish-toned ground-colour. Fore wing with discal band faintly developed. Hind wing markings very variable;

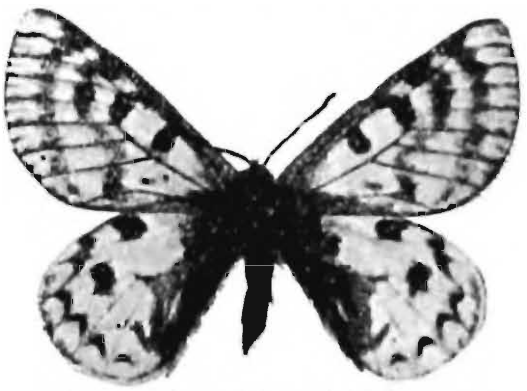


Fig. 97.—*P. simo avinoffi* Vty., ♂. (Hindu Kush: Beik, 5,000 m.; after Verity).

specimens occur with well-developed sagittate submarginal marks, and others without any submarginal marks, but these can be distinguished by the fore wing markings.

Habitat.—HINDU KUSH: Beik Pass, 18,000 feet. The Beik or Beyik Pass lies in 75° 10′ E. and 37° 20′ N. on the eastern outliers of the Hindu Kush.

91 *c*. Parnassius simo lorimeri Tytler. (Fig. 98, ♂).

Parnassius simo lorimeri, Tytler, 1926, p. 252, pl. iv, fig. 10 (♂) (Gilgit).

♂♀. "Very like *P. boedromus* f. *hohlbecki* Avinoff, from the Alexandra Mts., Central Asia. The sexes are exactly alike

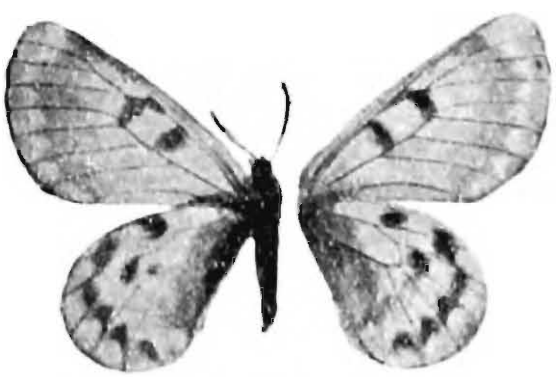


Fig. 98.—*P. simo lorimeri* Tytl., ♂. (After Tytler).

and differ from the form of *P. boedromus* above mentioned in being somewhat paler, the dark spots in cell of fore wing not so well developed, and in the greater development of the black spot in area 5 of the hind wing, which is as well developed as the spot in area 7" (*Tytler*, l. c.).

Habitat.—GILGIT : Kine-Chish Pass, about 14,000 feet.

Described from a ♂ and ♀, the only ones seen, flying at the extreme summit of the Pass, which leads into tribal territory.

91 *d.* **Parnassius simo colosseus** Bang-Haas.

Parnassius simo colosseus, O. Bang-Haas, 1935, p. 112 (♂♀, Baltistan : Saltoro Mts., 4,500 m., July ; Baltora Mts., 5000 m., July).

♂♀. Larger than other forms of *simo*. Fore wing with marginal and submarginal bands broad ; subcostal band usually clearly defined. Hind wing with very weak marginal band ; five or six isolated submarginal wedge-shaped marks.

Habitat.—BALTISTAN : Saltoro and Baltora Mts., from 13,500 to 15,000 feet.

91 *e.* **Parnassius simo saserensis** Bang-Haas.

Parnassius simo saserensis, O. Bang-Haas, 1937, p. 342 (♂, North Kashmir : Saser Pass, 5,000 m., July).

♂. Fore wing with subcostal band feebly developed, the marginal band reduced. Hind wing purer white, with weak marginal dusting ; median ocellus darkened.

Habitat.—NORTH KASHMIR : Saser Pass, 15,000 feet. Described from 2 ♂♂ taken in July.

91 *f.* **Parnassius simo zarraensis** Bang-Haas.

Parnassius simo zarraensis, O. Bang-Haas, 1934 *b*, p. 152 (♂♀, South-East Kashmir : Tagalang-la Pass, Zarra, 5,000 m., July).

♂♀. Ground-colour yellowish, the markings indistinct ; marginal bands reduced, forming occasionally white spots between the veins.

♀ with broad wings ; abdomen slightly hairy.

Habitat.—SOUTH-EAST KASHMIR : Tagalang-la Pass, 15,000 feet.

91 *g.* **Parnassius simo simonides** Austaut.

Parnassius simonides, Austaut, 1912, p. 360, fig. 4 ; id., l. c., p. 366, fig. 4 (N. Ladak).

♂♀. Smaller than the nominotypical form, the expanse being only 36 mm. Markings much more greyish instead of black. Fore wing with wider marginal band, the submarginal band more curved, no band connecting the costal and inner marginal spots. Ocelli larger, pale red, with a thin black ring. Hind wing with reduced inner black area, the two anal spots showing on the white ground-colour ; submarginal band of separate spots.

Habitat.—? NORTH LADAK. Described from a single pair. There is a doubt as to whether this form really came from Ladak.

91 *h*. **Parnassius simo simoides** O. Bang-Haas.

Parnassius simo simoides O. Bang-Haas, 1927, p. 104 (♂♀) (Ladak : Zanskar) ; Bollow, 1929, p. 81.

♂♀. Fore wing with wide marginal and submarginal bands ; in the ♀ the wide costal band reaches inner margin, but in the ♂ it is not complete, and the costal and inner marginal spots are not united. Hind wing with submarginal band distinctly dentate. Ground-colour white with a tinge of yellowish.

Habitat.—LADAK : Zanskar, south-west of Leh, 14,400 feet.

91 *i*. **Parnassius simo peteri** O. Bang-Haas. (Fig. 99, ♂).

Parnassius simo peteri, O. Bang-Haas, 1927, p. 27, t. 4, figs. 10 (♂), 11 (♀) (Bashahr : Shipki Pass) ; Bollow, 1929, p. 81.

♂♀. Fore wing with chalky-white ground-colour, the costal band not fully developed, only distinct to vein 2, thence

Fig. 99.—*P. simo peteri* O. B.-H., ♂. (After Bang-Haas).

scarcely perceptible to the faint spot on inner margin. Submarginal band finely dentate.

Habitat.—BASHAHR : Shipki Pass.

91 *j*. **Parnassius simo acconus** Fruhstorfer. (Fig. 100, imago).

Parnassius acconus, Fruhstorfer, 1903 *d*, p. 148 (Kambajong, *non* Sikkim) ; id., 1903 *b*, pp. 43, 45, t. 1, fig. 1 (*non* fig. 2) ; Stichel, 1907 *a*, p. 34 ; Verity, 1907–11, pp. 75, 76, pl. xvii, fig. 33 (♂) ; Fruhstorfer, 1908 *b*, p. 110, t. 50 *e*.
Parnassius simo acconus, Evans, 1932 *a*, p. 61.
Parnassius moelleri, Bingham, 1907, pp. 129, 130, fig. 34 (Sikkim).

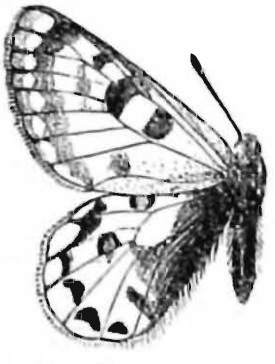


Fig. 100.—*P. simo acconus* Fruhst.

♂♀. The wings very opaque, with a matt surface, and

yellowish-white ground-colour upon which the black markings stand out prominently. *Upperside* of fore wing with post-discal dusky black band broader and placed nearer the margin than in *s. simo* Gray ; between this band and the black marginal edging is a submarginal band of the ground-colour, divided by the veins into a prominent series of spots. Hind wing with no black marginal edging, the white scaling extended to the edge, which is bounded by the slender ancillary black line.

Habitat.—SIKKIM, at elevations of 16,000 feet and over.

92. **Parnassius hannyngtoni** Avinoff. (Fig. 101, ♂♀).

Parnassius hunnyngtoni (sic), Avinoff, 1916, pp. 351–2, pl. 52, figs. 1 (♂), 2, 3 (♀) (Chumbi Valley) ; id., 1920, p. 80.
Tadumia acco hannyngtoni. Bryk, 1922, p. 47.
Parnassius acco hunnyngtoni (sic), O. Bang-Haas, 1927, p. 23, t. 4, fig. 7 (♂).
Parnassius acco hannyngtoni, Bollow, 1929, p. 81, t. 5 *e*.
Parnassius hannyngtoni, Evans, 1932 *a*, p. 61.

I take the liberty of spelling this name with an " a " instead of with a " u " as in the original, since the " u " is obviously

Fig. 101.—*P. hannyngtoni* Avin., ♂♀. (After Avinoff).
♂ (lower figure) ; ♀, upperside and underside (top figures).

an error ; the species was dedicated to Hannyngton. Bryk and Evans have both considered it necessary to make the correction.

♂♀. A small species with feeble markings. *Upperside* very white, without red spots. Fore wing with discal band more or less complete ; post-discal dark band, submarginal white spots, and marginal dark band all of equal width. Hind wing with the spots in area 5, middle of 7, and base of 7 small and black ; discal band more or less continuous from

vein 7 to inner margin; basal black scaling very reduced, submarginal spots small, well separated; margin white. Antennæ yellowish-grey, gradually darkening at the extremity. The ♀ pouch resembles that of *P. acco* Gray, but is shorter and does not reach so far round the upper part of body.

Expanse: ♂♀, 40–45 mm.

Habitat.—SIKKIM to SOUTH TIBET, 15,000–17,000 feet; very rare.

The shape of the ♀ pouch, as well as the characteristic white-scaled veins of the slightly pinkish surface of the hind wing below, place this species in the *acco* group.

Parnassius acco Gray.

A small species allied to *simo* Gray, and restricted to the Himalayas.

♂♀. Fringe of both wings yellowish-white or russet, the edge of the wing sometimes russet. Fore wing usually with three complete bands distally of the cell, the proximal one sometimes shortened or narrowed. Hind wing with red basal spots; ocelli small, with reddish or white centres; an ante-marginal row of black semi-lunate spots; marginal band with a black interrupted dusting. ♀ with more strongly developed red spots. Pouch baggy, encircling the abdomen, grooved below, and ending in two points.

Distribution.—LADAK to NEPAL and SIKKIM, found from 17,000 to 19,000 feet; rather rare. At least two subspecies can be separated, and three others are here retained provisionally.

93 *a*. **Parnassius acco acco** Gray. (Fig. 102, ♂♀).

Parnassius acco, Gray, 1852, p. 76, pl. xii, figs. 5, 6; Moore, 1902, p. 116 (part.), pl. 411, figs. 1, 1 *a*–1 *c* (♂♀); Stichel, 1907 *a*, p. 34, t. 16 *c*; Bingham, 1907, pp. 128–9; Verity, 1907–11, pp. 91, 318, pl. xix, figs. 22 (♂), 23 (♀), pl. lxiv, fig. 15 (♀) 16 (♀), pl. 3, fig. 20 (scales), pl. x, fig. 14 (sphragis); Bollow, 1929, p. 80.

Parnassius acco acco, Fruhstorfer, 1908, *b* p. 110; Evans, 1932 *a*, p. 61.

Tadumia acco, Bryk, 1922, p. 46.

The type of this species is a ♀ (described as a ♂) and is figured by Verity, 1911, pl. lxiv, fig. 16.

♂♀. *Upperside* dull greyish-white. Fore wing at the costa and base with some black irroration, the white scaling clearest and most dense in the cell; a jet-black bar across middle of cell and one across the discocellulars; a dusky black discal band, rather broad from costa to vein 5, below which it is very narrow and usually reaches only to vein 3, and but faintly connected to the black spot on inner margin; this band usually bears an anterior crimson spot; a broader and more

strongly marked complete post-discal band, separated from an equally wide dark marginal border by a complete row of small spots of the ground-colour. Hind wing with basal and inner area dusky black; a prominent red spot in area 5, a smaller one in the middle of 7, and a much smaller one in the base of 7; the spot in 5 is joined to the dark inner area by

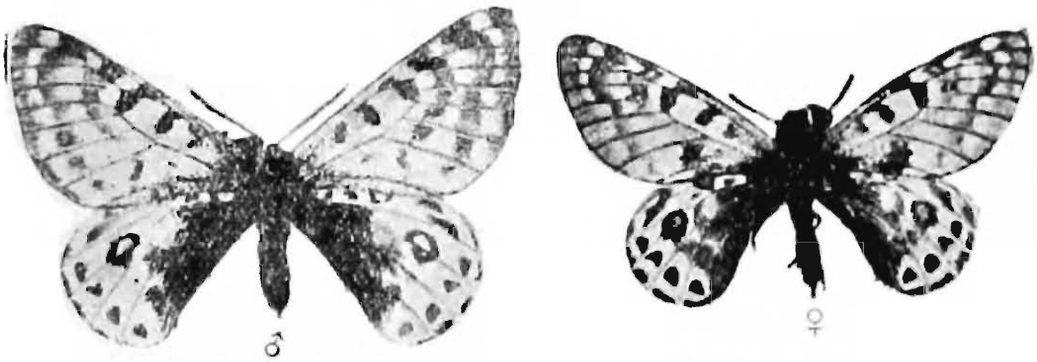


Fig. 102.—*P. acco acco* Gray, ♂♀. (After Verity).

a dusky band; usually a small black spot at base of area 6; submarginal spots prominent, cuneiform, well separated; outer margin narrowly black, interrupted at the veins.

Expanse: ♂♀, 40–60 mm.

Habitat.—NEPAL to TIBET and, perhaps, EAST LADAK. The types were at first thought to be from Ladak, but this was an error. The species is very rare.

93 *b*. **Parnassius acco tagalangi** O. Bang-Haas. (Fig. 103, ♂).

Parnassius acco tagalangi, O. Bang-Haas, 1927, p. 23, t. iv, figs. 1 (♂), 2 (♀) (Ladak); Bollow, 1929, p. 81.

♂♀. Intermediate between *a. acco* Gray and *hampsoni* Avinoff, but is smaller and paler than the former. Fore

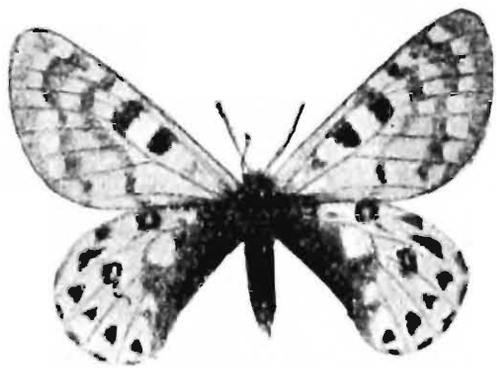


Fig. 103.—*P. acco tagalangi* O.B.-H., ♂. (After Bang-Haas).

wing with all three bands well developed and heavier than in *hampsoni*, similarly with the submarginal spots of the hind wing.

Habitat.—SOUTH LADAK: Tagalang-la Pass, 15,000 feet.

Whether this name can be sustained depends on a study of more material.

93 *c*. **Parnassius acco hampsoni** Avinoff. (Fig. 104, ♂).

Parnassius acco hampsoni, Avinoff, 1916, pp. 352–3, pl. lii, fig. 4 (♂) (Karakoram).

♂. Smaller than the nominotypical form and with less

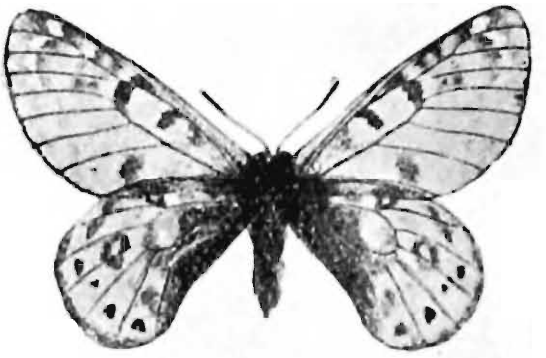


Fig. 104.—*P. acco hampsoni* Avin., ♂. (After Avinoff).

heavy markings. Hind wing with reduced submarginal lunules and the ocelli very pale pinkish.

Habitat.—KARAKORAM.

93 *d*. **Parnassius acco baltorana** Bang-Haas.

Parnassius acco baltorana, O. Bang-Haas, 1937, p. 302 (♂, Baltistan : Baltora Mts., Shigar, August).

♂. Ground-colour pure white. Fore wing without a subcostal band and no inner marginal spot. Hind wing with smaller ocelli and reduced submarginal band.

Apparently close to *hampsoni* Avin., of which it may be a form.

Habitat.—BALTISTAN : Baltora Mts., Shigar. Described from 1 ♂.

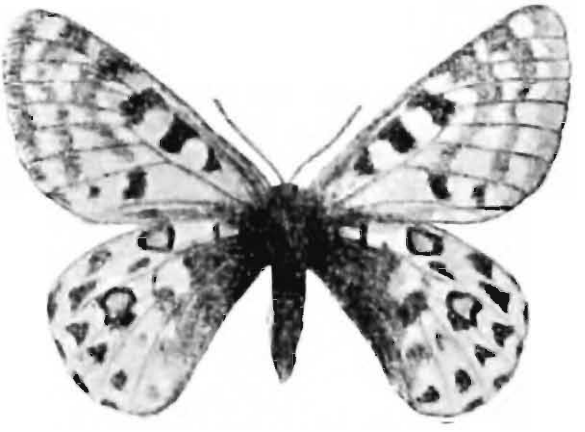


Fig. 105.—*P. acco pundjabensis* O. B.-H., ♂. (After Bang-Haas).

93 *e*. **Parnassius acco pundjabensis** O. Bang-Haas. (Fig. 105, ♂).

Parnassius acco pundjabensis, O. Bang-Haas, 1927, p. 23, t. iv, figs. 3 (♂), 4 (♀) (Spiti) ; Bollow, 1929, p. 81, t. 5 *c*.

♂♀. All three bands of the fore wing extend fully to the

margin ; costal band frequently with three red spots. Hind wing with very bright red ocelli and basal spots, but the colour soon fades and can even turn yellowish. Fresh specimens are a fine peach-red on the underside.

Habitat.—EAST SPITI : Tum-Tum-Thang Mts., 15,000 feet.

This form is here retained as a race provisionally.

93 *f.* **Parnassius acco gemmifer** Fruhstorfer.

Parnassius acco gemmifer, Fruhstorfer, 1904 *b*, (Kambajong) ; Stichel, 1907 *a*, p. 34 ; Fruhstorfer, 1908 *b*, p. 110 ; Verity, 1907–11, pp. 91, 318, pl. lviii, fig. 21 (♀) ; Avinoff, 1916, p. 353 ; Evans, 1932 *a*, p. 61 ; O. Bang-Haas, 1927, p. 23, t. 5, fig. 5 (♂).

♂♀. Distinguished from the western forms by the more strongly developed and darker markings. The marginal borders are much darker, and the ocelli of the hind wing are deeper red and more broadly ringed with black.

Expanse : ♂♀, 45–65 mm.

Habitat.—SIKKIM ; very rare.

Parnassius charltonius Gray.

A very large species, one of the finest in the genus.

♂♀. Fore wing with vein 10 from 7 ; veins 6 and 7 well separated at the origin ; discal band usually broadened below the cell, the bases of areas 2 and 3 being usually entirely black ; no red spot. Hind wing without a spot in base of area 7 ; a small red or black spot in middle of area 7 ; a very large red ocellus extending from vein 4 to vein 6, usually white-centred ; a red or black basal bar above the anal angle in areas 1 and 2 ; a complete row of blue-centred black sub-marginal spots on a dark ground ; a narrow black marginal line, more or less interrupted at the veins. ♀ pouch helici-form, being rolled upon itself, and furnished with a wide and longitudinal shallow groove. Markings more diaphanous than in the ♂.

Habits.—Flies on mountain slopes near glaciers ; does not frequently settle, and when it does it rests on the bare peaks. This makes it, perhaps, the most difficult butterfly to capture in the Himalayas. The ♀ descends to a lower elevation than the ♂. The butterfly is taken in July and August.

Distribution.—Turkestan (South Ferghana) to the NORTH-WEST HIMALAYAS ; rare. Taken at about 14,000 to 19,000 feet.

Although less variable than most other species several names have been given to various forms. In the Indian area, besides the nominotypical race, three other forms may be treated provisionally as subspecies.

94 *a*. Parnassius charltonius charltonius Gray. (Fig. 106, ♀).

Parnassius charltonius, Gray, 1852, p. 77, pl. xii, fig. 7 (♀); Bingham, 1907, p. 126; Stichel, 1907 *a*, p. 35; Verity, 1907–11, pp. 84, 317, pl. A, fig. 17 (venation and pattern), pl. 3, fig. 11 (scales), pl. xxi, fig. 3 (♀); Evans, 1932 *a*, p. 62, pl. vi, fig. A 13.10 (♂).
Kailasius charltonius, Bryk, 1922, p. 42.
Parnassius charltonius ab. *mendica*, Bryk, 1913 *b*, p. 153 (Ladak).

♂♀. Fore wing with the usual black cell-bar and discocellular bar; costal part of discal band parallel to the two former bars and a little wider than these, posterior part follows lower margin of cell, narrow between veins 3 and 5, but broadening out and directed distad from vein 3 to inner margin; post-discal band broad, narrowing to a point posteriorly, not reaching the tornus, and bent slightly inwards at vein 5; a broad, posteriorly narrowed, subhyaline marginal

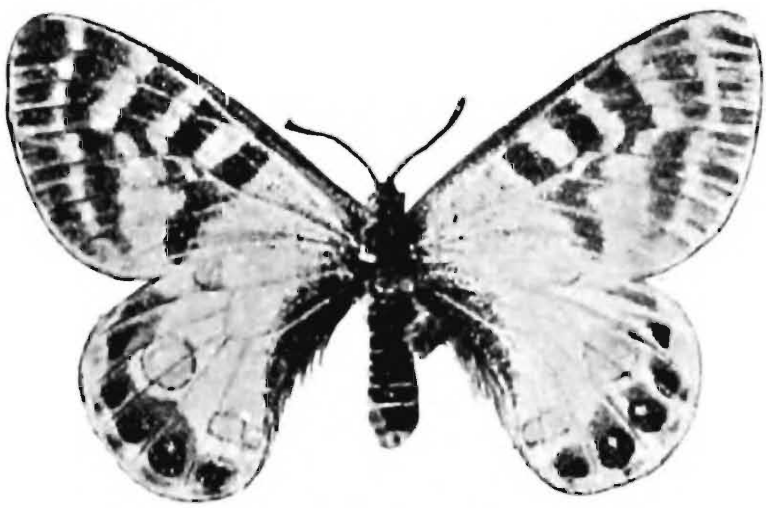


Fig. 106.—*P. charltonius charltonius* Gray, ♀. (After Verity)

border. Hind wing with inner area as far as the anal bar broadly and densely irrorated with black; a short, oblique, pretornal dusky black bar, rarely red-centred; the large discal ocellus centred with white; a small black or slightly red spot in middle of area 7; a submarginal curved series of five velvety black spots, each touched inwardly with silvery, superposed on a broad subhyaline dusky band which is broadest in the middle; a dusky antemarginal line, interrupted at the veins. Cilia of both wings white. ♀ with broader markings and much larger red ocelli on the hind wing; the pretornal bar always red-centred.

Expanse: ♂♀, 80–90 mm.

Habitat.—LADAK to KUMAON; rare. The type came from the country between Nepal and Tibet.

94 *b*. **Parnassius charltonius ducalis** Boullet & Le Cerf.

Parnassius charltonius ducalis, Boullet & Le Cerf, 1912, p. 143 (Chitral); Bollow, 1929, p. 83.
Parnassius charltonius ab. *parnassiomimus*, Bryk, 1913 *b*, p. 162 (Chitral).
Parnassius charltonius ab. *occidentalis*, Bryk, 1912, p. 10.

♂♀. The black markings more sharply defined and better developed than in the nominotypical form. The development of the black dusting from the base of inner margin to the anal ocellus on hind wing is striking, and the enlarged, rather elongate ocelli, with their bright carmine-red colour, always without white centres, are characteristic; the submarginal band with its blue ocelli separated by a narrow band from the marginal band.

Habitat.—CHITRAL. Taken at 14,000 feet, from June to August.

94 *c*. **Parnassius charltonius deckerti** Verity.

Parnassius charltonius deckerti, Verity, 1907–11, p. 85 (note), p. 317, pl. xix, fig. 14, ♀ (Kashmir, 4,200–4,800 m.).
Kailasius charltonius ♀ var. *deckerti*, Bryk, 1913 *b*, t. 4, figs. 1 (type), 2, 3.
Parnassius charltonius (part.), Moore (*non* Gray), 1879 *b*, pp. 5, 17, pl. i, fig. 3 (♀); id., 1882, p. 257.
Kailasius charltonius (part.), Moore (*non* Gray), 1902, p. 118 pl. 411, figs. 3, 3 *a*, 3 *b* (♂♀).
Parnassius charltonius ab. *haudei*, Bryk, 1912, p. 5 (Kashmir) id., 1913 *b*, p. 150, t. 4, fig. 4 (♂).
Parnassius charltonius ab. *flavomaculata*, Bryk, 1912, p. 8 (Kashmir).

♂♀. Ground-colour pale white. The ocelli much distended and of blood-red coloration; the inner side of the ring of the median ocellus is much enlarged and contrasts with the otherwise narrow black ring; anal spot the same colour as the ocelli. On the fore wing the post-discal band is more distinctly interrupted at vein 5 than in the nominotypical form.

Habitat.—KASHMIR, 12,000 to 14,400 feet.

94 *d*. **Parnassius charltonius bryki** Haude. (Fig. 107, ♂).

Parnassius charltonius bryki, Haude, 1912, p. 75, figs. 1–3 (♀) (Nilang Pass); Bryk, 1912, p. 65; id., 1913 *b*, p. 153, t. 5, fig. 7 (♂); O. Bang-Haas, 1927, p. 37, t. iii, fig. 12 (♀); Bollow,, 1929, p. 83.
Parnassius charltonius (part.), Verity (*non* Gray), 1907, pl. xxi, fig. 2 (♂).
Parnassius charltonius ab. *atroguttata*, Bryk, 1912, p. 8 (Nilang Pass); id., 1913 *b*, t. 5, fig. 6.

♂♀. Smaller than *deckerti* Verity and the nominotypical form, with a transverse costal band like the latter, but the arcs of the same are more rounded than pointed. Hind wing

more densely dusted, and therefore appears lighter; submarginal band somewhat reduced, but the submarginal ocelli well developed, not touching the median or anal ocelli; the

Fig. 107.—*P. charltonius bryki* Haude, ♂. (After Verity).

ocelli are smaller than in *ducalis* Bou. & Le Cerf and *deckerti* Verity.

Habitat.—SPITI: Nilang Pass, 14,000 feet; Tauling Pass to Shipki Pass; the Tum-Tum-Thang Mts.

Family PIERIDÆ.

Pieridæ, Duponchel, 1844, p. 23; Moore, 1904, p. 118; Verity, 1907, p. 109; Bingham, 1907, p. 134; Röber, 1907, p. 39; Fruhstorfer, 1910, p. 119; Bell, 1912, pp. 1131–45 (key to Indian species and general account); Klots, 1931, p. 139; id., 1932, p. 205.

Egg.—Cylindrical, narrowed near the apex, twice as high as broad, with longitudinal ribs which are connected by fine transverse ridges. Usually white at first, changing to yellow or orange. Those of *Cepora* are spotted with red, and those of *Leptosia* are whitish to blue.

Larva.—Cylindrical, smooth or slightly hairy as a rule, the hairs short and fairly dense, each arising from a minute tubercle. Usually some shade of green with pale longitudinal stripes. In *Delias* there are tufts of fairly long hair.

Pupa.—Angulate, the head pointed, sometimes produced into a long snout. Usually attached by the cremaster and a silken girdle. Some are suspended as in the Papilios (e. g. *Catopsilia*), others are fastened to a leaf or other surface horizontally (e. g. *Pieris*).

The pupæ of the suspended type are smooth, with bulging wings. These include *Leptosia*, *Catopsilia*, *Ixias*, *Hebomoia*, *Terias*, *Colotis*, *Valeria*. The pupæ of the second type have dorsal teeth, the thorax angled in the dorsal line, and the head produced to a snout that is usually up-curved. These include *Delias*, *Prioneris*, *Anapheis*, *Appias*, *Cepora*, *Colias*, and *Pieris*.

Imago.—Fore wing with veins 10 and 11 usually from the cell, rarely is 10 absent ; 9 usually present ; 7 usually coincident with 8 and stalked with 9, 6 usually stalked with them ; 5 usually from above middle of cell ; 1 *a* not forked at the base. Hind wing with veins 1 *a* and 1 *b* present, the inner area broad, with the margin channelled to receive the abdomen ; precostal absent or reduced in some genera. Both wings with cell closed ; discocellular (*udc*) usually absent on the fore wing.

The venation is more variable in the fore wing, development having proceeded by an upward movement of the veins, resulting in the fusion and apparent loss of some ; the more primitive forms have veins 7, 8, 9, 10, and 11 all present. In *Baltia* vein 5 has moved up, leaving only one discocellular (*ldc*) present. The position of veins 7+8 and 9 is variable, these two veins being sometimes very short and forming a minute fork at the apex of the wing ; in *Leptosia* vein 9 has disappeared, in *Delias* vein 10 is missing, whilst in *Colias* vein 10 is stalked with 9. Generally, however, veins 10 and 11 are more stable than the three preceding veins.

Antennæ of variable length, the club more or less ovate (abrupt), or short and thickened (incrassate) gradually to the apex.

Legs fully developed, claws bifid ; paronychium absent in *Colias* and *Baltia* ; pulvillus absent in *Gonepteryx*, *Colias*, and *Baltia*.

Scent-organs are found in the males of many genera, *e. g.* brands (*Colias*), plume-scales (*Delias*, *Pieris*), abdominal brushes (*Appias*).

The genitalia of all the genera, excepting one, have been investigated by Klots (1931, 1932), and various genera have been examined by other workers. The genitalia of *Delias* have been fully worked out by Talbot (1929 *a*), and of *Eurema* by Corbet and Pendlebury (1932). Considerable taxonomic use has been made of these structures, and even in the case of geographical races deviations have been found. It is also true that some species, known to be distinct on other grounds, possess quite similar genitalia, at least in the ♂. The following summary of the characters is given by Mehta (1933 *b*) :—

" Valvæ simple, very broad, harpe well developed, digitate

(e.g. *Terias hecabe* Linn.); costal margin fused. Cucullus narrow (e. g. *Delias*). Tegumen broad. Uncus acuminate. Saccus short. Penis long, slightly bent or with basal digitate processes (e. g. *Appias nero* Fabr.). Cornuti variable."

It may be noted that the simple acuminate uncus is rare in the genus *Delias*, three lobes being usually present.

Coloration very largely white, with black markings, for which reason the species of this family have acquired the distinctive appellation of "the whites." The underside is usually more brightly coloured. There is considerable variation of pattern and an extensive formation of geographical races. Most species exhibit seasonal forms, many are strongly dimorphic, and the ♀ is sometimes polymorphic.

Habits.—Eggs usually laid singly on the upperside of a leaf or young shoot. Some species deposit the eggs in clusters, as *Appias eleonora* (Boisd.), *Delias eucharis* (Drury), *Anapheis aurota* (Fabr.), *Colotis amata* (Fabr.), *Eurema silhetana* Wall., and *Leptosia xiphia* (Fabr.). In *Delias* the eggs are laid on the underside of the leaf, and here the larvæ herd together.

The larvæ, when full-grown and not gregarious, lie along the midrib on the upperside of the leaf, coating the leaf where they lie with a bed of silk. The food-plants of the Indian species belonging to the subfamily Pierinæ are mostly Capparidaceæ, whilst the species of Coliadinæ feed largely on Leguminosæ. Some species have carnivorous tendencies, and Bell has noted that some *Appias* larvæ greedily devoured the pupæ of *Leptosia*. The larvæ of some common species sometimes occur in such abundance as to become a pest.

The chief enemies are parasitic Hymenoptera and Diptera in the larval and pupal stages. The imago is usually on the wing for a considerable time, and often the successive generations overlap.

The males are fond of sun and are gregarious, congregating often in great numbers at river-banks and other wet places to drink. The females prefer the shade, and as a rule are not found with the congregations of males.

The remarkable habit in butterflies of this family of migrating in large numbers together has attracted the attention of travellers and naturalists in all parts of the world. "No satisfactory explanation of the reason for these migrations has yet been offered." This statement by Bingham is just as true to-day. "It is a wonderful sight—the clouds of butterflies, chiefly Pierids, and by far the greater number of them belonging to the genera *Appias* and *Catopsilia*, stream past for hours at a time, all going in one direction, and in all instances that I have witnessed flying against the wind" (*Bingham*).

Classification.—The Pieridæ were formerly treated as a subfamily of the Papilionidæ, but they differ considerably from these. The family is included by some with the Nymphaline forms under the superfamily NYMPHALOIDEA, but they differ in several ways from these, especially in the fully developed fore legs.

The family has been divided into four subfamilies comprising 63 genera. In the Indian area only the subfamilies Pierinæ and Coliadinæ occur, with 22 genera.

Studies on the phylogeny of the family have produced varying results. The most recent revision is by Klots (1931, 1932), and a classification is also given by Talbot (1932, 1934, 1935). The arrangement given by Evans (1932 *a*) is again different to either of the preceding ones, and is partially followed in this volume, some alterations in it being suggested by the work of Klots.

Distribution.—The Pierids are to be found in all parts of the world where butterflies can live, in the far Arctic and high mountain areas, and in desert areas as well as in tropical forests.

Most of the twenty-two Indian genera are strictly Indo-Malayan, none being peculiar to the Indian area; six are Palæarctic, and two (*Colotis* and *Anapheis*) are to be regarded as African.

Key to Subfamilies.

1. Hind wing with well-developed precostal vein, curved distad. Palpi always hairy — **Pierinæ**, p. 303.
2. Hind wing with precostal vein absent or very short and directed basad. Palpi usually not hairy — **Coliadinæ**, p. 488.

Subfamily PIERINÆ Swains.

Pierinæ, Swainson, 1840; Moore, 1904; Klots, 1931 (part.); Talbot, 1932.

Imago.—Hind wing with a well-developed precostal vein which is directed distad. Fore wing with 10 to 12 veins. Palpi with segments 1 and 2 furnished with hair or bristles below.

This subfamily may be divided into two groups: (*a*) fore wing with vein 6 given off from 7; (*b*) fore wing with vein 6 from the upper angle of the cell or just above it. This latter group was treated by Aurivillius as a distinct subfamily.

Key to Genera of Pierinæ.

A. Fore wing with veins 7 and 8 coincident (also in one *Euchloë*, see B).

1. Fore wing with vein 10 from the cell . 2.
   Fore wing with vein 10 absent . . DELIAS Hübn., [p. 319.
2. Fore wing with vein 9 absent . . . 3.
   Fore wing with vein 9 present, stalked with 7+8 . . . . . 4.
3. Hind wing with veins 5 and 6 close together at their origin . . . . . LEPTOSIA Hübn., [p. 305.
   Hind wing with veins 5 and 6 wide apart at their origin PONTIA Fabr., [p. 429.
4. Fore wing with costa serrate PRIONERIS Wall.,
   Fore wing with costa not serrate . . 5.
5. Fore wing with vein 11 anastomosing with 12 . . . . . ANAPHEIS Hübn., [p. 372.
   Fore wing with vein 11 free . . 6.
6. Fore wing with vein 5 from the stem of 7+8 and 9 . . . . . BALTIA Moore, [p. 378.
   Fore wing with vein 5 from the cell . . . 7.
7. Fore wing with vein 6 from the stem of 7+8 and 9 . . . . . 8.
   Fore wing with vein 6 from the cell-angle or below it . . . . . 13.
8. Fore wing with vein 6 from about mid-way between the fork of 7+8 and cell . . APORIA Hübn., [p. 310.
   Fore wing with vein 6 given off nearer the cell than to fork of 7+8 and 9 9.
9. Fore wing with vein 9 emitted from 7+8 very close to the apex, the stalk long PIERIS Schr., p. 413.
   Fore wing with vein 9 emitted from 7+8 further from the apex, the stalk shorter. 10.
10. ♂ with one or two hair-pencils on the abdomen . . . . . 11.
    ♂ without hair-pencils on the abdomen . 12.
11. ♂ with a tuft of hair arising between the 7th and 8th abdominal segments APPIAS Hübn., [p. 383.
    ♂ with two hair-pencils on the abdomen. SALETARA Dist., [p. 411.
12. Palpus with 3rd segment slender, as long as the 2nd. Fore wing with vein 6 from the stem of 7+8 and 9, nearly mid-way between fork and end of cell, and not nearer apex of cell than is vein 10 . . CEPORA Billb., [p. 359.
    Palpus with 3rd segment short and oval. Fore wing with vein 6 from the stem of 7+8 and 9, nearer the cell than to the fork, and nearer apex of the cell than is vein 10 . . . . . IXIAS Hübn., p. 439.
13. Fore wing with vein 6 from the upper angle of cell . . . . . COLOTIS Hübn., [p. 450.
    Fore wing with vein 6 from the junction of *udc* and *mdc*, *udc* very short HEBOMOIA Hübn., [p. 473.

B. Fore wing with veins 7 and 8 separate (only coincident in *Euchloë ausonia daphalis* Moore).

a. Fore wing with vein 6 from upper angle of cell . . . . . VALERIA Horsf. [p. 479.

b. Fore wing with vein 6 from the stem of 7, 8, 9 . EUCHLOË Hübn., [p. 434.

Genus **LEPTOSIA** Hübner.

Leptosia, Hübner, 1818, p. 13; Butler, 1870 *a*, p. 54; Moore, 1905 *b*, p. 19; Bingham, 1907, p. 137; Fruhstorfer, 1910, p. 121; Hemming, 1931 *a*, p. 273; id., 1934 *a*, p. 129 (type, *chlorographa* Hübn.); Evans, 1932 *a*, pp. 63, 65; Peile, 1937, p. 41.

Nina, Horsfield, 1829, p. 140 (type, *nina* Fabr.).

Nychitona, Butler, 1870 *a*, p. 41 (type, *dorothea* Fabr.); Moore, 1881 *a*, p. 117.

Type of the genus, *L. chlorographa* Hübn.

Imago.—Fore wing: costa slightly arched, apex very broad and greatly rounded; outer margin convex; tornus obtuse; inner margin straight, only a little shorter than the costa; cell long, more than half the length of wing; veins 10 and 11 from the cell; 7+8 and 9 coincident; 6 from the stem of 7+8 and 9; 5 from the cell with a very short *mdc*, or connate with the stem of 7+8 and 9, or shortly stalked; *ldc* long, curved. Hind wing: costa very slightly arched; outer margin strongly arched; inner margin straight or slightly arched; cell elongate, more than half the length of wing; precostal vein short, strongly curved distad; 5 and 6 connate from the cell or *mdc* very short; *udc* long, concave; 7 from the cell well distad; 8 slightly curved at base, then straight, extended very close along the costal margin. Antennæ slender, not quite half the length of the fore wing; club long, gradual, slightly flattened. Palpi short and slender, segments 2 and 3 short, the third much shorter than the second. Eyes naked; body slender.

Early stages. (See *nina nina* (Fabr.)).

Distribution.—CEYLON, INDIA, BURMA, and ANDAMAN ISLANDS to Hainan and South China, south to the Lesser Sunda Islands and Celebes; also in Africa. About four species known, with only one in the Indian area.

95. **Leptosia nina nina** (Fabricius). (Fig. 108, imago).

Papilio xiphia, Fabricius, 1781, p. 43.

Papilio nina, Fabricius, 1793, p. 194 (nom. nov. pro *xiphia*, præocc.).

Leptosia nina nina, Yates, 1931 *a*, p. 1006; Evans, 1932 *a*, p. 65, pl. vii, fig. B 1; Peile, 1937, p. 41, pl. vi, fig. 39 (♂).

Nychitona xiphia, Moore, 1881 *a*, p. 118, pl. xlvi, figs. 6, 6 *a*; id., 1886, p. 45 (Mergui); Davidson, Bell, & Aitken, 1897 *a*, p. 569; Ormiston, 1924, p. 81.

Leptosia xiphia, Mackinnon & de Nicéville, 1898, p. 585; Moore, 1905 *b*, p. 20, pl. 559, figs. 1 (♂), 1 *a*, 1 *b* (♀); Bingham, 1907, p. 138, fig. 36; Fruhstorfer, 1910, p. 121, t. 62 *f*; Bell, 1912, pp. 1145–7, pl. i, fig. 58 (♂) (life-history); Ormiston, 1917, p. 126 (Ceylon).

♂♀. *Upperside* white, the bases of the wings very slightly powdered with minute black scales. Fore wing: costa

speckled obscurely with black; apex and outer margin with black border to vein 3, broader at the apex, where it is angulate at vein 6; a very large, somewhat pear-shaped post-discal spot also black. Hind wing uniformly white; in most specimens an obscure fine marginal black line.

Underside white; costal margin and apex of fore wing broadly, and the whole surface of the hind wing irrorated with transverse, very slender, greenish strigæ and minute dots; these on the hind wing have a tendency to form sub-basal, median, and discal obliquely transverse obscure bands. Fore wing with post-discal black spot as on upperside; outer margins of both wings with minute black, short, transverse slender lines at the apices of the veins that have a tendency to coalesce and form a marginal line as on the upperside.

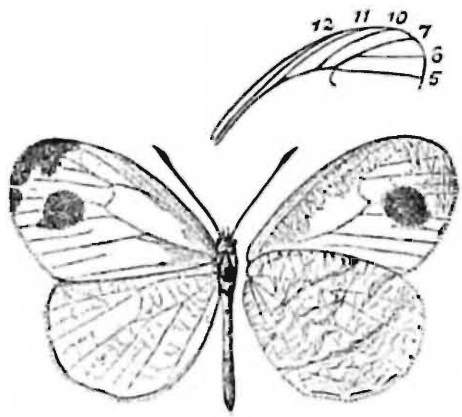


Fig. 108.—*Leptosia nina nina* (Fabr.), ♂, and venation of fore-wing.

♀ with the black markings on upperside of fore wing usually slightly broader. Antennæ dark brown spotted with white, head brownish, thorax and abdomen white.

Expanse: ♂♀, 35–50 mm.

Early stages (from *Bell*, 1912):—

Egg.—Cylindrical, slightly swollen in the middle, becoming abruptly narrow at the top; thirteen longitudinal ribs of triangular section, of which only six reach the top, where their ends, as minute teeth, surround the flat end. Colour blue.

Larva.—Grey-green, with an indistinct supraspiracular dark line, below which is a whitish spiracular line; a dark dorsal line. The body is crossed transversely by depressed lines at equal distances from each other; between these lines are rows of black, erect, short bristles, surrounded at their bases by a circular green mark; there is a single row between each two lines; interspersed among these bristles are a few white cylindrical tubercles bearing each an erect, white, long hair generally carrying at its tip a drop of amber-coloured transparent liquid; these long hairs are most numerous on segments 2, 12, and 13. Length 17 mm., breadth 2·5 mm.

Pupa.—Slight and delicate-looking. Cremaster stout, square, with a dorsal depression near hind margin. Surface glabrous, very minutely transversely striated, shiny. Very transparent green, often suffused with pink; a dorsal and lateral brown line, sparsely covered with obsolescent pink-brown spots; a lateral row of black spots on segments 3 to 12, those on 5 exuding a black or white liquid which dries like gum; there is one spot on each segment; beak yellow, with a median ring of seven black spots. Length 13·6 mm., breadth 3 mm.

Habits (from *Bell*, 1912).—Egg laid on the underside of a leaf near the ground, generally on a young leaf. The larva lives on the underside of a leaf as a rule, but may be found on the upperside. Food-plants: capers. Has been bred upon *Capparis heyneana* Wall. and *Cratæva religiosa* Forst. f., in Kanara. The larva grows rapidly, and the pupal stage lasts about a week.

The butterfly is a very weak flier, and may at all times be found in the undergrowth, fluttering along weakly, with the wings held horizontally, open for longer intervals than is usual with other Pierines. It is conspicuous when flying, but at rest becomes nearly invisible from the pattern of greenish strigæ and lines which cover the exposed parts of the wings; it rests usually on the underside of a leaf, on a thin upright stem or on a dead stick.

Habitat.—CEYLON, PENINSULAR INDIA to Mussooree, BURMA, and the ANDAMAN ISLANDS. Also extends to Indo-China, Siam, Hainan, and South China. A common species. It extends also in a number of subspecies to Malaya, the Philippines, Celebes, and the Lesser Sunda Islands.

Genus **BALTIA** Moore. (Fig. 109).

Baltia, Moore, 1878 *b*, p. 228 (type, *shawi* Bates); id., 1904, p. 144 Bingham, 1907, p. 158, fig. 40; Verity, 1907, p. 111; id., 1911, p. 322; Röber, 1907, p. 56; Evans, 1932 *a*, p. 65; Klots, 1932, p. 218.

Type of the genus, *B. shawi* (Bates).

Imago.—Wings small, fore wing not over 22 mm. long Fore wing: costa strongly arched at base, almost straight to apex, slightly emarginate in the middle, apex blunt; outer margin convex; tornus obtusely angulate, inner margin straight; cell more than half length of wing; veins 1 *c* and 11 from the cell; 7+8 and 9 on a very long stalk; 6 emitted from the stem of 7+8 and 9 at about mid-way between cell and apex of wing; 5 emitted from near the base of the stem of 7+8 and 9; *ldc* evenly curved, the others absent. Hind wing oval; precostal vein long, at a wide angle, and bent distad

near the tip ; vein 8 very short ; *mdc* about a third the length of *udc* ; *ldc* slightly shorter than *udc*. Antennæ slender, about half the length of fore wing, club large and abrupt.

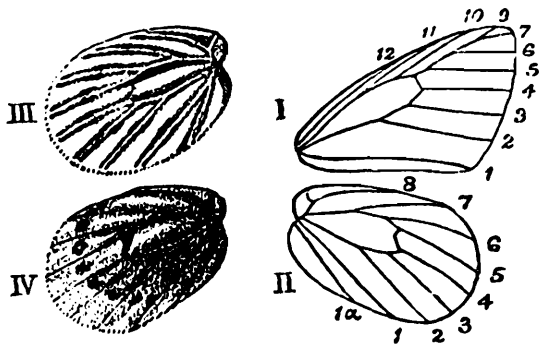


Fig. 109.—*Baltia*.

I, venation of fore wing ; II, venation of hind wing ; III, *B. butleri* (Moore), hind wing ; IV, *B. shawi* (Bates), hind wing.

Palpus with third segment slender, shorter than the second. Head and thorax very hairy. Tarsus without pulvillus and paronychium.

Distribution.—The high mountains of Turkestan, Mongolia, Tibet, and the HIMALAYAS, above 13,000 feet. Two species are known, and both occur in the Himalayas.

The butterfly flies near the ground.

Key to Species.

a. Hind wing underside more or less dusted with black scales . . . . . *shawi* (Bates), p. 308.

b. Hind wing underside not dusted with black, the veins evenly bordered on each side by broad lines of black scales [p. 309. *butleri* (Moore),

96. **Baltia shawi** (Bates).

Mesapia shawi, Bates, 1873, p. 305 (Chinese Tartary).
Baltia shawi, Moore, 1878 *b*, p. 228 (♂♀) ; id., 1879 *b*, p. 3, pl. i, fig. 5, ♂ ; id., 1904, p. 144, pl. 522, figs. 2, 2 *a*–2 *c* (♂♀) ; Röber, 1907, p. 56, t. 23 *b* ; Bingham, 1907, p. 159, fig. 4 ; Verity, 1907–11, pp. 112, 322, pl. xxvii, figs. 2, 3, pl. xxx, figs. 1, 2 ; Evans, 1932 *a*, p. 65 ; Klots, 1932, pl. xii, fig. 88 (genitalia).

♂. *Upperside* dead white ; base of wings irrorated with black scales. Fore wing with costal margin very narrowly yellowish ; veins 11 and 12 irrorated with black scales ; a prominent black spot at end of cell ; a narrowly subtriangular, short, oblique, subapical black bar, its apex downwards ; and a series of black marginal spots from the apex to vein 1, more prominent at the apex. Hind wing uniform, the irroration of black scales more extended than on the fore wing.

Underside : fore wing white ; costa and apex irrorated with black scales ; costa and outer margin edged with a line

of pinkish-yellow ; other markings somewhat as on upperside. Hind wing white with a dull pinkish tinge ; the whole surface irrorated with black scales that form a broad elongate patch on posterior half of wing and an obscure curved macular band beyond the cell ; a black bar at end of cell.

♀. *Upperside* somewhat thickly irrorated all over with black scales. Fore wing with the black *dc* spot and marginal inwardly-pointed triangular black spots as in the ♂, but the latter more complete and reaching to tornus, the spots larger ; no subapical bar, but a complete, outwardly dentate, curved discal black band that crosses the wing from costa to inner margin. Hind wing with very dense black irroration forming a broad posterior patch and curved macular discal band.

Underside similar to that of the ♂, but on the fore wing there is a complete marginal series of triangular black spots and a complete, outwardly dentate, curved discal black band ; hind wing with the black irroration more dense. In both sexes the antennæ are white ringed with black ; head whitish ; thorax and abdomen fuscous-black ; beneath : head and thorax fuscous-black, abdomen prominently white.

Expanse : ♂♀, 30–40 mm.

Habitat.—CHITRAL to LADAK, from 15,000 to 18,000 feet ; not rare. Also in Turkestan.

Baltia butleri (Moore).

This species much resembles *shawi* (Bates). Hind wing *upperside* with two black spots on the *dc* veins, and on the *underside* with the veins white edged with black. The black markings less developed than in *shawi*, and the fore wing is without black marginal spots.

Distribution.—Turkestan, Mongolia, Tibet, and the HIMALAYAS. Five subspecies are described, of which two occur in the Himalayas.

97 *a*. **Baltia butleri butleri** (Moore).

Synchloe butleri, Moore, 1882 *a*, p. 256, pl. ii, figs. 6, 6 *a*, ♂ (Lahoul).

Baltia butleri, Moore, 1904, p. 145, pl. 522, figs. 3, 3 *a*, 3 *b* (♂♀) ; Bingham, 1907, p. 159, fig. 3 ; Röber, 1907, p. 56, t. 23 *b* ; Verity, 1917, p. 113, pl. xxviii, figs. 4, 5, pl. xxx, fig. 3 ; Evans, 1932 *a*, p. 65.

♂. *Upperside* : fore wing markings smaller and narrower than in *shawi*, the marginal spots reduced to three or four. Hind wing with two conspicuous black discocellular spots.

Underside : fore wing with ground-colour white, veins dusky, costa narrowly and apex suffused with pinkish-ochraceous ; discocellular spot as on upperside ; veins 4, 5, 6, and

the apical portion of 7 broadly bordered on each side with black scales that run parallel to but do not touch the veins. Hind wing ground-colour pinkish-ochraceous, the veins conspicuously white and, except for the *dc* veins, broadly edged with black scales on each side.

♀. *Upperside* similar to *shawi* ♀, but the wings are irrorated with black scales only at their bases; fore wing markings smaller and narrower, and the discal band diffuse and ill-defined posteriorly. Hind wing with two spots on the discocellular veins, and the discal macular band is more conspicuous than in the ♀ of *shawi*.

Underside as in the ♂, the fore wing with discal band showing through. In both sexes the antennæ, head, thorax, and abdomen as in *shawi*.

Expanse: ♂♀, 35–45 mm.

Habitat.—LADAK to KUMAON, 15,000 to 18,000 feet; rare.

97 *b*. **Baltia butleri sikkima** Fruhstorfer.

Baltia shawi sikkima, Fruhstorfer, 1903 *b* (*b*), p. 50 (Sikkim); Elwes, 1904, p. 390; Verity, 1907, p. 115.
Baltia sikkima, Moore, 1905 *a* p. 231.
Baltia butleri sikkima, Röber, 1907, p. 56; Evans, 1932 *a*, p. 65.

♂♀. *Upperside* of fore wing with a complete submarginal band which is continued on the hind wing.

Underside more brightly coloured than in *b. butleri*, the cell yellow; hind wing and apex of fore wing with the veins yellow, broadly defined by dark brown.

Expanse: ♂♀, 35–45 mm.

Habitat.—SIKKIM, 12,000 to 17,000 feet; very rare. The British Museum contains specimens from Tibet, but only one ♂ from Sikkim, taken at Lachen Pok, 17,000 feet, June 1921 (Coll. Evans).

Genus **APORIA** Hübn.

Aporia, Hübner, 1819, p. 90 (*cratægi* Linn.); Röber, 1907, p. 40; Bingham, 1907, p. 160, p. 162, fig. 41; Fruhstorfer, 1910, p. 138; Klots, 1931, p. 201; Dixey, 1932, p. 64, figs. 433–7 (plume-scales); Evans, 1932 *a*, pp. 63, 67; Hemming, 1934 *a*, p. 124 (type, *Papilio cratægi* Linn.).
Leuconea, Donzel, 1837, p. 80 (*cratægi*).
Pieris, Moore (*non* Schr.), 1904, p. 147.
Mesapia, Gray, 1856, p. 92 (type, *peloria* Hew.); Röber, 1907, p. 43; Verity, 1907, p. 114.
Metaporia, Butler 1870 *a*, p. 51 (type, *agathon* Gray); Röber, 1907, p. 41; Klots, 1931, pp. 201, 202 (*Aporia* subgenus).

Type of the genus, *A. cratægi* (Linn.), from Europe.

♂♀. Fore wing typically elongate, the inner margin very nearly three-fourths the length of the costa; costa very

slightly arched; apex blunt; outer margin convex; inner margin straight; cell elongate, more than half the length of wing; discocellular veins oblique. Veins 10 and 11 from the cell; 7+8 and 9 on a long stalk; 6 from the stalk of 7+8 and 9, about a third from its basal end; 5 from the cell, with *mdc* varying from half as long to as long as *ldc*. Hind wing comparatively long, narrow, subpyriform; cell elongate, discocellulars outwardly oblique; precostal vein straight, the tip usually either bent distad or forked. Antennæ about half the length of fore wing, the club abrupt. Palpi slender, subporrect, hairy in front; third segment nearly as long or as long as the second.

Habits.—Larvæ gregarious on Prunaceæ, Rubiaceæ, and Berberidaceæ, and usually hibernate when young. Some species make a rustling noise when on the wing, and the flight is somewhat like that of *Parnassius*.

Distribution.—The whole Palæarctic Region excepting North America, and usually only in high alpine regions. Five species occur in the HIMALAYAS.

Key to Species.

1. Wings thinly scaled. Hind wing with vein 8 short, its distal end placed above the origin of vein 6. Palpus very hairy .. .. .. [p. 311. *peloria* (Hew.),
   Wings more thickly scaled. Hind wing with distal end of vein 8 placed well beyond the origin of vein 6. Palpus much less hairy . 2.
2. Hind wing upperside with pale border, the veins crossing it white or narrowly black. Hind wing underside yellow .. .. 3.
   Hind wing upperside with dark border or with marginal vein-spots almost connected .. 4.
3. Hind wing upperside usually unmarked, no discal sagittate band ... . [p. 312. *leucodice* (Eversm.),
   Hind wing upperside with a prominent discal band . ... [p. 314. *nabellica* (Boisd.),
4. Upperside black, with a curved series of post-cellular white spots; submarginal white spots prolonged to double streaks in the ♀. [p. 316. *harrietæ* de Nicév.,
   Fore wing upperside with discal area white, the veins broadly darkened, more widely so in the discal area; grading to a dark form with white post-cellular stripes and shorter white submarginal ones [p. 317. *agathon* (Gray),

98. **Aporia peloria** (Hewitson).

Pieris peloria, Hewitson, 1852–155, *Pieris* II, figs. 15, 16 (Tibet).
Mesapia peloria, Röber, 1907, p. 43, t. 18 *a*, 19 *b*; Verity, 1907 *a*, p. 114, pl. xxvi, figs. 2–4.
Aporia peloria, Evans, 1932 *a*, p. 67.

A small and very distinct species, for which Gray erected the genus *Mesapia*.

♂. *Upperside* white tinged with yellow, the veins prominently black. Wings rounded. Fore wing transparent in the distal area. Hind wing with vein 8 very short, ending at a point above the origin of vein 6; submarginal spots ill-defined.

Underside of hind wing yellow, with very prominent black veins. Palpus and thorax strongly hairy.

♀. *Upperside* of fore wing and *underside* of hind wing yellow. Hind wing *upperside* yellowish-white, with black marginal wedge-shaped spots.

Expanse : ♂♀, 42–44 mm.

Habitat.—KUMAON to the Tibet border, above 13,000 feet; not rare in Western China. Recorded by H. G. Champion (1926, p. 275) as abundant in one or two places in the Girthi Valley, on the Kumaon-Tibet border, at about 13,000 feet. It was usually found frequenting the strips of dense growth of *Geranium pratense* Linn., which are characteristic of the inner valleys.

Aporia leucodice (Eversmann).

A very variable species, composing five subspecies, of which three are found in the Indian area.

♂♀. *Upperside* white without any dark suffusion. Fore wing with a submarginal band and a discocellular mark which varies in size; the *udc* 5 to 6 not angled. Hind wing usually without a sagittate discal band. A pale marginal border, with the veins crossing it white or narrowly black.

Underside yellow, with or without a sagittate discal line.

Distribution.—Persia and Turkestan to KUMAON; common. Three subspecies can be distinguished in the Indian area.

99 *a*. **Aporia leucodice balucha** Marshall.

Aporia balucha, Marshall, 1882 *b*, p. 760; Swinhoe, 1885 *b*, p. 342; Bingham, 1907, p. 162.
Aporia leucodice balucha, Fruhstorfer, 1910, p. 138; Evans, 1932 *a*, p. 68; id., 1932 *b*, p. 199.
Metaporia sorex, Grose-Smith, 1887 *a*, p. 129; Smith & Kirby, 1889, *Pieris* II, figs. 8, 9.
Pieris leechi, Moore, 1904, p. 150.
Metaporia leechi, Röber, 1907, p. 42, t. 19 *a*.

♂♀. Distinguished from the nominotypical form by the broader black bands on both wings and the darker yellow underside of the hind wing.

Upperside of fore wing with a complete post-discal band, and with the veins in the distal and apical area mostly black, the black scaling widened at the margin. Black discocellular spot of variable size, wider in the ♀.

Underside of fore wing with apical area darker yellow than

in *soracta* Moore, the veins more broadly edged with black; a post-discal black band. Hind wing darker yellow than in *soracta*, with broader black edging to the veins and a prominent sagittate discal band.

Expanse: ♂♀, 40–50 mm.

Habitat.—BALUCHISTAN to CHITRAL and LADAK, 8,000–10,000 feet; not rare.

99 *b*. **Aporia leucodice soracta** Moore. (Fig. 110, imago).

Aporia soracta, Moore, 1857 *a*, p. 83 (N.W. India); id., 1882, p. 256, pl. ii, fig. 5 (larva); id., 1904, p. 148, pl. 523, fig. 1 (larva, pupa), figs. 1 *a*, *b*, *c*, *d* (♂), 1 *e*, *f* (♀); Doherty, 1886 *a*, p. 135; Mackinnon & de Nicéville, 1898, p. 589; Verity, 1907, p. 126, pl. xxvi, fig. 20, pl. xxvii, figs. 23, 24; Frustorfer, 1910, p. 138.
Metaporia soracta, Röber, 1907, p. 41, t. 18 *a*.
Aporia leucodice soracta, Evans, 1932 *a*, p. 68, pl. vii, B 2, ♂; Peile, 1937, p. 47, pl. v, fig. 33 (♂).
Aporia soracta denigrata, Fruhstorfer, 1910, p. 138 (Punjab).

♂♀. A large race which varies much in the extent of the black markings. *Upperside* milk-white, the veins of both

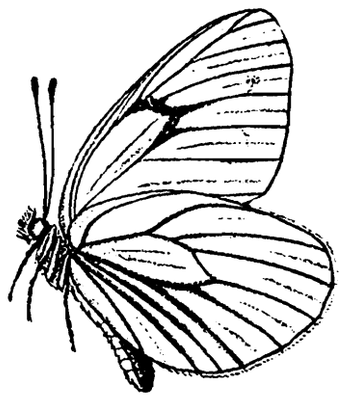


Fig. 110.—*Aporia leucodice soracta* Moore.

wings black. Fore wing with a post-discal band which is usually obsolete in area 3; a heavy discocellular bar; a thin marginal black line from base of costa to base of inner margin, more or less interrupted at the middle of inner margin; base slightly dusted with black. Hind wing unmarked except for a marginal black line as on fore wing.

Underside of fore wing white, the apex and costal edge pale yellow, black markings as on upperside. Hind wing pale yellow, the precostal area chrome-yellow, the discocellulars somewhat prominently defined with black; area 2 divided longitudinally by a black line; discal band often absent. Cilia of both wings dusky brown. Antennæ black; head, thorax, and abdomen white, generally strongly suffused with fuscous-black, beneath white.

Expanse: ♂♀, 50–70 mm.

Form **denigrata** Fruhst.—Fore wing almost unmarked, or with weak black lines.

A melanic aberration of the ♂ is in the British Museum (ex Coll. Evans) from Mussooree. *Upperside* of fore wing with heavy black suffusion over the distal area; on the *underside* this suffusion is more concentrated over the discal area. The post-discal line is very heavy.

Larva.—Brown, with fine soft hairs. On *Berberis lycium* Royle, family Berberidaceæ.

Pupa.—White, dotted with black; head-process obtuse; a thoracic and abdominal protuberance.

Habits.—According to Peile (1937) the butterfly frequents the flowers of horse-chestnut. It was found to be abundant at Mussooree at 5,000 to 6,000 feet in May and June, but was absent at 3,000 feet.

Habitat.—KASHMIR to UNITED PROVINCES, Mussooree; common.

99 *c*. **Aporia leucodice sara** Evans.

Aporia leucodice sara, Evans, 1932 *a*, p. 68 (Kumaon).

♂♀. *Upperside* of fore wing with the post-discal band heavier and the spots in areas 2 and 4 much larger than in nearly all specimens of *soracta* Moore. Hind wing with a black post-discal sagittate line.

Underside more like *soracta*; the fore wing with post-discal spots in 2 and 4 more strongly developed; hind wing with veins more heavily blackened, and the post-discal sagittate line more marked than in most *soracta*.

Habitat.—KUMAON; common.

Aporia nabellica (Boisduval).

♂♀. A very distinct species. *Upperside* usually darkened, the fore wing at least with the cell darkened on both sides. *Upperside* of hind wing a pale marginal border, the veins crossing it white or nearly black; a prominent sagittate discal band. *Underside* of hind wing dark yellow, with discal band as on upperside.

Distribution.—CHITRAL to KUMAON, in two subspecies: both rare.

100 *a*. **Aporia nabellica hesba** Evans.

Aporia nabellica hesba, Evans, 1912 *a*, pp. 559, 976 (Chitral); id., 1932 *a*, p. 68, pl. vii, B 5.3 (♂).

♂. *Upperside* bright lemon-yellow. Fore wing with cell suffused with black.

Underside of fore wing with cell partly suffused with black; a heavy black discocellular bar and post-discal band.

♀. White or pale yellow, without black suffusion.

Expanse: ♂♀, 50–60 mm.

Habitat.—CHITRAL, at 9,000 feet; very rare.

100 *b*. **Aporia nabellica nabellica** (Boisduval). (Fig. 111, ♂).

Pieris nabellica, Boisduval, 1836, p. 509.
Metaporia nabellica, Butler, 1872, p. 61 ; Röber, 1907, p. 42, t. 19 *b*.
Aporia nabellica, Mackinnon & de Nicéville, 1898, p. 589 ; Bingham, 1907, p. 163.
Pieris nabellica, Moore, 1904, p. 151, pl. 524, figs. 1 *a* (♂), 1 *b* (♀).
Aporia nabellica, Fruhstorfer, 1910, p. 138.
Aporia nabellica nabellica, Evans, 1932 *a*, p. 68.
Aporia nabellica ferrari, Tytler, 1926, p. 252 (Dalhousie).

♂. *Upperside* with pale yellow ground-colour, suffused with black for the greater part. Fore wing with a submarginal series of more or less rectangular spots ; a large ill-defined black discocellular patch ; some anterior post-discal elongate greyish spots. Hind wing with prominent sagittate discal band.

Underside white, the veins on both wings very broadly black-edged. Fore wing apex slightly yellow ; posterior area

Fig. 111.—*Aporia nabellica nabellica* (Boisd.), ♂, from Kashmir.

sometimes clouded with black ; post-discal black band as on upperside, but broader. Hind wing dark yellow ; broad sagittate band as on upperside ; base of costa chrome-yellow. Antennæ black, apex of club ochraceous ; head and thorax clothed with fine dusky greyish-black hairs ; abdomen black above, beneath greyish-white.

♀. White or nearly so, and densely suffused with black scales as far as the discal band on both wings, leaving only a pale marginal and post-cellular area.

Expanse : ♂♀, 50–65 mm.

Form **ferrari** Tytler.—This name is applied to very pale specimens of both sexes with reduced black markings. Described from specimens taken at Dalhousie, Dugi Pass, and Valossa.

Habits.—Flies slowly and heavily, and frequents Umbelliferæ.

Habitat.—Kashmir to Kumaon, 9,000–13,000 feet ; rare.

Aporia harrietæ (de Nicéville).

♂♀. *Upperside* black with white markings. Both wings with a cell-stripe. Fore wing with a prominent row of five post-cellular spots, and hind wing with a similar row of smaller spots.

Underside of hind wing with a prominent chrome-yellow spot at the base of the costa.

A large and uncommon species comprising three subspecies, of which only the nominotypical race occurs in the Indian area.

Distribution.—BHUTAN and Yunnan to South-East Tibet and Western China.

101. **Aporia harrietæ harrietæ** (de Nicéville).

Metaporia harrietæ, de Nicéville, 1892 *a*, p. 341, pl. i, figs. 3 (♂), 4 (♀) (Bhutan).
Pieris harrietæ, Moore, 1904, p. 152, pl. 524, figs. 2, 2 *a* (♂), 2 *b* (♀).
Aporia harrietæ, Bingham, 1907, p. 166; Evans, 1932 *a*, p. 68.
Aporia harrietæ harrietæ, Fruhstorfer, 1910, p. 139.

♂♀. *Upperside* black. Fore wing with a thin white basal costal streak; cell with a large creamy-white patch occupying its basal three-fourths; a large patch occupying the basal two-thirds of area 1 *b*; a post-cellular curved series of prominent white spots, of which the posterior one, in area 2, is the largest and occupies the base of the area; a series of diffuse submarginal white spots between the veins, in the ♀ elongated into double streaks. Hind wing in the basal half with the veins white, broadly margined on both sides with black; cell almost entirely creamy-white; post-cellular markings consisting of a very narrow costal and a wide subcostal streak, followed by five spots, one in each area, that in area 3 the smallest; two elongate streaks in area 1; two basal white streaks occupying the whole of areas 1 *a* and 1 *b*; marginal diffuse spots as on the fore wing, but each spot divided by the black internervular fold.

Underside of fore wing differs from the upperside only in having a marginal series of double white streaks in each area from the costa to vein 3, decreasing in size posteriorly. Hind wing with base of costa bright yellow; markings as on upperside, but pale yellow, and a pair of elongate, wedge-shaped, pale yellow streaks in each area, each streak with pointed apex, its base broad and on the margin; in area 7 a distally pointed stripe. Cilia black. ♀ with paler markings.

Expanse: ♂♀, 70–80 mm.

Habitat.—BHUTAN; very rare.

Aporia agathon (Gray).

A species of large size, with three subspecies in the Indian area. The most easterly race is the nominotypical one, with a striped pattern strongly resembling certain Danaidæ, and is the darkest form. The most westerly race is the lightest form, whilst between these occur two races with markings of an intermediate kind. At one time these were regarded as distinct species, and later as individual forms of one species, whilst recently Evans has treated them as races.

♂♀. *Upperside* black, with white or dusky discal and submarginal stripes which are sometimes connected to form a single row. Cell of the hind wing white.

Underside similar, the hind wing at base of costa bright yellow.

Larva (*caphusa* Moore).—Gregarious, pupating under the dry leaves at the foot of their food-plant, the pupæ being also gregarious. The larvæ spin a joint web, and lie together in communities of ten or more. They feed only at night. Colour when full grown dirty brown, head black, each segment with a dorsal longitudinal dark brown stripe; body covered with weak white hairs. Just before pupation the colour turns to a light green, with the head and stripes as before (from *Mackinnon*, 1898).

Pupa.—Very similar in shape to that of *A. l. soracta*; greenish-yellow with black markings (from *Mackinnon*, 1898).

Food-plant.—Berberis nepalensis Spring.

Distribution.—HIMALAYAS and Yunnan to Tibet and Formosa. Four subspecies can be distinguished in the Indian area.

102 *a*. **Aporia agathon phryxe** (Boisduval).

Pieris phryxe, Boiduval, 1836, p. 446.
Aporia phryxe, Mackinnon & de Nicéville, 1898, p. 589.
Metaporia phryxe, Moore, 1904, p. 154, pl. 525, figs. 1, 1 *a* (♂), 1 *b* (♀); Röber, 1907, p. 42, t. 19 *a*.
Aporia agathon var. *phryxe*, Bingham, 1907, p. 166.
Aporia agathon phryxe, Fruhstorfer, 1910, p. 139; Evans, 1932 *a*, p. 68; Peile, 1937, p. 48, pl. vi, fig. 43 (imago).

♂♀. The white areas predominate, the black ground forming stripes more markedly on veins 2 to 4 of the fore wing and on 2 to 6 of the hind wing, expanding at the margin, the outer margin of both wings being black. Fore wing with a heavy black discocellular bar.

Underside similar; hind wing with the white stripes more constricted at the middle.

Expanse: ♂♀, 80–90 mm.

Habitat.—KASHMIR to GARHWAL; not rare.

102 *b*. **Aporia agathon caphusa** (Moore).

Metaporia caphusa, Moore, 1872, p. 564; id., 1904, p. 155, pl. 525, figs. 2 *a*, *b* (♂), *c* (♀); Röber, 1907, p. 42.
Aporia caphusa, Mackinnon & de Nicéville, 1898, p. 589, pl. v, figs. 20 *a–c* (larva, pupa).
Aporia agathon var. *caphusa*, Bingham, 1907, p. 165.
Aporia agathon phryxe f. *caphusa*, Fruhstorfer, 1910, p. 139.
Aporia agathon caphusa, Evans, 1932 *a*, p. 68, pl. vii, fig. B 5.5 (♂); Peile, 1937, p. 48.

♂♀. The black ground-colour is more developed than in *phryxe* (Boisd.), the black stripes being mostly broader than the white ones. The anterior white stripes on both wings are not continuous, and the posterior ones are almost divided by black scaling, though they are sometimes continuous; the white stripe on the inner margin of both wings shows no trace of a black dividing-line.

Underside similar; fore wing subapical spots and those of the hind wing faintly yellow.

Habitat.—Garhwal to United Provinces, Mussooree; not rare, sometimes abundant.

102 *c*. **Aporia agathon ariaca** (Moore).

Metaporia ariaca, Moore, 1872, p. 564; id., 1904, p. 156, pl. 526, figs. 1, 1 *a* (♂), 1 *b* (♀).
Aporia ariaca, Mackinnon & de Nicéville, 1898, p. 590.
Aporia agathon phryxe f. *ariaca*, Fruhstorfer, 1910, p. 139.

♂♀. A light form, somewhat resembling *caphusa* (Moore), but the cell of the fore wing is dusted with black and all the markings are reduced, especially on the hind wing. Connects *caphusa* with *a. agathon*.

Habitat.—Kumaon; known chiefly from Naini Tal. Not common.

102 *d*. **Aporia agathon agathon** (Gray). (Fig. 112, ♂).

Pieris agathon, Gray, 1831, p. 33 (Nepal); id., 1846, p. 8, pl. 8, fig. 1.
Metaporia agathon, Butler, 1870 *a*, p. 51, pl. 3, fig. 10; Moore, 1904, p. 156, pl. 526, figs. 2, 2 *a*, 2 *b* (♂♀); Klots, 1932, pl. x, fig. 63 (genitalia).
Aporia agathon, Elwes, 1888, p. 415; Swinhoe, 1893, p. 309; Mackinnon & de Nicéville, 1898, p. 590; Bingham, 1907, pp. 163–5, fig. 42.
Aporia agathon agathon, Fruhstorfer, 1910, p. 139; Evans, 1932 *a*, p. 68.

♂♀. The darkest race. *Upperside* of fore wing with a broad cell-stripe; in area 1 two or more confluent streaks obscurely divided by a diffuse blackish line; a post-discal series of five short lines in areas 3, 4, 5, and 10; a submarginal series of elongate narrow spots; both the submarginal and post-discal series are curved inwards anteriorly. In most specimens

the streaks in area 1 and the cell-stripe are dusted with black. Hind wing with a broad streak on the inner margin divided by vein 1 *a*; two narrow long streaks in area 1 *c*; a much broader, elongate, oval cell-stripe, with another elongate broad streak above it in area 7; a post-discal series of five narrow elongate spots, followed by a submarginal series of more or less oval spots.

Underside similar, the markings more sharply defined, and on the fore wing generally broader and whiter, except that the anterior one or two streaks or spots of both series,

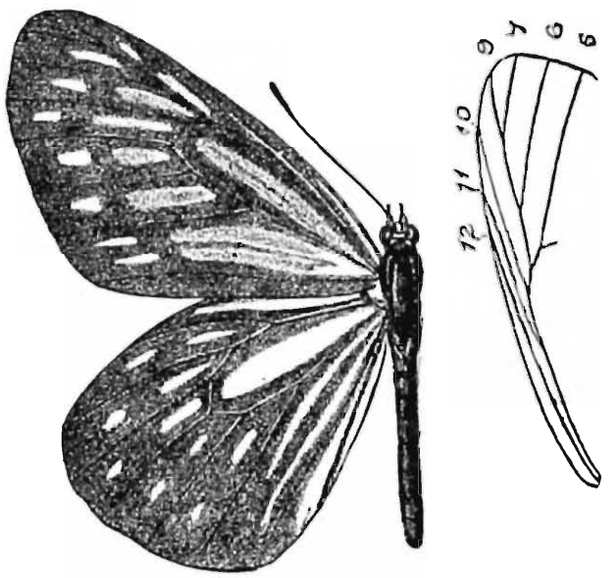


Fig. 112.—*Aporia agathon agathon* (Gray), ♂, and venation of fore-wing.

like all the markings of the hind wing, are strongly suffused with bright yellow. Antennæ, head, thorax, and abdomen black; abdomen beneath white, the anterior legs with one or two white spots.

Expanse: ♂♀, 80–90 mm.

Habitat.—NEPAL to the SHAN STATES; rare, especially the ♀.

Genus **DELIAS** Hübner. (Fig. 113, venation).

Delias, Hübner, 1819, p. 91; Butler, 1872, p. 26; Moore, 1881 *a*, p. 139; Mitis, 1893, p. 97; Butler, 1897 *a*, p. 143; Moore, 1904, p. 163; Röber, 1907, p. 43; Bingham, 1907, p. 139; Fruhstorfer, 1910, p. 123; Talbot, 1928 *a*, pp. 1–56, id., 1929 *a*, pp. 57–116, id., 1929 *b*, pp. 117–67, id., 1929 *c*, pp. 168–219; id., 1930 *a*, pp. 220–59; Klots, 1931, p. 204; Talbot, 1932 *a*, p. 73; Dixey, 1932, p. 61; Evans, 1932 *a*, pp. 63 68,; Hemming, 1934 *a*, p. 124 (type, *tyche* Hübn., 1823=*egialea* Cram., 1777); Talbot, 1935, p. 627; id., 1937, pp. 261–656; Peile, 1937 *a*, p. 49.

Symmachlas, Hübner, 1819–27, pl. 122 (*nigrina* Fabr.).

Cathæmia, Hübner, 1819, p. 92; Scudder, 1875, p. 136 (type, *cæneus* Linn.); Klots, 1931, p. 204; Talbot, 1931, p. 229; id., 1932, p. 114; id., 1935, p. 628.

Thyca, Wallengren, 1859, p. 76; Scudder, 1875, p. 282 (type *aganippe* Don.); Wallace, 1867, p. 344.
Piccarda, Grote, 1900, p. 32 (*eucharis* Drury); Moore, 1904, p. 175; Talbot, 1928 *a*, pp. 2, 34.

Type of the genus, *D. egialea* (Cramer), from Java.

♂♀. Fore wing: costa nearly straight, very slightly arched; apex very broadly rounded; outer margin oblique; tornus obtusely rounded; inner margin straight; cell about half length of wing; vein 11 from the cell; 10 absent; 7+8 and 9 on a long stalk; 6 from the stem of 7+8 and 9; *udc* absent, *mdc* usually shorter than *ldc*; 5 from near upper angle of cell; 2, 3, and 4 well separated. Hind wing: cell a regular oval, slightly over half length of wing; precostal vein long, directed distad; vein 8 reaching to before the middle of the costa;

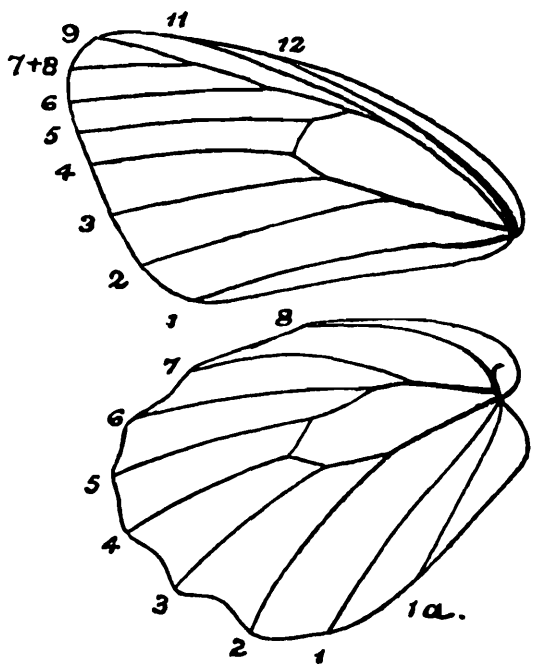


Fig. 113.—*Delias eucharis* (Drury), venation.

7 from the cell, reaching the apex of wing; 5 nearer to 6 than to 4; 2 farther from 3 than 3 is from 4. Antennæ about half length of fore wing, club abrupt. Palpi short, third segment slender, as long as or longer than the second.

Genitalia.—♂. These organs are of quite simple construction. The *valve* is triangular and of variable size, and exhibits much specific variation. Many species possess a curious structure in the middle basal region of the valve. This consists of a rounded hole or groove in the membranous lining, and close to it on the membrane at one side is a short flap or tubercle which is directed towards the groove and sometimes overlays it. The size of the hole and the shape of the flap vary in different species, and many species are quite without this organ. The *uncus* is formed of three lobes in most species, but

in a few only one lobe is present. This organ differs with every species, and sometimes a subspecific difference can be seen. In the determination of species which present close pattern similarities the uncus is infallible (cf. *belladonna* group).

♀. In common with many other genera of Pieridæ the bursal sac bears a sclerotized plate called the *lamina dentata*. In *Delias* this plate is found near the lower or larger end of the sac. It is usually long and narrow, with a median constriction, and the armature of teeth is confined to the distal lobes. The form of the plate and its dentition are different in each species. A distinctive form is found in the *belladonna* and *hyparete* groups. In the former it is very large and somewhat square, the distal edge of the lobes very slightly rounded, and the armature sparse. In the latter group the plate is very large, with broad and well-rounded lobes.

Scent-scales.—These scales are found on the fore wing of all species, and are sometimes very abundant. They exhibit considerable variation which is of specific value. Four types of scent-scale are found in *Delias*: (1) flask-shaped, with a large disc; (2) flask-shaped, with a small disc; (3) flask-shaped, with a large disc and a rather broad neck; (4) long and narrow, the neck rapidly tapering.

Larva.—Differs from the larvæ of other Pierinæ in the possession of tufts of long hair which may form either a dorsal and two lateral rows or only a dorsal row.

Pupa.—Stout; head-process short or long, bifid or simple. Often three rows of spines corresponding to the larval hairs.

Habits.—The larvæ feed on species of mistletoe (*Loranthus*). They are gregarious on the underside of a leaf. The early stages of only a few species are known. The butterfly frequents grassy country and open woodland from 2,500 to 8,000 feet, rarely to 10,000 feet. It haunts flowering trees and shrubs, the male often abundant, but the female remaining at the tree-tops most of the time. The flight is slow and weak.

Mimicry.—All the species have the hind wing more or less brightly coloured on the underside, and in some cases there is also a striking colour on the upperside of the fore wing or on both wings. These patterns are probably all examples of warning coloration. A number of species are mimicked by other Pieridæ, one by a Satyrid (*Elymnias*), and others by Nymphalids (*Mynes*). In India some species of the *belladonna* group are closely resembled by *Prioneris thestylis* (Doubl.), and *Prioneris sita* (Feld.) is an excellent mimic of *Delias eucharis* (Drury).

Distribution.—Central and Southern China, Formosa, Hainan, Tibet, INDIA, South and East Australia, New Guinea, and the

Solomons. No species has been found on the Key Islands, where the food-plant appears to be absent.

The genus contains 157 species so far recorded, and reaches its greatest development in New Guinea, where 67 species are known to occur, and where many more are likely to be discovered.

In the Indian area there are thirteen species comprising twenty-four subspecies.

Key to Species of Delias.

1. Hind wing underside without red markings. 2.
   Hind wing underside with red markings... 10.
2. Hind wing underside with a dark border bearing large white or yellow spots .. 3.
   Hind wing underside with black ground-colour, and with yellow and white spots and stripes .. .. 4.
   Hind wing underside yellow, with a narrow black border bearing small linear white spots . .. . [p. 350. *agostina* (Hew.),
3. Hind wing underside with the veins not darkened .. .. [p. 323. *agoranis* Gr.-Sm.,
   Hind wing underside with the veins black . *singhapura* (Wall.),
4. Hind wing upperside without a yellow costal patch or with only vestiges of a yellow spot. [p. 324. *patrua* Leech, p. 326.
   Hind wing upperside with a basal yellow costal patch . ... 5.
5. Hind wing underside with cell-stripe entirely yellow .. .. [p. 338. *belladonna* (Fabr.),
   Hind wing underside with cell-stripe white at its proximal end ... . 6.
6. Hind wing upperside with a long, narrow, sharply-defined white cell-stripe, and with small marginal spots .. .. [p. 327. *lativitta* Leech,
   Hind wing upperside with cell-stripe not long and narrow, only sharply defined in the ♀; large, rounded, marginal spots.. .. . 7.
7. Hind wing upperside with the discal stripe in area 4 short and broad, its proximal edge emarginate or straight, and as broad as the area. ♀ with extended white markings. Uncus with middle lobe shorter than the lateral ones .. .. [(Moore), p. 330 *sanaca sanaca*
   Hind wing upperside with the discal stripe in area 4 short and narrow, not as broad as the area, its proximal edge sharply defined on underside, never emarginate .. . [p. 332. *sanaca oreas* Talb., 8.
8. Hind wing underside with the white stripe in area 1 *c* below vein 2 always present and produced proximally of the stripe in 2. Uncus with middle lobe shorter than lateral ones. ♀ with broad white cell-stripe and white discal patches ... . [Fruhst., p. 333. *sanaca perspicua*
   Hind wing underside with the white stripe in area 1 *c*, when present, not produced proximally of the stripe in 2. Uncus broad, lateral lobes rounded . . ... . 9.

9.	Hind wing underside with the white stripe in area 1 *c* prominent and proximally defined; submedian fold along lower edge of stripe rarely black, but yellow. Uncus with middle lobe longer than lateral ones. ♀ resembles *perspicua* ♀	[Butl., p. 336. *berinda boyleæ*
	Hind wing underside with white stripe in area 1 *c* minute or absent, and no yellow anal patch. Uncus with middle lobe longer than lateral ones	[p. 337. *b. berinda* (Moore),
10.	Hind wing underside with a red subbasal band from costa or vein 8 to inner margin.	11.
	Hind wing underside with a broad red subcostal stripe in area 7	[p. 347 *descombesi* (Boisd.),
	Hind wing underside with a submarginal band of red spots; veins black	12.
11.	Hind wing upperside without a red patch. . .	*aglaia* (Linn.), p. 342
	Hind wing upperside with a red basal patch reaching well below the cell	[p. 345. *thysbe* (Cram.),
12.	Upperside with a submarginal black line. . . .	*eucharis* (Drury),
	Upperside without a submarginal black line	[p. 352. *hyparete* (Linn.), [p. 356.

103. **Delias agoranis** Grose-Smith.

Delias agoranis, Grose-Smith, 1887 *a* (*b*), p. 266, ♂ (Burma, Siamese frontier); Smith & Kirby, 1889, *Delias* I, figs. 7, 8 (♂); Adamson, 1808, p. 117; Talbot, 1929 *a*, p. 89, pl. xxxvii, fig. 1 (♂).
Delias agostina agoranis, Bingham, 1907 *a*, p. 147.
Delias singhapura agoranis, Fruhstorfer, 1910, p. 124.
Piccarda agoranis, Moore, 1904, p. 182, pl. 535, figs. 2, 2 *a* (♂♀).

♂. *Upperside* white. Fore wing: costa broadly greyish-black, and some dusting of the same colour beyond the end of the cell; outer margin broadly black, narrowing to vein 2, below which it is prolonged as a thin submarginal line to vein 1 *a*; a series of small white submarginal spots, those in areas 4 to 6 larger than the others. Hind wing: a series of marginal triangular black spots at the ends of the veins, those on veins 2 and 3 much larger than the others.

Underside of fore wing with the veins broadly black, the costal border black, and black apical and marginal area, within which the submarginal spots and three short subapical stripes are clearly defined. Hind wing pale lemon-yellow; outer margin with a broad black border bearing six prominent white spots placed near the margin, the two anterior spots tinged with yellow; the veins blackened distally.

♀. *Upperside* of fore wing brownish-black, with the cell and a streak between the veins dusky white. Hind wing white with the outer margin bordered with brownish-black, and with submarginal greyish-white interspaces.

Underside of fore wing with the veins more broadly black than in the ♂. Hind wing as in the ♂.

Expanse: ♂♀, about 78 mm.

Habitat.—SOUTHERN BURMA; also taken in Siam. Very rare; only a few specimens in collections.

Delias singhapura (Wallace).

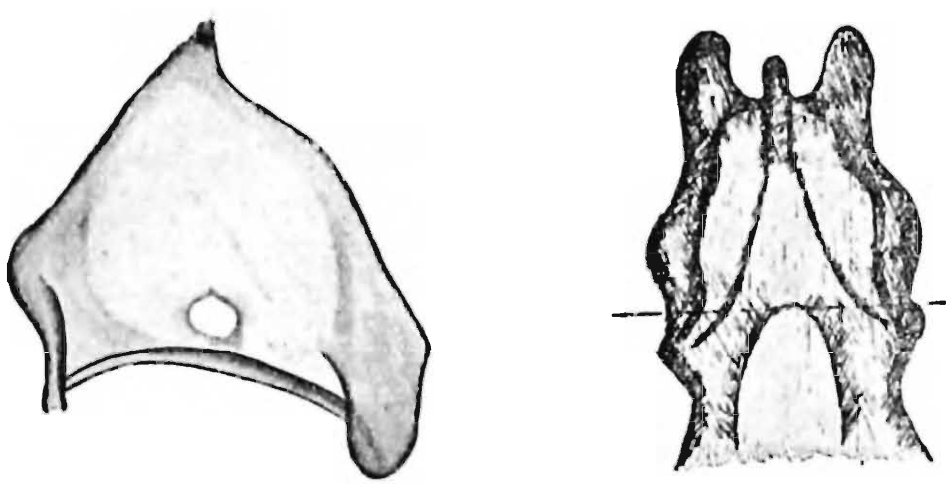
♂♀. This species is distinguished from the allied *agoranis* by the prominent black veins of the hind wing underside. Fore wing upperside with the black apical area extended to the cell.

Distribution.—The MERGUI ISLANDS, Malay Peninsula, Siam, Sumatra, and Borneo. Three subspecies are distinguished.

104. **Delias singhapura singhapura** (Wallace). (Fig. 114, genitalia; fig. 115, ♂).

Thyca singhapura, Wallace, 1867, p. 353, pl. vii, fig. 2 (♂) (Singapore).
Delias singhapura, Distant, 1885, p. 293, fig. 100 (♂).
Delias singhapura singhapura, Fruhstorfer, 1910, p. 124; Talbot, 1929 *a*, p. 91, pl. xxxvii, fig. 2 (♂); id., 1937, pl. viii, fig. 1 (valve), pl. xviii, fig. 1 (scent-scale).

♂. *Upperside* white. Fore wing with the veins black for the greater part; a blackish apical area which reaches the



a *b*

Fig. 114.—*D. singhapura singhapura* (Wall.), genitalia (*a*, valve; *b*, uncus).

cell. Hind wing with the veins blackened distally; a narrow blackish marginal border from anal angle to area 3, and small dark marginal marks on veins 3 to 5.

Underside of fore wing white, the veins blackened, especially in the apical area; apex black, either narrowly or not extending more than half the distance between apex and cell; in lighter specimens a narrow submarginal black line marks off

the submarginal spots, which are better defined in darker specimens ; there are six submarginal spots, somewhat ovate, and twice as large in some specimens than in others. Hind wing bright yellow, with the veins and costal edge black ; a black marginal border from 5 to 7 mm. wide, slightly extended on the veins ; a series of six submarginal spots, the posterior four greyish-white and incurved proximally, the anterior two yellow.

♀. *Upperside* creamy-white. Fore wing with distal broad brownish-black area, with diffuse inner edge ; proximal area dusted with black ; submarginal pale indistinct marks, the

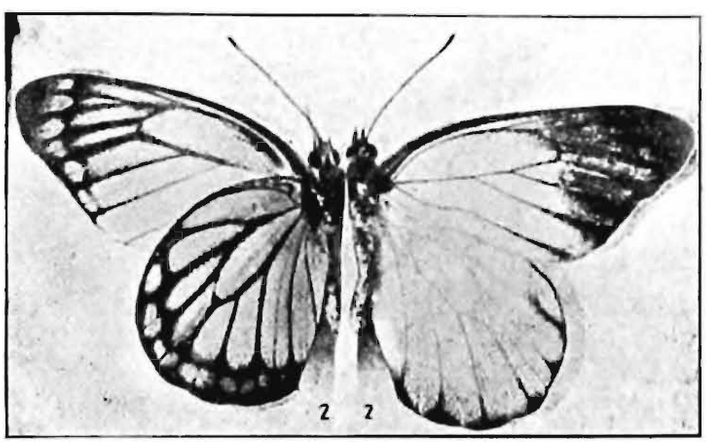


Fig. 115.—*D. singhapura singhapura* (Wall.), ♂ holotype.

double tornal spot more distinct. Hind wing without black dusting ; marginal dark border wider than in the ♂ and more produced on the veins, and with greyish edging much more extensive than in the ♂.

Underside as in the ♂.

Expanse : ♂♀, 66 mm.

Scent-scale (fig. 6 *a*, p. 14).—Long and strongly tapering, the disc small.

Genitalia (fig. 114).—Valve : distal edge with a short obtuse process ; dorsal edge nearly straight but strongly excurved posteriorly ; ventral fold well developed ; cavity large. Uncus very broad ; middle lobe short, narrow and rounded ; lateral lobes longer, broad and rounded.

Habitat.—The Mergui Islands, extending to Singapore and Siam.

This subspecies is very rare, and only a few specimens are in collections. The species is quite common in Borneo.

There are two females in the British Museum, one from Peninsular Siam (Renong) and one from Perak.

Delias patrua Leech. (Fig. 116, genitalia).

This species is distinguished by the absence of a yellow costal patch on the hind wing upperside, by the prominent yellow inner marginal border of the hind wing, and by the narrow suffused cell-stripe and thin discal stripes on both wings.

Scent-scale.—Long and tapering, with a small disc.

Genitalia (fig. 116).—Valve : apex produced to a relatively long triangular process directed distad ; dorsal edge posteriorly, well rounded ; ventral edge incurved anteriorly ; ventral fold strongly developed ; cavity and flap large. Uncus : lobes

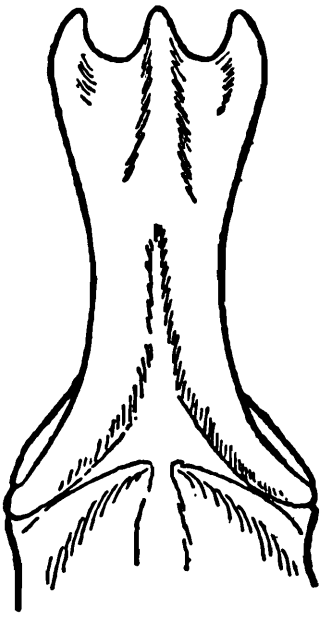


Fig. 116.—*D. patrua* Leech, genitalia (uncus, after Jordan).

of about equal length, lateral ones well separated from the middle one, broad and inflexed ; tegumen strongly incurved.

Distribution.—Central and Western China to Yunnan and BURMA. Two subspecies.

105. **Delias patrua shan** Talbot. (Fig. 117, ♂).

Delias patrua shan, Talbot, 1937, p. 266 (♂) (Shan States).

♂. *Upperside* smoky black. Fore wing with greyish-white stripes and spots, the distal stripes in areas 2 and 3 thicker than the others ; six small submarginal spots, the anterior two in 5 and 6 are linear and joined to the discal stripes ; tornal spot double, placed on the edge of a grey marginal spot which usually forms a short extension to the inner margin. Hind wing with some yellow scaling at the base of the costa ; cell-stripe more distinct than on the fore wing ; discal stripes narrow and distinct, the one in area 4 usually thicker

than the others; grey submarginal spots of moderate size, those in 2 and 3 larger than the others; costal edge grey; areas 1 *a* and 1 *b* entirely yellow, and the part of 1 *c* below the submedian fold is yellow for its distal half or third.

Underside with paler ground-colour and more distinct stripes; submarginal spots in areas 5 and 6 yellow, and there is a yellow streak in 8, interrupted in the middle; cell-stripe continuous, without a separate distal spot. Hind wing with a basal costal yellow stripe filling area 8, extending over most of 7, but not touching the cell; the lower edge of this patch is scaled with white; cell-stripe yellow, white proximally; discal stripes in areas 2 to 6 yellow, mostly white-edged; discal spot in 6 rather small; the yellow stripe in 1 *c* extends to the margin and includes the inner one of the double submarginal

Fig. 117.—*D. patrua shan* Talb., ♂.

spots; an ill-defined white stripe in 1 *c*; submarginal spots somewhat rounded, prominent and yellow.

Expanse: 86–90 mm.

Habitat.—SHAN STATES, 5,000 to 6,000 feet, in May; rare.

Delias lativitta Leech. (Fig. 118, genitalia).

This species is easily recognized by the white cell-stripe on the hind wing; this stripe is long, sharply defined, and prominent, but in the ♀ sometimes dusted with black.

Scent-scale.—Longer than that of *patrua*, but otherwise very similar.

Genitalia (fig. 118).—Valve: apex not produced; ventral fold not strongly developed; cavity and flap nearly as in *patrua*. Uncus: somewhat like that of *patrua*, but middle lobe longer than the others.

Distribution.—West and South-west China to Formosa, Yunnan, BURMA, and BHUTAN. Four subspecies. Common in China, but the ♀ is always rare.

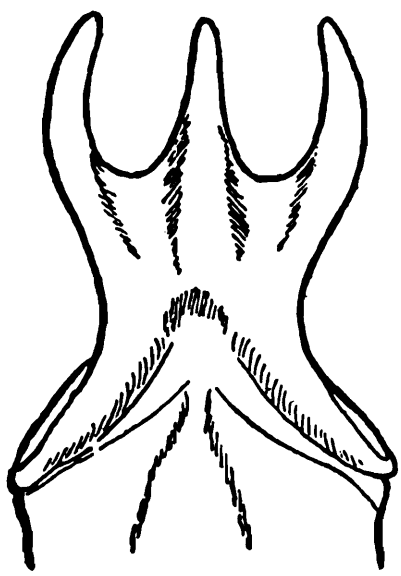


Fig. 118.—*D. lativitta* Leech, genitalia (uncus, after Jordan).

106. **Delias lativitta parva** Talbot. (Fig. 119, ♂).

Delias lativitta parva, Talbot, 1937, p. 268 (♂) (Bhutan).

♂. *Upperside* with white and grey-white stripes and spots as in *patrua* Leech, but more prominent. The stripes are narrower and the submarginal spots smaller than in the nominotypical form. Fore wing with a long and well-marked

Fig. 119.—*D. lativitta parva* Talb., ♂.

though slightly dusky cell-stripe; discal stripes in areas 4 to 6 usually connected with the submarginal spots; fringe purer white than in *patrua*. Hind wing with white and prominent cell-stripe; discal stripe in 4 longer than the

others and proximally pointed ; submarginal spots bordered distally with grey, especially those in 2 and 3, and tornal area with extended grey scaling ; inner area proximally white or yellowish-white, distally yellow ; this yellow area extends usually to vein 2 or at least to beyond the submedian fold.

Underside similar to the upperside, the markings lighter ; the inner yellow area on hind wing tends to become reduced proximally.

Expanse : 82 mm.

Habitat.—BHUTAN, 6,500 feet ; NORTH-EAST BURMA, 5,000–8,000 feet ; SHAN STATES, 5,000 feet. Rare, only 3 ♂♂ in the British Museum ; ♀ unknown.

This race is only slightly differentiated from the nomino-typical one.

Delias sanaca (Moore). (Fig. 120, genitalia).

This species differs from *lativitta* Leech in the broader or more diffuse cell-stripe of the hind wing, in the larger marginal

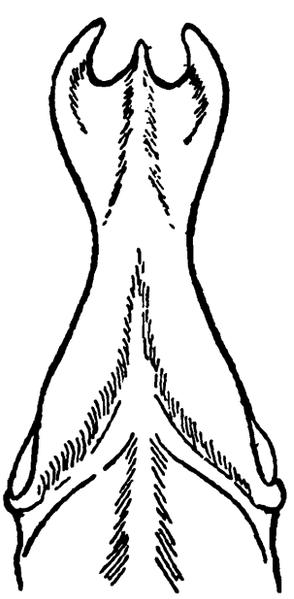


Fig. 120.—*D. sanaca* (Moore), genitalia (uncus, after Jordan).

spots, and in the shape of the stripe in area 4 of the hind wing. One form of *sanaca* is very like a form of *berinda* (Moore). In the more typical examples of *sanaca* the stripe in 4 of the hind wing is short and broad, with its proximal edge emarginate or straight. This character will not be very helpful in determining specimens from Burma, where the race *perspicua* Fruhst. is confusingly similar to *D. berinda boyleæ* Butl. Specimens of the latter are lighter, especially on the hind wing, and the white stripe in area 1 *c* on the underside is not produced proximally of the stripe in 2. It is advisable to examine the uncus to be certain. The ♀ of *sanaca* has a prominent

white cell-stripe on the hind wing upperside, and the other markings somewhat resemble those of the ♂. In Burma specimens it is often difficult to know whether a given ♀ belongs to *sanaca* or to *berinda*. Examine the spots in areas 2 and 3 of the hind wing underside. In specimens of *sancaa* the distance between the distal edge of these spots and the inner edge of the submarginal spots opposite them is not greater than 4 mm. In specimens of *berinda* the distance mentioned is greater than 4 mm.

Scent-scale.—Flask-shaped, posteriorly broad and rounded, sharply tapering anteriorly.

Genitalia.—Valve : similar to that of *lativitta*, the ventral edge slightly and more evenly curved, and the ventral fold much more developed ; cavity large, with small flap.

Uncus : middle lobe always shorter than the lateral ones, which are curved.

Distribution.—NORTH-WEST INDIA to SIKKIM, BHUTAN, NORTHERN BURMA, Yunnan, and Tong-king. Four subspecies.

107 *a*. **Delias sanaca sanaca** (Moore). (Fig. 121, ♂).

Pieris sanaca, Moore, 1857 *a*, p. 79 (West Himalaya) ; id., 1857 *b*, p. 103, pl. 44, fig. 4 (err. 6) (♀).
Thyca sanaca, Wallace, 1867, p. 348 (♀).
Delias sanaca, Elwes, 1886, p. 159 ; de Nicéville, 1889 *c*, p. 343 ; Moore, 1904, p. 163, pl. 528, figs. 1, 1 *a*, *b* (♂), 1 *c*, *d*, *e* (♀) ; Röber, 1907, p. 44 ; Evans, 1912 *a*, p. 975.
Delias belladonna sanaca, Fruhstorfer, 1910, p. 130.
Delias sanaca sanaca, Jordan, 1925, p. 282 ; Evans, 1932 *a*, p. 70 ; Talbot, 1937, p. 272, pl. xlv, fig. 2 (♂), pl. xxvii, figs. 83, 85 (scent-scale), pl. xiii, fig. 81 (valve) ; Peile, 1937, p. 51, pl. vi, fig. 37 (♂).
Delias sanaca var. *flavalba*, Marshall, 1882 *b*, p. 759 (Kunawar).
Delias belladonna var. *flavalba*, Bingham, 1907, p. 149.
Delias sanaca f. *flavalba*, Talbot, 1937, p. 274, pl. xliv, fig. 1 (♂).
Delias sanaca f. *confusa*, Talbot, 1928 *b* (*b*), p. 224 (♂) (North-West India) ; id., 1937, p. 274, pl. xliv, fig. 2 (♂).

♂. *Upperside* with well-developed white markings. Fore wing submarginal spots large and triangular ; submedian stripe broad and very distinct. Hind wing with broad white cell-stripe, pointed proximally and distally, sometimes dusky in the basal half ; discal patches forming a broad band which narrows anteriorly, and posteriorly is often merged with the submarginal spots ; submarginal spots in areas 2 to 6 large and, excepting the anterior one, somewhat rounded ; inner area pale yellow for the distal half or less, the proximal half white, only slightly darkened at the base.

Underside of fore wing with white markings strongly developed. Hind wing with the yellow discal spots edged prominently with white ; patch in area 1*c* below vein 2 entirely white ; yellow anal spot never entirely separated from

inner yellow area ; fold in area 1*c* not, or only weakly, scaled with black distally.

♀. *Upperside* ground-colour paler brown than in the ♂, fore wing markings yellowish, hind wing with white markings. Fore wing discal patches larger than in the ♂, the spots beyond the cell sharply defined, that in area 4 proximally incurved. Hind wing with more extended white markings than in the ♂ ; inner area distally yellowish-white, only distinctly yellow along the fold in 1*c*.

Underside with white and yellow markings more extended than in the ♂ ; fore wing with submarginal spots very large. Fringes black in both sexes.

Expanse : ♂, 69–94 mm. ; ♀, 84–96 mm.

Fig. 121.—*D. sanaca sanaca* (Moore), ♂.

Variation.—The normal form described above lies mid-way in a series leading to a very light form on the one side and to a very dark one on the other.

Form **flavalba** Marsh.—The lightest form. Fore wing with the cell almost white ; inner area between the margin and vein 2 almost entirely white, but sometimes with an indistinct black submedian stripe ; discal spots large, sometimes merged with the submarginal ones and forming broad or narrow stripes. Hind wing white or with a black stripe along lower margin of cell ; submarginal spots sometimes so entirely merged with the discal area that there is even no dark submarginal line.

♀. Fore wing yellowish-white, the proximal half only dusky on the veins. Hind wing as in the ♂.

Form **confusa** Talb.—Closely resembles *D. belladonna horsfieldi* Gray. Distinguished from the nominotypical form by the black ground-colour occupying a greater area than the

white colour, so that the white discal stripes and spots are much smaller on the upperside, and to a less extent reduced on the underside.

♀. Lighter than the ♂ but darker than in the nominotypical form. *Upperside* of hind wing with reduced discal white patches, that in area 4 especially short; prominent black areas between the cell-patch and discal band, and between the discal band and submarginal spots.

The above is the first record of the ♀ of this form, and is made from a transfer recently presented to the British Museum by Lieut.-Colonel H. D. Peile, who found the insect dead on the ground at Mussooree, 5,500 feet, 1916, about May.

Habitat.—North-West India: common at Mussooree from April to June at about 5,000 feet; also known from Garhwal, and may be said to range from Kulu to Kumaon.

The forms *flavalba* and *confusa* both rare. Nothing definite can be said about the early stages and habits and the broods. The species has been confused with *belladonna* (Fabr.), and is still imperfectly understood.

107 *b*. **Delias sanaca oreas** Talbot.

Delias sanaca oreas, Talbot, 1928 *b* (*a*), p. 178 (♂♀) (Sikkim); id., 1937, p. 275, pl. xliv, fig. 5 (♂), pl. xlv, fig. 1 (♀); Evans, 1932 *a*, p. 70; Peile, 1937, p. 51.

Delias belladonna var. *horsfieldi*, Elwes (*non* Gray), 1888, p. 409 (part.), pl. x, fig. 3 (♀) (Sikkim).

A very dark race, somewhat resembling *perspicua* (Fruhst).

♂. *Upperside* of fore wing with some slight greyish scaling; discal stripes short and thin, partly dusky; submarginal spots very small. Hind wing with spots well defined and without grey suffusion; discal spot in area 4 short and somewhat square, its proximal edge distinctly emarginate; discal spots in 2 and 3 smaller than the one in 4.

Underside of fore wing with only slight grey basal scaling; discal stripe in area 2 not longer than that in 3; grey stripe in the submedian area diffuse, and not completely divided by the submedian fold. Hind wing with discal spot in 4 as on upperside, the spot in 3 also square.

♀. Markings as in the ♂ more emphasized, on the fore wing much whiter, with the cell-bar very strongly marked. Hind wing with white cell-stripe, sharply defined; discal spots grey, more defined than in the ♂, and with proximal white edging; submarginal spots large.

Underside as in the ♂.

Habitat.—Sikkim, 6,000–8,000 feet. Known from Sinchul (type) and the Darjeeling district. Taken in June and July. The ♂ not rare, ♀ very rare.

107 *c*. **Delias sanaca perspicua** Fruhstorfer. (Fig. 122, ♂♀).

Delias belladonna perspicua, Fruhstorfer, 1910, p. 130, t. 56 *a* (♀) (Upper Burma).
Delias sanaca perspicua, Jordan, 1925, p. 282; Evans, 1932 *a*, p. 70; Talbot, 1937, p. 276, pl. xliv, fig. 3 (♂).

This subspecies inhabits the same area in Burma as *D. berinda boyleæ* Butl., and both are so remarkably alike

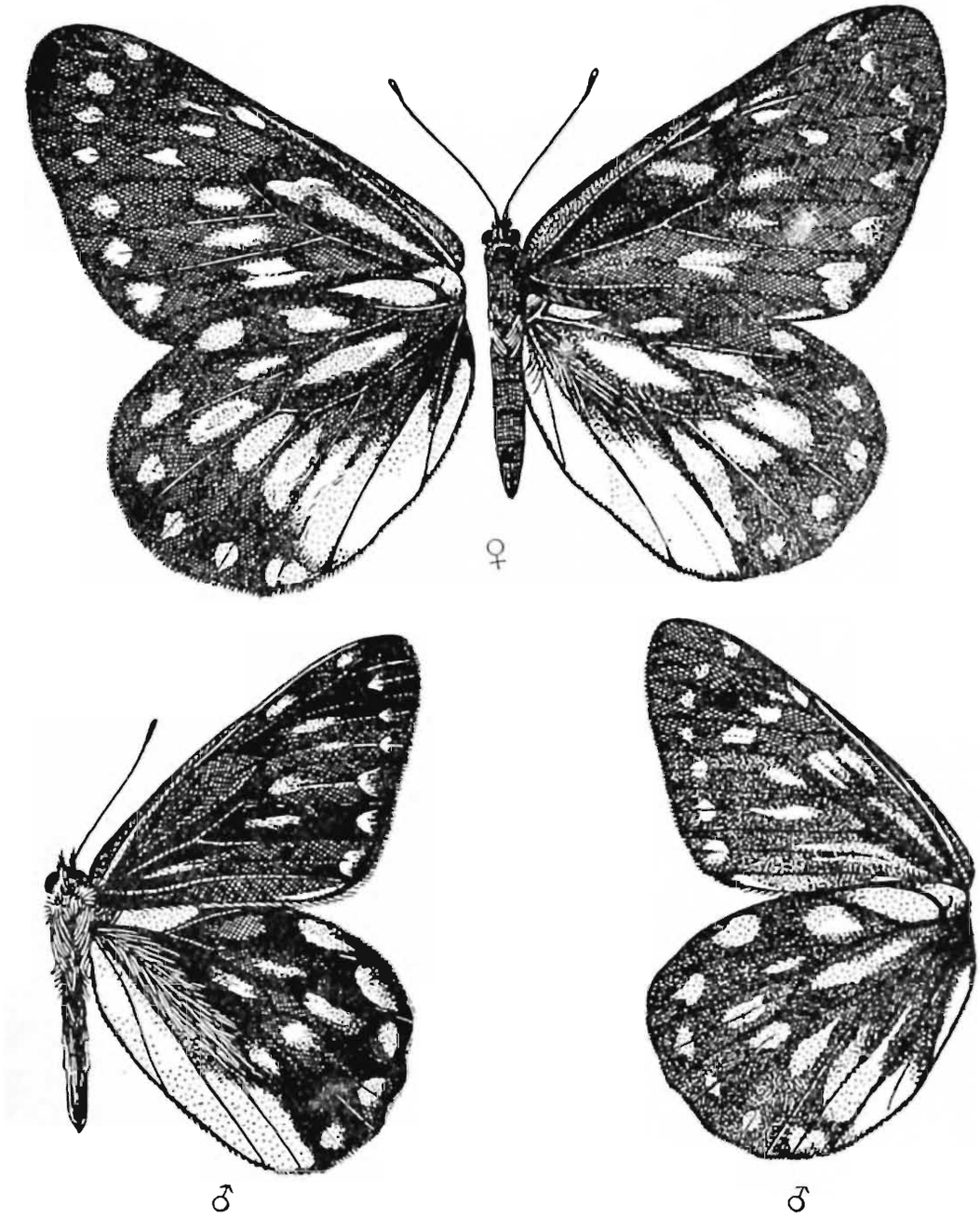


Fig. 122.—*D. sanaca perspicua* Fruhst., ♂, ♀ holotype.

that they can be determined with certainty only by an examination of the uncus. The following points of difference between the two species may be observed in Burmese specimens :—

In *perspicua* the hind wing underside with the fold in area 1 *c* scaled with black, the white stripe in 1 *c* smaller than in

boyleæ and usually quite separate, or otherwise almost separate, from the yellow area. Hind wing upperside with the white stripes usually narrow.

In *boyleæ* the hind wing underside with the fold in area 1 *c* not scaled with black over the yellow area, the white stripe in 1 *c* not separated from the yellow area. Hind wing upperside with usually broad white stripes, purer white than in *perspicua*.

♂. Rather dark. Fore wing upperside with very narrow stripes and small submarginal spots. Hind wing markings larger, with a distinct short white distal cell-stripe.

Underside markings on fore wing more distinct than on upperside. Hind wing with discal and submarginal yellow spots usually small; discal spot in area 3 not longer than that in 2, and usually shorter; in large-spotted specimens the inner edge of the discal spot in 4 is straight or slightly emarginate; white stripe in 1 *c* very short, not usually projecting proximally of the spot in 2; fold in 1 *c* usually scaled with black distally; yellow anal spot either well separated from the inner yellow area or merged with it.

♀. Closely resembles the ♀ of *berinda boyleæ*.

Upperside of fore wing with distinct grey-white markings, the spots and stripes small. Hind wing with a broad white cell-stripe, and well-defined white discal patches which are larger than on the fore wing; patch in area 4 incurved on its proximal edge.

Underside as in the ♂, the spots larger; spot in area 4 with its proximal edge usually more distinctly incurved than on upperside, but sometimes this spot is drawn out into a streak as in most examples of *boyleæ*; hind wing discal spots in 2 and 3 placed with their distal edges at a distance of 4 mm. or less from the inner edge of the corresponding submarginal spots.

Habitat.—North-East Burma, 5,000–8,000 feet; also in Yunnan, South-West China and Tong-king. ♂ not rare, ♀ very rare.

107 *d*. **Delias sanaca bhutya** Talbot.

Delias sanaca bhutya, Talbot, 1937, p. 278 (♂) (Bhutan).

This subspecies appears to connect *oreas* Talb. and *perspicua* Fruhst.

♂. Differs from *oreas* on the upperside of hind wing in having the spot in area 4 less defined and not emarginate on its proximal edge. Differs from *perspicua* in the reduction of white scaling in the upperside markings. Hind wing discal spots for the most part bluish-grey like the submarginal ones, whilst in *perspicua* they are for the most part white; spot in area 2 small or indistinct.

Underside of hind wing with the white stripe in area 1 *c* rather short and dusted with black ; in *perspicua* this stripe is more prominent and usually without black dusting ; yellow border in 1 *a* narrower than in *perspicua* ; yellow stripe in 1 *b* not prolonged basad except as a very thin line.

Habitat.—BHUTAN, 6,000–9,500 feet.

Delias berinda (Moore). (Fig. 123, genitalia).

This species is distinguished from similar *belladonna* forms by the partly white cell-stripe on the hind wing underside. The nominotypical form is distinguished from the forms previously described by the absence of yellow on the hind wing upperside. The only other race occurring within the Indian area is *boyleæ* Butl. ; this may be distinguished from

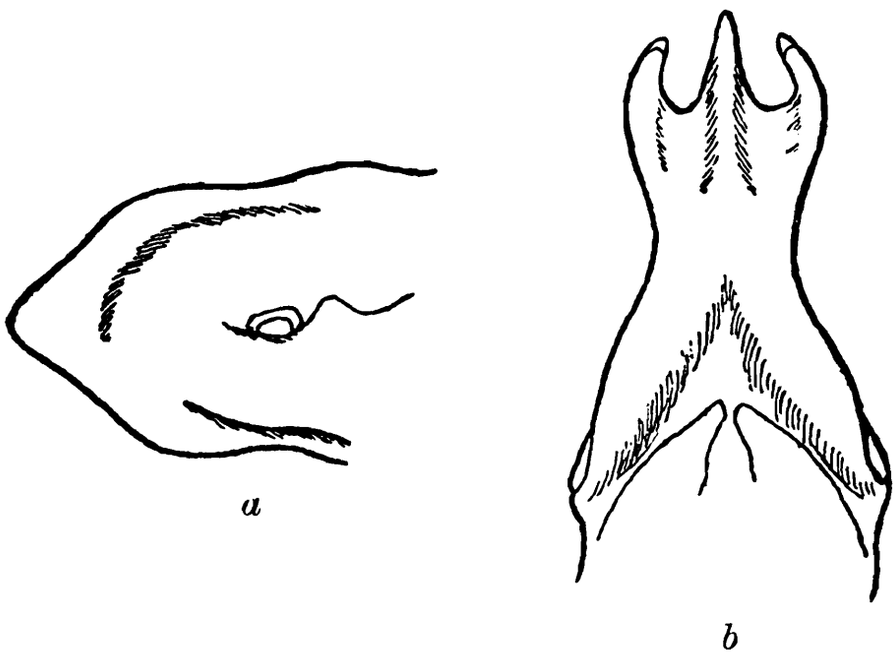


Fig. 123.—*D. berinda* (Moore), genitalia (*a*, valve ; *b*, uncus : after Jordan).

the similar *sanaca perspicua* Fruhst. by the characters given in the description of that form (p. 333). In all cases the species can be known by the uncus having the middle lobe longer than the lateral ones.

Scent-scale (fig. 6 *b*, p. 14).—More narrow than that of *sanaca* and more attenuated anteriorly.

Genitalia (fig. 123).—Valve : resembles that of *sanaca*, the ventral fold less developed. Uncus : middle lobe longer than the lateral ones, which are short, narrow, and curved.

Distribution.—SIKKIM, ASSAM, and BURMA to Western and Central China. Three subspecies.

108 *a*. **Delias berinda boyleæ** Butler. (Fig. 124, ♂♀; 124 *a*, valve).

Delias boyleæ, Butler, 1885, p. 58 (♂) (Darjeeling).
Delias belladonna ab. *boyleæ*, Fruhstorfer, 1910, p. 130.
Delias berinda boyleæ, Jordan, 1925, p. 283; Talbot, 1928 *b* (*a*), p. 179 (♀); Evans, 1932 *a*, p. 70; Talbot, 1937, p. 281, pl. xlvi, fig. 3 (♂), pl. xliv, fig. 4 (♀), pl. xii, fig. 80 (valve).
Delias belladonna var. *amarantha*, Mitis, 1893, p. 133, pl. ii, fig. 3 (♂) (Darjeeling).

♂. Distinguished from the nominotypical race by the

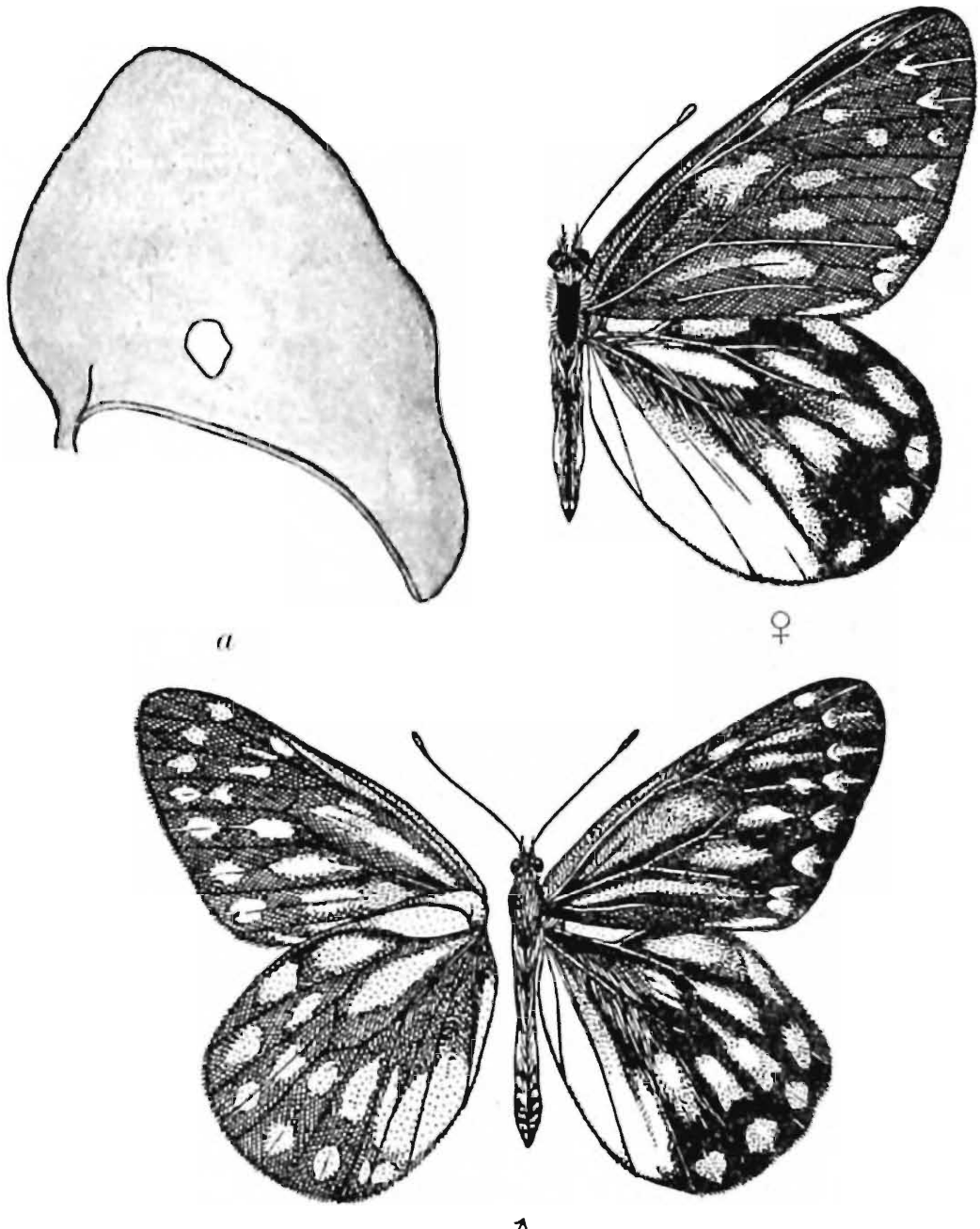


Fig. 124.—*D. berinda boyleæ* Butl., ♂ ♀ (*a*, valve).

yellow area on hind wing upperside. Fore wing with grey-white markings; cell-stripe obscure, discal spots short, small, and mostly linear; submarginal spots sharply defined. Hind

wing markings largely white ; a short and sharply defined distal cell-stripe ; discal patches large and sharply defined ; submarginal spots not large ; inner area with more than the distal half yellow, usually a yellow spot in area 2.

Underside with all markings sharply defined. Hind wing discal spots of medium size, with much white edging ; spot in area 4 usually white, and often with a proximal prolongation ; white stripe in 1 *c* short, and not produced proximally of the stripe in area 2 ; fold in 1 *c* not scaled with black where it crosses the yellow area ; yellow anal spot rarely separated from the yellow area in 1 *c*.

♀. Closely resembles this sex of *perspicua*. Hind wing underside with the spots in areas 2 and 3 having their distal edges placed at a distance of over 4 mm. from the inner edge of the submarginal spots.

Underside as in the ♂, the submarginal spots and the hind wing patches smaller than in *perspicua*.

Expanse : ♂, 79–96 mm. ; ♀, 92–100 mm.

Variation.—A rare colour form exists in which all the yellow markings on both sides are of a deep brick-red. This is **amarantha** Mitis. There is a single specimen (♂) in the British Museum, without exact locality.

Habitat.—SIKKIM to BURMA, 5,000 feet ; Yunnan and South-West China. Known from Darjeeling (type), the Southern Shan States, Bernardymo, and Bhamo district. There is a single ♂ in the British Museum from Nepal. Has been taken in South-East Tibet (Drowa Gompa) at an elevation of 10,000 feet. Both sexes not rare.

108 *b*. **Delias berinda berinda** (Moore). (Fig. 125, ♂♀).

Thyca berinda, Moore, 1872, p. 566 (♀) (Khasi Hills).
Delias berinda, Moore, 1904, p. 167, pl. 530, figs. 1 *b*, 1 *c* (♀, type) (text partim).
Delias berinda berinda, Jordan, 1925, pp. 282–3, figs. 5, 7 (genitalia) ; Talbot, 1929 *a*, pl. iii, fig. 77 (genitalia) ; Evans, 1932 *a*, p. 70 ; Talbot, 1937, p. 280, pl. xxvii, fig. 84 (scent-scale), pl. xlv, fig. 5 (♂), pl. xlvi, fig. 5 (♀) ; Peile, 1937, p. 51.

♂. *Upperside* black with grey-white markings. Fore wing cell with usually only slight grey scaling ; discal stripes usually small and indistinct ; submarginal spots small and distinct. Hind wing cell with a short and indistinct distal stripe ; discal spots usually small and linear, spot in area 2 sometimes absent ; submarginal spots small ; inner area entirely without yellow, being either black or with proximal grey-white scaling.

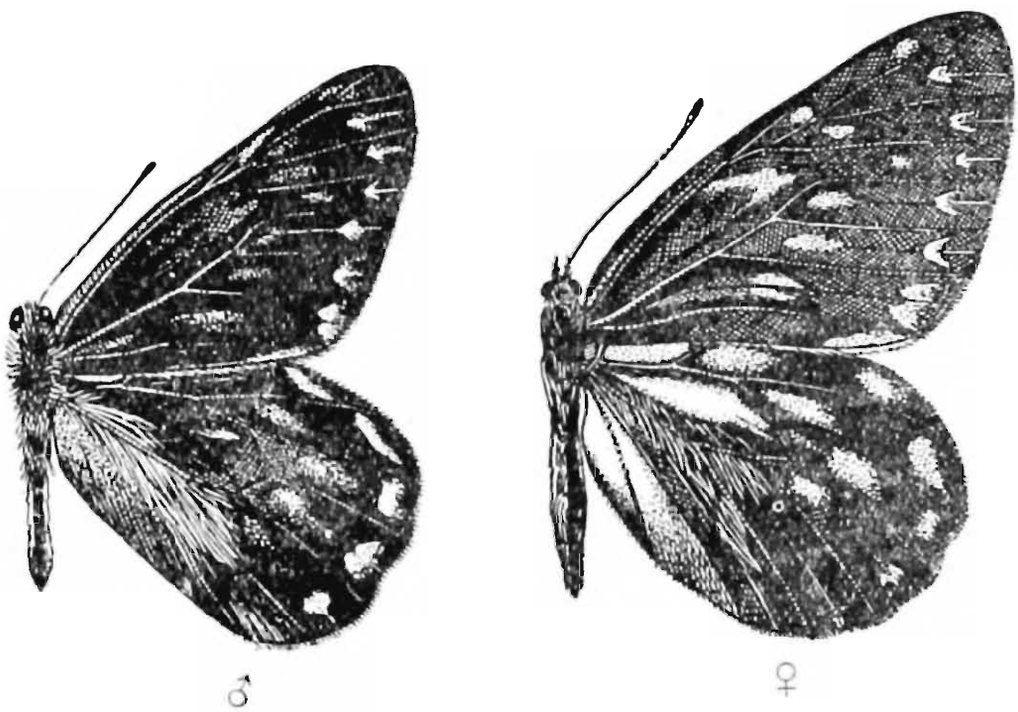
Underside black. Fore wing markings more distinct than on upperside. Hind wing discal spots rather small, those in

areas 4 and 5 usually white; submarginal spots in 1*c* to 4 much smaller than the others; inner area usually unmarked, sometimes a narrow white bar in 1*c*.

♀. *Upperside* paler than the ♂; markings slightly yellow, or on the hind wing white. Fore wing discal markings and spot in end of cell more distinct than in the ♂. Hind wing with cell-stripe prominent, white, narrow and pointed at both ends, sometimes dusky; discal spots diffuse and somewhat dusky, no spot in 2; inner area as in the ♂.

Underside as in the ♂.

Expanse: ♂, 84–96 mm.; ♀, 100 mm.



♂ ♀

Fig. 125.—*D. berinda berinda* (Moore). ♂ ♀.

Habitat.—ASSAM (Naga and Khasi Hills and Abor country) and NORTHERN BURMA (Chin Hills); occurring from 3,000 to 7,000 feet. Not common.

Delias belladonna (Fabr.). (Fig. 126 *a–c*, genitalia).

Distinguished from all other species of the group by the cell-patch of the hind wing underside being entirely yellow; by the yellow basal costal patch on both sides of the hind wing being shorter, more rounded, and not distally produced; by the discal spot in area 6 of the hind wing underside being usually white; by the clearly-defined discal submedian patch on the fore wing underside. In the ♀ there is no cell-stripe on the hind wing upperside, or at most only a distal spot.

Scent-scale.—Smaller than those of the preceding species in the *Belladonna* group, and with a larger disc.

Genitalia (fig. 126).—Valve : somewhat as in *sanaca* (Mooré) and *berinda* (Moore), ventral fold narrow ; cavity smaller, and the flap more pointed than in other species of the group. Uncus : the three lobes of equal length, the middle one narrow, the lateral ones slightly curved.

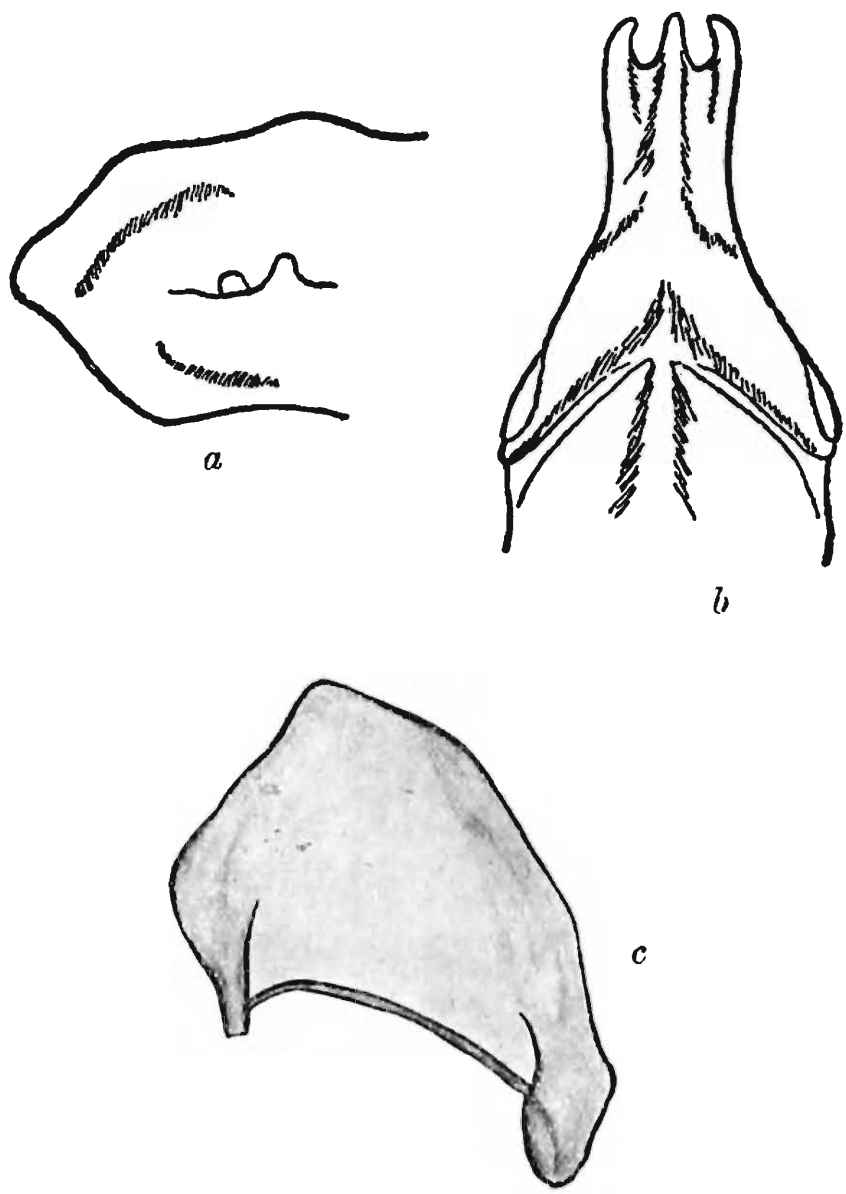


Fig. 126.—*D. belladonna* (Fabr.), genitalia.
(*a*, valve ; *b*, uncus : after Jordan ; *c*, valve of *b. ithiela* Butl.).

Distribution.—North-West India to Burma, Western, Central, and Southern China, Yunnan, Tong-king, Siam, the Malay Peninsula, Sumatra, and Celebes. Not recorded from Borneo. Ten subspecies, half of these occurring within the Indian area.

109 *a*. **Delias belladonna horsfieldi** (Gray). (Fig. 127, ♂).

Pieris horsfieldi, Gray, 1831, p. 32 (Nepal); id., 1846, p. 7, pl. viii, fig. 2 (type).
Delias horsfieldi, Mackinnon & de Nicéville, 1898, p. 585, pl. v, fig. 19 (pupa) (West Himalayas); Moore, 1904, p. 166 (part.), pl. 529, figs. 1, 1 *a*, 1 *b*.
Delias belladonna horsfieldi, Jordan, 1925, p. 285; Evans, 1932 *a*, p. 69, pl. vii, fig. B 6.7 (*non* B 6.8) (♂); Talbot, 1937, p. 288, pl. xlvii, figs. 1 (♂), 3 (♀); Peile, 1937, p. 50 (text only).
Delias hearseyi, Butler, 1885, p. 58 ("Barrackpore," err.).
Delias belladonna var. *surya*, Mitis, 1893, p. 132 ("Kashmir," *recte* Massuri).

♂♀. The white markings strongly developed, especially on the hind wing. *Upperside* of hind wing with large white discal patches and prominent distal cell-spot; in the ♀ these

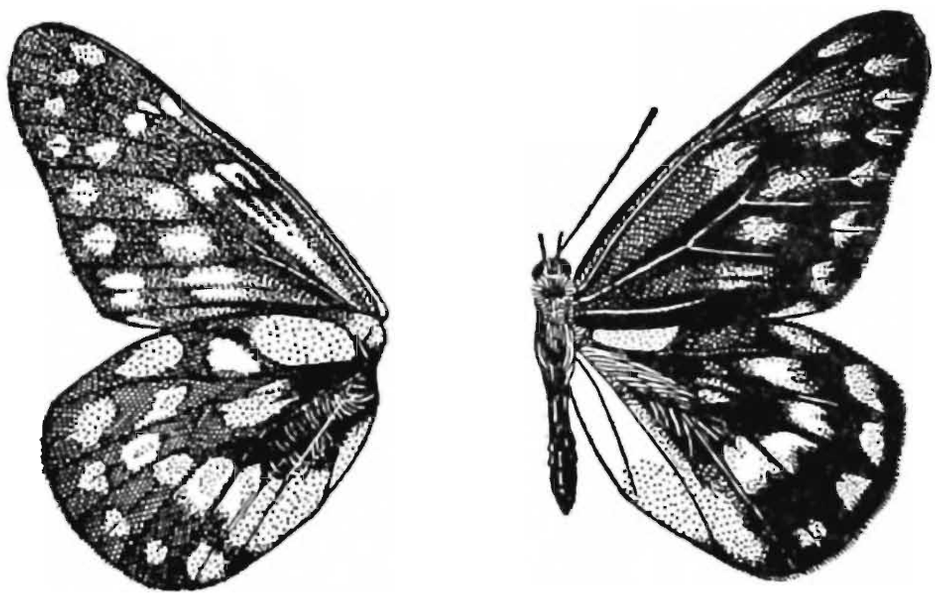


Fig. 127.—*D. belladonna horsfieldi* (Gray), ♂, from Simla.

markings are creamy-white, and the cell-spot sometimes fills most of the cell.

Underside markings larger and more sharply defined than on upperside, the cell-stripe on both wings prominent. Fore wing with a bar across the distal end of the cell. Some specimens approach the race *ithiela* Butl. in having the inner yellow area on the hind wing upperside reduced.

Expanse: ♂, 76–90 mm.; ♀, 75–96 mm.

This race closely resembles the darker specimens of *D. sanaca sanaca* Moore, and the two have been confused in the records of most authors.

Habitat.—Kulu to Kumaon and Nepal, 2,000–8,500 feet; also occurs in Sikkim as a form with *ithiela* Butl. Not rare.

109 *b*. **Delias belladonna ithiela** (Butler).

Thyca ithiela, Butler, 1869 *b*, p. 242 ("Penang," err.).
Delias ithiela, Butler, 1871 *a*, p. 62, pl. 24, fig. 1 (♂); Moore, 1904, p. 167, pl. 530, figs. 1, 1 *a* (♂♀).
Delias belladonna var. *ithiela*, Bingham, 1907, p. 149; Fruhstorfer, 1910, p. 130.
Delias belladonna ithiela, Jordan, 1925, p. 286; Talbot, 1929 *a*, pl. iii, fig. 78 (uncus); Evans, 1932 *a*, p. 69; Talbot, 1937, p. 287, pl. xlv, fig. 6 (♀), pl. xlvi, fig. 1 (♂); Peile, 1937, p. 50.
Delias horsfieldi, Moore (*non* Gray), 1904, pl. 529, fig. 1 *c* (♀).

♂♀. Resembles *horsfieldi* (Gray), but all the markings on both sides are smaller; hind wing with usually no yellow scaling over the inner area, or with only a small yellow patch which is more often present in the ♀ on the *underside*. Specimens with a small yellow inner patch on the hind wing *upperside* somewhat resemble *D. sanaca oreas* Talb. Some specimens, in which the markings are larger, resemble *horsfieldi* on the upperside, but the inner yellow area on the underside is more restricted.

Habitat.—SIKKIM, 2,000–3,000 feet, rarely at 6,000–8,000 feet. Common. Sometimes found in ASSAM as a rare form with *lugens* Jord.

109 *c*. **Delias belladonna lugens** Jordan.

Delias belladonna lugens, Jordan, 1925, p. 286 (Assam; North-West Burma); Evans, 1932 *a*, p. 70; Talbot, 1937, p. 289; Peile, 1937, p. 50.
Delias belladonna, Elwes (*non* Fabr.), 1888, pl. x, fig. 2 (♀) (Khasi Hills).

♂♀. Markings smaller than in *ithiela* (Butler), the hind wing *upperside* never with a yellow anal patch, which also is rarely indicated beneath. A darker race than *ithiela*.

Habitat.—ASSAM and NORTHERN BURMA, 2,500–8,000 feet. Known from the Naga and Khasi Hills, the Lushai Hills, and Upper Shan States. A single specimen is recorded from BHUTAN. Sometimes occurs in SIKKIM as a rare form with *ithiela*. Not rare.

109 *d*. **Delias belladonna hedybia** Jordan.

Delias belladonna hedybia, Jordan, 1925, p. 286 (Tenasserim; Shan States); Talbot, 1937, p. 290, pl. xlvii, figs. 2 (♂), 4 (♀).
Delias belladonna burmana, Evans, 1926, p. 713 (♂) (North Burma, Shan States); id., 1932 *a*, p. 70.

A small race resembling both the nominotypical form and *horsfieldi* (Gray) in certain respects.

♂♀. Differs from *horsfieldi* in the hind wing anterior discal spots being smaller, especially on the underside; the orange

inner area is as large or larger ; discal spot in area 2 in the ♀ tinged with yellow. *Underside* of hind wing with reduced cell-spot, smaller than the spot in area 2 ; other spots smaller than on upperside, especially the submarginal ones ; inner yellow area large, but well separated from the tornal spot.

Expanse : ♂, 72–88 mm. ; ♀, 74–90 mm.

Habitat.—SHAN STATES to AMHERST DISTRICT, Ataran, 3,000–5,000 feet ; ♂ not rare, ♀ scarce. Also occurs in Siam and Perak.

109 *e*. **Delias belladonna belladonna** (Fabricius).

Papilio belladonna, Fabricius, 1793, p. 180 ; Donovan, 1923, pl. 35 (♀, type).

Delius belladonna belladonna, Talbot, 1937, p. 283, pl. lvi, fig. 6 (♀ type, after Donovan).

The identity of this race has been the subject of much speculation. No specimen is yet known which quite resembles the figure given by Donovan, or by Jones (Icones, pl. 37, fig. 2, unpublished), the latter figure being the original. It seems possible that the type came from Tong-king or Cochin-China, and the race from this area was treated by Talbot (1937) as the true *belladonna*. Confirmation is required by an examination of ♀ specimens from the area mentioned, but so far these are absent from collections. The race enters the Indian area in the Bhamo District of Burma.

♂♀. Somewhat resembles *hedybia* Jordan and *horsfieldi* (Gray), but is larger than these, and with the markings smaller than in the latter race. Hind wing *underside* with cell-spot minute or absent. The inner yellow area of the hind wing tends to be reduced. In one of three females from Yunnan the hind wing cell-spot is minute, and the yellow patch in area 2 is well developed ; more approaches the ♀ of *hedybia*.

Expanse : ♂, 80–92 mm., ♀, 83–92 mm.

Habitat.—NORTH-EAST BURMA ; Bhamo District, 2,200–5,500 feet. Also in Yunnan and Tong-king. ♂ not rare ; ♀ scarce.

Delias aglaia (Linnæus). (Fig. 128 *a*, *b*, genitalia).

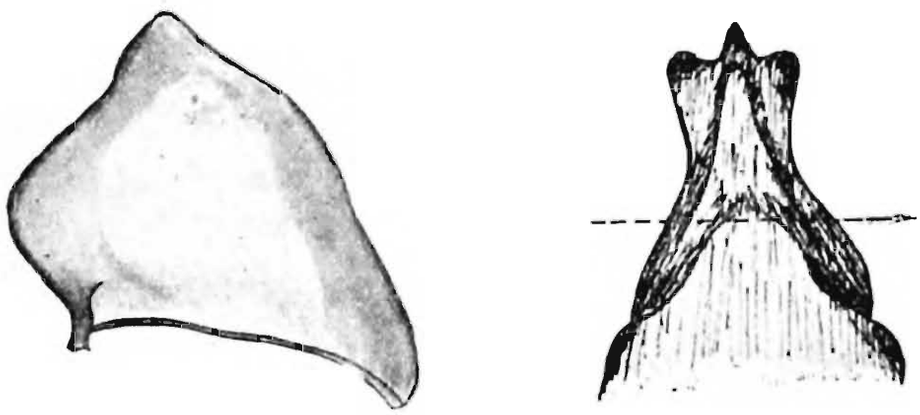
This species can be recognized by the red subbasal band on the hind wing underside, whilst the upperside of this wing is without a red patch. *Upperside* of both wings with a bluish-grey discal band and a discocellular dot. ♀ with more complete discal band on fore wing.

Scent-scale (fig. 6 *c*, p. 14).—Somewhat resembles the scale of *D. belladonna*, with a large disc, and gently tapering.

Genitalia (fig. 128).—Valve : distal edge slightly produced and rounded, dorsal edge posteriorly rounded, ventral fold very weak. Uncus : middle lobe short and triangular, but

much more prominent than the lateral ones, which are short and rounded.

Early stages.—Not properly described. According to Fruhstorfer (1910) the larvæ are red, " each segment with long hairs, of which the lateral ones are black and the dorsal yellow. On young leaves of *Nauclea rotundifolia* Roxb. (Rubiaceæ), where they rest together in large numbers." It is much more likely that the larvæ feed on a *Loranthus* growing on the tree mentioned. According to Kershaw (' Butterflies of Hong Kong,' 1907, p. 96) the eggs are spindle-shaped, smooth, and bright yellow. They are laid in a batch of twenty,



a *b*

Fig. 128.—*D. aglaia* (Linn.), genitalia (*a*, valve ; *b*, uncus).

thirty or more, on the upperside of leaves of the food-plant. The young larvæ are yellow, sparsely hairy, with the head black.

Distribution.—South-West and South-East China, Formosa, and Hainan to the HIMALAYAS and BURMA, south and east to the Malay Peninsula, the Philippines, and Java. A number of subspecies are distinguished, of which the nominotypical race alone occurs within the Indian area.

110 *a*. **Delias aglaia aglaia** (Linnæus). (Fig. 129, ♂).

Papilio aglaia, Linnæus, 1758, p. 465.
Delias aglaia, Butler, 1897 *a*, p. 162 ; de Nicéville, 1902 *a*, p. 24 ; Moore, 1904, p. 169, pl. 513, figs. 1, 1 *a–d* (♂♀, larva, pupa) ; Bingham, 1907, p. 145 ; Adamson, 1908, p. 117 (Burma).
Delias aglaia aglaia, Fruhstorfer, 1910, p. 133 ; Talbot, 1929 *a*, pl. iii, fig. 84, pl. iv, fig. 28 (genitalia) ; Evans, 1932 *a*, p. 71, pl. iii, fig. B 6.12 (♂ underside) ; Talbot, 1937, p. 317, pl. xlviii, figs. 3 (♂), 4 (♀) ; Peile, 1937, p. 52.
Papilio dione, Drury, 1773, pl. viii, figs. 3, 4 (♂).
Papilio pasithoe, Linnæus, 1767, p. 755.
Delias pasithoe, Butler, 1879 *a*, p. 2 (Cachar) ; id., 1872, p. 29 ; Moore, 1878 *a*, pp. 839, 856 (Upper Tenasserim) ; Elwes & de Nicéville, 1887, p. 432 ; Elwes, 1888, p. 407 (Sikkim) ; Watson, 1891 *a*, p. 51 (Burma).

♂. *Upperside* black. Fore wing with submarginal greyish-white, somewhat hastate spots, each with a short distal streak ; a rounded white discocellular spot ; cell with some greyish scaling ; a greyish-white stripe in area 1 *b*, and a short and indistinct one in 2. Hind wing with a discal broad greyish-white band which is posteriorly merged with a large bright yellow inner area ; a rounded white discocellular spot which is usually separated from the discal band ; post-discal greyish-white spots, similar to those on the fore wing, but larger and more prominent ; the stripe in area 2 is sometimes yellow, and may be merged with the post-discal spot.

Underside black. Forewing with a well-defined broad greyish-white discal band ; other markings as on upperside, but more defined. Hind wing black ; a subbasal dark red band from costa to inner margin ; inner yellow area as on upperside, but darker : yellow stripes and spots as follows :

Fig. 129.—*D. aglaia aglaia* (Linn.), ♂, from Naga Hills.

one filling the distal half of cell, a broad stripe in areas 2 to 4, and three somewhat oval spots in 5, 6 and 7, and two or three small ones close to the upper distal edge of cell ; the spot in 7 is usually short and is rarely accompanied by a second proximal spot.

♀ *Upperside* brownish-black, with similar but more prominent and whiter markings than in the ♂. Fore wing with a grey-white discal band formed of a large distal cell-patch, a stripe in area 2, and another in 1 *b*, all separated by the veins. Hind wing with extended grey-white discal area and pale yellow inner area ; post-discal spots larger than in the ♂, with dusky distal edges which are not produced.

Underside as in the ♂.

Expanse : ♂, 68–84 mm. ; ♀, 69–92 mm.

Habitat.—Nepal to Assam and Burma, 2,000–7,000 feet ; not rare. Also in South-West China and Yunnan.

110 *b*. **Delias aglaia beata** Fruhst.

Delias aglaia beata, Fruhstorfer, 1905, p. 76 (Mergui Islands); id., 1910, p. 133; Talbot, 1937, p. 321.

Allied to *parthenope* (Wallace), from the Malay Peninsula, and also to *thyra* (Fruhst.), from Siam and Tong-king.

♂. *Upperside* very similar to *thyra*, with a variable discal band on both wings. The submarginal streaks are thinner and less developed than in *thyra*, especially at the apex of the fore wing and on the hind wing. Hind wing with more developed yellow area than in *parthenope*.

Underside of fore wing with discal band broader than in *thyra*.

♀. *Upperside* with the submarginal streaks less distinct than in *thyra*. Fore wing with a white discal band, sometimes clouded over, and much wider than in *thyra* or in *a. aglaia* (Linn.). Hind wing with broad white discal and inner area, reaching end of cell and basal part of area 2.

Underside of hind wing as in the ♂; fore wing with the band broader.

Expanse: ♂, 72–82 mm.; ♀, 74–84 mm.

Habitat.—Mergui Islands and Lower Tenasserim: not common.

Delias thysbe (Cramer).

This species is at once recognized by a large red basal area on the hind wing, extending to below the cell.

Scent-scale.—Similar to that of *aglaia* (Linn.), but shorter and narrower.

Genitalia (fig. 130).—Valve: very like that of *aglaia* forms, the dorsal edge more uniformly rounded. Uncus: resembles that of *aglaia*, but wider and with more prominent lobes.

Distribution.—South India; Simla to Burma, Yunnan, Siam, and Tong-king, to the Malay Peninsula. Four subspecies, including two in the Indian area.

111 *a*. **Delias thysbe pyramus** (Wallace). (Fig. 130 *a*, *b*, genitalia).

Thyca pyramus, Wallace, 1867, p. 347 (Nepal).

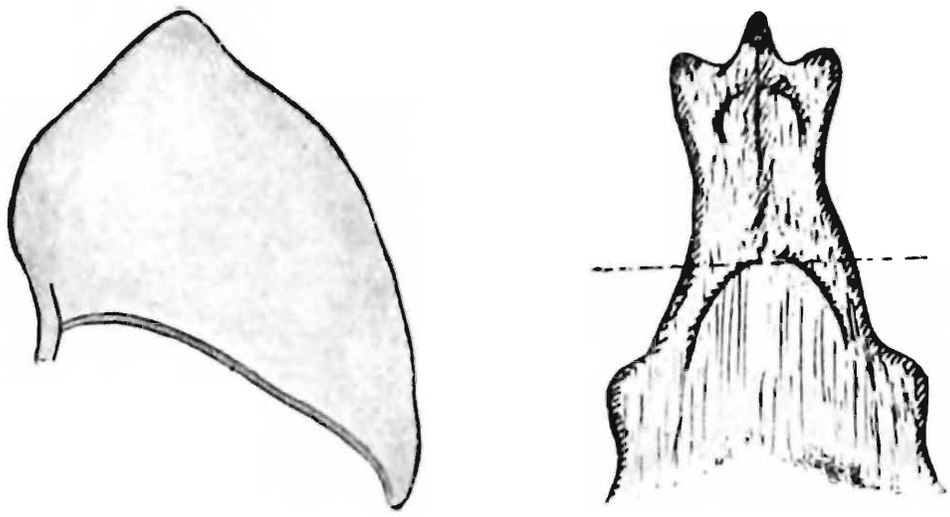
Delias thysbe pyramus, Fruhstorfer, 1910, p. 134, t. 56 *a*; Talbot, 1929 *a*, pl. iii, fig. 89, pl. vi, fig. 10 (genit.); Evans, 1932 *a*, p. 71; Talbot, 1937, p. 335, pl. xxviii, fig. 94 (scent-scale); Peile, 1937, p. 52.

Pieris thysbe, Gray (*non* Cramer), 1846, p. 8, pl. 6, fig. 1 (♂) (Nepal).

Delias thysbe, Moore (*non* Cramer), 1904, p. 171, pl. 532, figs. 1, 1 *a* (♂), 1 *b*, 1 *c* (♀); Bingham, 1907, p. 146, pl. xviii, fig. 117; Adamson, 1908, p. 117 (Burma).

♂. *Upperside* of fore wing with markings ashy-grey; four

subapical stripes in areas 4, 5, 6, and 8, their distal ends pointed and almost touching the margin; in area 3 a long broad stripe; in areas 2 and 1 *b*, a submarginal patch, the one in area 2 somewhat ovate, the one below it more square, and toothed on its proximal edge; a discal patch in the base of area 2, and a broad submedian stripe extending from the base to near the submarginal spot, are more bluish-grey; a bar in the end of the cell, anteriorly wider; two small spots in areas 4 and 5, placed against the cross-veins; usually an indistinct tornal spot on the inner margin. Hind wing with a large red basal area, its distal edge incurved in the cell. Distal dusky grey-white stripes well developed in areas 2 to 6, all more or less distally pointed, and proximally only divided by the veins; a short stripe in 7 almost touches the red proximal part of this area; a narrow bar across the end of the cell, adjacent to the stripe in area 4. Between



a *b*

Fig. 130.—*D. thysbe pyramus* (Wall.), genitalia (*a*, valve; *b*, uncus).

the inner edge of these stripes and the red area is a broad band of blackish-brown ground-colour; a yellow inner area, the stripe in 1 *c* bright yellow, as also often the distal part of 2, with sometimes a distal spot of the same colour in area 3; area 1 *b* usually tinged ochreous.

Underside of fore wing with discal patches on the whole larger. Hind wing with a larger cell-spot, which is buff-yellow and triangular; the black discal band of variable width. A broad red subbasal band from vein 8 to the inner margin; this band is darker than on upperside, sprinkled with black scales, and the veins crossing it more heavily black than on upperside. Distal stripes pale yellowish-buff, distal inner area brighter yellow, and the two stripes in areas 1 *b* and 1 *c* form a somewhat oblong bright yellow patch which reaches the margin.

♀. *Upperside* of fore wing resembles the ♂ in the colour and form of the distal markings and cell-bar, but the stripes are darker grey; discal patches larger than in the ♂, the two below the cell strongly marked. Hind wing with red basal area as in the ♂, showing a tendency to reduction posteriorly in and below the cell, especially in Burma specimens; distal stripes in areas 1*c* and 2 always bright yellow, usually also those in 3 and 4, which may be often dusted with black; the stripe in 5 also sometimes bright yellow, and a triangular spot in the end of the cell is also similarly coloured.

Underside as in the ♂. The yellow coloration, in museum specimens, tends to become deeper and more ochreous with age.

Expanse: ♂, 80–90 mm.; ♀, 84–98 mm.

Habitat.—NEPAL to BHUTAN, ASSAM, and BURMA; also in Western Yunnan and Western Siam. Not rare, and common in most places where found.

A male from the Khasi Hills, with white, instead of red and yellow, markings on both sides, is in the Tring Museum.

111 *b*. **Delias thysbe kandha** Doherty.

Delias kandha, Doherty, 1886 *b*, p. 262 (Madras); Moore, 1904, p. 173.

Delias thysbe kandha, Bingham, 1907, p. 146; Fruhstorfer, 1910, p. 134; Evans, 1932 *a*, p. 71; Talbot, 1937, p. 337.

♂♀. Pale markings larger than in *pyramus* (Wall.), with smaller and better defined black areas. *Upperside* of fore wing with the apical grey streaks obscurely tinged with ochreous. Hind wing with the inner area pale cream instead of yellow.

Underside of hind wing with discal markings and inner area almost uniform bright yellow, inclining to lemon; the basal ochre spot is much larger and more distinct than in *pyramus*.

Expanse: ♂♀, 98 mm.

Habitat.—SOUTH INDIA. The only known specimens are 4 ♂♂, 3 ♀♀, obtained by Doherty on the Potingi Pass, 3,000–5,000 feet, in the Eastern Ghats, in the Vizagapatam District of the Madras Presidency.

Delias descombesi (Boisduval).

This species is characterized by the possession of a red stripe in the basal part of area 7 of the hind wing underside. *Upperside* largely white, the ♀ with a black hind wing border bearing submarginal spots.

Underside of fore wing with white vein-streaks and subapical and submarginal spots. Hind wing largely yellow or orange, with a marginal black border.

Scent-scale (fig. 6 *d*, p. 14.)—Long and narrow, gently tapering, with a large disc.

Genitalia (fig. 131).—Valve with apical process prominent and slightly curved; cavity with a large flap. Uncus very broad, with short triangular middle lobe, the outer lobes being only rounded lateral expansions of the tegumen.

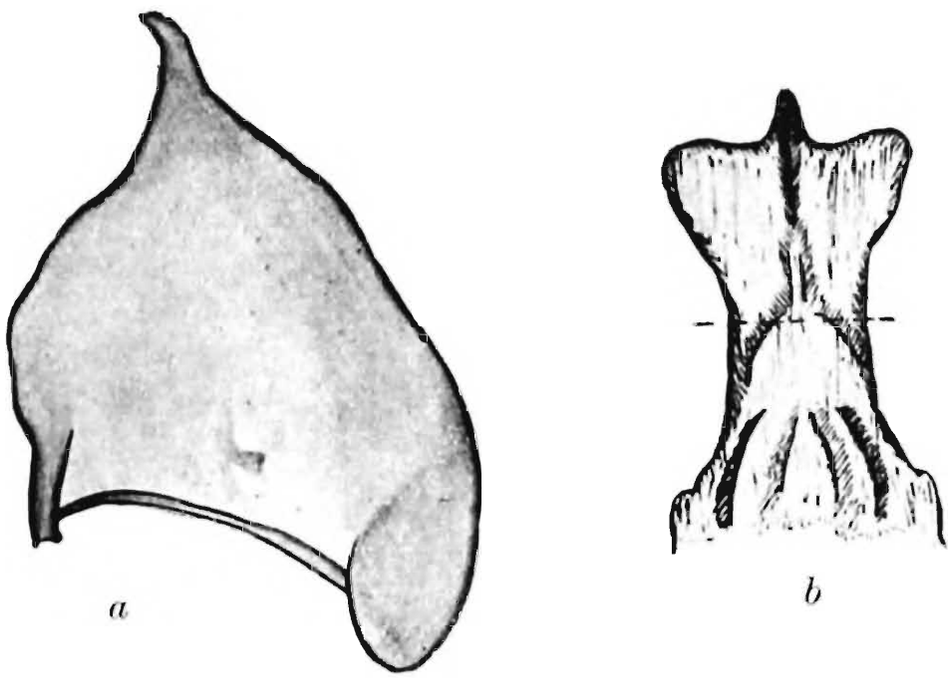


Fig. 131.—*D. descombesi descombesi* (Boisd.), genitalia (*a*, valve; *b*, uncus).

Distribution.—NEPAL to BURMA, south and east to Flores. Five subspecies, of which only the nominotypical form occurs in the Indian area.

112. **Delias descombesi descombesi** (Boisduval). (Fig. 131 *a*, *b*, genitalia).

Pieris descombesi, Boisduval, 1836, p. 465 (Cochin-China).
Delias descombesi, Moore, 1878 *a*, p. 839; Elwes, 1886, p. 433; id., 1888, p. 408; de Nicéville, 1883 *b*, p. 98; Manders, 1890, p. 532; Bingham, 1907, p. 144, pl. xvii, fig. 111; Adamson, 1908, p. 118 (Burma); Talbot, 1929 *a*, pl. iv, fig. 101, pl. vi, fig. 9 (genit.).
Piccarda descombesi, Moore, 1904, p. 183, pl. 536, figs. 1, 1 *a* (♂), 1 *b*, 1 c (♀).
Delias descombesi descombesi, Talbot, 1937, p. 377, pl. xiv, fig. 111 (genit.), pl. xxx, fig. 109 (scent-scale), pl. lxvii, figs. 1, 2 (gynandromorph).
Delias descombesi leucacantha, Fruhstorfer, 1910, p. 131, t. 52 *b* (Sikkim); Evans, 1932 *a*, p. 70, pl. vii, fig. B 6.11 (♂ underside).
Delias descombesi ♀ f. *leucogæa*, Fruhstorfer, 1910, p. 131; Talbot, 1937, p. 381.
Delias descombesi ♀ f. *auriga*, Fruhstorfer, 1910, p. 131; Talbot, 1937, p. 381.

♂ *Upperside* white. Fore wing with costa narrowly black, and a small black apical area which extends on the margin to

about vein 4, with usually some black scaling below this vein ; sometimes the apical area is for the greater part bluish-grey, owing to the encroachment of white scaling. Hind wing white, except for some thin black marginal dusting in most specimens.

Underside of fore wing with black ground-colour, the veins very thinly streaked with white ; a narrow discocellular white bar, three subapical white stripes, and four submarginal spots ; the subapical stripes distally narrower and lightly dusted with black ; the submarginal spots in areas 3 and 4 smaller than the others, and all less defined distally. Hind wing yolk-yellow ; a broad subcostal red stripe in area 7, extending from the base of the area to the middle of costa, rest of the area black ; area 5 black ; costa edged with yellowish-white, and its base yellowish-white ; an outer marginal black border which is deeply toothed on the veins ; six submarginal spots of variable size, either yellow or white, divided proximally only by the veins, and with sharply defined proximal edge ; below the cell, in the basal area, some dark scaling.

♀. *Upperside* of fore wing with black ground-colour ; veins 1*a* to 4 streaked with grey-white for their proximal two-thirds, as well as the upper and lower margins of the cell ; some slight grey-white dusting over the basal half of costa and cell and below the cell ; a sharply defined discocellular white bar which, on the lower vein, forms a rounded spot ; seven submarginal white spots, of which those in areas 2 and 3 are always the smaller, the others subject to variation ; the subapical spots in 5 and 6 each with a linear distal prolongation. Hind wing creamy- to yellowish-white, with a broad black marginal border which invades the light area between the veins as in the ♂ underside ; a series of yellowish or greyish-white marginal streaks on the intraneural folds.

Underside of fore wing as in the ♂ but darker. Hind wing paler than in the ♂, the veins streaked with white, which merges into the ground-colour ; marginal black border wider than in the ♂, with longer invaginations between the veins ; yellow area more or less dusted with black, and a black streak along lower margin of cell ; submarginal spots larger than in the ♂, and usually more distinctly separated from one another.

Expanse : ♂, 65–88 mm. ; ♀, 80–90 mm.

Variation.—The species is subject to much individual variation within small limits. There is a light form in both sexes and two forms of female. Very rarely the hind wing subcostal stripe is of a deep chestnut colour instead of red. In the ♀ the fore wing is sometimes without any vein-streaks, or these streaks are very large.

Form **leucacantha** Fruhst.—This is much the commoner form. *Underside* of fore wing with strongly developed white vein-streaks and submarginal spots; hind wing with the submarginal spots usually white.

♀ form **leucogæa** Fruhst.—*Upperside* of fore wing much darkened. Hind wing *underside* with white submarginal spots.

♀ form **auriga** Fruhst.—*Upperside* of fore wing much darkened, almost black, with the veins finely white. Hind wing orange-yellow, with yellow submarginal spots on the *underside*; the underside may be rich orange in some specimens.

A gynandromorph is recorded by Elwes (1888, p. 408) from Sikkim. This specimen is perfectly symmetrical, and the genitalia of both sexes are complete except for the absence of the right-hand valve. The insect is now in the British Museum. It is figured by Talbot (1937).

Habits.—" Common in Sikkim at low elevations, and up to 3,000 feet, from March to December. Fond of settling on the sweet-scented flowers of *Cinchona ledgeriana* Moeus (Rubiaceæ) in the lower plantations at Mongpo " (*Elwes*, 1888).

Habitat.—NEPAL to BURMA, 2,000–5,000 feet. Also in Siam, Annam, Saigon, and Cochin-China. Not rare.

Delias agostina (Hewitson).

Upperside white in the ♂; ♀ with fore wing black and hind wing pale to deep yellow.

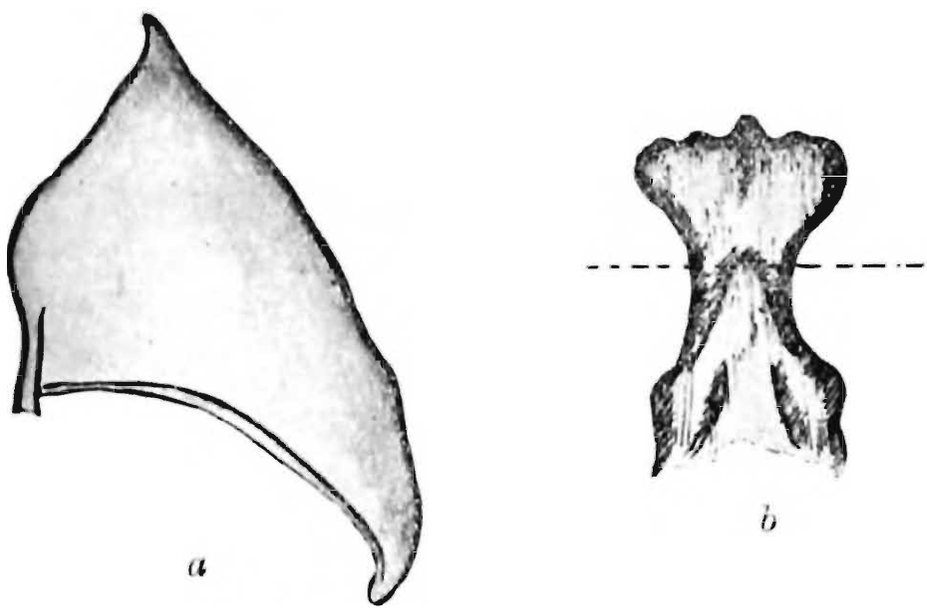


Fig. 132.—*D. agostina agostina* (Hew.), genitalia (*a*, valve; *b*, uncus).

Underside of fore wing in both sexes black-brown with white stripes, of the hind wing yellow.

Scent-scale (fig. 6 *e*, p. 15).—Flask-shaped, short and broad, and sharply tapering, with large disc.

Genitalia (fig. 132).—Valve with a short triangular apical process directed dorsad. Uncus very broad, middle lobe short and triangular, with blunt tip ; lateral expansion of the tegumen well rounded, bearing small side lobes.

Distribution.—NEPAL to BURMA, Siam, Annam, and the Malay Peninsula. Three subspecies, of which only the nomino-typical form occurs in the India area.

113. **Delias agostina agostina** (Hewitson). (Fig. 132 *a*, *b*, genitalia).

Pieris agostina, Hewitson, 1852–5, *Pieris* 1, pl. i, figs. 1, 2 (♂) Sikkim).
Thyca agostina, Wallace, 1867, p. 353 (♀).
Delias agostina, Elwes, 1888, p. 408 ; Watson, 1888, p. 25 ; id., 1891, p. 51 ; id., 1897 *a*, p. 668 ; Manders, 1890, p. 533 ; Swinhoe, 1893, p. 311 ; Bingham, 1907, p. 147, pl. xvii, fig. 112 ; Adamson, 1908, p. 117 (Burma) ; Evans, 1932 *a*, p. 69, pl. vii, fig. B 6.1 (♂ underside).
Piccarda agostina, Moore, 1904, p. 181, pl. 535, figs. 1, 1 *a* (♂), 1 *b*, 1 *c* (♀).
Delias agostina agostina, Fruhstorfer, 1910, p. 123, t. 54 *d* ; Talbot, 1929 *a*, pl. iv, fig. 111, pl. vi, fig. 11 (genit.) ; id., 1937, p. 433, pl. xiv, fig. 121 (genit.), pl. xxxi, fig. 12 *c* (scent-scale).
Pieris nesba, Lucas, 1852, p. 324 (♀).
Delias agostina infumata, Fruhstorfer, 1903 *a*, p. 174 (Tenasserim) ; id., 1910, p. 124, t. 54 *e*.
Delias agostina orita, Fruhstorfer, 1910, p. 183 (♀) (Tong-king).

♂. *Upperside* white. Fore wing with black apical area, which narrows to a point at veins 3 or 2, and bears a series of five small white submarginal spots ; the spots in areas 5 and 6 are larger than the others, and have each a distal dash ; costal border black. Hind wing without markings, rarely with black marginal marks on veins 2 to 4.

Underside of fore wing with ground-colour blackish-brown and white stripes between the veins ; all the stripes usually wider than the black area between them ; these stripes are on the inner margin and in areas 1*b* to 8, and in the cell ; black marginal border bearing white spots, more strongly marked than on upperside, and reaching vein 2. Hind wing pale to deep yellow ; a narrow black border which reaches veins 5 or 6, and bears four or five somewhat linear white spots, each of which has a small marginal projection on the fold ; costa edged thinly with white ; fringe of fore wing white ; of the hind wing white from costa to area 4, and posteriorly dusky.

♀. *Upperside* of fore wing blackish-brown ; cell and costa dusted with grey ; short, narrow post-cellular stripes which vary from dusky grey to grey-white ; some specimens are

very dark with slight grey powdering, and others show prominent grey-white stripes; a submarginal row of four to six rather small white spots, the apical ones more linear. Hind wing pale to deep yellow, inner area paler; veins more or less dusted with black, and vein 6 always heavily black; marginal black border of varying width, its edge crenulate; a submarginal row of five or six white dots, each connected to the margin by a short dash on the fold.

Underside as in the ♂. Fore wing with white stripes narrower, Hind wing with the veins usually whitened, whilst the marginal border is wider and the spots larger, the two or three anterior ones usually yellow.

Expanse: ♂♀, 64–78 mm.

Habitat.—NEPAL to LOWER BURMA (Dawna Range), 3,000–5,000 feet. Also in Siam and Tong-king. Not rare, and common in parts of Burma and in the Khasi Hills.

114. **Delias eucharis** (Drury). (Fig. 133 *a*, *b*, genitalia; Pl. III, figs. 1, larva, 2, pupa).

Papilio eucharis, Drury, 1773, pl. x, figs. 5, 6 (♂); Cramer, 1779, pp. 14, 16, pl. cci, figs. B, C (♂), pl. ccii, fig. C (♀).

Pieris eucharis, Horsfield & Moore, 1857, p. 80, pl. 1, figs. 1, 1 *a* (larva and pupa).

Delias eucharis, Moore, 1881 *a*, p. 140, pl. liv, figs. 1, 1 *a* (♂♀), 1 *b* (larva and pupa); Forsayeth, 1884, pp. 377, 385 (life-history); Davidson & Aitken, 1890 *a*, p. 358 (life-history); Davidson, Bell, & Aitken, 1897 *a*, p. 569; Mackinnon & de Nicéville, 1898, p. 586.

Piccarda eucharis, Moore, 1904, p. 175, pl. 534, figs. 1, 1 *a*–1 *d* (larva and pupa, ♂♀).

Delias eucharis, Bingham, 1907, p. 141, pl. xvii, fig. 109; Fruhstorfer, 1910, p. 124, t. 51 *a*; Manders, 1912, p. 153; Bell, 1912, p. 1149, pl. 1, fig. 17 (larva, pupa), pl. i, fig. 59 (♂), 59 *a* (♀) (life-history); Ghosh, 1914, p. 27, pl. iii, figs. 1–4 (egg, larva, pupa, imago); Talbot, 1929 *a*, pl. v, fig. 130, pl. vii, fig. 65 (genit.); Fraser, 1930, p. 260; Yates, 1931, p. 1006; Evans, 1932 *a*, p. 69, pl. vii, fig. B 6.3 (♂); Talbot, 1937, p. 497, pl. xvi, fig. 144 (genit.), pl. xxxiii, fig. 143, 144 (scent-scale), pl. liii, fig. 6 (pupa); Peile, 1937, p. 49, pl. i, fig. 7.

This species can be recognized by the hind wing beneath bearing a submarginal row of large brick-red spots. It is one of the best known species of the genus, and is an ornament among the butterflies inhabiting Ceylon and the plains of India.

♂. *Upperside* white. Fore wing with all the veins blackened; a submarginal black line, anteriorly placed mid-way between margin and end of cell, angled at vein 5, and reaching vein 2 or the submedian; this line marks off a submarginal row of seven white spots and a linear apical mark; the three anterior spots are elongate, the fourth, in area 4, is short and narrow, the fifth and sixth more triangular, and the posterior one is

square and large, not always clearly separated; these spots, excepting the lower one, are distally pointed or narrowed, and they touch or nearly touch the margin. Hind wing with a submarginal black line from vein 2 to vein 6, at veins 3 and 4 it is placed about mid-way between cell and margin; marginal area slightly pink from the colouring showing through from below; veins 1 *b* to 6 black from the submarginal line to the margin, and at the end of each is a small marginal black triangular spot, its base on the margin.

Underside of fore wing white, and all the veins heavily blackened; submarginal line as on upperside, but much heavier; submarginal spots as on upperside, either all white or with the subapical two and the linear apical mark yellow. Hind wing with a submarginal heavy black line from the costa to vein 1 *b*; area proximally of the submarginal line yellow, with the exception of area 5 which is usually white, and area 6 which is sometimes partly white; there is a thin white distal edging to the yellow proximal area, except where the veins cross it; all veins blackened; marginal area occupied by a row of six large brick-red spots each edged with a dusting of dull white, and in shape somewhat square or subtriangular, the pointed distal end touching the margin; a small anal spot in area 1 *b*; the spots are only separated by the thinly blackened veins, and the marginal area between the spots is black. Fringes dull white, anteriorly on the fore wing blackened slightly between the veins.

♀. *Upperside* with all the veins heavily blackened. Fore wing ground-colour greyish dusky white; submarginal line much heavier than in the ♂, the spots a little smaller, the subapical ones with a yellowish tinge. Hind wing with veins 2 to 8 heavily blackened, more so in the proximal area; proximal area pale buff; veins 1 *a* and 1 *b* thinly darkened; a prominent row of six submarginal spots, white, tinged with pink, of similar size and shape to those of the ♂ underside.

Underside resembles the ♂. Fore wing subapical spots yellow. Very dark specimens occur in which the light markings on the fore wing are much reduced. In some specimens the ground-colour of the fore wing is yellowish. Hind wing with veins slightly more blackened than in the ♂; proximal area with area 5 only white at its distal end, and area 6 usually yellow.

Expanse: ♂♀, 66–83 mm.

Scent-scale (fig. 6 *f*, *g*, p. 15).—Flask-shaped, very broad at the base, with a thick and scarcely tapering neck, which is furnished with fimbriæ for half, or nearly half, its length; the disc rather large.

Genitalia (fig. 133).—Valve broad, with rounded apical

edge, ventral edge slightly rounded, dorsal edge strongly excurved posteriorly. Uncus rather broad, with three small and well separated lobes ; middle lobe triangular, larger than the lateral ones, which are short, narrow, and rounded.

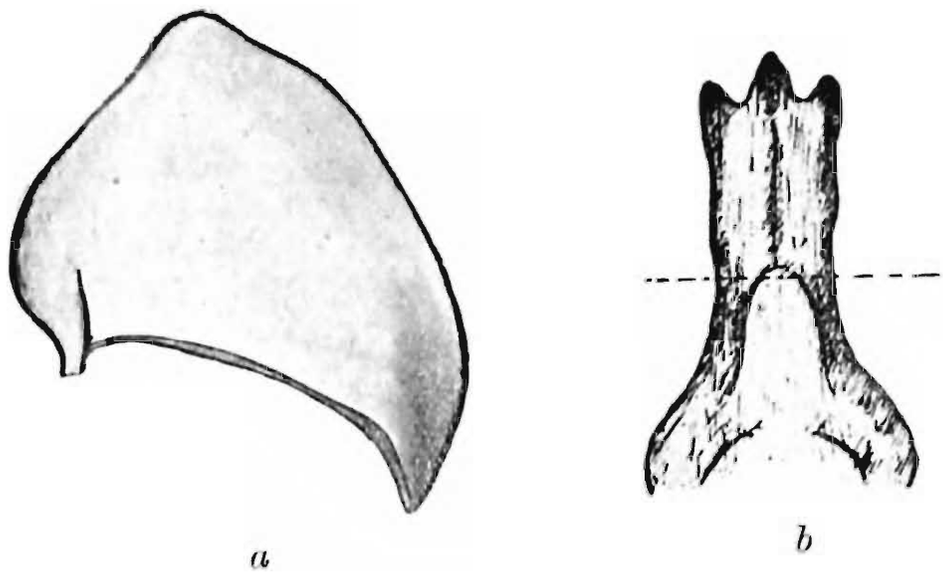


Fig. 133.—*D. eucharis* (Drury), genitalia (*a*, valve ; *b*, uncus).

Variation.—Much individual variation occurs on the underside (see Manders, 1912). The species has a restricted range, and so has not produced any subspecific form. A rare aberration occurs in which the hind wing spots are yellow instead of red.

Life-cycle.—According to Ghosh (1914), two periods were observed, as follows :—

Eggs, apparently freshly laid, collected .	8th March, 29th November.
Eggs hatched	11th–12thMarch,4thDecember.
Caterpillars pupated	1st April, 21st January.
Butterflies emerged .	19th April, 11th February.

Egg.—" The eggs are deposited usually on the upper surfaces of tender leaves of the mistletoe, one to several eggs being laid on the same leaf. Up to sixty-nine eggs have been found in a cluster on a single leaf. Even when thus deposited in a cluster, unlike most butterfly eggs, they are scattered irregularly. They stand vertically on the surface on one end, which is broad, or lie on one side. The egg is about 1½ mm. high and about 1 mm. in diameter at the base. It is round, flask-shaped, being narrow at the top, which, however, does not end in a point but is concave. There are longitudinal ribs on the surface. The upper ends of the ribs run beyond and project to some extent beyond the rim of the concavity. The colour is yellow " (*Ghosh*, 1914).

The larva and pupa have been fully described by Bell (1912 *a*), and the following is taken from his descriptions :—

Larva.—The larva, on emerging, eats the egg-shell, and then moves off, closely followed by the others, to the margin of the leaf, which is nearly always an old one, and never a very young one. They commence feeding side by side, finishing one leaf after another, until full-fed. They are always badly parasitized, generally by Diptera. They are sluggish in movement, and drop by a silk thread when disturbed, though not very readily. When about to pupate, each larva goes off by itself and attaches itself by the tail-pad and girdle to a horizontal or perpendicular surface.

Head round and somewhat flat, black, with a white line at the base of the jaws and mandibles ; antennæ white, black-tipped. The body is coloured a greasy, greenish-yellow brown ; second segment with anterior half white, and behind this a dorsal black patch ; a lateral white line on segments 2 and 3 ; head sparsely covered with white hairs ; segment 2 with six white hairs ; a subdorsal row of long, white, erect hairs ; a dorso-lateral and supraspiracular row of white hairs ; body covered with small white tubercles bearing each a small, erect white hair ; venter yellow. Length, 40 mm. ; breadth, 6 mm.

Pupa.—Head rounded in front, the vertex bearing two subdorsal, cylindrical, round-topped, short tubercles, one on each side ; a single central, short and spherical, very short-pedicelled tubercle, directed forward ; segment 2 highly carinate in dorsal line, and slightly convex ; thorax carinate in dorsal line, separated from segment 2 by a depression, short, with a broad and convex tubercle on the shoulder ; abdomen swollen at segment 7, which is the stoutest part of the body ; cremaster stout, triangular and down-curved ; a dorsal row of pointed, conical, rather large tubercles on segments 6 to 11 ; a subdorsal row of much smaller tubercles on segments 2 to 12, and a supraspiracular row on segments 3 to 9. The surface is smooth, shiny, and of a slightly greenish light yellow ; front tubercle of head, dorsal tubercles, and lateral tubercles on 6 to 9 shiny black ; abdomen patched laterally with black on segments 10 to 12 ; sides, underside, and base of cremaster are marked more or less with black, and there are black marks on the wing-cases and underside of head. Length, 25 mm. ; breadth, 7 mm.

Habits.—The larvæ feed on *Loranthus* growing on various trees, such as mango, sissoo (*Dalbergia sissoo* Roxb., Leguminosæ), gula (*Ficus glomerata* Roxb., Moraceæ), etc., and are very largely found about March. The butterfly has been bred upon *Loranthus longiflorus* Descr., *elasticus* Descr., and *scurrula*

Linn. The butterflies have been observed at Pusa and at Rangpur to visit mustard flowers in large numbers in November and December. They are weak fliers and flutter about, hardly ever flying straight. They rest with the wings closed over the back, are found on the wing in all weathers, and occasionally may be seen drinking at moist patches on roads and in river beds in the hot weather. The ♂ is said to have a strong scent, sometimes very strong, something like that of sweet briar.

Mimicry.—*D. eucharis* (Drury) is very closely resembled by *Prioneris sita* Feld. on both surfaces and in both sexes. The resemblance on the underside of the hind wing is very startling, and represents one of the best known examples. Both species were observed by Fraser (1931) at Lakati, flying together, the *Prioneris* in overwhelming superiority.

Habitat.—CEYLON and PENINSULAR INDIA as far as the lower slopes of the Himalayas. Abundant in Ceylon up to 4,000 feet, and elsewhere up to 7,000 feet.

Delias hyparete (Linnæus).

♂♀. *Upperside* white. Fore wing usually with a black apical area, and the veins black.

♀. *Underside* with the veins black. Hind wing with a submarginal band of red spots, the basal area with more or less extended yellow.

Scent-scale.—Resembles that of *D. eucharis* (Drury), but is sharply tapering, with a narrower and longer neck.

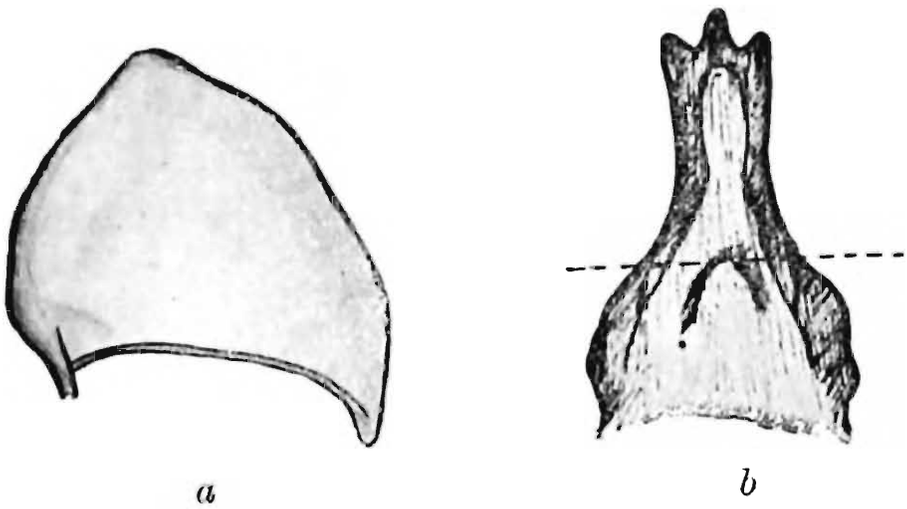


Fig. 134.—*D. hyparete indica* (Wall.), genitalia (*a*, valve; *b*, uncus).

Genitalia (fig. 134).—Valve as in *D. eucharis*, the dorsal edge more evenly rounded. Uncus very similar to that of *eucharis*, narrower, the lobes a little smaller.

Distribution. An Indo-Malayan species, which ranges

from the Philippines, Borneo, Java, and Sumatra to South China. It is very variable, and seventeen subspecies are to be distinguished, of which three are found in the Indian area.

115 *a*. **Delias hyparete ethire** Doherty.

Delias ethire, Doherty, 1886 *b*, p. 262 (♂♀) (Madras); Taylor, 1888, p. 15 (Orissa).
Piccarda ethire, Moore, 1904, p. 180.
Delias hierta ethire, Bingham, 1907, p. 143.
Delias hyparete ethire, Fruhstorfer, 1910, p. 125; Evans, 1932 *a*, p. 69; Talbot, 1937, p. 509.

♂. *Upperside* lighter than in *indica* Wall. Fore wing with the subapical band distinctly marked. Hind wing with some light grey marginal scaling.

Underside of hind wing with the red band narrower than is usual in *indica*. Fore wing with submarginal spots more prominent than is usual in *indica*.

♀. *Upperside* much lighter on both wings than most *indica*. Fore wing submarginal spots yellowish and more prominent than in the lighter specimens of *indica*. Ground-colour creamy-white on both wings.

Underside of fore wing with submarginal spots usually mostly yellow, with the veins more heavily darkened than in the ♂.

Habitat.—Peninsular India: Madras to Bengal. Rare, more frequent in the Madras Presidency, but recorded by Taylor (1888) as being very common at Khurda, in Orissa.

115 *b*. **Delias hyparete indica** (Wallace). (Fig. 134 *a*, *b*, genitalia).

Thyca indica, Wallace, 1867, p. 351 (♂♀) (Burma, Siam).
Delias hyparete hierte ab. *indica*, Fruhstorfer, 1910, p. 125.
Delias hyparete indica, Talbot, 1929 *a*, pl. v, figs. 131, 132 (genit.); id., 1937, p. 507.
Pieris hierte, Moore (*non* Hübner), 1865 *b*, p. 758.
Delias hierte, Watson, 1888, p. 25; id., 1891, p. 51; id., 1897 *a*, p. 668; Manders, 1890, p. 533; Swinhoe, 1893, p. 311.
Piccarda hierte, Moore, 1904, p. 178, pl. 532, figs. 2, 2 *a* (♂), 2 *b*, *c* (♀) (Nepal); id., l. c., pl. 533, figs. 1, 1 *a* (♂), 1 *b*, *c* (♀) (Burma); Adamson, 1908, p. 117 (Burma).
Delias hierta (sic), Bingham, 1907, p. 142, pl. xvii, fig. 110.
Delias hyparete hierte, Fruhstorfer, 1910, p. 125, t. 51 *a*; Evans, 1932 *a*, p. 69.
Thyca devaca, Moore, 1872, p. 566 (♀).
Delias hyparete ciris, Fruhstorfer, 1910, p. 125, t. 51 *b* (Siam).

♂. *Upperside* of fore wing with all the veins blackened; a black subapical area of varying extent, not reaching the cell; sometimes these are only dusted with black, the more or less distinct white or dusky spots in this area suppressing the distal black, though not effacing the inner edge, which always

remains as a heavy post-discal line. Hind wing rarely with slight marginal black, but the veins often blackened distally.

Underside of fore wing with the veins more heavily black; subapical spots clearer white and larger than on upperside, variable in size, the anterior three at least linear, and all distally pointed, with a prolongation to the margin. Hind wing with the yellow area of variable extent, usually extended beyond the cell and only reaching the red band posteriorly; all the veins, excepting 1 *a*, are blackened; submarginal band of six brick-red spots separated by the veins, the three posterior ones rather large, those in areas 2 and 3 with a proximal point; no proximal black edging to these spots; a distal black edging of from 1 to 2 mm. in width.

♀. *Upperside* usually rather darkened; with two exceptions all the veins of both wings heavily darkened; vein 1 *b* of hind wing thinly blackened, vein 1 *a* not blackened, and sometimes both not blackened at all. Fore wing more or less densely dusted with black, usually to a less degree over the cell and in areas 1 *b*, 2 and 3; submarginal spots dusky white as in the ♂, but more prominent on the darker ground. Hind wing with a black outer border of variable width, often much darkened over the distal area, but areas 1 *a*, *b*, and *c* and the cell always stone-white, this colour extending more or less beyond the cell, and some specimens are not darkened at all.

Underside of fore wing with heavier vein-stripes than in the ♂, the apical area more extended black, and the subapical spots white or yellow. Hind wing with the veins more heavily blackened and with more extended yellow than is usual in the ♂.

Expanse: ♂♀, 72–88 mm.

Variation.—The name *ciris* Fruhst. was founded upon Siamese specimens. The type of *indica* also came from Siam, and both refer to the darker form; all transitions occur to the very light form. Extreme light females are very rare, and may belong to the dry season. The name *devaca* Moore was based upon a ♀ in which the hind wing below had been skilfully painted.

Habitat.—KUMAON to BURMA, up to 6,000 feet; common; also in Siam, Tong-king, Annam, and Cochin-China.

115 *c*. **Delias hyparete metarete** Butler.

Delias metarete, Butler, 1879 *b*, p. 550 (Malacca); Distant, 1885, p. 292, pl. xxiv, figs. 13 (♂), 14 (♀); Moore, 1886, p. 49 (Mergui).

Piccarda metarete, Moore, 1904, p. 181, pl. 533, figs. 2, 2 *a* (♂), 2 *b*, *c* (♀).

Delias hyparete metarete, Fruhstorfer, 1910, p. 125; Corbet & Pendlebury, 1934, p. 95, pl. iii, fig. 24; Talbot, 1937, p. 510.

♂. *Upperside* of fore wing with black apical area reaching usually to end of cell ; no post-discal black line nor light subapical spots ; veins 1 *a*, 2, and 3 not so heavily blackened as in *indica*. Hind wing with a marginal narrow black edging and a diffuse dusky border.

Underside of fore wing with the apical area very little darkened ; a post-discal or subapical line always present, marking off the submarginal spots, which are usually lightly dusted with black. Hind wing yellow area restricted to area 8, base of 7, base or basal half of cell, and the inner area to veins 2 or 3 ; red spots in areas 1 *c* and 2 very large, those in 3 to 5 with a proximal black edging which is sometimes faintly continued to vein 2 or to 1 *b* ; spots in areas 4 to 6 much smaller than in *indica*, the spot in 6 not often present.

♀. *Upperside* as in *indica*. *Underside* of fore wing usually lighter, and with thinner vein-streaks than in *indica*. Hind wing as in the ♂, the yellow area slightly more extended.

Expanse : ♂♀, 64–84 mm.

Larva and pupa.—" The larva is yellow and hairy, and the pupa is yellow with shining black spots " (*Corbet & Pendlebury*, 1934).

Habits.—" The butterfly frequents open woods and is found occasionally in gardens, being seen on the wing even at dusk. Although it is most abundant on the plains, it is often quite common at elevations up to 4,000 feet " (*Corbet & Pendlebury*, 1934).

Habitat.—The MERGUI ISLANDS, south to Peninsular Siam, the Malay Peninsula, and Sumatra. The type-specimens came from Malacca. Common.

Genus **CEPORA** Billberg. (Fig. 135).

Cepora, Billberg, 1820, p. 76 ; Scudder, 1875, p. 138 (type, *coronis* Cram.) ; Talbot, 1931, p. 228 ; Klots, 1931, p. 203 ; Hemming, 1934 *a*, p. 125 (type, *coronis* Cram.).

Huphina, Moore, 1881 *a*, p. 136 (type, *coronis* Cram.) ; id., 1905 *a*, p. 206 ; Watson, 1894 *a*, pp. 494, 523, pl. i (seasonal forms) ; Bingham, 1907, p. 181 ; Fruhstorfer, 1910, p. 141 ; Evans, 1932 *a*, pp. 63, 72.

Type of the genus, *C. coronis* Cramer (=*nerissa* Fabr.).

♂♀. Fore wing : costa arched, more strongly so than in *Appias*, apex blunt ; outer margin straight ; tornus rounded ; inner margin straight, about three-fourths the length of the costa ; veins 10 and 11 from the cell ; 7+8 and 9 on a long stalk ; 6 from the stem of 7+8 and 9, at mid-way or less between the fork of these veins and end of cell ; *mdc* from a third to more than half the length of *ldc*.

Hind wing : short and broad ; costa arched ; apex broadly rounded ; outer margin slightly convex ; tornus strongly

curved, obtuse ; inner margin slightly convex ; cell elongate ; *dc* veins very oblique ; precostal spur fairly long, bent distad from near its base. Antennæ slender, less than half the length

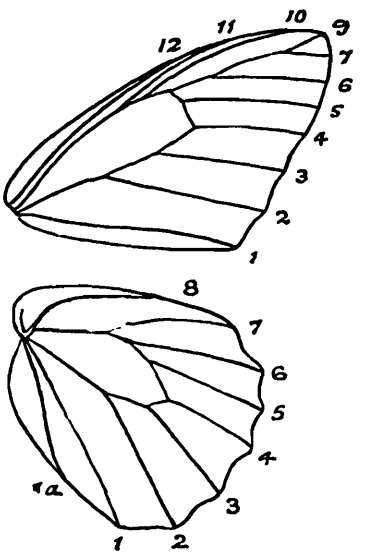


Fig. 135.—*Cepora*, venation.

of fore wing, club abrupt. Palpi with segments 1 and 2 fringed anteriorly with slender hairs ; segment 3 slender, acute, closely scaled.

Habits.—The larvæ feed on Capparidaceæ. The butterflies inhabit the lowlands, though a few ascend to 5,000 feet. They are fond of congregating in swarms at wet and moist places, and are mostly slow fliers. Many species exhibit marked seasonal dimorphism.

Distribution.—INDIA, CEYLON, BURMA, and ANDAMAN ISLANDS to Hainan, South China, and Formosa, south to the Pacific and Australia. Three species occur in the Indian area.

Key to Species.

1. Hind wing upperside broadly orange at the tornal angle	*lea* (Doubl.), p. 360.
Hind wing upperside without orange or yellow coloration	2.
2. Fore wing underside with a black spot in the middle of area 3, separated from the black border by a white spot	*nerissa* (Fabr.), p. 362.
Fore wing underside without a detached black spot in area 3	*nadina* (Luc.), p. 367.

Cepora lea (Doubleday).

♂♀. Recognized by the orange tornal area of hind wing. Fore wing white.

Distribution.—BURMA to Sumatra and Borneo. Only the nominotypical form occurs in the Indian area.

116. **Cepora lea lea** (Doubleday).

Pieris lea, Doubleday, 1864 *a*, p. 23 (Moulmein).
Huphina lea, Moore, 1886, p. 49 (Mergui); Elwes & de Nicéville, 1887, p. 432; Moore, 1905 *a*, p. 213, pl. 545, figs. 1, 1 *a*, 1 *b* (♂♀); Bingham, 1907, p. 182, pl. xvii, fig. 116 (♂); Adamson, 1908, p. 119 (Burma, near Rangoon); Evans, 1932 *a*, p. 72, pl. viii, fig. B 9.1.
Huphina lea lea, Fruhstorfer, 1910, p. 144, t. 64 *e*.
Huphina lea continentalis, Röber, 1927, p. 401 (Upper Burma).

♂. *Upperside* of fore wing white; the base, costal, subcostal and median veins slightly blackened; outer margin bordered with black, broad at the apex and narrowing to the tornus, the inner edge of this border diffuse and slightly produced along the veins. Hind wing with outer margin narrowly bordered with black; tornal area broadly bright orange, merging into canary-yellow along the inner area below the cell.

Underside of fore wing white; costal margin black; cell bordered with black; apical and outer marginal area brownish-black, broader than on upperside; two subapical spots bright yellow; two elongate white spots beyond end of cell and a small yellowish spot above them. Hind wing canary-yellow; outer margin broadly bordered with brownish-black; a large yellow apical spot in area 7; indistinct submarginal lunules in areas 2 and 3; a tornal orange area which narrows anteriorly to vein 3; veins 6, 7, and 8 blackened. Antennæ black. Hairs of the head greenish, of the thorax bluish-grey. Abdomen dusky greenish-white above, purer white below.

♀. Resembles the ♂, but with more extended black. *Upperside* of fore wing similar to the underside in the ♂; a submarginal white spot in area 1 and another in area 4; in area 2 the inner edge of the marginal black is deeply indented. Hind wing with extended area of canary-yellow, suffusing the whole of the cell.

Underside of both wings with three subapical yellow spots.

Expanse: ♂♀, 40–55 mm.

Dry-season form **continentalis** (Röber).—♂. *Upperside* of fore wing with narrower marginal black, the white stripes in areas 3 to 6 more extended. Hind wing with narrower marginal black.

Underside with the dark marginal borders, especially on the hind wing, more brownish and slightly narrower than in the wet form. Hind wing with veins 6 to 8 only slightly darkened.

♀. *Upperside* with extended white areas. Fore wing with costal area and median vein only slightly darkened, the post-cellular spots in areas 4 and 5 more prominent. Hind wing with the veins not at all darkened.

Underside as in the ♂.

Habitat.—Karen Hills to Southern Burma; common.

Cepora nerissa (Fabricius).

♂. *Upperside* white. Fore wing with outer marginal black border especially broad in the apical area; a black spot in the middle of area 2, separated from the black border by a white spot; costal border darkened for its proximal half. Hind wing with outer marginal border of variable extent, sometimes only represented by vein-marks.

♀. Black markings more extended on both sides, and the veins mostly darkened, especially the margin of the cell. Fore wing with a submarginal black spot in area 1 *b*. Hind wing with the outer border bearing submarginal white spots.

In the dry-season form the black markings are reduced in both sexes, especially on the hind wing.

Underside much paler.

Distribution.—CEYLON, INDIA, BURMA, and ANDAMAN ISLANDS, north to Formosa, south to Sumbawa. Four subspecies in the Indian area.

117 *a*. **Cepora nerissa phryne** (Fabricius). (Pl. II, figs. 7, larva, 8, pupa).

Papilio phryne, Fabricius, 1775.
Huphina phryne, Moore, 1881 *a*, p. 136, pl. 53, figs. 1, 1 *a*, 1 *b* (♂♀, larva, pupa); Watson, 1894, p. 494, pl. i, figs. 7–12 (♂♀); Davidson, Bell, & Aitken, 1897 *a*, p. 574; Bell, 1913, pp. 95–98, pl. i, fig. 61 (♂), 61 *a* (♀) (life-history); Ormiston, 1918, p. 143.
Huphina nerissa var. *phryne*, Bingham, 1907, p. 185.
Papilio evagete, Cramer, 1779, p. 47, pl. ccxxi, figs. F, G (Coromandel); Fabricius, 1793, p. 196 (=*phryne* Fabr.).
Huphina nerissa evagete, Fruhstorfer, 1910, p. 141, t. 64 *a*, *b*; Ormiston, 1924, p. 99; Yates, 1931, p. 1006; Evans, 1932 *a*, p. 72.
Cepora coronis evagete, Peile, 1937, p. 53, pl. vii, fig. 59 (♂).
Papilio zeuxippe, Stoll, 1781, p. 141, pl. 362, figs. E, F (♀) (Coromandel).
Huphina nerissa evagete dry form *zeuxippe*, Fruhstorfer, 1910, p. 141, t. 64 *a*, *b*.
Papilio cassida, Fabricius, 1798, p. 427; Swinhoe, 1885 *a*, p. 137.
Pieris hira, Moore, 1865 *a*, p. 490, pl. xxxi, fig. 17 (♂) (N.W. Himalayas).
Huphina hira, de Nicéville 1885 *a*, p. 50; Moore, 1905 *a*, p. 209, pl. 543, figs. 2 *c* (♂), 2 *d* (♀).
Huphina pallida, Swinhoe, 1885 *a*, p. 137 (Poona).

♂. A small race. *Upperside* of fore wing with apical black area bearing prominent white spots. Hind wing with marginal black border dentate on the inner edge.

Underside of hind wing with a prominent submarginal dusky black band, interrupted in area 5.

♀. *Upperside* with extensive blackish-brown markings. Fore wing usually with yellow subapical spots; cell heavily

bordered with blackish-brown, leaving only a white median streak ; veins all darkened, especially the submedian and vein 4. Hind wing with prominent submarginal white spots within the blackish-brown marginal border ; upper margin of cell blackened, the other veins less darkened than on the fore wing.

Dry-season form **zeuxippe** (Stoll), *hira* (Moore).—♂♀. *Upperside* with restricted black markings which are blackish-brown in the marginal area and greyish-black in the ♂ in the proximal area.

Extreme dry-season form **pallida** (Swinhoe).—♂♀. *Upperside* markings with a distinctly brown tinge, the veins not darkened in the ♂, the ♀ on fore wing with vein 4 and cell-margins only darkened. Hind wing white, with small marginal spots.

Underside of hind wing pale yellow, the veins only very slightly scaled with black.

Expanse : 40–55 mm.

Larva.—In the 1st and 2nd instars it is oily yellowish-green with a black head, and all the tubercles prominent and large in comparison with what they become later. 3rd instar dark green ; venter much lighter, grey-green. Surface of body transversely impressed, with seven fine parallel lines to each segment, each interval between every two lines having a single central row of minute white tubercles, each tubercle bearing a short white hair or bristle ; the main tubercles are but little larger than the others, and each bears a somewhat longer hair, which has often a globule of transparent clear liquid at its tip ; the whole surface is clothed with extremely minute, brown, erect hairs ; a fringe of rather long, fine, white, erect hairs all round the body on the subspiracular and lateral ventral areas. 5th instar nearly the same as the 4th. Dark bluish-green, the venter light greyish-green. Length, 27 mm. ; breadth, 4 mm. (from *Bell*, 1913).

Pupa.—Cremaster narrow, square at the extremity, very shortly bifid. Colour of body dark bluish- or grass-green ; wings greenish-white, as also the venter ; segment 2 and top of snout whity-brown ; thoracic carina similarly whity-brown, with a fine double black line along the summit, not continued anteriorly beyond the apex ; carina of segment 4 similar in colour, and with a similar black line ; flat portions of segments 6 and 7 whity-brown, the points of all teeth black ; a yellow, supraspiracular, abdominal line along the narrow ledge. Length, 20 mm. ; snout, 1·5 mm. ; breadth, 7 mm. at segment 7 (from *Bell*, 1913).

Habits.—The butterfly has been bred upon *Capparis aphylla* Roth., *C. sepiaria* Linn., *C. heyneana* Wall., and

C. horrida Linn. f. These food-plants are found in all sorts of country. The eggs are laid singly anywhere on the food-plant ; a favourite place is the top of a thorn. The caterpillar always lies in the centre of the upperside of a leaf. The pupa is formed on the upperside of a leaf, sometimes on the underside, or upon a vertical surface as that of a tree-trunk or stone, etc. The imago emerges in about ten days, and remains quiescent for several hours afterwards if left undisturbed. The flight is fast and fairly strong, in more or less of a straight line. Fond of the sun and frequents open spaces near vegetation, coming frequently to flowers, and resting on or near the ground (from *Bell*, 1913).

Peile (1937) notes that the butterfly is common in the plains, being found about garden hedges. It occurs at Mussooree in the October migrations, and in Kumaon it is common up to 4,000 feet, from June to October.

Habitat.—CEYLON and PENINSULAR INDIA to the NORTH-WEST PROVINCES and NEPAL. Common.

117 *b*. **Cepora nerissa nerissa** (Fabricius). (Fig. 136 *a*, ♀).

Papilio nerissa, Fabricius, 1775, p. 471 ; id., 1793, p. 192 (China).
Huphina nerissa, Doherty, 1886 *a*, p. 135 ; Mackinnon & de Nicéville, 1898, p. 590 ; Bingham (part.), 1907, p. 183, fig. 49 *a* (♀).
Papilio coronis, Cramer, 1775, p. 69, pl. xliv, figs. B, C (♀) (China).
Huphina coronis, Moore, 1905 *a*, p. 207, pl. 543, figs. 1, 1 *a* (♂), 1 *b* (♀), 1 *c*, *d* (♂), 1 *e* (♀) (wet form), 1 *f*, 1 *g* (♂), 1 *h* (♀, int. f.), 2, 2 *a* (♂), 2 *b* (♀) (dry form).
Pieris copia, Wallace, 1867, p. 340 (♂) (" Bengal ").
Huphina nerissa f. *copia*, Fruhstorfer, 1910, p. 141 ; Seitz, 1931, p. 172, fig. (gynandromorph).
Huphina nerissa phryne, Fruhstorfer (*non* Fabr.), 1910, p. 141, t. 64 *a*, *b* ; Evans, 1932 *a*, p. 72, pl. viii, fig. B 9.2 (♀).

A large race ; apical area of fore wing in ♂ usually without spots.

♂. *Upperside* white ; a greyish-blue shade at base of wings and along the veins, due to the dark markings showing through from the underside. Fore wing with veins black ; apical area broadly black, narrowing to the tornus. Hind wing with marginal black spots on the veins, of varying size and number, in the more extreme wet form forming a narrow black border.

Underside of fore wing white, tinged yellow over the costal and apical area ; the veins broadly margined on both sides by dusky black ; a black submarginal spot in areas 1 *b*, 2, and 5. Hind wing yellow, the veins diffusely bordered with black ; a heavy dusky submarginal slightly sagittate line from veins 2 to 6 ; a dusky costal spot in area 7, and a conspicuous chrome-yellow spot in the precostal area. Antennæ black,

obscurely speckled with white ; head and thorax bluish-grey; abdomen dusky black ; beneath, the palpi and abdomen white, thorax yellow.

♀. Similar to the ♀ of *phryne*, the black areas still more extended, the wings being brownish-black with white markings. Fore wing with the spot in area 1 *b* very large, and the proximal white stripe in this area is dusted with black. Hind wing with a submarginal series of greyish-white double spots ; a broad

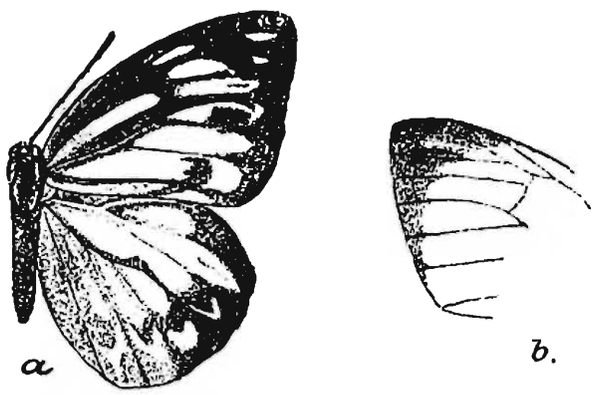


Fig. 136.—*a*, *C. nerissa nerissa* (Fabr.), ♀ ; *b*, *C. nerissa dapha* (Moore), fore wing upperside, distal half.

white cell-stripe, extended into areas 4 and 5 ; inner area suffused with yellow.

Underside similar to the ♂, the veins much more broadly margined with diffuse black scaling.

Dry-seasom form **copia** (Wall.).—*Upperside* with black areas much restricted, the veins scarcely darkened on the fore wing, and not at all on the hind wing. Fore wing with usually no spot in area 1 *b*. Hind wing with black markings restricted to about three small triangular marginal vein-spots.

Underside much paler yellow, somewhat ochraceous. Hind wing distal area yellowish-white, the submarginal line thin, interrupted in area 5.

♀. Creamy-white, with brownish-black markings of variable extent, and in the extreme form it much resembles the ♂.

Expanse : ♂♀, 50–65 mm.

Habitat.—SIKKIM to ASSAM ; common.

117 *c*. **Cepora nerissa dapha** (Moore). (Fig. 136 *b*, ♂ fore wing).

Appias dapha, Moore, 1878 *a*, p. 838 (Moulmein).
Huphina dapha, Elwes & de Nicéville, 1887, p. 432 ; Watson, 1894, p. 495, pl. i, figs. 1–6 (♂♀).
Huphina nerissa var. *dapha*, Bingham, 1907, p. 186.
Huphina nerissa dapha, Fruhstorfer, 1910, p. 141, t. 64 *a* ; Evans, 1932 *a*, p. 72.
Huphina copia, Adamson (*non* Wall.), 1908, p. 119 (Burma).

A small race in which the apical area of the fore wing

upperside is usually without spots, or these are indistinct. The name *dapha* applies to the dry-season form.

Wet-season form **depuncta**, nov.—♂. *Upperside* more resembles the dry form *copia* Wall. Fore wing with spot in area 1 *b* absent, and often also the one in 3 ; apical area with indistinct marks, often none ; veins only slightly darkened. Hind wing with narrow marginal black band, more or less dentate on its inner edge.

Underside of fore wing with basal two-thirds of costal area greenish-yellow. Hind wing with areas 7 and 8 and inner basal area below cell pale yellow to orange-yellow ; veins greyish-black, lightly dusted with greenish ; small indistinct submarginal spots.

♀. *Upperside* more resembles the wet form *phryne* (Fabr.), and white markings more extended than in Sikkim specimens. Hind wing as in the ♂, but the submarginal markings more prominent.

Underside as in the ♂, but markings more accentuated.

Types, ♂♀, from Burma, Bhamo district (British Museum).

Dry-season form **dapha** (Moore).—♂. *Upperside* with brownish-black markings. Fore wing without submarginal spots ; narrow outer dark border, produced on the veins. Hind wing unmarked, the inner area slightly yellowish.

Underside of fore wing with the apical area, and all the hind wing, pale greyish-brown, the vein-stripes a little darker than the ground-colour. Hind wing with an obscure submarginal line.

♀. *Upperside* with slightly more extended dark markings. Fore wing with prominent submarginal spot in area 3. Hind wing with small marginal vein-spots.

Underside of hind wing of a deeper brownish than in the ♂ ; a dusky indistinct submarginal band.

Expanse : ♂♀, 50–60 mm.

Habitat.—BURMA and ASSAM, extending to Siam and the Malay Peninsula. Occurs as a straggler on the Central Nicobars ; rare in Assam, but common elsewhere.

117 *d*. **Cepora nerissa lichenosa** (Moore).

Pieris lichenosa, Moore, 1877 *a*, p. 591.
Huphina lichenosa, Watson, 1894, p. 495 ; Moore, 1905 *a*, p. 212, pl. 544, figs. 2, 2 *a*, 2 *b* (♂♀).
Huphina nerissa lichenosa, Bingham, 1907, p. 187 ; Fruhstorfer, 1910, p. 142, t. 63 *a* ; Evans, 1932 *a*, p. 72.

A large and distinctive race.

♂. *Upperside* of fore wing with basal half of costal margin tinged with greenish-yellow and dusted sparsely with black ;

apical third of the wing obliquely from the costa to the tornal angle jet-black, the inner edge of this border irregular and more or less sinuous ; an obscure whitish submarginal spot on the black area in 3 ; vein 4 and *ldc* sometimes slightly darkened. Hind wing with outer margin anteriorly black, the distal ends of the veins in this area very finely black.

Underside of fore wing with costal margin very broadly and the apex suffused with greenish-yellow ; median vein on inner side broadly bordered with dusky black, continued along the basal half of vein 4, and then transversely downwards as a black band, diffuse below vein 3. Hind wing for the greater part moss-green, leaving only obscure elongate spots of the ground-colour apparent in the anterior areas ; the whole surface of the wing more or less closely dusted with black.

♀. Resembles the ♂, but is darker, owing to the broad dusky black border to the veins on both the upper and undersides.

Expanse : ♂♀, 55–65 mm.

Habitat.—ANDAMAN ISLANDS ; common.

Cepora nadina (Lucas).

This species is usually larger than most forms of *nerissa* Fabr., and can be distinguished from that species by the absence of a separated black spot in area 3 of the fore wing underside.

The larvæ feed on *Capparis* and are very similar to those of *nerissa*.

Distribution.—CEYLON and PENINSULAR INDIA to SIKKIM, BURMA and the ANDAMAN ISLANDS, extending to Hainan, Tong-king, and Siam, Annam, the Malay Peninsula, and Sumatra. Four subspecies in the Indian area.

118 *a*. **Cepora nadina cingala** (Moore).

Huphina cingala, Moore, 1905 *a*, p. 219, pl. 546, figs. 3, 3 *a*. 3 *b* (♂♀).

Huphina nadina cingala, Fruhstorfer, 1910, p. 142, t. 63 *b* : Evans, 1932 *a*, p. 72.

Huphina remba, Moore (*non* Moore, 1857), 1881 *a*, p. 137, figs. 2, 2 *a* (♂) ; Ormiston, 1917, p. 144 ; id., 1924, p. 99.

♂. Resembles *remba* (Moore). *Underside* of hind wing without a pale streak in or beyond the cell ; in the wet form with very dark green ground-colour and broad dark brown discal area.

♂. *Upperside* of hind wing with a whitish basal spot.

Expanse : ♂♀, 55–65 mm.

Habitat.—CEYLON, 2,000–4,000 feet ; rare.

118 *b*. **Cepora nadina remba** (Moore).

Pieris remba, Moore, 1857 *a*, p. 75 (♂, South India); Wallace, 1867, p. 340 (♀).
Huphina remba, Hampson, 1889, p. 363; Watson, 1894, p. 496; Davidson, Bell, & Aitken 1897 *a*, p. 575; Moore, 1905 *a*, p. 217, pl. 546, figs. 2, 2 *a* (♂), 2 *b* (♀); Bell, 1913, p. 98 (early stages).
Huphina nadina remba, Bingham, 1907, p. 190; Fruhstorfer, 1910, p. 142; Yates, 1931, p. 1006; Evans, 1932 *a*, p. 72, pl. viii, fig. B 9.3 (♂).
Huphina liquida, Swinhoe, 1890, p. 361.

Wet-season form **remba** (Moore).—♂♀. Resembles the wet form of *n. nadina*, from which it differs as follows :—

♂. *Upperside* of fore wing with distal half from middle of costa obliquely, to before the tornal angle, intense black, the base with a bluish shade. Hind wing with the distal area dusted with bluish-grey; outer margin anteriorly from apex to vein 4 decreasingly black.

Underside white. Fore wing with costal margin and apex broadly greenish-yellow; a large, prominent, bright yellow subapical spot, below which is a large black irregular patch, angulate at, and touching, the lower apex of cell. Hind wing greenish-yellow, the veins black; a discal band of dense black irroration, its inner edge sharply defined and extended from costa through the cell to vein 1; the lower discal and tornal areas less densely dusted with black; a bright, greenish-yellow, irregular spot in the middle of area 6. Antennæ dark brown, head and thorax anteriorly with greenish-yellow pile; thorax in median and posterior areas with long bluish-grey hairs; abdomen black; beneath, the palpi and thorax yellow; abdomen white.

♀. *Upperside* dark brownish-black. Fore wing with base of cell and upper basal half of area 1 white, densely dusted with black; apical half of cell, base of area 3, basal two-thirds of area 2, a submarginal large round spot in area 1, and a pretornal short stripe on inner margin, white. Hind wing with a more or less triangular central area white, its lower margin abruptly transverse, its base and posterior half dusted with black.

Underside similar to the ♂, but the distal dusky patch on fore wing larger and more prominent. Hind wing with more prominent dark irregular discal area.

Dry-season form **liquida** (Swinhoe).—♂. *Upperside* of fore wing with restricted black area. Hind wing with narrow outer black border.

Underside of fore wing with costal margin and apex broadly dull ochraceous with a yellow tint, this colour on the apex margined on its inner side by an irregular dusky, blackish,

subtriangular patch. Hind wing dull ochraceous with a yellow tint; an irregular dusky discal band that does not reach the costa nor inner margin.

♀. Darker than the ♂, the *upperside* with slightly extended black markings.

Underside marking paler and duller than in the ♂.

Early stages (from *Bell*, 1913) :—

Egg.—Spindle-shaped, with 12 longitudinal ridges, every two anastomosing before the apex and ending together in a single small tooth, the teeth forming a small ring round the top of the egg. Surface shiny, light yellow mottled with rosy red.

Larva.—Resembles *C. phryne* (Fabr.). The surface of body covered with small white tubercles, each bearing a short hair; a fringe of fine, rather long white hairs along the subspiracular and lateral ventral region. Length, 32 mm.; breadth, 4 mm.

Pupa.—Resembles that of *C. phyrne* (Fabr.). Green or brownish-green, the flat dorsal parts and the snout and vertex of head yellow or brown; thoracic carina tipped with brown and edged with a thin black line; teeth of abdomen white, tipped with black; ventrally the prominent edges and the somewhat bulging wings are light green. Length, 17·5–20 mm.; breadth, 7 mm. between the points of the teeth of segment 7

Habits (from *Bell*, 1913).—The eggs are laid on a thorn, a leaf, or anywhere on the plant, generally near the ground. The larvæ feed upon capers, as *Capparis heyneana* Wall., *C. moonii* Wight, *C. roxburghii* DC., and prefer shade. The butterfly is confined to the hills and regions of heavy rainfall. It is very active and somewhat devious in its line of flight, keeping a good deal to the thick underwood. It does not usually frequent flowers, and rarely rests on leaves in open places, so that it is not easy to catch. Found mostly in evergreen jungle, and does not rise to any great height above the ground.

Habitat.—PENINSULAR INDIA; rare.

118 *c*. **Cepora nadina nadina** (Lucas). (Fig. 137, ♂).

Pieris nadina, Lucas, 1852, p. 333 (♂♀, Khasi Hills).
Huphina nadina, Moore, 1905 *a*, p. 214, pl. 545, figs. 2, 2 *a*–2 *e* (♂♀); Bingham, 1907, p. 188; Adamson, 1908, p. 119 (Burma).
Huphina nadina nadina, Fruhstorfer, 1910, p. 142, t. 63 *b*; Evans, 1932 *a*, p. 72.
Pieris nama, Moore, 1857 *a*, p. 76 (♂♀, N. India); id., 1857 *b*, p. 102, pl. xliv, figs. 1, 2.
Huphina nama, Swinhoe, 1893, p. 309; Watson, 1894, p. 495, pl. ii, figs. 6, 7; Moore, 1905 *a*, p. 214, pl. 545, figs. 2, 2 *a* (♂), 2 *b* (♀).

Huphina nadina nadina f. *nama*, Fruhstorfer, 1910, p. 142.
Pieris amba, Wallace, 1867, p. 340 (♂, N. India).
Huphina amba, Swinhoe, 1893, p. 309; Moore, 1905 *a*, p. 214, pl. 545, figs. 2 *c*, *d* (♂ type), 2 *e* (♀).
Huphina nadina nadina dry form *amba*, Fruhstorfer, 1910, p. 142, t. 64 *a*.
Appias amboides, Moore, 1884, p. 31 (♂) (Silhet, Assam).

Wet-season form **nadina** (Lucas).—♂. *Upperside* white. Fore wing with basal half of costal margin suffused with greenish-yellow and sparsely dusted with black; apical area and outer margin black, the inner edge of this area arched and acutely produced inwards along the veins, the marginal black narrowed posteriorly. Hind wing with dark border showing through from below, accentuated by a slight black dusting.

Underside white. Fore wing with costal margin and apex very broadly suffused with greenish-yellow, and dusted more or less densely with black, with diffuse submarginal dusky patches in areas 3 and 4; a submarginal oblique short band,

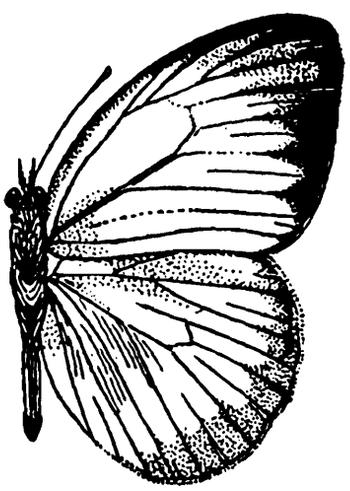


Fig. 137.—*C. nadina nadina* (Lucas), ♂ of wet form from Sikkim.

bright yellow, its margins ill-defined; in areas 1 to 3 the black marginal markings on the upperside show through as a greenish-blue shade. Hind wing suffused with greenish-yellow that leaves only a broad white streak in the cell, continued into areas 4 and 5; the whole surface of the wing more or less densely dusted with black, with a broad posterior obscure dark discal patch, and a broad outer border, between which the area is bright yellow; a spot of bright yellow also in area 6.

♀. *Upperside* of fore wing dark brownish-black with white markings; an oval, elongate, broad streak in the cell, continued into the base of area 4; broad streaks, outwardly ill-defined, from bases of areas 2 and 3; a large submarginal spot in area 1 and a pretornal short streak along inner margin;

sometimes the whole of the cell and the greater portion of the basal part of area 1 are white. Hind wing dark brownish-black fading to dusky brownish-white posteriorly ; the cell, basal half of area 4, and an elongate, broad, outwardly-pointed streak in area 5 white.

Underside similar to that of the ♂, but with extended black areas. Hind wing with the veins more strongly edged with black, and the discal dark patch more conspicuous than in the ♂.

Dry form **amba** (Wall.).—♂. *Upperside* with reduced black areas, the marginal black often not reaching vein 1. Hind wing with slight marginal black dusting.

Underside with the greenish-yellow suffusion of the wet form replaced by ochraceous-brown. Hind wing with the white markings of the wet form replaced by a paler ochraceous shade than on the rest of the wing ; veins broadly edged with black ; discal dark band usually obsolescent.

♀. *Upperside* resembles the wet form, but the ground-colour is paler and duller.

Underside with apical area of fore wing and all the hind wing grey or sandy yellow.

Habitat.—SIKKIM to BURMA ; not rare.

118 *d*. **Cepora nadina andamana** (Swinhoe).

Huphina nama var. *andamana*, Swinhoe, 1889, p. 398.
Huphina andamana, Moore, 1905 *a*, p. 217, pl. 546, figs. 1, 1 *a*, 1 *b* (♂♀).
Huphina nadina andamana, Bingham, 1907, p. 190 ; Fruhstorfer, 1910, p. 142 ; Evans, 1932 *a*, p. 72.

♂. Resembles the nominotypical wet form. *Upperside* of fore wing with more extended apical and marginal black. Hind wing with the white markings reduced to a large yellowish-white discocellular spot.

Underside of fore wing with more prominent black inner border to the greenish-yellow apical area.

♀. Somewhat resembles the ♂. Both wings with the basal area posteriorly dusky grey and dusted with black. Fore wing with extended black distal area, anteriorly reaching the upper angle of the cell. Hind wing with the anterior veins broadly edged with black distally, forming an irregular anterior black marginal band.

Underside of hind wing darker green than in the ♂, the post-discal band conspicuous.

There is no special dry-season form, but certain specimens taken in March and April have the black on the upperside of the fore wing much restricted.

Habitat.—ANDAMAN ISLANDS ; not rare.

Genus **PRIONERIS** Wallace. (Fig. 138, venation).

Prioneris, Wallace, 1867, p. 383 (*thestylis* Doubl.) ; Butler, 1870 *a*, p. 39, pl. i, fig. 1 (venation) (type, *thestylis* Doubl.) ; Moore, 1881 *a*, p. 140 ; id., 1904 *a*, p. 186 ; Bingham, 1907, p. 150, fig. 38 (venation) ; Frushtorfer, 1910, p. 135 ; Klots, 1932, p. 207 ; Evans, 1932 *a*, pp. 63, 71 ; Peile, 1937, p. 52.

Type of the genus, *P. thestylis* Doubleday.

♂♀. Fore wing with costa widely arched, strongly serrate in the ♂ ; apex produced, subacute ; outer margin oblique, slightly incurved towards tornus, which latter is rounded ; inner margin about two-thirds the length of costa ; cell slightly longer than half the length of wing ; veins 10 and 11 from the cell ; 7+8 and 9 on a long stalk ; 6 from the stem of 7+8 and 9 ; *mdc* very oblique, longer than *ldc*.

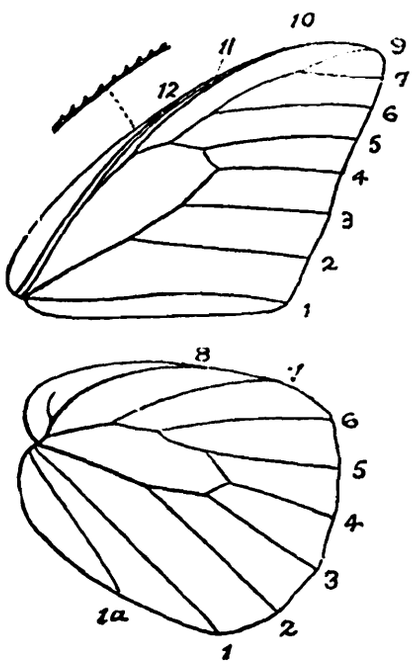


Fig. 138.—*Prioneris thestylis* (Doubl.), venation.

Hind wing more or less pyriform ; costa nearly straight from base to near apex, then strongly arched, the arch continued along outer margin to tornus ; tornus rounded, not well marked ; inner margin widely arched ; cell long, the area between it and the costa very broad ; *dc* veins very long, lower angle of cell acute ; precostal vein long, curved distad. Antennæ long, slender, slightly more than half length of fore wing, club gradual. Palpi anteriorly thickly fringed with long stiff hairs ; 3rd segment slender, nearly as long as the 2nd, slightly clavate, scaled. Head above with a tuft of long hairs ; eyes large, prominent, naked. Thorax and abdomen moderately stout.

Larva.—Blue-green, with lateral soft white hairs and blue tubercles, those on head and sides with black dots. Food-plant: *Capparis*.

Pupa.—Light green; head with sharp snout, dorsum carinate, with a yellow line, and with two strong lateral spines.

Distribution.—CEYLON, INDIA, and BURMA to Hainan and South China, south to Borneo, Java, and Sumatra. Eight species known, of which three occur in the Indian area. Some species are rare, others extremely common. They enter into mimetic association with *Delias*.

Key to Species.

1. Hind wing underside with a red basal patch	[p. 377 *clemanthe* (Doubl.),
Hind wing underside with no red basal patch	2.
2. Hind wing underside with a marginal series of red spots	*sita* (Feld.), p. 377.
Hind wing underside without a marginal series of red spots	*thestylis* (Doubl.), p. 373.

Prioneris thestylis (Doubleday).

This species resembles on both sides some forms of *Delias sanaca* (Moore) and *D. belladonna* (Fabr.). The markings are white and yellow with a black ground-colour, and the hind wing underside has no red markings.

♂. *Upperside* of fore wing white, with broad black apical area bearing white spots.

♀. Resembles the ♂, the fore wing darker, with small white post-cellular spots. In the wet-season form the ♀ is black with white spots, and more nearly resembles *Delias berinda* (Moore).

Distribution.—MUSSOOREE to BURMA, extending to Hainan, South China, and Formosa, and south to the Malay Peninsula. Only the nominotypical subspecies occurs in the Indian area.

119. **Prioneris thestylis thestylis** (Doubleday).

Pieris thestylis, Doubleday, 1842, p. 76 (N. India); id., 1847, p. 44, pl. vi, fig. 2 (♂).

Prioneris thestylis, Wallace, 1867, p. 384; Elwes, 1888, p. 410; Moore, 1904, p. 187, pl. 538, figs. 1, 1 *a* (♂), 1 *b*, *c*, *d*, *e* (♀), pl. 539, figs. 1, 1 *a* (♀); Bingham, 1907, p. 151, pl. xvii, fig. 113; Adamson, 1908, p. 118 (Burma); Evans, 1932 *a*, p. 71, pl. viii, fig. B 7.1 (♂); Klots, 1932, pl. xi, fig. 73 (genitalia); Peile, 1937, p. 52.

Prioneris thestylis thestylis, Fruhstorfer, 1910, p. 135, t. 57 *e*.

Pieris seta, Moore, 1857 *a*, p. 78 (N. India); id., 1857 *b*, p. 102, pl. xliv, fig. 3 (♀).

Prioneris thestylis f. *seta*, Fruhstorfer, 1910, p. 135.

Prioneris watsoni, Hewitson, 1868, p. 99 (♂♀, N. India); Butler, 1872, p. 28 (Silhet); Moore, 1878 *a*, p. 839; id., 1904, p. 189, pl. 539, figs. 2, 2 *a* (♂), 2 *b*, *c* (♀, type).

Prioneris thestylis f. *watsoni*, Fruhstorfer, 1910, p. 135, t. 57 *a*.

Prioneris thestylis jugurtha, Fruhstorfer, 1910, p. 135 (Siam).

Wet-season form.—♂. *Upperside* of fore wing with white proximal and distal black area, the veins on the former area blackened; costal and apical area to vein 4 black as far as the cell, and continuing broadly to the inner margin; apical area with three long white streaks, and a short one near the apex; submarginal spots in areas 2 to 4, and a tornal spot divided by the fold. Hind wing white, with the veins black on the distal two-thirds; a marginal black border in which submarginal spots are either not detached from the proximal area or are detached by extended black, as in the more extreme wet forms.

Underside much darker than the upperside. Fore wing with the apical stripes and the submarginal spot in area 5 yellow. Hind wing with blackish-brown ground-colour, and prominent yellow markings, some of which may be edged slightly with white; a basal costal patch with black precostal vein, a broad cell-stripe, seven discal spots in areas 2 to 7, the one in 2 elongate, the one in 5 placed near the cell; a small spot in 7, above the cell; seven submarginal spots, the posterior two sometimes absent, the ones in areas 5 and 6 larger than the others. Antennæ black; head and thorax clothed with long bluish-grey pile; abdomen blackish; underside of palpi, head, and thorax black, of abdomen white.

♀. *Upperside* deep brownish-black, with the following white markings, in addition to a broad sullied white area, distally suffused with yellow, which fills the basal three-fourths of areas 1 *a* and 1 *b* of the hind wing. Fore wing with a slender streak near base of cell, four spots at apex of cell as in the ♂ underside; two slender, somewhat curved streaks from near base of area 1, with a series of elongate discal spots in areas 2 to 6, and a submarginal series of elongate spots or short narrow streaks in areas 1 to 7, the streak in area 1 double; a short marginal streak before the tornus and a large subcostal spot produced outwards as an obscure slender streak in area 9. Hind wing with a broad cell-stripe, a discal series of somewhat oblong spots, and a submarginal series of smaller spots; a large median yellow area reaching to vein 3.

Underside markings as in the ♂, but all a little smaller. Hind wing with discal yellow area below vein 5 more prominent than in the ♂.

Expanse: ♂♀, 70–90 mm.

Dry-season form **watsoni** Hew.—♂. Smaller than the wet form, with black areas much restricted. Hind wing *upperside* white with a yellow tinge, and a thin black outer marginal line.

Underside of fore wing with the black area scarcely more extended than on the upperside. Hind wing black restricted

chiefly to a stripe filling the proximal half of area 1 *c*, the greater part of areas 7 and 8, and a narrower outer border; areas 2 to 6 white and occupied by yellow patches, area 6 with two spots, and the patches in areas 4 and 5 sometimes divided.

♀. *Upperside* of fore wing with more extended black than in the ♂. Hind wing more strongly yellowish; areas 1 *a* and 1 *b* yellow, with a large anal yellow patch reaching vein 3 and sometimes vein 4; a narrow black outer border, its edge crenulate.

Underside as in the ♂.

Form **seta** (Moore).—An extreme wet form. ♂ with extended black areas. ♀ very dark, with small spots on both sides, and hind wing *upperside* with also no extended yellow area.

The name **jugurtha** Fruhstorfer applies to specimens of the nominotypical form in which the submarginal spots on the *underside* are well developed.

The species is fond of open country and congregates at moist places; the ♀ visits flowers.

Habitat.—MUSSOOREE to BURMA, Hainan, and South China; not rare.

120. **Prioneris sita** (C. & R. Felder). (Fig. 139, ♂).

Pieris sita, C. & R. Felder, 1865, p. 161, pl. xxv, fig. 12 (♂).
Prioneris sita, Moore, 1881 *a*, p. 141, pl. 54, fig. 2 (♂); Davidson, Bell, & Aitken, 1897 *a*, p. 570; Moore, 1904, p. 190, pl. 536, figs. 2 (♂), 2 *a*, *b* (♀), *c* (pupa); Bingham, 1907, p. 154; Fruhstorfer, 1910, p. 136; Bell, 1912, p. 1151 (life-history); Ormiston, 1917, p. 127 (Ceylon); id., 1924, p. 82; Yates, 1931 *a*, p. 1006 (Coorg); id., 1932 *a*, p. 700, pl. (dry, interm., and wet forms of ♂); Fraser, 1930, p. 261 (*P. sita* and *D. eucharis*); Evans, 1932 *a*, p. 71, pl. viii, fig. B 7.2 (imago).

Dry-season form.—♂. *Upperside* white, with a slight glaucous or greenish tint. Fore wing with the veins margined narrowly with black; outer margin with a narrow, black, strongly dentate border. Hind wing with the veins margined narrowly with black on the distal third; a marginal black line.

Underside of fore wing white, costa black, apex suffused with yellow, all the veins from base broadly bordered with black that does not expand at the margin; an ill-defined, transverse, somewhat diffuse, post-discal black band from veins 1 to 7 Hind wing rich chrome-yellow up to a post-discal black band, beyond which the ground-colour is white with a series of large marginal vermilion-red rectangular or truncated cone-shaped spots; veins from base bordered somewhat narrowly but conspicuously with black. Antennæ brownish-black; head and thorax clothed with long bluish-grey hairs; abdomen glaucous-white; underside of palpi and thorax greyish-white, abdomen white.

♀. Similar to the ♂, the black edgings to the veins of both wings on both sides broader. *Upperside* with the veins of both wings black to the base ; both wings with a dusky black diffuse post-discal band.

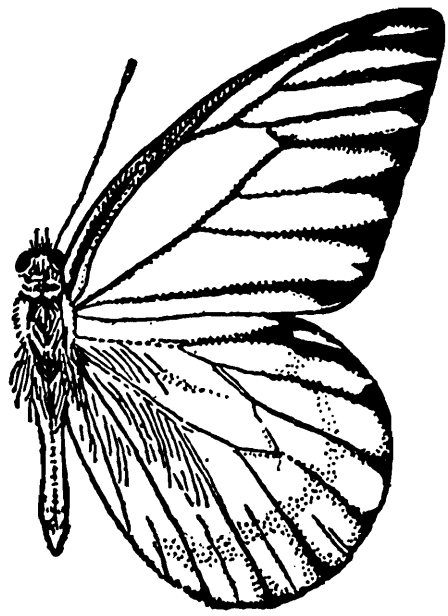


Fig. 139.—*P. sita* (Feld.), ♂, from Ceylon.

Underside of fore wing with the cell traversed by three slender longitudinal black lines ; the yellow and red markings brighter than in the ♂.

Expanse : ♂♀, 80–90 mm.

Wet-season form.—♂. Hind wing with a post-discal black heavy line ; veins more heavily black, with triangular marginal spots. Fore wing with the veins more heavily black, and *underside* markings more darkened than in the dry form.

♀. Black markings heavier than in the dry form. Fore wing *upperside* often with three black lines in the cell, as on the underside. Apex more rounded than in the ♂, and outer margin slightly falcate at vein 4.

Larva.—" Dull blue-green. Head and all the segments dotted with minute blue tubercles, those on the head and sides black-tipped ; dorsal surface pubescent ; a lateral fringe of soft white hairs below the spiracles " (*Bell*, 1912).

Habits.—According to Bell (1912), this species inhabits the big evergreen jungles of the Western Ghats in Bombay, and generally keeps to the very tops of large and tall trees. The butterfly appears at about 8 A.M. and disappears after 2 P.M. It comes to damp places on roads and in beds of rivers or streams in the hot days preceding the monsoon, and is fond of the sun. The female does not fly round the

tree-tops nor comes to damp places. Larva feeds on capers. In Malabar it appears only during September to October (*Fraser*, 1930 *a*). In the Ghats it appears at the end of December, becomes plentiful in March, and occurs up to May, also occurring lower down in Coorg (*Yates*).

Mimicry.—*Prioneris sita* bears an extraordinary likeness to *Delias eucharis* (Drury). The latter is much commoner as a rule, and flies all the year round. Fraser (1930 *a*) records that at Likati both species were in company, but the *Prioneris* in overwhelming superiority. Its flight is much more strong and swift than that of the *Delias*. It foregathers with *Catopsilia* and *Appias* on wet sand beside the river at Likati, where it is numerous in September.

Habitat.—CEYLON and PENINSULAR INDIA; not common, the ♀ always rare.

Prioneris clemanthe (Doubleday).

♂. *Upperside* white. Fore wing with the veins more heavily darkened in the anterior part of the wing. Hind wing with or without a narrow black border.

Underside of hind wing with a red basal spot; the greater part of the wing chrome-yellow, darker over the inner area.

♀. *Upperside* of fore wing dusted with black, the veins broadly blackened. Hind wing with an outer dark border of variable width, sometimes enclosing dusky submarginal spots.

Underside of hind wing yellow, with red basal spot and white or yellow marginal spots.

Distribution.—SIKKIM to BURMA, extending to Hainan and South China, and to the Malay Peninsula and Sumatra. Four subspecies, of which only the nominotypical one occurs in the Indian area.

121. **Prioneris clemanthe clemanthe** (Doubleday).

Pieris clemanthe, Doubleday, 1846 *a*, p. 23 (N. India).
Prioneris clemanthe, Wallace, 1867, p. 385 (♀); Elwes, 1888, p. 411; Moore, 1904, p. 191, pl. 537, figs. 1 1 *a–f* (♂♀); Bingham, 1907, p. 153; Adamson, 1908, p. 118 (Burma); Fruhstorfer, 1910, p. 136, t. 57 *b*, *d*; Evans, 1932 *a*, p. 71, pl. viii, fig. B 7.3 (♂).
Pieris helferi, C. & R. Felder, 1865, p. 161, t. xxv, figs. 10, 11 (imago, Moulmein).
Prioneris clemanthe helferi, Fruhstorfer, 1910, p. 137.

♂. *Upperside* white. Fore wing with the veins black, veins 1, 2, and 3 and the cell less darkened than the rest; narrow outer black border, deeply toothed at the veins; costal border and costal apical area dusted with black. Hind wing with the yellow ground-colour of the underside partially

invisible through transparency; veins less darkened than on fore wing; a marginal black line.

Underside of fore wing white, the veins broadly edged with black; small post-discal black spots on veins 3, 4, 5, 6, and 9. Hind wing yellow; base of area 8 vermilion-red; all the veins jet-black and prominent; a marginal white border from apex to tornus; a marginal black line, heavier posteriorly. Antennæ and head black, thorax clothed with long bluish-grey hairs, abdomen white; underside of palpi and thorax dusky black, abdomen white.

♀. *Upperside* of fore wing with the veins heavily blackened and the wing densely dusted with black, more lightly in the discal area. Hind wing with narrow marginal black border and a submarginal black line; veins darker than in the ♂.

Underside of fore wing similar to the ♂, but discal stripes and submarginal spots lighter. Hind wing paler yellow than in the ♂, the veins heavily black; a submarginal black line, accentuated on the veins; marginal paler yellow spots in areas 3 to 7, the two posterior ones tending to white; the margin black from vein 3 to the tornus or beyond. Antennæ black; head, thorax, and abdomen nearly black, much darker than in the ♂.

Expanse: ♂♀, 80–90 mm.

Form **helferi** (Feld.).—This is much darker. ♂ with hind wing *upperside* with a narrow black marginal border; fore wing *underside* with prominent post-discal bars. ♀ with hind wing *upperside* having a broad black outer border bearing dusky white submarginal spots. This is probably a wet-season form.

The butterfly is found in open country and on the edges of woods; it frequents flowers.

Habitat.—SIKKIM to BURMA; rare in Sikkim, more common in Assam, the ♀ rare; also extends to South China, Tong-king, and Siam.

Genus **ANAPHEIS** Hübner.

Anapheis, Hübner, 1819, p. 93; Moore, 1904, p. 158; Bingham, 1907, p. 155; Fruhstorfer, 1910, p. 137; Klots, 1932, p. 206 (=*Belenois* subgenus; type, *creona* Cramer); Hemming, 1934 *a*, p. 127 (type, *creona* Cram.); id., 1937, p. 151 (synonymy).

Glycestha, Billberg, 1820, p. 76; Scudder, 1875, p. 178 (type, *coronea* Cramer); Hemming, 1934 *a*, p. 127 (type, *coronea* Cram.=*java* Linn.); id., 1937, p. 151 (a synonym of *Anapheis* Hübn.).

Type of the genus, *A. creona* (Cram.).

♂♀. Fore wing with costa very slightly arched, nearly straight; apex slightly produced, but more or less obtuse;

outer margin slightly convex ; tornus obtuse ; inner margin sinuous ; cell about half length of wing ; veins 10 and 11 from the cell well basad, and 10 anastomosed with 11 as a general rule ; 7+8 and 9 on a long stalk ; 6 from the stem of 7+8 and 9 ; *mdc* and *ldc* oblique, the former as long as, or a little longer than, the latter, curved or straight. Hind wing pear-shaped ; cell slightly longer than half length of wing ; precostal vein fairly long, curved distad from the base. Antennæ about half length of wing, the club abrupt, broad and slightly flattened ; palpi robust, third segment usually slightly longer than the second ; eyes naked ; legs slender, scaled, without long hairs.

Distribution.—The whole of Africa, Palestine to Asia Minor, Arabia, Persia, INDIA (except Assam and Burma), NICOBAR ISLANDS, CEYLON, south to the Pacific and Australia. About eight species are known, but only one occurs in the Indian area.

Anapheis aurota (Fabricius).

This species is known under the familiar name of *mesentina* (Cramer).

♂♀. *Upperside* white. Fore wing with a prominent black discocellular spot ; a black apical area enclosing some white spots which are sometimes obsolete, but very prominent in the dry-season form. Hind wing with a black marginal border enclosing white spots.

Underside of hind wing yellow or yellowish-white, the veins black ; a white-spotted marginal border as on upperside.

Distribution.—CEYLON, INDIA (except Assam and Burma), NICOBAR ISLANDS to Palestine and Africa. Three subspecies, of which two are found in the Indian area.

122 *a*. **Anapheis aurota taprobana** (Moore).

Pieris taprobana, Moore, 1872, p. 565.
Belenois taprobana, Moore, 1881 *a*, p. 137, pl. liii, figs. 3, 3 *a*, 3 *b* (♂♀) ; Ormiston, 1917, p. 139 ; id., 1924, p. 95.
Anapheis taprobana, Moore, 1904, p. 162, pl. 527, figs. 2, 2 *a*–2 *c* (♂♀).
Anapheis mesentina taprobana, Bingham, 1907, p. 157 ; Fruhstorfer, 1910, p. 137, t. 63 *f*.
Belenois mesentina taprobana, Evans, 1932 *a*, p. 71.
Glycestha aurota taprobana, Peile, 1937, p. 53.
Belenois fervidior, Fruhstorfer, 1897, p. 326 (Ceylon).

♂. Differs from the nominotypical form as follows :— *Upperside* of fore wing with deep black apical area, the enclosed white elongate spots more or less obsolete. Hind wing with the black marginal border much broader, the

enclosed white spots, except the spot in area 6, very much smaller, somewhat obsolescent, sometimes absent in area 4.

Underside markings of a very intense black and broader, the fore wing with the apical spots, the white of the cell, and the anterior half of wing generally overlaid with rich chrome-yellow. Hind wing deep rich chrome-yellow, the submarginal spots subhastate ; the spot in area 4 absent.

♀. Resembles the ♂, but the apical spots of the fore wing and the submarginal spots of the hind wing are entirely absent.

Habitat.—CEYLON ; common.

122 *b*. **Anapheis aurota aurota** (Fabricius). (Fig. 140, ♂ ; Pl. II, figs. 5, larva, 6, pupa).

Papilio aurota, Fabricius, 1793, p. 197 (Coromandel).
Anapheis aurota, Hemming, 1932, p. 283.
Glycestha aurota aurota, Peile, 1937, p. 53, pl. vi, fig. 40 (♂).
Papilio mesentina, Cramer, 1780, p. 140, pl. cclxx, figs. A, B (Coromandel).
Pieris mesentina, Moore, 1857 *a*, p. 72, pl. xii, figs. 9, 9 *a* (larva, pupa) ; Verity, 1908, p. 128, pl. xxvi, figs. 25, 26 (♂), pl. xxvii fig. 33 (♂), pl. xxix, fig. 12 (♀).
Belenois mesentina, Davidson, Bell, & Aitken, 1897 *a*. p. 575 (early stages and habits, Kanara) ; Mackinnon & de Nicéville, 1898, p. 590 ; Evans, 1932 *b*, p. 199 (Baluchistan).
Anapheis mesentina, Moore, 1904, p. 158, pl. 527, fig. 1 (larva, pupa), 1 *a*, *b*, *c* (♂), 1 *d* (♀, dry-season form), 1 *e* (♂), 1 *f*, *g*, *h* (♀, wet-season form) ; Bingham, 1907, p. 155, fig. 39 (♂) ; Bell, 1912, p. 1153, pl. i, fig. 60 (♂), 60 *a* (♀) (early stages).
Anapheis mesentina mesentina, Fruhstorfer, 1910, p. 137 ; Hemming, 1932, p. 283 (=primary homonym=*aurota* Fabr.).
Belenois mesentina mesentina, Evans, 1932 *a*, p. 71.
Pieris lordaca, Walker, 1870, p. 48 (Harkeko, Red Sea).
Belenois lordaca, Butler, 1886 *a*, p. 375 (Western India) ; id., 1888 *a*, pp. 203–4 ; Yerbury, 1892 *a*, p. 216.
Anapheis mesentina f. *lordaca*, Fruhstorfer, 1910, p. 137.
Belenois auriginea, Butler, 1886 *a*, p. 374 (Campbellpore) (♀) ; id., 1888 *a*, pp. 203–4.

The nominotypical form is that of the wet season, of which *auriginea* Butler is a synonym. The dry-season form is *lordaca* Walker.

Wet-season form.—♂. *Upperside* white. Fore wing with costal area to base of vein 11 dusky black ; a prominent curved jet-black discocellular bar ; a broad black apical area, narrowing to vein 2, its edge anteriorly straight to vein 4, and excurved in area 2 ; six white spots in the apical area, of which the anterior four are elongate. Hind wing with a marginal black border from veins 2 to 6, bearing four round white spots in areas 2 to 5.

Underside of fore wing similar to the upperside, the markings more clearly defined and the apical spots larger. Hind wing yellowish-white, all the veins very broadly bordered with black; areas 1, 2, 6, and 7 with black cross-bars; marginal black border with white spots as on upperside. Fringes white, alternated with black.

The ground-colour on both sides is variable. Upperside often cream-colour; underside sometimes with the base of the cell and apical elongate spots on fore wing, and the whole surface of hind wing varying to rich chrome-yellow.

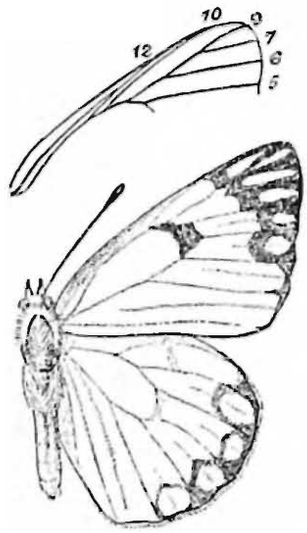


Fig. 140.—*A. aurota aurota* (Fabr.), ♂.

♀. Resembles the ♂, but the black markings broader, the white apical spots of fore wing often partly obsolete on *upperside*. Antennæ in both sexes black, sparsely dotted with white; head, thorax, and abdomen white; thorax above often bluish-grey.

Expanse: ♂♀, 40–55 mm.

Dry-season form **lordaca** (Walk.).—♂♀. Similar to the wet-season form, but on the *upperside* the black markings are narrower, the white markings on the apical area of fore wing broader and longer, and on the hind wing the white submarginal spots are larger and almost merge with the white ground-colour on the inner side.

Underside with the ground-colour almost pure white, on the hind wing slightly yellowish.

Early stages (from *Bell*, 1912):—

Egg.—At first white, turning later to orange.

Larva.—1st and 2nd instars oily yellowish-green, with each segment bearing a dorso-lateral hair which carries a globule

of liquid at its tip. 3rd instar green, with a broad supraspiracular purple-brown band. 4th instar greenish-ochreous, with a broad supraspiracular band mottled with white, the region below it white enamelled with green, brown, and yellow blotches; a dorsal double green line; anal segment with two yellow vitreous tubercles, one on each side of dorsal line; body surface oily-looking, with the usual subdorsal, dorso-lateral, and supraspiracular tubercles, which are yellow, vitreous, and conical, each bearing a short brown hair which may exude a globule of liquid from its tip; a subspiracular tubercle, bearing a longish white hair; also many minute tubercles, each bearing a short fine white hair; a subspiracular fringe of rather long fine white hairs. 5th instar resembles the 4th instar; the purple band only dotted with the little white tubercles; the region below the band mottled greenish-brown; the broad greenish-ochreous dorsal colour finishes square at the hind margin of segment 12 or nearly so. Length, 35 mm.; breadth, 4 mm.

Pupa.—Green, with a faint supraspiracular band; top of thoracic carina black behind, yellowish in front; end of snout yellow; the sides black, as also the shoulder-points and teeth of segment 7; tubercles all black; abdomen tinged yellow; wings marked with black; surface of abdomen pitted. Sometimes the colour of the pupa is greyish-bone, in which case the tubercles are bright yellow. Length, 23 mm.

Habits (from *Bell*, 1912).—The eggs are laid in clusters, up to 200 in a batch, on the young shoots or the undersides of young leaves. The larvæ eat their way out near the top as a rule, and as often as not do not eat the egg-shell; they herd together during the first stages, but separate in the last; they are much subject to attack by parasites.

Pupation often takes place in company, one close up against the other on a perpendicular surface, or horizontal, on the upperside or underside of a leaf or against a stone or tree-trunk indiscriminately. The females of a brood emerge before the males.

The butterfly is a fairly strong flier; it prefers open places and hot sunshine, and flies low, being fond of resting on the ground with wings closed and, in dull weather, with the fore wings drawn down between the hind wings.

Food-plants: Capers. Has been bred on *Capparis aphylla* Roth., *C. sepiaria* Linn., *C. heyneana* Wall., *Cadaba indica* Lam., and *Mærua arenaria* Hook. f. & Thoms.

Habitat.—All INDIA except Assam and Burma; common. A straggler is recorded from Great Nicobar. The subspecies also extends to Palestine and Africa.

Genus **APPIAS** Hübner. (Fig. 141, venation).

Appias, Hübner, 1819, p. 91 ; Butler, 1870 *a*, pp. 37, 49 (type, *zelmira* Cramer) ; id., 1898 *a*, p. 392 ; Moore, 1881 *a*, p. 134 ; id., 1905 *a*, p. 193 ; Watson, 1894, pp. 497, 523, pl. ii (seasonal forms) ; Röber, 1907, p. 51 ; Bingham, 1907, p. 197 ; Fruhstorfer, 1910, p. 148 ; Bell, 1912, p. 1136 ; id., 1913, p. 329 ; Klots, 1931, p. 256 ; id., 1932, pp. 208, 209 ; Dixey, 1932, pp. 62, 73 (plume-scales) ; Evans, 1932 *a*, pp. 64, 72 ; Hemming, 1934 *a*, p. 126 (type, *zelmira* Stoll).

Catophaga, Hübner, 1819, p. 93 ; Scudder, 1875, p. 136 (type, *paulina* Cramer) ; Butler, 1898 *a*, pp. 392, 458 ; Klots, 1932 ,pp. 208, 209 ; Hemming, 1934 *a*, p. 126 (type, *paulina* Cramer).

Hiposcritia, Geyer, 1832, p. 16 ; Moore, 1881 *a*, p. 133 (type, *pandione* Geyer) ; Butler, 1898 *a*, p. 392 ; Hemming, 1934 *a*, p. 126 (type, *pandione* Geyer).

Tachyris, Wallace, 1867, p. 361 ; Scudder, 1875, p. 274 (type, *nero* Fabr.) ; Butler, 1898 *a*, pp. 392, 458.

Lade, de Nicéville, 1898 *b*, p. 153 (type, *lalassis* Gr.-Sm.) ; Bingham, 1907, p. 216.

Type of the genus, *A. zelmira* Stoll (=*libythea* Fabr.).

♂♀. Fore wing with costa widely arched ; apex acute or subacute, slightly rounded or slightly falcate, always more

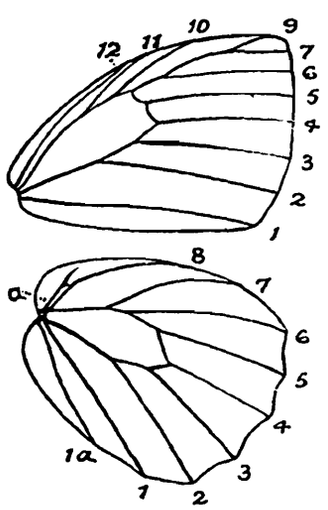


Fig. 141.—*Appias lyncida eleonora* (Boisd.), venation.

rounded in the ♀ than in the ♂ ; outer margin straight ; tornus well-marked ; inner margin straight or slightly sinuous ; cell always a little longer than half the length of the wing ; veins 10 and 11 from the cell, well basad ; 7+8 and 9 on a long stalk ; 6 from the stem of 7+8 and 9 ; *mdc* usually about half as long as *ldc*. Hind wing more or less broadly pear-shaped ; precostal vein long, curved distad from its base ; *ldc* longer than *udc* or *mdc*. Antennæ about half length of fore wing or a little longer ; club well marked and flattened, usually abrupt. Palpus with the third segment very slender and pointed, as long as or longer than the second. The ♂, and

sometimes the ♀, with two long hair-pencils arising from the intersegmental membrane distad of the eighth abdominal segment; these hair-pencils are absent in *lalassis* Gr.-Sm.

Habits.—They are fast fliers. The males congregate in large numbers at wet places. Migratory swarms have often been observed. The female is strongly dimorphic and is usually much rarer than the male.

Distribution.—The whole Indo-Australian region, extending to South, East, and West China and Africa. The Indian area contains ten species.

Key to Males.

1.	No abdominal hair-pencils	*lalassis* Gr.-Sm., p. 385.
	Abdominal hair-pencils present .	2.
2.	Upperside orange to crimson, veins more or less blackened .	*nero* (Fabr.), p. 410.
	Upperside never orange to crimson ..	3.
3.	Fore wing with *mdc* placed at right angles to upper edge of cell . .	4.
	Fore wing with *mdc* placed at an acute angle to upper edge of cell	7.
4.	Hind wing underside with a black dot at end of cell, and black marginal dots between the veins.	5.
	Hind wing underside without a black dot at end of cell, and no marginal dots between the veins..	6.
5.	Fore wing underside with a large black spot at end of cell	*lalage* (Doubl.), p. 387.
	Fore wing underside without a large black spot at end of cell, and no detached spot in area 3	*indra* (Moore), p. 390.
6.	Hind wing underside yellow, a broad dark chocolate marginal border	*lyncida* (Cram.), p. 396.
	Hind wing underside without a dark chocolate marginal border	*libythea* (Fabr.), p. 393.
7.	Fore wing upperside with marginal black produced inwardly in area 3.	9.
	Fore wing upperside with marginal black not produced inwardly in area 3 .	8.
8.	Fore wing with apex obtuse, outer margin incurved; underside usually with a post-discal black spot in area 3, apical black usually prominent on upperside. .	*paulina* (Cram.), p. 403.
	Fore wing with apex acute, outer margin straight; underside without a post-discal black spot in area 3, upperside apical black very narrow or absent	*albina* (Boisd.), p. 400.
9.	Fore wing underside with a prominent black spot in area 3	*leis* (Hübn.), p. 408.
	Fore wing underside without a black spot in area 3, except as part of a black post-discal band which is not always present.	*wardi* (Moore), p. 406.

Key to Females.

1.	Upperside orange to crimson; fore wing with black apical area bearing spots of ground-colour	*nero* (Fabr.), p. 410.
	Upperside black and white	2.
2.	Fore wing upperside without white spots in the black apical area; a prominent spot in the middle of area 3 conjoined with black apical area	*lalassis* Gr.-Sm., p. 385.
	Fore wing upperside with apical area bearing white spots	3.
3.	Hind wing underside with discal markings.	4.
	Hind wing underside without discal markings	6.
4.	Hind wing underside with a black or brownish discal stripe from vein 2 to veins 5 or 6, and a similar stripe along vein 7, weakly indicated in dry forms	*libythea* (Fabr.), p. 393.
	Hind wing underside with discal markings from vein 1 *a* to costa, no stripe along vein 7	5.
5.	Fore wing underside with a large black spot at end of cell, sometimes merged with a band crossing wing to base of cell	*lalage* (Doubl.), p. 387.
	Fore wing underside without a black spot at end of cell	*indra* (Moore), p. 390.
6.	Fore wing upperside largely darkened, with white stripes between the veins, sometimes a white cell-stripe	*lyncida* (Cram.), p. 396.
	Fore wing upperside largely white, with black outer and costal borders .. .	7.
7.	Hind wing upperside with the marginal black border dentate	8.
	Hind wing upperside with the marginal black border not dentate, irregular or straight.	*leis* (Hübn.), p. 408.
8.	Fore wing upperside with at least 4 subapical white spots in areas 3 to 6 ..	9.
	Fore wing upperside with not more than 3 subapical white spots in areas 4 to 6 (*A. p. galathea* excepted)	*paulina* (Cram.), p. 403.
9.	Fore wing upperside with edge of dark basal area slightly but distinctly incurved....	*albina* (Boisd.), p. 400.
	Fore wing upperside with edge of dark basal area distinctly straight	*wardi* (Moore), p. 406.

123. **Appias lalassis** Grose-Smith. (Fig. 142, ♂).

Appias lalassis, Grose-Smith, 1887 *b*, p. 265, ♂; Smith & Kirby, 1889, *Pierinæ*, pl. ii, figs. 1–3 (♂) (Burmah); Butler, 1898 *a*, p. 395; Fruhstorfer, 1910, p. 154, ♂; Evans, 1932 *a*, pp. 72, 73, ♂♀, pl. viii, fig. B 10.1 (♂).

Lade lalassis, de Nicéville, 1898 *b*, p. 153; Moore, 1905 *b*, p. 1, pl. 551, figs. 1, 1 *a*–1 *c* (♂); Bingham, 1907, p. 216, fig. 54 *a* (♂), *b* (anal segments); Adamson, 1908, p. 120 (♂, Toungoo-Sekkan).

Pieris indroides, Honrath, 1889, p. 403 (Perak).

Appias lalassis f. *indroides*, Fruhstorfer, 1910, p. 154.

This species possesses all the characteristics of the genus

with the exception of the abdominal hair-pencils, which are absent.

♂. *Upperside* very pale creamy-white. Fore wing with a black dot on *ldc*, apical area densely dusted with black; traces of a spot are sometimes found in area 3; *mdc* forms a right angle with upper edge of cell. Hind wing unmarked except for a trace of a black speck on the discocellulars.

Underside ground-colour similar to upperside. Fore wing with apical area faintly pink, more or less dusted with black; black spot on *ldc* more prominent than on upperside; a more or less conspicuous round black spot in the middle of area 3. Hind wing very faintly pink, more or less dusted with black; a distinct black discocellular dot, and similar marginal dots between the veins. Antennæ dark brown; head with

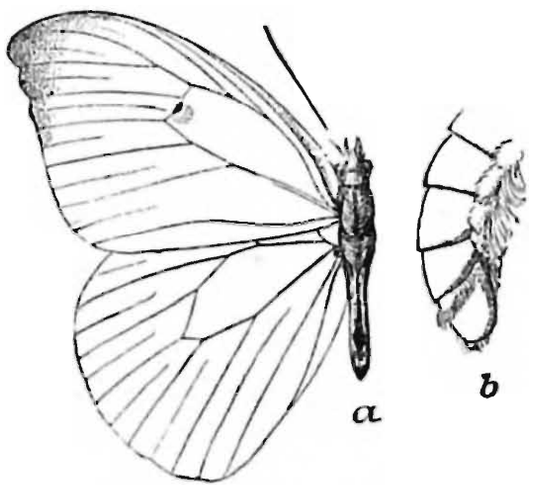


Fig. 142.—*A. lalassis* Gr.-Sm.
a, ♂; *b*, apical abdominal segments.

dusky black, thorax with bluish-grey hairs; abdomen black with white lateral scaling; underside of palpi, thorax, and abdomen white.

♀. Fore wing with strongly produced apex. *Upperside* of fore wing with a prominent spot in the middle of area 3 conjoined with the black apical area. Hind wing with black marginal spots.

Expanse: ♂♀, 65–75 mm.

Form **indroides** (Honr.).—Fore wing with more extended black dusting.

Underside of hind wing yellowish, with reddish-brown dusting.

Habitat.—SOUTHERN SHAN STATES to SOUTHERN BURMA; rare. Also found in the Malay Peninsula and Siam.

Appias lalage (Doubleday).

♂. *Upperside* of fore wing with broad black apical area bearing two or three white spots ; a black discocellular spot, usually large ; a large black spot in the middle of area 3, separated from the marginal black by a white spot ; *mdc* forms a right angle with upper edge of cell.

Underside of fore wing with a large black discocellular spot, and a spot in area 3 as on upperside. Hind wing with dark transverse markings ; a minute black spot on *ldc*, and marginal black dots between the veins.

♀. The black markings on both wings more extended. Fore wing with the discocellular spot joined to the black apical area by a band which usually extends to the base of the cell.

Distribution.—UNITED PROVINCES, Mussooree, to SOUTHERN BURMA, Tong-king and Hainan, the Malay Peninsula, and Siam. Two subspecies, at least, are found in the Indian area.

124 *a*. **Appias lalage lalage** (Doubleday). (Fig. 143 *a*, ♂).

Pieris lalage, Doubleday, 1842, p. 76 (♀, N. India) ; id. and Westwood & Hewitson, 1847, pl. vi, fig. 5.
Tachyris lalage, Elwes, 1888, p. 419.
Appias lalage, Mackinnon & de Nicéville, 1898, p. 591.
Hyposcritia lalage, Moore, 1905 *a*, p. 222, pl. 547, figs. 1, 1 *a*–1 *f* (♂♀), pl. 548, figs. 1, 1 *a*–1 *e* (♂♀) ; Adamson, 1908, p. 119 (Burma).
Appias lalage, Bingham, 1907, pp. 208, 209, fig. 53 *a*.
Appias lalage lalage, Fruhstorfer, 1910, p. 153, t. 59 *b* ; Evans, 1932 *a*, p. 73, pl. viii, fig. B 10.2 (♀) ; Peile, 1937, p. 54, pl. vii, fig. 58 (♀).
Pieris durvasa, Moore, 1857 *a*, p. 73 ; id., 1857 *b*, p. 103, pl. xliv, fig. 6.
Appias lalage durvasa, Fruhstorfer, 1910, p. 153, t. 59 *b*.
Catophaga pseudolalage, Moore, 1879 *a*, p. 142 (Sikkim).
Appias lalage durvasa f. *pseudolalage*, Fruhstorfer, 1910, p. 153, t. 59 *a*.
Hiposcritia argyridina, Butler, 1885, p. 340 (Manipur).
Appias lalage argyridina, Fruhstorfer, 1910, p. 153.
Appias lalage durvasa ab. *confluens*, Fruhstorfer, 1910, p. 153.

Wet-season form.—♂. *Upperside* white. Fore wing with base and basal half of costa densely dusted with black, the latter tinged with yellow ; a large black spot on the *ldc*, usually separated from a black spot in area 3, the latter spot usually merged with the marginal black, cutting off a white submarginal spot in 3 ; apical third black, bearing two or three white subapical spots ; marginal black reaching vein 2. Hind wing with an irregular, somewhat macular outer black border which becomes diffuse inwardly and on the tornus ; cilia yellow.

Underside of fore wing white, with black discocellular spot as on upperside, base of costa yellowish-green; a heavy post-discal black band which curves from the costal margin to below vein 2, and is widened beyond the apex of the cell; a black spot and a white submarginal spot in area 3 as on upperside; apical area greenish-yellow to ochraceous. Hind wing uniform ochraceous-yellow, the veins brighter yellow; dusky transverse narrow bands, more or less distinct, irregular and complete, or broken up.

♀. *Upperside* with black markings more extended than in the ♂. Fore wing apical black reaching into the cell and usually extended as a stripe to the base of the cell; marginal black very broad, extending obliquely to the inner margin, sometimes narrowly to the base; a small white tornal spot in addition to the other spots as in the ♂; anterior subapical spot usually yellow. Hind wing with basal two-thirds white, tinged with yellow chiefly around the base; outer third dusky black that broadens considerably posteriorly to the inner

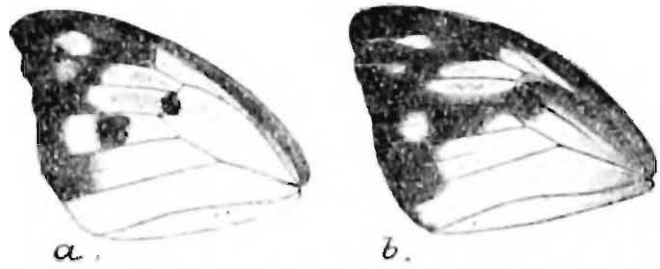


Fig. 143.—*a*, *A. lalage lalage* (Doubl.), ♂, upperside of fore wing; *b*, *A. lalage lagela* Moore, ♂, upperside of fore wing.

margin, and anteriorly encloses in area 6, sometimes also in 7, an irregular white spot.

Underside of fore wing with extreme base and lower basal half of cell yellowish-green, rest of cell black, and other black and white areas much as on upperside; apical area as in the ♂. Hind wing ochraceous-yellow to purplish-white, with heavier submarginal band than in the ♂, and other markings more distinct. Antennæ in both sexes black, spotted sparsely with white; head and thorax with tufted greenish-yellow hairs, abdomen fuscous; underside of head, thorax, and abdomen yellowish-white.

Dry-season form **argyridina** (Butler).—♂. *Upperside* similar to the wet-season form, but the black markings smaller and more restricted; the bases of both wings with a strong silvery gloss, only weakly shown in the wet form. Fore wing with the spot in area 3 usually free.

Underside with similarly restricted black markings; apex of fore wing and the whole area of the hind wing with the

ochraceous-yellow of a duller tint than in the wet-season form.

♀. *Upperside* very similar to the ♂ of the wet-season form.

Underside black markings similar to those in the ♂ of the wet season. Fore wing with upper half of cell yellowish-green, the apex lilacine-brown, dusted with black. Hind wing uniform lilacine-brown densely dusted with black, with a tendency to the formation of a broad transverse patch across the middle area of the wing. Some specimens have the fore wing tinged with yellow, and a basal yellow tinge on the hind wing.

Expanse : ♂♀, 55–80 mm.

Form **pseudolalage** (Moore).—The black markings are still further reduced, the discocellular spot is very small, and the hind wing is without black markings on the upperside.

♂ form **confluens** Fruhst.—The black discocellular spot on the fore wing is united with the marginal black.

The name *durvasa* Moore applies to the wet form and is therefore a synonym of the nominotypical form.

Habitat.—UNITED PROVINCES, Mussooree, to BURMA, Tavoy ; not rare.

124 *b*. **Appias lalage lagela** (Moore). (Fig. 143 *b*, ♂).

Catophaga lagela, Moore, 1878 *a*, p. 838, pl. 52, fig. 4 (♀, Tenasserim).

Hyposcritia lagela, Moore, 1905 *a*, p. 225, pl. 548, figs. 2, 2 *a*–2 *c* (♂♀) ; Adamson, 1908, p. 119 (Upper Tenasserim).

Appias lalage lagela, Bingham, 1907, pp. 208, 209, fig. 53 *b* (♂) ; Fruhstorfer, 1910, p. 153 ; Evans, 1932 *a*, p. 73 ; Peile, 1937, p. 55.

♂. *Upperside* of fore wing with a dark band as in the ♀ of the nominotypical form. Hind wing with black marginal border continuous, not macular but inwardly diffuse.

Underside of fore wing with the cell anteriorly shaded with dusky black ; apical area yellow.

♀. Similar to the nominotypical ♀ of the wet season. *Upperside* of fore wing with marginal black not continued along inner margin ; the connecting bar between the marginal black and the black in the cell is narrowed by a triangular emargination of its lower edge at the base of area 3.

Underside of fore wing with black marginal area not reaching the tornus, and the black area in cell is separated from the marginal black by the basal third of area 3, which is entirely white ; apical area pearly-white tinged with purple. Hind wing as in the nominotypical form.

Habitat.—MERGUI ARCHIPELAGO to SOUTHERN BURMA ; rare. Also found in the Malay Peninsula and Siam.

Appias indra (Moore).

♂. *Upperside* of fore wing with broad black apical area, produced inwards in area 3 ; marginal black reaching vein 2 ; two to five white spots in the black area ; no detached black spot in area 3 ; *mdc* forms a right angle with upper edge of cell. Hind wing with or without a narrow marginal black border.

Underside of fore wing without a discocellular black spot, and no spot in area 3 ; apical ochraceous area bordered with brownish-black. Hind wing with variable ground-colour and more or less distinct transverse bands which are complete or interrupted ; a minute black discocellular spot, and similar marginal spots between the veins.

♀. Black markings more extensive, especially on the hind wing. Fore wing upperside with two white subapical spots.

Distribution.—CEYLON, INDIA, and BURMA to Hainan, South China, and Formosa, south to the Malay Peninsula and Lombok, Borneo, and Palawan. Three subspecies are found in the Indian area.

125 *a*. **Appias indra narendra** Moore. (Fig. 144 *b*, ♂).

Appias narendra, Moore, 1877 *b*, p. 48 (♂, Ceylon); id., 1881 *a*, p. 134, pl. 51, figs. 4, 4 *a*, 4 *b* (♂♀).
Hyposcritia narendra, Moore, 1905 *a*, p. 228, pl. 550, figs. 1, 1 *a*–1 *i* (♂♀); Butler, 1898 *a*, p. 393.
Appias indra narendra, Bingham, 1907, pp. 206, 207, fig. 52 *b* ; Fruhstorfer, 1910, p. 153 ; Ormiston, 1924, p. 96 ; Evans, 1932 *a*, p. 73, pl. viii, fig. B 10.3 (♂).

Wet-season form.—♂. *Upperside* of fore wing with two white subapical spots in the broad black apical area. Hind wing with narrow outer marginal black border.

Underside of fore wing with the black subapical band as wide as the pale apical area.

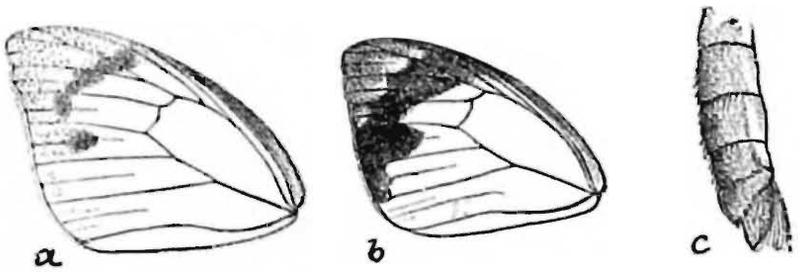


Fig. 144.—*a*, *A. indra indra* (Moore), underside of fore wing, ♂ ; *b*, *A. indra narendra* Moore, underside of fore wing, ♂ ; *c*, abdomen of *Appias*, showing anal brush.

♀. *Upperside* of hind wing black, with the base of area 4 white.

Underside of hind wing more densely dusted with black than in the nominotypical race.

Dry-season form.—The difference between the seasonal forms is less marked than in the nominotypical race.

♂. *Upperside* of hind wing with the outer margin bordered with black, though often narrowly.

Underside as in the nominotypical race, but the shade of brown on the apex of fore wing and over the hind wing is darker, the dusting of black scales more dense, the black post-discal band on fore wing broader.

♀. *Upperside* differs from the wet-season form only in the width of the marginal black on the hind wing, which is about half as wide as in wet-season specimens.

Expanse : 60–70 mm.

Habitat.—CEYLON, 2,000–4,000 feet; rare.

125 *b*. **Appias indra shiva** (Swinhoe).

Hyposcritia shiva, Swinhoe, 1885 *a*, p. 138, pl. ix, figs. 1, 2 ; Moore, 1886, p. 49 ; Butler, 1898 *a*, p. 393.
Appias indra shiva, Fruhstorfer, 1910, p. 152, t. 59 *d* ; Yates, 1930, p. 833 ; id., 1931, p. 1006 (Coorg) ; Evans, 1932 *a*, p. 73.
Appias indra statilia, Fruhstorfer, 1910, p. 153, t. 59 *d* (as *narendra*) (Nilgiris and Travancore).

♂♀. Smaller than *narendra* Moore.

Upperside of fore wing with narrower apical black ; apex more pointed than in *narendra*. Hind wing without a black marginal border in the ♂.

Underside of hind wing paler greyish-brown than in *narendra*.

Specimens with broader black apical area, resembling *narendra*, are form **statilia** Fruhst.

Habitat.—PENINSULAR INDIA ; not frequent.

According to Yates (1930 *a*) it is abundant in Coorg in some seasons.

125 *c*. **Appias indra indra** (Moore). (Fig. 144 *a*, ♂).

Pieris indra, Moore, 1857 *a*, p. 74 (N. India) ; id., 1857 *b*, p. 103, pl. xliv, fig. 5 (♀).
Tachyris indra, Wallace, 1867, p. 381 (♂) ; Elwes, 1888, p. 419.
Hyposcritia indra, Wood-Mason & de Nicéville, 1887, p. 372 ; Butler, 1898 *a*, p. 392 ; Moore, 1905 *a*, p. 226, pl. 549, figs. 1, 1 *a*–1 *h* (♂♀); Adamson, 1908, p. 119 (♂, Burma).
Appias indra, Bingham, 1907, p. 205, fig. 52 *a*.
Appias indra indra, Fruhstorfer, 1910, p. 152, t. 59 *a* ; Evans, 1932 *a*, p. 73.
Appias mahana, Moore, 1877 *b*, p. 48 (Darjeeling).
Appias indra indra f. *mahana*, Fruhstorfer, 1910, p. 152, t. 59 *a*.
Hyposcritia imbecilis, Moore, 1884, p. 46 (Silhet).
Tachyris indigis, Weymer, 1887, p. 11, pl. i, fig. 3 (N. India).

Wet-season form.—♂. *Upperside* white. Fore wing with the base and basal half of costa thickly dusted with black ;

a minute black discocellular spot; apical and marginal area to costal half and vein 2 broadly black, the inner edge of this area produced inwards in area 3; three subapical white spots. Hind wing white, with a discocellular black dot.

Underside of fore wing white; costa at base pea-green; a post-discal broad oblique black stripe that reaches the outer margin and extends to vein 2; apical area yellowish, obscurely dusted with black. Hind wing pale yellow, with very obscure post-discal white patches; the whole wing dusted sparsely with black; discocellular black spot more or less conspicuous.

♀. *Upperside* white. Fore wing with basal area densely dusted with black. Apical and marginal black area very broad, anteriorly reaching nearly to the cell, posteriorly extending in a broad stripe along the inner margin to the base, in area 2 narrower owing to a projection of the ground-colour; two subapical white spots. Hind wing dusky black, merging in the basal half to diffuse dusky grey; two or more small anterior submarginal white spots.

Underside similar to that of the ♂. Fore wing with the basal yellowish-green more extended; post-discal black band much broader and produced inwards along the inner margin for a short distance; apical area greenish-yellow, with an obscure series of pearly-white patches between it and the black band; a similar short tornal streak. Hind wing differs from that of the ♂ in the deeper yellow ground-colour, which, however, is similarly dusted with black and marked with black bars; a conspicuous submarginal series of pearly-white patches.

An intermediate form of the ♀ is common in which the black areas on both wings are much restricted; on the hind wing it is reduced to a marginal border which spreads diffusely inwards and obscurely encloses a submarginal series of white diamond-shaped spots.

Antennæ in both sexes black, chequered with white; head and thorax with bluish-grey hairs; abdomen black with sparse white scaling; underside of head, thorax, and abdomen white.

Dry-season form **mahana** Moore.—♂. *Upperside* with the black areas much restricted.

Underside of fore wing with post-discal black band very short, often diffuse and obscure; apical area of fore wing and the entire hind wing light earth-brown, more or less densely dusted with black, on the hind wing the black dusting forming ill-defined zigzag markings.

♀. *Upperside* similar to that of the ♂, the black on the fore wing of somewhat greater extent; hind wing with outer margin obscurely dusted with black.

Underside similar to that of the ♂, the post-discal black band on fore wing broader.

Antennæ in both sexes dark brown ; head with ochraceous-brown, thorax with bluish-grey hairs, abdomen blackish ; underside of head, thorax, and abdomen white.

Habitat.—NEPAL to BURMA ; ♂ not rare, ♀ scarce. Also extends to Hainan and South China, the Malay Peninsula, and Cochin-China.

Appias libythea (Fabricius).

♂. A character given by Evans (1932 *a*) will be found very useful for separating the ♂ from similar-looking specimens of *albina* and *paulina* ; *mdc* of fore wing is placed at right angles to upper edge of cell. Fore wing with the apex produced ; outer margin never crenulate ; apical area with the veins black.

Underside of fore wing with the veins in the apical and outer marginal areas black. Hind wing veins more or less darkened ; no black discocellular dot ; a brownish-black transverse stripe from vein 2 to veins 5 or 6, and a similar stripe along vein 7.

♀. Black markings extended. Fore wing with a black stripe almost filling the cell and joined to the distal black by a narrow stripe along vein 4.

Early stages (from *Bell*, 1913) :—

Egg.—Shaped like a short-necked bottle, and with ten longitudinal ribs ; a narrow ring of five teeth at the top. Pearl-white when first laid, becoming orange later.

Larva.—Body covered with minute, short, erect hairs ; the main tubercles represented by small white spots each bearing a slightly longer fine hair ; some longer, fine, whitish hairs along the dorso-ventral line beneath the spiracles. The body is rather light yellowish-green, and, with the exception of the head and venter, is closely blotched with light purplish spots. Length, 30 mm. ; breadth, 4 mm.

Pupa.—Light green, often with a brownish shade ; a lateral abdominal row of black spots, and a subdorsal row of yellow ones. Head retracted under segment 2, and with snout of moderate length ; segment 2 with a small lateral rounded knob. Length, 18 mm. ; breadth, 6 mm. at shoulders.

Habits (from *Bell*, 1913) :—The eggs are laid singly, nearly always on a young shoot or on the upper surface of a leaf. The larva eats the egg-shell and rests along the midrib of the leaf. It is much parasitized. It feeds on Capparidaceæ, e. g., *Cratæva religiosa* Forst. f., *Capparis separia* Linn. Pupation takes place on a leaf or branch of the food-plant. The growth is rapid, sometimes not more than twenty days

elapsing from the laying of the egg to the emergence of the imago.

The butterfly has a strong, quick, and fairly straight flight. It comes sparingly to flowers, and generally rests on a leaf at some distance from the ground. The males sometimes come to wet places in numbers, the females hardly ever. Although a typical butterfly of the plains, it is by no means confined to open country. The females vary much with the season, and the darker ones are more common in the hot weather.

Distribution.—CEYLON, INDIA, BURMA, NICOBAR ISLANDS, extending to Hainan, the Malay Peninsula, and North Philippines. Two subspecies, including the nominotypical one, are found in the Indian area.

126 *a*. **Appias libythea libythea** (Fabricius). (Fig. 145 *a*, *b*).

Papilio libythea, Fabricius, 1775, p. 471 (Ceylon); Donovan, 1800, pl. xxiii, fig. 3.
Appias libythea, Moore, 1881 *a*, p. 134, pl. 52, figs. 3, 3 *a* (♂♀); Davidson & Aitken, 1890, p. 358; Davidson, Bell, & Aitken, 1897 *a*, p. 573; Watson, 1890 *a*, p. 268; id., 1894, pp. 497–8; Mackinnon & de Nicéville, 1898 *b*, p. 591; Moore, 1905 *a*, p. 203, pl. 542, figs. 2, 2 *a*, 2 *b*, 3, 3 *a*, 3 *b* (♂♀); Bingham, 1907, p. 200; Bell, 1913, p. 331; Ormiston, 1924, p. 97; Yates, 1930 (*b*), p. 834 (♀ variation); id., 1931, p. 1006.
Appias libythea libythea, Fruhstorfer, 1910, p. 148, t. 58 *a*; Evans, 1932 *a*, p. 73; Peile, 1937, p. 55.
Papilio zelmira, Stoll, 1780, p. 64, pl. cccxx, figs. C, D (♀, ndia).
Appias zelmira, Swinhoe, 1893, p. 309; Watson, 1894, p. 497, pl. ii, figs. 1–5; Moore, 1905 *a*, p. 200, pl. 542, figs. 1, 1 *a* (♂), 1 *b*, *c* (♀).
Appias libythea zelmira, Bingham, 1907, p. 201.
Appias libythea f. *zelmira*, Fruhstorfer, 1910, p. 149, t. 58 *a*.
Appias ares, Swinhoe, 1885 *a*, p. 138 (♀, S. India).
Appias libythea ♀ f. *ares*, Fruhstorfer, 1910, p. 148, t. 58 *a*.
Appias retexta, Swinhoe, 1890, p. 360 (♂♀, Poona).
Calophaga swinhoei, Moore, 1905 *b*, p. 11, pl. 556, fig. 1 *a* (♂) (S. India).
Appias wardi yaksha, Fruhstorfer, 1910, p. 157 (Poona).

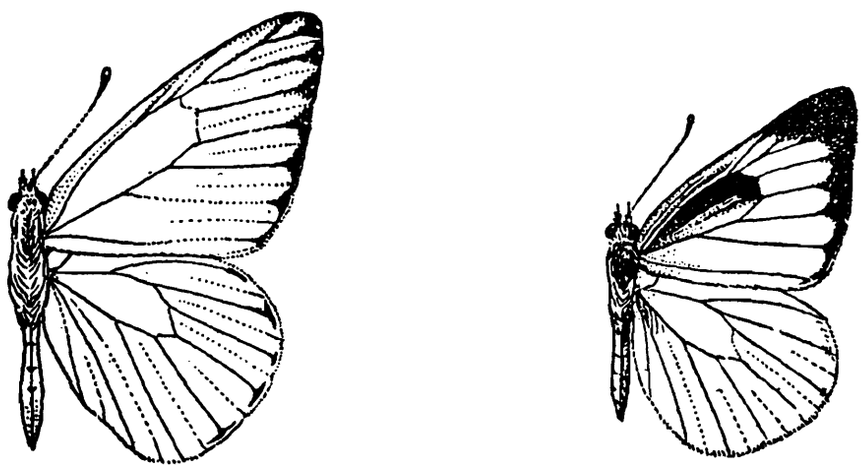
Wet-season form.—♂. *Upperside* pure white. Fore wing with costa, apex, and outer margin anteriorly very narrowly shaded with dusky black, this colour produced very finely along the veins for a short distance; the rest of the veins white.

Underside pure white, the black colour merely indicated along the costa and at the apex.

♀. *Upperside* white. Fore wing without pale spots in the distal black border; cell largely black; costa, apical area, and outer margin broadly black; the black in the cell joined to the marginal black along vein 4, leaving a short, oval, oblique bar of the ground-colour beyond the cell; the marginal black narrows posteriorly, and its inner edge is irregular;

posterior inner area with a somewhat diffuse dusky black streak from base, narrowed distally and not reaching the marginal black. Hind wing with outer margin more or less broadly black ; a dusky shading that forms a diffuse subcostal streak from the base, and another more diffuse obscure discal streak that leaves between it and the dark margin a series of, posteriorly, very ill-defined markings of the white ground-colour, which decrease in size up to area 6.

Underside white, with similar, but more diffuse, markings. Fore wing with the marginal black interrupted by a series of white streaks between the veins. Hind wing with marginal black scaling very faint ; basal and discal dusky shading as on upperside, but more or less obsolescent. Antennæ in both sexes dusky black, obscurely spotted with white ; head, thorax, and abdomen bluish-white above, white beneath.



a *b*

Fig. 145.—*A. libythea libythea* (Fabr.).
a, wet-season form, ♂ ; *b*, dry-season form, ♀.

Dry-season form **ares** Swinhoe.—♂. *Upperside* of fore wing with the black markings reduced. *Underside* markings faint, more brownish, the ground-colour ochraceous.

♀. *Upperside* of fore wing with black markings restricted to the upper half of cell, and on the costa, apical area, and outer margin are altogether much narrower than in the wet-season form. Hind wing with markings restricted to a narrow macular outer border, with mere indications of a dusky detached discal streak.

Underside with apex of fore wing and whole of hind wing of an ochraceous tint ; the black markings of the upperside show through by transparency.

Expanse : ♂♀, 50–60 mm.

Habitat.—Ceylon, Peninsular India to Punjab ; not common.

126 *b*. **Appias libythea olferna** Swinhoe.

Appias olferna, Swinhoe, 1890, p. 358 (Upper Bengal); Moore, 1905 *a*, p. 201, pl. 542, figs. 1 *d*, *e* (♂), 1 *f* (♀).
Appias libythea f. *olferna*, Fruhstorfer, 1910, p. 149.
Appias libythea olferna, Evans, 1932 *a*, p. 73, pl. viii, fig. B 10.4 (♀); Peile, 1937, p. 55.
Appias irvini, Swinhoe, 1890, p. 359 (Burma).
Appias libythea f. *irvini*, Fruhstorfer, 1910, p. 148, t. 58 *a*.
Appais zelmira, Adamson (*non* Stoll), 1908, p. 118 (Burma).
Appias libythea f. *sopara*, Fruhstorfer, 1910, p. 148.

Wet-season form.—♂. A larger race than the preceding. *Upperside* of fore wing with a black submarginal line between which and the margin, above vein 3, the veins are heavily blackened.

Underside pale yellow-brown to white. Fore wing with the veins blackened in the apical area. Hind wing with vein 8, the median vein, and vein 7 darkened; veins darkened beyond the cell.

♀. *Underside* of hind wing with the veins more broadly darkened; a broad yellowish discal band.

Dry-season form **irvini** Swinhoe.—♂. Black markings much reduced, especially on the hind wing underside.

♀. *Upperside* of fore wing with prominent white submarginal spots.

Expanse: ♂♀, 55–65 mm.

Habitat.—Bengal to Assam and Burma; Car Nicobar; not common. Also extending to Hainan and the Malay Peninsula. According to Adamson (1908) the insect is common in central Burma.

Appias lyncida (Cramer, 1777).

♂. Fore wing narrowed at the apex; *mdc* forms a right angle with upper edge of cell. Both wings with an outer marginal black border, more or less dentate on its inner edge.

Underside of fore wing with a brownish-black costal and outer marginal border, broad in the apical area where there is a yellow subapical spot. Hind wing yellow, with a broad chocolate-brown marginal border.

♀. *Upperside* of fore wing dusky black; prominent white stripes in areas 1*b*, 2, 4, and 5. Hind wing largely dusky black with whitish discal area.

Underside white.

Early stages and habits (from *Bell*, 1913, as observed in *latifasciata* Moore):—

Egg.—Bottle-shaped, with eleven or twelve longitudinal ribs which are finely transversely striated; an apical crown of five or six teeth. Light green when laid, turning quickly to orange.

Larva.—Surface of body with the usual seven parallel lines to each segment, the interspaces between each two lines being occupied by a single row of shiny black tubercles, each row reaching down each side as far as the subspiracular yellow line or narrow band; tubercles on head and on segments 2 to 4 larger than the others; body covered somewhat profusely with erect, minute, fine hairs; spiracles large, oval, white. Colour, dark yellowish-green with a yellow dorsal line, and subspiracular yellow narrow band. Length, 30 mm.; breadth, 4 mm.

Pupa.—Snout long, laterally compressed, the tip much turned up and attenuated. Light green or brownish, with a lateral row of black dots; thoracic carina yellow on the top; snout black on upperside; a black dorsal mark near the front margin of segments 9 to 12; underside whitish. Length, 18 mm.; breadth, 6 mm. at shoulders.

Habits.—The eggs are laid in batches of from 4 to 12 and more, on young shoots or on the uppersides of leaves. The larvæ are gregarious until full-grown. The time from the laying of the eggs to the emergence of the imago is about three weeks. The larvæ are attacked by parasites.

The butterfly is not nearly so common in the plains as in the hills. It is a strong flier, but keeps near the ground, often resting on it. Not often seen at flowers, but congregates at wet spots in the hot weather, and sometimes in such numbers as to nearly obscure the landscape when put up suddenly in a narrow stream. Has been bred upon *Cratæva religiosa* Forst. f., family Capparidaceæ.

Distribution.—CEYLON and PENINSULAR INDIA to SIKKIM, BURMA, and the NICOBAR ISLANDS, extending to the Loo Choo Islands, the Malay Peninsula, and Philippines to Celebes and Timor.

127 *a*. **Appias lyncida taprobana** Moore.

Appias taprobana, Moore, 1879 *a*, p. 143 (Ceylon); id., 1881 *a*, p. 135, pl. 52, figs. 1, 1 *a*–1 *c* (♂♀, larva, pupa); id., 1905 *a*, p. 198, pl. 541, figs. 2, 2 *a*–2 *c* (♂♀); Ormiston, 1924, p. 98.
Appias hippo taprobana, Bingham, 1907, p. 205.
Appias lyncida taprobana, Fruhstorfer, 1910, p. 148; Evans, 1932 *a*, p. 74; Peile, 1937, p. 55.
Appias vacans, Moore (*non* Butler), 1881 *a*, p. 135, pl. 52, figs. 2, 2 *a* (♂).
Appias aperta, Butler, 1886 *c*, p. 188 (Ceylon); Moore, 1887, p. 532.

Wet-season form.—♂. *Upperside* with very broad black marginal borders, strongly dentate on the inner edge.

Underside of hind wing deep ochraceous, veins 6 to 8 blackened.

♀. *Upperside* of fore wing with white stripes well developed, and cell-stripe prominent.

Dry-season form **aperta** Butl.—♂. Black markings reduced. Hind wing *underside* pale yellow, dark marginal border reaches vein 6.

♀. *Upperside* of fore wing with extended creamy-white areas. Hind wing with sharply-defined black marginal border.

Underside similar to the ♂, the edge of the marginal border dentate.

Expanse : ♂♀, 55–70 mm.

Habitat.—CEYLON ; rare.

127 *b*. **Appias lyncida latifasciata** Moore. (Pl. II, figs. 3, larva, 4, pupa).

Appias latifasciata, Moore, 1881 *b*, p. 312 (♂♀).
Catophaga latifasciata, Watson, 1894, p. 501.
Appias latifasciata, Moore, 1905 *a*, p. 199, pl. 541, figs. 3, 3 *a* (♂), 3 *b* (♀).
Appias lyncida latifasciata, Fruhstorfer, 1910, p. 148 ; Yates, 1931, p. 1006 ; Evans, 1932 *a*, p. 74 ; Peile, 1937, p. 55.
Appias hippoides, Davidson, Bell, & Aitken (*non* Moore), 1897 *a*, p. 574 (early stages and habits).
Appias hippo, Bell (*non* Cramer), 1913, p. 334, pl. i, fig. 18 (larva), 18 *a* (pupa).

Wet-season form.—♂. *Upperside* with the dark marginal borders narrow, and dentate on the inner edge.

Underside of hind wing with dark marginal border very broad, reaching the end of the cell ; veins 6 to 8 prominently blackened, and a black stripe in the basal half of area 6.

♀. Similar to *taprobana*. *Upperside* of fore wing with the white areas more or less coalescent.

Underside of hind wing with very broad, dark marginal border.

Dry-season form.—Not very different from specimens of the wet season ; black areas reduced, and hind wing *underside* paler and veins 6 to 9 not blackened ; the narrower marginal border only extends to vein 6.

♀ with fore wing *upperside* prominently white ; hind wing with sharply defined black marginal border ; otherwise as in *aperta* Butl.

This race is only slightly differentiated from the Ceylon one.

Habitat.—PENINSULAR INDIA, up to 4,000 feet ; rare.

127 *c*. **Appias lyncida eleonora** (Boisduval). (Fig. 146, ♂).

Pieris eleonora, Boisduval, 1836, p. 481 ("Amboina ").
Appias eleonora, Butler, 1872, p. 47 (Silhet ; Moulmein).
Appias vacans, Butler, 1870 *c*, p. 490 (Sikkim) ; id., 1869–74, p. 90, pl. xxxiv, figs. 5, 6 (♀) ; Moore, 1886, p. 49 (Mergui Islands) ; id., 1905 *a*, p. 196, pl. 541, figs. 1, 1 *a* (♂), 1 *b*, *c* (♀).

Appias lyncida hippoides f. *vacans*, Fruhstorfer, 1910, p. 148, t. 58 *d* (as *epicœna*).
Appias hippoides, Moore, 1881 *b*, p. 312 (N.E. Bengal); id., 1886, p. 49 (Mergui Islands); id., 1905 *a*, p. 194, pl. 540, figs. 1, 1 *a* (♂), 1 *b*, c (♀), 1 *d*, *e* (♂), 1 *f*, *g* (♀); Adamson, 1908, p. 118 (Burma).
Catophaga hippoides, Watson, 1894, p. 501.
Appias lyncida hippoides, Fruhstorfer, 1910, p. 148, t. 58 *d* (as *hippo*); Evans, 1932 *a*, p. 74, pl. viii, fig. B 10.5 (♂); Peile, 1937, p. 56.
Appias hippoides var. *epicœna*, Swinhoe, 1889, p. 398.
Appias hippo, Bingham (*non* Cramer), 1907, p. 203.
Appias lyncida hippoides ♀ f. *lurida*, Fruhstorfer, 1910, p. 148.

Wet-season form.—♂. *Upperside* white; along the costal border of fore wing and the dark border of hind wing a bluish flush due to the dark border of underside showing through. Fore wing with costal area dusted with black, more densely over the basal half; marginal black border dentate; subcostal

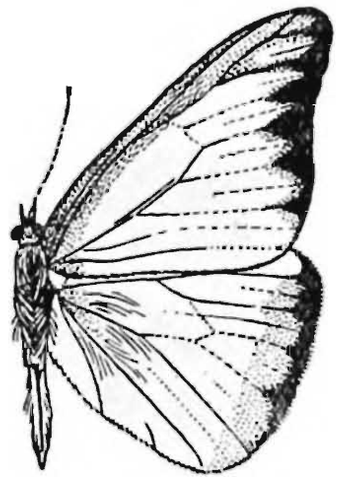


Fig. 146.—*A. lyncida eleonora* (Boisd.), ♂ from Assam.

vein and veins anterior to vein 6 black. Hind wing marginal border feebly dentate.

Underside of fore wing white; costal area more or less densely dusted with black, expanding to a broad black apical area and continued as a marginal border, narrowing to the tornus, the border dentate as on upperside; a subapical yellow or white oval spot in area 6. Hind wing sulphur-yellow, the dark marginal border much wider than on the upperside, and still less dentate. Antennæ black, sparingly dotted with white; head, thorax, and abdomen white, with a bluish tinge.

♀. *Upperside* dusky blackish-brown. Fore wing with short, somewhat broad, white streaks in areas 1, 2, 4, and 5, these streaks very variable in width and length. Hind wing with basal half and inner area broadly white, variable in extent and merging into the dark distal area.

Underside of fore wing similar to the upperside, the white streaks much broader and longer; a dusky white cell-stripe; base dusted with yellow; apex with a large diffuse purplish patch. Hind wing with basal two-thirds pale sulphur-yellow; apical third dusky brownish-black, the margins of the two colours fairly sharply defined; veins black in the discal area.

Females with yellow instead of white areas on the fore wing upperside are called **lurida** Fruhst.

Dry-season form **vacans** Butl.—♂. Smaller than the wet-season form, the black marginal borders narrower.

♀. Resembles the ♂ of the wet season, but the fore wing with a broad continuous costal stripe; marginal black dentate.

Underside closely resembles the wet season ♂, the fore wing without a subapical spot. Many intermediate forms are found between the extreme dry and wet forms of ♀.

Habitat.—SIKKIM to BURMA, extending to Hainan, Tong-king, Siam, and Annam; common.

The description given by Boisduval fits this form very well. No form of this species has so far been found in the Moluccas.

127 *d*. **Appias lyncida nicobarica** Moore.

Appias nicobarica, Moore, 1905 *a*, p. 198.
Appias lyncida nicobarica, Fruhstorfer, 1910, p. 148; Evans, 1932 *a*, p. 74.
Appias hippo andrea, Bingham (*non* Erscholtz), 1907, p. 205.

♂. *Underside* of fore wing with the subapical spot white. Hind wing pale yellow, the veins not darkened.

♀. *Upperside* of hind wing with the distal area greenish.

Habitat.—CAR NICOBAR and CENTRAL NICOBAR ISLANDS; not rare.

127 *e*. **Appias lyncida galbana** Fruhstorfer.

Appias lyncida nicobarica ♀ f. *galbana*, Fruhstorfer, 1910, p. 149.
Appias lyncida galbana, Evans, 1932 *a*, p. 74.

♂. Hind wing *upperside* with the dark marginal border much wider than in the preceding race.

♀. Much darkened. Fore wing *upperside* with the light areas olive or greenish. Hind wing light or dark yellow.

Habitat.—SOUTH NICOBAR ISLANDS; not rare.

Appias albina (Boisduval, 1836).

This species is so similar in both sexes to *paulina* (Cram.) that some experience of both species is necessary for a correct determination. Some specimens of the dry-season ♂ are often

like some males of *libythea* (Fabr.), but may be easily distinguished by the position of the *mdc* of fore wing, which makes an acute angle with the upper edge of the cell. Yates (1932, p. 698) tabulates a number of characters by which the Indian *albina* ♂ may be distinguished from *libythea* ♂.

♂. *Upperside* white. Fore wing with apex acute; outer margin straight; upper angle of cell strongly acute; black scaling at the apex and base either narrow or absent, no spot in area 3.

♀ *Upperside* white. Fore wing with costal and outer margins bordered with black, the apical area much broader; the ground-colour extends nearest the margin in area 2, where its edge is excurved; apical area with at least four white subapical spots in areas 3 to 6; basal area densely dusted with black, the edge of this area distinctly incurved. Hind wing with a marginal narrow black border, dentate on its inner edge.

The species is subject to seasonal variation, which is more marked in the ♀. The ♀ is polymorphic, and three forms are found in the Indian area. The butterfly is often common, and frequents flowers.

Distribution.—China and INDIA, south and east to Australia and the Papuan region. One subspecies in the Indian area.

128. **Appias albina darada** (C. & R. Felder). (Fig. 147, ♂♀).

Pieris darada, C. & R. Felder, 1865, p. 166 (Silhet).
Catophaga darada, Moore, 1905 *b*, p. 12, pl. 557, figs. 1, 1 *a* (♂), *b*, *c* (♀, wet form), *d* (♂, type), *e*, *f* (♀, dry form), *g* (♂), *h*, *i* (♀, extreme dry form); Adamson, 1908, p. 120 (Burma).
Appias melania darada, Fruhstorfer, 1910, p. 155.
Appias albina darada, Evans, 1932 *a*, p. 74, pl. viii, fig. B 10.6 (♂); Yates, 1932, p. 698.
Appias paulina darada, Peile, 1937, p. 56, pl. xxi, figs. 206, 207 (♂♀).
Appias neombo, Moore (*non* Boisd.), 1881 *a*, pl. 50, figs. 3 *a*, *b* (♀) (=*principalis* Fruhst.).
Appias paulina, Elwes & de Nicéville (*non* Cramer), 1887 *a*, p. 432 (Tavoy, Siam).
Appias albina ♀ f. *flava*, Rober, 1891, p. 282 (Wetter Island).
Appias albina, Bingham (*non* Boisd.), 1907, p. 212.
Appias albina confusa, Fruhstorfer, 1910, p. 154, t. 60 *d* (Sikkim, Assam, Siam, Tong-king).
Appias albina confusa ♀ f. *principalis*, Fruhstorfer, 1910, p. 154.
Appias albina confusa ♀ f. *semiflava*, Fruhstorfer, 1910, p. 154.
Appias albina ♀ f. *norma*, Evans, 1924, p. 971 (Ceylon); id., 1932 *a*, p. 74 (=*principalis* Fruhst.).

♂. *Upperside* of fore wing with black apical and sometimes marginal scaling, absent in dry-season specimens. Hind wing unmarked.

Underside with the apical area of fore wing and the whole hind wing pale dull ochraceous, this colour much paler in dry-season specimens.

♀ form **principalis** Fruhstorfer.—*Upperside* white, the black areas wider in wet-season specimens; white subapical spots large, or partly merged with the ground-colour, in dry-season specimens.

Underside of fore wing with a narrow post-discal black band, which is irregular and defines the edge of the marginal black of the upperside, this band becoming narrower and more diffuse in dry-season specimens; apical area bluish-white; a costal basal stripe of greenish-yellow dusting, more or less oblique, and narrowing distally. Hind wing bluish-white.

♀ form **semiflava** Fruhst.—Resembles *principalis*, but the *underside* of hind wing and of the apical area of fore wing are rich yellow.

♀ form **flava** Röb.—Markings as in the previous form. *Upperside* yellow.

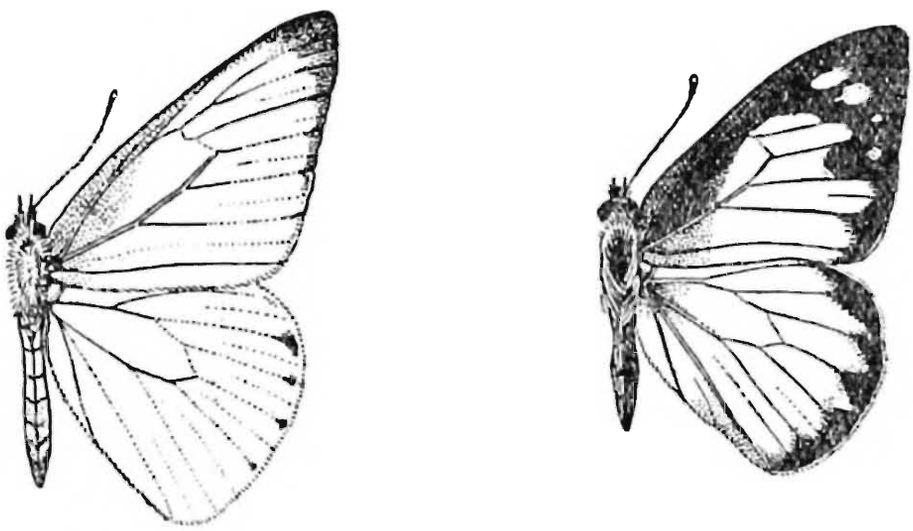


Fig. 147.—*A. albina darada* (Feld.), wet-season form, ♂♀ from Sikkim.

Underside of fore wing with apical area yellow as on upperside, the proximal area of wing sulphur-yellow. Hind wing yellow as on upperside.

Expanse: ♂♀, 60–75 mm.

The white form *principalis* Fruhst. is more frequent during the dry season, but all three forms occur in both seasons, and with corresponding variations in the extent of the black markings and size of the subapical spots. The form *flava* Röber is more common in Ceylon, but does occur in S. India, being absent from Sikkim and Burma.

The name *swinhoei* (Moore), usually associated with this species, was founded upon a ♂ of *libythea* (Fabr.) belonging to the dry form *ares* Swinh.

A ♀ from Car Nicobar, in the collection of Colonel Ferrar,

resembles the form *neombo* (Boisduval), from the Malay Peninsula, in having a detached black spot in area 3 of the fore wing, but has no subapical spots.

Larva.—" Light green with a yellow-white spiracular band from segments 2 and 3 to segment 12, where the band expands somewhat. Head round, shining, yellow covered with small conical setiferous black tubercles ; body rugose, with six transverse rows, from above the spiracular region over the dorsum, of small, shining, setiferous, conical black tubercles to each segment ; segments 2, 12, and 13 have only a few transverse rows of such tubercles."

Pupa.—" Dirty whitish, with a pink shade on segments 4 to 14. The head-process from between the eyes is long, flattened at the sides, slightly curved, pointed at the extremity edges on ventral surface minutely serrate. The front margin of segment 2 is produced into a small subdorsal tooth, and the dorsal line is rather strongly carinate ; thorax highly carinate on the dorsal line ; lateral teeth of segments 6, 7, and 8 are all of the same size and are pointed ; the head production, the points on segment 2, the teeth on segments 6 and 7 (sometimes) and the extremity of the cremaster black" (after *de Nicéville*).

Habitat.—CEYLON and PENINSULAR INDIA to SIKKIM, BURMA, and ANDAMAN ISLANDS ; not common as a rule ; rare in Sikkim. According to Yates (1930) it is very common in Coorg.

Appias paulina (Cramer).

♂. Fore wing with the apex obtuse, outer margin gently incurved between veins 6 and 3. *Upperside* of fore wing with apical and marginal black scaling, sometimes with a narrow marginal black border, these black markings much reduced or absent in dry-season specimens ; a black spot often present in area 3, more often on the underside, and in Indian specimens rarely found except in the Nicobar race.

♀. Closely resembles *albina* (Boisd.) ♀. *Upperside* of fore wing (except in the Nicobar race) with not more than three subapical white spots in areas 4 to 6 ; basal dark area with its edge almost straight.

Underside of fore wing with the post-discal black band broader than in *albina*, anteriorly reaching, or nearly reaching, the base of area 5 ; apical area white in the dry-season form, yellow in the wet-season form. Hind wing as the apical area of fore wing according to season.

Distribution.—CEYLON ; NICOBAR and ANDAMAN ISLANDS, south and east to North New Guinea, and north to the Riu Kiu Islands. Two subspecies in the Indian area.

129 *a*. **Appias paulina paulina** (Cramer).

Papilio paulina, Cramer, 1777, p. 21, pl. cx, figs. E, F (♀, Coromandel).
Catophaga paulina, Moore, 1905 *b*, p. 7, pl. 554, figs. 1, 1 *a*–1 *g* (♂♀).
Appias paulina, Bingham, 1907, p. 210; Ormiston, 1924, p. 97.
Appias melania paulina, Fruhstorfer, 1910, p. 155.
Pieris galene, C. & R. Felder, 1865, p. 165.
Catophaga galene, Moore, 1881 *a*, p. 132, pl. li, figs. 2, 2 *a*, 2 *b* (♂♀); id., 1905 *b*, p. 9, pl. 555, figs. 1, 1 *a* (♂), 1 *b* (♂ type), 1 *e*, *f*, *g*, *k*, *j* (♀), figs. 1 *c*, *d*, *h*, *i* (♂♀, wet-season form).
Appias melania paulina f. *galene*, Fruhstorfer, 1910, p. 155.
Appias paulina galene, Evans, 1932 *a*, p. 74; Peile, 1937, p. 57.
Catophaga lankapura, Moore, 1879 *a*, p. 142 (♂♀, Ceylon); id., 1881 *a*, p. 133, pl. l, figs. 4, 4 *a* (♂), pl. li, figs. 1, 1 *a* (♀, wet season).
Appias melania paulina f. *lankapura*, Fruhstorfer, 1910, p. 155.
Catophaga venusta, Moore, 1881 *a*, p. 132, pl. li, fig. 3 (♀, Ceylon).
Appias albina venusta, Fruhstorfer, 1910, p. 154.
Appias melania paulina f. *fasciata*, Fruhstorfer, 1910, p. 155, t. 61 *a*.

Wet-season form **lankapura** (Moore).—♂. *Upperside* of fore wing with the costa, apex, and outer margin more or less densely dusted with black, this black scaling narrowed on the margin posteriorly and not reaching the tornus. Hind wing with light black dusting along inner margin, on tornus, and along posterior part of outer margin.

Underside of fore wing with apical area pale yellow. Hind wing entirely pale yellow.

♀. *Upperside* of fore wing white; basal area up to as far as two-thirds of the cell dusted with black, which gives that part a bluish-grey appearance, the edge of this area straight; costa and apical area broadly black; the inner edge of this black area is irregularly curved, extended inwards and forming a right angle on vein 3, invaded deeply by the ground-colour in area 2, below which it is more or less oblique and even, to the inner margin near tornus; three subapical, more or less yellowish spots in areas 4 to 6. Hind wing pale yellow; outer margin with broad black border dentate on inner edge; base and areas 1 and 2 dusted with black.

Underside of fore wing with basal area dusted with pale yellow; apical area rich chrome-yellow. Hind wing rich chrome-yellow, base greenish. Antennæ black, speckled with white dots; frons and thorax with dusky greyish-green hairs; abdomen blackish; underside of thorax yellow, of abdomen white.

Form **fasciata** Fruhst.—Hind wing *underside* with a submarginal black band.

Dry-season form **paulina** (Cram.) (=*galene* Feld., *venusta* Moore).—♂. *Upperside* with sparse black dusting which is often quite absent.

Underside with apex of fore wing and entire hind wing dull ochraceous.

♀. *Upperside* resembles the wet form, but fore wing with narrower black area; hind wing with narrower and more sharply dentate black border.

Underside with apex of fore wing and entire hind wing pearly bluish white.

Expanse: 55–75 mm.

Habitat.—CEYLON; not rare. Occurs up to 6,000 feet, usually at the edges of woods, and has a rapid and long-sustained flight.

129 *b*. **Appias paulina galathea** (Felder).

Pieris galathea, C. Felder, 1862, p. 485 (Sambelong).
Catophaga paulina var. *galathea*, Wood-Mason & de Nicéville, 1881 *a*, p. 237.
Catophaga galathea, Moore, 1905 *b*, p. 6, pl. 553, figs. 1, 1 *a*–1 *g* (♂♀).
Appias galathea, Bingham, 1907, p. 211.
Appias melania galathea, Fruhstorfer, 1910, p. 155, t. 60 *d*.
Appias paulina galathea, Evans, 1932 *a*, p. 75 (text only).
Catophaga roepstorfi, Moore, 1884, p. 44 (♂).

♂. *Upperside* creamy-white. Fore wing with a very slight dusting of black along costal margin, at apex and for a very short distance down outer margin; a round, black, post-discal spot in area 3, variable in size and sometimes only indicated; cilia anteriorly dusky black, posteriorly white. Hind wing unmarked; cilia yellowish posteriorly.

Underside of fore wing white; basal half of cell sulphur-yellow; costa narrowly and apical area ochraceous or butter-yellow; spot in area 3 more clearly defined. Hind wing butter-yellow. Antennæ brown speckled with white; hairs on head and thorax anteriorly dusky greenish-yellow, on thorax posteriorly bluish, scaling of abdomen white; underside of head and thorax very pale yellow, of abdomen white.

♀. In both seasonal forms almost identical with *paulina*, but on the *upperside* the fore wing has always four or five (not two or three as in *paulina*) subapical white spots, whilst on the *underside* the oblique, curved, black band that crosses the fore wing is slightly narrower, and its outer margin more irregular.

The ♀ exists in four forms, which resemble those found in *A. albina darada* Feld. As no *albina* males have been found on the Nicobar Islands it may be assumed that these females all belong to *galathea*.

Form **galathea** (Felder).—*Upperside* yellow.

Underside of fore wing with apical area stone-white, the rest of the wing, excepting area 1 *a* and part of 1 *b*, sulphur-yellow. Hind wing entirely stone-white.

Form **flava** Röber.—*Upperside* yellow. Underside of fore wing as in *galathea* except that the apical area is yellow. Hind wing entirely yellow.

Form **semiflava** Fruhstorfer.—*Upperside* white; hind wing may be tinged yellow, usually at costa and inner area.

Underside as in *flava*, but the sulphur-yellow area of fore wing restricted to the cell. (See figure in Moore, 1905 *b*, pl. 553, figs. 1 *b*, *c*).

Form **principalis** Fruhstorfer.—*Upperside* white.

Underside as in *galathea* Feld. (See figure in Moore, 1905 *b*, pl. 553, figs. 1 *f*, *g*).

Habitat.—NICOBAR ISLANDS; not rare. There is no authenticated record of *galathea* occurring on the Andaman Islands.

130. **Appias wardi** (Moore).

Catophaga wardi, Moore, 1884, p. 43 (♂♀, Nilgiris); Hampson, 1889, p. 362; Watson, 1894, p. 499; Davidson, Bell, & Aitken, 1897 *a*, p. 574; Butler, 1898 *a*, p. 398; Moore, 1905 *b*, p. 3, pl. 552, figs. 1, 1 *a*–1 *i* (♂♀).

Appias wardi, de Nicéville, 1900, p. 256; Bingham, 1907, p. 214; Fruhstorfer, 1910, p. 157, t. 60 *f* (♂); Bell, 1913, p. 341 (early stages); Yates, 1931, p. 1007.

Appias paulina wardii, Evans, 1932 *a*, p. 74.

Appias neombo, Moore (*non* Boisd.), 1881 *a*, p. 131, pl. 1, fig. 3 (♂).

Wet-season form.—♂. *Upperside* white, with the general appearance of an *albina* (Boisd.) ♀. Fore wing with base densely and broadly dusted with black, this scaling extending along the costa to the apical area; apical and marginal black area broad, its inner edge irregular, curving from costa to vein 4, thence vertically to vein 3, outwards in area 2, and irregularly to inner margin; four subapical white spots in areas 3 to 6, with usually an additional linear anterior spot. Hind wing with slight basal black dusting; an outer narrow, marginal, black border, wider from costa to vein 6, its inner edge strongly dentate.

Underside of fore wing white; apical area butter-yellow; a post-discal, somewhat narrow, zigzag-curved, irregular black band from middle of costa to tornus. Hind wing butter-yellow.

♀. *Upperside* somewhat similar to that of the ♂, but differs in the much greater extent of the black area, which occupies the outer apical half of fore wing, and on the hind wing forms a broad marginal band; fore wing with two subapical spots; basal black scaling rather dense. Hind wing with the black border wider anteriorly as in the ♂, and bordered proximally with more or less extensive black dusting, which extends posteriorly to the similar band of black dusting along the inner margin.

Underside of fore wing white; basal half of cell suffused with sulphur-yellow; post-discal black band as in the ♂, but much broader; apical area pearly bluish-white. Hind wing pearly bluish-white.

Dry-season form **arida**, nov.—♂. *Upperside* similar to the wet form. Fore wing with more restricted black basal scaling and apical black; apical area usually with a more or less diffuse appearance, the subapical spots very ill defined. Hind wing white, sometimes with a faint yellowish tinge.

Underside of fore wing white, with a bluish tint broadly along the basal two-thirds of costal margin; apical area butter-yellow; post-discal black band usually absent or indicated by some black scales. Hind wing uniform butter-yellow. Figured by Moore (*q.v.*) as *neombo*.

♀. *Upperside* similar to the wet form, but black areas much restricted, as in the ♂.

Underside of fore wing with the post-discal black band very much narrower than in the wet form. Hind wing with a yellow tinge. Very similar to the *principalis* form of *albina darada*, and sometimes difficult to separate with certainty. The *albina* ♀ is usually without any black dusting over the inner or submarginal areas of hind wing, which is a feature of *paulina* and *wardi*.

In both sexes and in both seasonal forms the antennæ are black dotted with white, the tufted hair on the head and thorax anteriorly greyish-green, abdomen white; underside of head and thorax pale yellowish-white; abdomen white.

Expanse: ♂♀, 55–75 mm.

This insect appears to replace *paulina* in Southern India. It is so much modified, possessing the characteristics of both *paulina* and *leis*, that it seems best to treat it as a species.

The name *yaksha* Fruhst., which was supposed to represent a dry form of *wardi*, applies to small males of *libythea* (Fabr.), somewhat intermediate between wet- and dry-season specimens. This is revealed by an examination of the type, now in the British Museum.

Early stages and habits (from *Bell*, 1913):—

Larva.—Resembles that of *lyncida latifasciata* Moore, but is, as a rule, more thickly covered with black tubercles. Surface of body rugose, bearing six transverse rows, from above the spiracular region over the dorsum, of small, shiny, conical setiferous, black tubercles to each segment; segments 2, 12, and 13 with only a few transverse rows of such tubercles. Body light green, sometimes tinged with lilac, and with a yellowish-white, narrow, spiracular band from segments 2 and 3 to 12, where the band expands. Length, 30 mm.; breadth, 3·75 mm.

Pupa.—Resembles that of *latifasciata*, with the head process long, flattened laterally, slightly curved, pointed at the extremity. Dirty white, with a pink shade on segments 4 to 14 ; snout, points on segment 2, extremity of cremaster, and sometimes the teeth of segments 5 to 7 are black ; a dorsal black spot on hind margin of segment 2, a similar spot just behind the shoulder, a lateral one on segments 3 to 12, and a dorsal one on the front margins of 9 and 10 ; always a semicircle of six dark dorsal spots on areas 6 and 7 The colour of the pupa when formed under a leaf is probably green, the markings more or less as above. Length, 21·25 mm., of which the snout is 2·75 mm. ; breadth at shoulders, 5 mm.

Habits.—Eggs are laid on the tender leaves of capers, such as *Capparis heyneana* Wall., probably singly, though there are generally many larvæ on each tree, indicating that the eggs might be laid in clusters. The pupa is generally attached to the underside of a leaf, or to the trunk of a tree or branch. Pupal stage of short duration.

The butterfly is a strong and fast flier. It frequents the evergreen parts of the North Kanara district from sea-level up to 2,500 feet, and seemingly is confined to the hill jungles, where the rainfall is heavy. It is fond of sun, congregates at wet places, is not frequent at flowers, and flies very high.

Habitat.—Peninsular India, *e.g.*, Kanara, the Nilgiri Hills, Coorg, Travancore ; rare, but according to Yates (1930) is fairly common on the Ghats.

Type of *arida* in the British Museum, from the Nilgiri Hills, 3,500 feet, March 8th, 1886. ♀ allotype from Kanara ; Kutgul, March (*ex* Coll. Davidson).

Appias leis (Hübner, 1832).

This species, if it be really distinct from *paulina* (Cram.), is as yet but imperfectly known. A variety of forms, some of which may be assigned to *paulina* and others to *leis*, are found in the Malayan-Papuan area. The Indian *adamsoni* (Moore) appears to belong to the *leis* group of forms, and its nearest ally is *distanti* (Moore), from the Malay Peninsula. It is strange that the *paulina* forms have a discontinuous distribution, and that in north New Guinea a form should exist which is very like *galathea* from the Nicobars. It is possible that *leis* and *paulina* are conspecific.

♂. *Upperside* resembles the ♀ of *albina* (Boisd.), or in some forms has the marginal black much reduced, with a dentate edge, and with or without a free spot in area 3 of the fore wing ; basal black scaling narrow or absent. Hind wing with or without a marginal black border, which is strongly dentate.

Underside of fore wing, in forms with reduced black on

upperside, without a post-discal black band; usually this band is present, being narrow, and proceeding from a prominent spot in area 3 anteriorly to vein 6; apical area yellowish. Hind wing yellowish.

♀. Resembles *paulina* and *wardi*. *Upperside* of fore wing with black areas broader than in *paulina*, and the basal black scaling much denser, its edge straight; three subapical white spots in areas 4 to 6, and often a fourth anterior spot present. Hind wing with broad, black, marginal border, its inner edge irregular, straight or incurved, but not dentate; basal and inner areas more or less dusted with black.

Underside as in *paulina*, but on the fore wing the black post-discal band is wider. Hind wing with or without a broad, dark, marginal border or submarginal band.

Distribution.—BURMA, south and east to the Pacific and Australia. One subspecies in the Indian area.

131. **Appias leis adamsoni** (Moore).

Catophaga adamsoni, Moore, 1905 *b*, p. 4, pl. 551, figs. 2, 2 *a* (♂), 2 *b*, *c* (♀, wet-season form), 2 *d*, *e* (♂, extreme dry-season form); Adamson, 1908, p. 120 (Burma, ♂).
Appias melania adamsoni, Fruhstorfer, 1910, p. 155, t. 61 *a*.
Appias paulina adamsoni, Evans, 1932 *a*, p. 74, pl. viii, fig. B 10.7, (♂, as *galathea* Feld.).
Appias leis, Bingham (*non* Hübn.), 1907, p. 213.

Wet-season form.—♂. *Upperside* somewhat resembles the ♀ of *albina* (Boisd.). Fore wing with base and costa somewhat thickly dusted with black; apical area broadly black; outer marginal series of inwardly-pointed black triangular vein-spots, these spots confluent along the extreme margin; between veins 3 and 6 a short post-discal black line that ends posteriorly in a large black spot in area 3, this line confluent along the veins with the marginal black, the two thus enclosing a vertical series of three prominent white spots. Hind wing with a marginal series of black vein-spots, these spots elongate and prominent anteriorly, obsolescent and diffuse posteriorly.

Underside of fore wing white; apical area above an oblique line that passes through base of vein 6, ochraceous; a diffuse, black, curved, subapical band from costa to outer margin, but is usually obsolete; a prominent large, quadrate, black, post-discal spot in area 3; basal area tinged with yellow, Hind wing ochraceous-yellow.

♀. *Upperside* white. Fore wing with large basal area densely dusted with black, producing a dark grey appearance; costa and a little more than apical half of wing jet-black; the inner edge of this area irregular, formed very much as in *wardi*, and straight or slightly excurved from vein 2 to inner margin; an oblique subapical line of four white spots in pairs. Hind

wing with the base and a broad band to the tornus thickly dusted with black; distal third black, its inner edge curved and diffuse; a slight yellowish-green tinge on inner margin and at base.

Underside of fore wing resembles the upperside, but the cell, except at the lower angle, yellowish-green; apical area broadly pearly-white, tinged at apex with greenish. Hind wing pearly-blue, sometimes pink, the veins and outer margin narrowly and diffusely bordered by greenish-yellow; curved post-discal and submarginal purplish-black bands, ill defined and irregular. Antennæ black speckled with white; head and thorax in ♂ with bluish-grey, in the ♀ with greyish-green long hairs; abdomen greyish-black; underside of thorax yellow; of abdomen, white.

Dry-season form **alcesta**, nov.—♂. *Upperside* of fore wing with black markings much restricted and often diffuse; the post-discal black band and the black spot in area 3 often only indicated by a few diffuse scales. Hind wing with marginal spots much less prominent or absent.

Underside of fore wing with only the black spot in area 3 present.

♀. Similar to wet-season ♂ specimens, the black areas less broad, and the post-discal short black band on fore wing often absent.

♂ holotype from the Karen Hills, 2,000 feet, November, 1920 (W H. Evans) (British Museum).

Expanse: ♂♀, 55–75 mm.

Habitat.—Burma. According to Evans (1932 *a*) not rare, but no series of specimens are seen in collections; ♀ rare.

Appias nero (Fabricius, 1793).

An easily recognized species with its *upperside* deep crimson-lake to orange, the veins black.

A frequenter of wooded areas, and often congregating at wet places; flight rapid. The ♂ usually common, except in India; ♀ scarce.

Distribution.—Sikkim to Burma and Hainan, extending to Java, the Philippines, Celebes, and Buru.

132. **Appias nero galba** (Wallace).

Tachyris galba, Wallace, 1867, p. 378 (N. India); Adamson, 1908, p. 120 (Chin Hills, ♂).
Catophaga galba, Watson, 1894, p. 499.
Appias nero galba, Fruhstorfer, 1910, p. 150; Evans, 1932 *a*, p. 75, pl. viii, fig. B 10.8 (♂).
Appias nebo, Smith & Kirby, 1894, *Appias*, pl. i, figs. 1, 2 (♂, Burma).
Appias nero galba f. *nebo*, Fruhstorfer, 1910, p. 150.
Appias nero, Bingham (*non* Fabr.), 1907, p. 202, pl. xvi, fig. 108 (♂).

♀. *Upperside* vermilion to deep crimson-red, the veins more or less black; outer margin of both wings and apex of fore wing more or less dusted with black.

Underside of fore wing apical area and most of the hind wing rich chrome-yellow; fore wing with basal and discal areas orange; costal and inner margin of fore wing and inner margin of hind wing broadly yellow; veins concolorous. Antennæ black, dotted sparsely with white, club tipped with orange; head, thorax, and abdomen black with dark greyish-green hairs.

♀. *Upperside* coloration as in ♂. Fore wing with costa narrowly, apex and outer margin more broadly, black; a post-discal short oblique black band, terminating in area 4, where it is separated from the marginal black by a spot of the ground-colour; a submarginal black bar in area 2 also encloses between it and the marginal black a spot of the ground-colour. Hind wing with a marginal black border, crenulate on its inner edge.

Underside of fore wing with the basal and discal areas vermilion-red, apex dusky ochraceous, with a pale, ill-defined, short bar that limits it on the inner side; indications of the post-discal black band and of the bar in area 2 as on upperside. Hind wing dull ochraceous, darkening to ochraceous-red along outer margin; an irregular and diffuse discal purplish band.

Expanse: 65–80 mm.

Specimens with light yellow upperside are **nebo** Gr.-Sm. & Kirby. These may belong to the dry season.

Habitat.—SIKKIM to BURMA; not common, and rare in Sikkim. Also extends to Siam and Tong-king.

Genus **SALETARA** Distant.

Saletara, Distant, 1885 *a*, pp. 287, 316 (*nathalia* Feld.); Butler, 1898 *a*, p. 392; Bingham, 1907, p. 217; Fruhstorfer, 1910,) p. 181; Klots, 1932, p. 211.

Type of the genus, *S. panda nathalia* (Felder), from the Philippines.

♂. Fore wing with apex acute; costa nearly straight; outer margin straight, slightly excurved posteriorly to the rounded tornus; inner margin straight; cell long, more than half length of wing; veins 10 and 11 from the cell basad; 7+8 and 9 rather short, on a long stalk; 6 from the stem of 7+8 and 9; *mdc* about two-thirds as long as *ldc*, angled, with a short spur projecting into the cell from the angle; *ldc* straight. Hind wing with precostal vein fairly long, tapering, sharply curved distad; *mdc* very oblique. Abdomen with a long dorsal hair-pencil arising from the eighth tergite, besides the two ventral tufts as in *Appias*.

♀. In Malayan, Papuan, and some Philippine forms vein 9 of the fore wing is absent.

Antennæ, palpi, head, thorax, and abdomen as in *Appias*.

Habits.—*Saletara* are found only in the plains and frequent wet places. The flight is swift and steady. Early stages unknown.

Distribution.—NICOBAR ISLANDS and Malay Peninsula, extending to the Pacific islands (absent in the Lesser Sunda Islands). Four species are known, of which one is found in the Nicobars.

Saletara panda (Godart, 1819).

♂. *Upperside* white to yellow. Fore wing with narrow costal and outer marginal black borders.

♀. *Upperside* white or yellow. Fore wing with dark basal area and very broad costal and outer black borders. Hind wing with dark basal area and a black outer border of variable width, its inner edge dentate or even.

Two forms of both sexes are usually found, a white and a yellow one.

Distribution.—SOUTH NICOBAR ISLANDS and Malay Peninsula to Java, the Philippines, Celebes, and Sula Islands. The ♂ usually common, the ♀ scarce.

133. **Saletara panda chrysæa** Fruhstorfer.

Saletara panda chrysæa, Fruhstorfer, 1930 *c*, p. 124 (Great Nicobar); id., 1904 *c*, p. 348; id., 1910, p. 182, t. 62 *a*.
Saletara chrysæa, Moore, 1905 *b*, p. 15, pl. 558, figs. 1, 1 *a*–1 *c* (♂♀); Bingham, 1907, p. 217, pl. xvii, figs. 114, 115 (♂♀).
Appias panda chrysæa, Evans, 1932 *a*, p. 75.

♂. *Upperside* of fore wing pale sulphur-yellow, darker towards the tornus; basal area dusted with black; costa narrowly, outer margin more broadly, black, not extended to the tornus. Hind wing rich chrome-yellow, fading to sulphur-yellow along the inner margin; base slightly dusted with black.

Underside rich cadmium-yellow, basal third of costa of fore wing and upper part of inner margin of hind wing slightly paler. Antennæ black, speckled on the inner side with white; palpi and frons yellow, mixed with dusky black hairs; head above greenish, thorax with bluish-grey hairs, abdomen yellowish-white; underside of thorax yellowish, and of abdomen white; anal tufts dark brown.

♀. *Upperside* rich cadmium-yellow. Fore wing with basal area dusted with black to near apex of cell; costa, apex very broadly, and outer fourth of wing jet-black. Hind wing with a broad basal area, extending to the tornus, dusted with black; costa pale sulphur-yellow; outer margin broadly

bordered with black, its inner edge diffuse; inner margin broadly white; cilia anteriorly yellow, posteriorly black.

Underside of fore wing with basal two-thirds dull yellow; costa suffused basally with dusky black; inner margin whitish; a post-discal evenly curved black band from vein 7 to tornus, edged in the apical part with white; distally of this band the costa, apical area, and outer margin rich yellow. Hind wing somewhat pearly-white with a pinkish tinge, edged with yellow along the costa and outer margin to tornus.

Expanse: ♂♀, 50–60 mm.

Habitat.—SOUTH NICOBAR ISLANDS; rare.

Genus **PIERIS** Schrank.

Pieris, Schrank, 1801, pp. 152, 161; Latreille, 1810, p. 440 (type, *brassicæ* Linn.); Verity, 1907, p. 115 (part.); Bingham, 1907, p. 167 (part.); Röber, 1907, p. 44; Fruhstorfer, 1910, p. 139; Klots, 1932, pp. 212, 213; Evans, 1932 *a*, pp. 63, 66; Hemming, 1934 *a*, p. 128 (type, *brassicæ* Linn.); id., 1934 *b*, p. 33.

Danaus, Oken (*non* Kluk), 1815, p. 723; Crotch, 1872, p. 60 (type, *brassicæ* Linn.); Moore, 1905 *a*, p. 124.

Ganoris, Dalman, 1816, p. 61 (type, *brassicæ* Linn.).

Andropodum, Hübner, 1822, pp. 2–5, 7–9; Hemming, 1933, p. 199 (type, *brassicæ* Linn.); id., 1934 *a*, p. 129.

Tachyptera, Berge, 1842, pp. 19, 92–105; Hemming, 1934 *a*, p. 129; id., 1934 *b*, p. 38 (type, *brassicæ* Linn.).

Synchloe, Hübner, 1819, p. 26; Butler, 1870 *a*, p. 51 (type, *callidice* Hübn.); Röber, 1907, p. 50; Hemming, 1931, p. 273 (type, *callidice* Hübn., 1799); id., 1934 *a*, p. 130.

Parapieris, de Nicéville, 1897 *a*, p. 563 (type, *callidice* Esp.); Moore, 1905 *a*, p. 140; Fruhstorfer, 1910, p. 140.

Type of the genus, *P. brassicæ* (Linn.).

♂♀. Fore wing with costa arched, apex obtuse; outer margin straight; tornus broadly rounded; inner margin straight or slightly sinuous, more than three-fourths the length of the costa; cell elongate, more than half length of wing; veins 10 and 11 from the cell; 7+8 and 9 on a long stalk; 6 from the stem of 7+8 and 9; *mdc* oblique, from a third to more than half as long as *ldc*. Hind wing subtriangular, the costa very long, both apex and tornus evenly rounded, outer margin short, gently arched; cell more than half the length of wing, pointed at lower angle; precostal vein fairly long, curved strongly distad; *mdc* shorter than *udc* and *ldc*; *ldc* more or less angled. Antennæ about half the length of fore wing, club small and gradual or large and spatulate; palpi slender, third segment short.

The genus *Synchloe* Hübner is here merged with *Pieris*, to form a secondary group, whilst the genus *Pontia* Fabricius retains generic status.

Distribution.—The whole North American and Palæarctic region, INDIA and BURMA to the Malay Peninsula; absent from Ceylon and the Andaman Islands.

Key to Groups and Species.

A. Hind wing underside in Indian forms with a post-discal or submarginal series of spots. Antennal club large and spatulate ..	[p. 414. CALLIDICE Group,
B. Hind wing underside in Indian forms without a post-discal or submarginal series of spots. Antennal club gradual, not large or spatulate	[p. 418. BRASSICÆ Group,

Callidice Group.

a. Hind wing underside with markings green	*callidice* Hübn., [p. 415.
b. Hind wing underside with markings not green. ..	*dubernardi* (Oberth.), [p. 416.

Brassicæ Group.

1. Fore wing upperside with a triangular black subapical costal patch	[p. 418. *krueperi*, Stgr.,
Fore wing upperside without a triangular black subapical costal patch . . .	2.
2. Hind wing underside with the veins defined with black	3.
Hind wing underside with the veins not defined with black	4.
3. Large species. Fore wing with a prominent black spot in area 3, its inner and outer edges incurved; hind wing with a prominent black apical spot	[p. 422. *extensa* Pouj.,
Smaller species. Fore wing with black spot in area 3 small, more or less rounded; hind wing with small apical black spot	*napi* (Linn.), p. 419.
4. Fore wing upperside with marginal black reaching to below vein 3	5.
Fore wing upperside with marginal black not reaching to below vein 4	*rapæ* (Linn.), p. 428.
5. Fore wing upperside with inner edge of black area dentate	6.
Fore wing upperside with inner edge of black area not dentate	7.
6. Hind wing upperside with a continuous marginal black band; in the ♀ only traversed by the white veins .. .	[p. 424. *deota* (de Nicév.),
Hind wing upperside without a marginal black band, only separated spots or specks	[p. 425. *canidia* (Sparrm.),
7. Hind wing underside dusted with black... .	*brassicæ* (Linn.),
Hind wing underside not dusted with black, uniform ochraceous-yellow .	[p. 426. *naganum* (Moore), [p. 423

Callidice Group (=*Synchloe* Hübn., *Parapieris* de Nicév.).

♂♀. Antennal club large and spatulate. Hind wing underside with green or yellow ground-colour, and in Indian forms with dark post-discal or submarginal spots, resembling some species of *Aporia*. Genitalia with the valve rounded in the apical part; ædeagus with a prominent basal prong.

The species of this group are confined to high elevations. They have a rapid and irregular flight, and are very shy.

Only four species are placed in this group, of which two are found in the Indian area.

Pieris callidice (Hübner, 1799).

♂. *Upperside* white. Fore wing with a prominent discocellular spot; marginal black spots on the veins; a black post-discal stripe reaching vein 3, with a spot in area 1*b*.

Underside markings greenish. Hind wing with the pale spots sagittate.

♀. *Upperside* with extended black markings. Hind wing with basal area darkened, outer margin broadly black, with white submarginal spots.

Distribution.—The high mountains of Europe to Turkestan and West China, entering the Indian area on the North-West. Five subspecies, of which only one is found in the Indian area.

134. **Pieris callidice kalora** Moore.

Pieris kalora, Moore, 1865 *a*, p. 449, pl. xxxi, fig. 15 (♂, N.W. Himalayas).
Pieris callidice var. *kalora*, Verity, 1908–1911, pp. 131, 326, pl. lxvi, figs. 9 (♀), 11 (♂).
Parapieris callidice kalora, Fruhstorfer, 1910, p. 140.
Synchloe callidice kalora, Talbot, 1932, p. 278.
Pieris callidice kalora, Evans, 1932 *a*, p. 66, pl. vii, fig. B 4.2 (♂).
Parapieris callidice, de Nicéville (*non* Hübner), 1897 *a*, p. 563; Moore, 1904, p. 140, pl. 521, figs. 3, 3 *a*, 3 *b* (♂♀).
Pieris callidice, Bingham (*non* Hübner), 1907, p. 178.
Pieris callidice var. *kalora* ab. *magnomaculata*, Verity, 1911, p. 326, pl. lxvi, fig. 10 (Hunza); Bollow, 1930, p. 101.

♂. *Upperside* white. Fore wing with extreme base of areas 1 *a*, 1 *b*, and cell black; a discocellular black quadrate spot; a post-discal curved series of inwardly dentate spots, the one in area 3 often absent, and those in 1 and 2 obsolete or absent; a marginal series of similar but more clearly defined spots on veins 3 to 7. Hind wing unmarked except for a basal dusting of black; the pattern of the underside visible through transparency.

Underside of fore wing white; basal half of costal margin and quadrate discocellular spot dull black; a post-discal curved series of four black spots in areas 1, 3, 5, and 6, followed by elongate green streaks along veins 3 to 7 that reach the outer margin. Hind wing green; an elongate, oval, yellowish-white cell-spot; a post-discal and marginal curved series of yellowish-white, inwardly lanceolate spots; a yellowish-white streak in area 7. Antennæ black, spotted with white; head fuscous-grey; thorax blackish-grey; abdomen black, with more or

less sparse white scaling; underside of head, thorax, and abdomen white.

♀. *Upperside* of fore wing as in the ♂, but the markings much larger, the post-discal spots very prominent, with a large quadrate spot in area 1 *b*. Hind wing with extensive black scaling over the basal and inner areas; a broad marginal black border, dentate on its inner edge, and bearing five prominent ante-marginal white spots.

Underside of fore wing much as in the ♂, but apical and marginal green area more extended, the white streaks that traverse it longer; the black post-discal spots absent in areas 5 and 6. Hind wing similar to that of the ♂, but the yellowish-white lanceolate spots are narrower and smaller.

Expanse: ♂♀, 50–60 mm.

The form **magnomaculata** Verity represents a ♂ in which the discocellular spot of the fore wing is as large as in the ♀.

The species flies in company with *Parnassius* at the edges of glaciers and snowfields at 9,000–15,000 feet elevation.

Habitat.—N.W Frontier Province, Safed Koh to Chitral and United Provinces, Kumaon; common.

Pieris dubernardi Oberthür (1884).

♂. *Upperside* of fore wing with a prominent black spot in area 3, and traces of a band below this spot. Hind wing with an apical black spot in area 6.

Underside of fore wing with a proximal white and distal yellow area, the veins broadly edged with black. Hind wing yellow, the veins edged with black; a post-discal row of black spots.

♀. *Upperside* of fore wing with a prominent black discal band; hind wing with a black post-discal band.

Distribution.—Sikkim, Tibet, Eastern Turkestan to North and West China and North Yunnan. Five subspecies, of which one is found in the Indian area.

135. **Pieris dubernardi chumbiensis** (de Nicéville).

Parapieris chumbiensis, de Nicéville, 1897 *a*, p. 563, pl. i, fig. 6 (♂, Chumbi Valley); Moore, 1904, p. 143, pl. 522, figs. 1, 1 *a* (♂).
Pieris chumbiensis, Bingham, 1907, p. 174.
Synchloe chumbiensis, Röber, 1907, p. 50, t. 20 *e*.
Pieris dubernardi var. *chumbiensis*, Verity, 1908–1911, pp. 136, 329, pl. lxvi, fig. 20 (♂).
Parapieris dubernardi chumbiensis, Fruhstorfer, 1910, p. 140.
Pieris dubernardi chumbiensis, Evans, 1932 *a*, p. 66, pl. vii, fig. B 4.5 (♂).
Pieris dubernardi, Elwes (*non* Oberthür), 1888, p. 415.

♂. *Upperside* of fore wing with veins black; costal margin narrowly black; outer margin more broadly black, narrowing

posteriorly, the inner edge of apical area evenly curved ; a large round black spot in middle of area 3 ; *ldc* edged on either side with black ; basal area dusted with black. Hind wing with a dark greyish appearance, due to the markings of the underside showing through ; veins black ; a black subapical costal spot ; basal area heavily dusted with black.

Underside of fore wing with the veins edged with black, the spot in area 3 as on upperside ; distal marginal area broadly yellow, especially above vein 4. Hind wing yellow ; veins very broadly edged with black that gives an appearance of streaks to the ground-colour ; precostal area edged with deep cadmium-yellow. Antennæ, head, thorax, and abdomen deep fuscous-black.

♀. *Upperside* blackish-brown, with the white markings more or less dusted with black. Fore wing basal area, including the cell, and posterior area below vein 3 to mid-way between cell and margin, greyish-white ; costa dusted with grey ; a small diffuse grey spot in the base of area 3, and a similar short narrow spot in 4 ; an apical and marginal series of purer white spots, not sharply defined ; the apical spots above vein 4 with linear distal prolongations, the spot in 5 much longer than the others, and the three lower spots placed nearer the margin ; these spots separated from the basal area by the ground-colour, which forms a post-discal band reaching vein 4, where it expands to a spot, and is indistinctly prolonged to vein 5. Hind wing with greyish-white basal area, including most of the cell, area 1 *c*, a short stripe in 2, a smaller and narrower spot in 3, two short dusky streaks in 4 and 5, and a more prominent streak in 6 ; a white costal stripe in 7, the costal edge lightly dusted with black ; six marginal white stripes in areas 1 *c* to 6, divided by the veins, which are edged broadly with the ground-colour, and divided transversely by a post-discal band of ground-colour from costa to vein 1 *b*, thinning out below vein 3 ; the marginal bars cut off by the post-discal band are purer white than the proximal part ; inner margin white, with veins 1 *a* and 1 *b* edged with grey ; cilia white.

Underside as in the ♂. Antennæ black, speckled with white, club ochreous at the tip. Head, thorax, and abdomen black above, with greyish hair ; palpi black, striped with yellow on outer side ; underside of thorax with grey-white hair, of abdomen dusted with yellow.

Expanse : ♂♀, 45–60 mm.

Habitat.—SIKKIM : Chumbi Valley ; ♂ not rare, ♀ scarce.

The description of the ♀ given above is from the single specimen in the British Museum, taken in the Chumbi Valley, 13,500 feet, 2. vii. 1925.

Brassicæ Group.

♂♀. Antennal club gradual, not spatulate. Hind wing underside with no post-discal nor submarginal spots. Valve with an apical process ; ædeagus with a short basal prong.

Pieris krueperi Staudinger (1860).

This species is distinguished by having on the fore wing a triangular black subapical costal patch, and coalescent black marginal spots.

Distribution.—Greece and Syria to Turkestan, the Pamirs, and NORTH-WEST INDIA. Five subspecies, of which one is found in the Indian area.

136. **Pieris krueperi devta** (de Nicéville). (Fig. 148, ♀).

Mancipium devta, de Nicéville, 1883 *a*, p. 82, pl. ix, figs. 9, 9 *a* (♂♀, Ladak).
Danaus devta, Moore, 1904, p. 130, pl. 518, figs. 3, 3 *a*, *b* (♂♀).
Pieris devta, Röber, 1907, p. 46, t. 20 *b*.
Pieris krueperi devta, Bingham, 1907, p. 175 ; Verity, 1908–1911, pp. 151, 336, pl. xxxiii, figs. 18, 19 (♂♀, Turkestan) ; Fruhstorfer, 1910, p. 140 ; Evans, 1932 *a*, p. 66 ; id., 1932 *b*, p. 199 (Baluchistan).

♂. *Upperside* of fore wing with base of costa dusted with black ; a costal triangular black patch, usually touching the dark apical area ; marginal, black, triangular, inwardly pointed coalescent spots on veins 3 to 5 ; a large black spot in

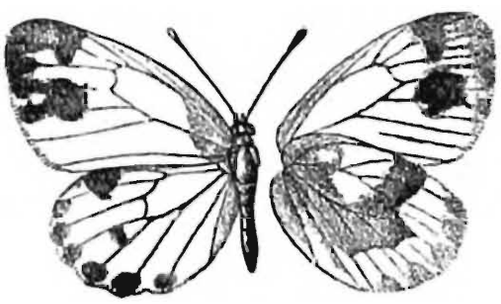


Fig. 148.—*P. krueperi devta*, ♀.

area 3, often joined to the marginal spot. Hind wing with a black subapical costal spot ; small and indistinct marginal spots.

Underside of fore wing similar to the upperside, the outer marginal area faintly ochraceous or greenish-yellow. Hind wing with the basal two-thirds dusted more or less thickly with black, with the exception of a short, very broad, inwardly oblique band of the ground-colour that extends from the middle of the costa to within the upper portion of the cell ;

the outer edge of the dusky area is transverse from costa to area 5, thence curved outwards to vein 4, and obliquely inwards to vein 1 *a* ; dark marginal vein-spots more or less distinct. Antennæ brown, paler at their apices ; head fuscous ; thorax and abdomen black above, whitish beneath.

♀. *Upperside* similar to the ♂. Fore wing with the black markings broader, more conspicuous, and extended lower along the margin than in the ♂. Hind wing with slightly larger costal spot, and rarely some indistinct small black marginal vein-spots.

Underside as in the ♂. Fore wing with the additional black spot in area 1 small, the spot in area 3 very large. Hind wing with diffuse marginal spots, more or less continuous or coalescent, and washed with greenish.

In fig. 148, reproduced from Bingham, the marginal spots on the hind wing are much too large.

Expanse : ♂♀, 50–55 mm.

Habitat.—BALUCHISTAN to LADAK ; very rare, but more frequent in Kashmir at about 9,000 feet.

Pieris napi (Linnæus, 1758).

A very variable and common species, with many racial, individual, and seasonal forms. Some of these races are rather distinct, and one of them, *melete* Ménétr., has long been regarded as a distinct species, but there is no satisfactory proof of this.

♂♀. *Upperside* of fore wing with black apical area ; a black spot in area 3, often produced to the inner margin. Hind wing with a black costal spot.

Underside with the veins more or less edged with black, the hind wing greenish.

Egg.—These are laid singly, and are green.

Larva.—Head grey-green with a black spot. Body dark green, lighter at the sides ; dotted with black, and with more prominent whitish dots ; a yellow spiracular stripe edged with reddish-yellow ; spiracles black. *Food-plants* : Cruciferæ.

Pupa.—Resembles *rapæ*, but is more slender and angular ; head process abrupt, a dorsal row of black dots, and a lateral row of larger dots. Yellowish-green, whitish or bone-yellow, or mottled grey.

Distribution.—The whole Palæarctic region, including North America, extending into SIKKIM, NORTH-WEST INDIA, and BURMA.

137 *a*. **Pieris napi ajaka** Moore.

Pieris ajaka, Moore, 1865 *a*, p. 490, pl. xxxi, fig. 16 (♀, Kunawur); Röber, 1907, p. 47.
Danaus ajaka, Moore, 1904, p. 132, pl. 519, figs. 2, 2 *a*, 2 *b*, 3, 3 *a* (♂♀).
Pieris melete ajaka, Verity, 1908–1911, pp. 140, 166, 331, pl. xlix, fig. 2 (♀); Fruhstorfer, 1910, p. 140.
Pieris napi ajaka, Evans, 1932 *a*, p. 67; Peile, 1937, p. 45, pl. v, fig. 32 (♀).
Pieris napi melete, Bingham (*non* Ménétries), 1907, p. 173 (part.).
Pieris ajaka f. *ajanta*, Röber, 1907, p. 48.

♂. *Upperside* markings weak.
Underside yellowish, more so on hind wing, which has a yellow costal stripe.
♀. *Upperside* of fore wing with well developed apical black; a large spot in area 3; a prominent spot in 1 *b*, forming a bar to the inner margin, with a proximal marginal prolongation. Hind wing upperside with apical spot large.

Dry-season form **ajanta** Röb.—Smaller, about the size of *P. rapæ*, the markings reduced and pale, and *upperside* with a yellowish tinge; *underside* white.
Expanse: ♂♀, 40–55 mm.
Habitat.—PUNJAB, Murree, to UNITED PROVINCES, Kumaon; common.

137 *b*. **Pieris napi montana** Verity. (Fig. 149, ♀).

Pieris melete var. *montana*, Verity, 1908, p. 141, pl. xxxi, figs. 20, 21 (♂♀, Sikkim); Fruhstorfer, 1910, p. 140.
Pieris napi montana, Evans, 1932 *a*, p. 67; Peile, 1937, p. 45.
Ganoris ajaka, Doherty (*non* Moore), 1886 *a*, p. 135.
Mancipium ajaka, Wood-Mason & de Nicéville (*non* Moore), 1887, p. 372.
Danaus ajaka, Moore (*non* Moore, 1865), 1904, pl. 519, fig. 3 *b* (Cherrapunji, ♀).
Pieris melete ajaka, Corbet (*non* Moore), 1937, p. 48 (♂, Perak).
Pieris melete, Watson (*non* Ménétr.), 1897 *a*, p. 669; Mackinnon & de Nicéville, 1898, p. 590.
Pieris napi melete, Bingham (*non* Ménétr.), 1907, pp. 173, 174 (part.), fig. 44 (♀).

♂. *Upperside* with the veins black and conspicuous. Fore wing slightly dusted with black at the base; costal margin very narrowly black; apical black area joined to marginal black formed of three, inwardly triangular, continuous or coalescent spots on veins 2 to 4; a round black spot in middle of area 3, and in many specimens traces of a similar spot in the outer half of 1 *b*. Hind wing with an obliquely placed subcostal spot before the apex.
Underside with the veins more or less widely margined with black; apex of fore wing and whole of hind wing somewhat tinged with dull ochraceous, not so yellow as in typical

napi. In many specimens there is an indication of black bars between veins 1 and 2 and 3 and 4 respectively; hind wing with base of costa bright yellow. Antennæ dark dull brown, paler at their apices; head, thorax, and abdomen black with more or less of white hairs and scaling; beneath whitish.

♀. Markings similar to those of the ♂, the *upperside* much darker. Fore wing with black basal dusting extended nearly to apex of cell; apical and marginal black much broader; spots in areas 1 and 3 much larger; spot in 3 sometimes coalescent with the marginal black; spot in 1 *b* continued in a broad

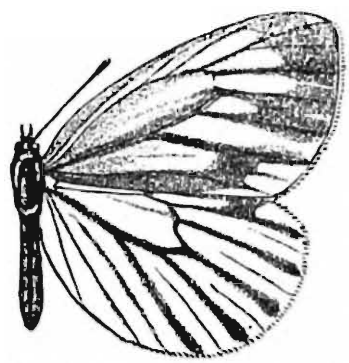


Fig. 149.—*P. napi montana* Verity, ♀.

streak along the inner margin to base. Hind wing as in the ♂, but the black edging to the veins much broader; specimens from high elevations with extended black basal and discal scaling.

Underside as in the ♂.

Expanse: 50–60 mm.

Habitat.—SIKKIM to the SOUTHERN SHAN STATES; not rare. A ♂ is recorded by Corbet (1937) from Perak, perhaps introduced.

137 *c*. **Pieris napi melaina** Röber.

Pieris melaina, Röber, 1907, p. 48, t. 20 *g* (♂♀, Tibet).
Pieris melete melaina, Verity, 1908–1911, pp. 140, 331, pl. lxvi, figs. 29, 30 (♂♀, Chumbi Valley); Riley, 1927, p. 123 (Sikkim, 11,500 feet; Tibet, 11,000 feet).
Pieris napi melaina, Evans, 1932 *a*, p. 67; Peile, 1937, p. 46.

♂. *Upperside* with veins strongly darkened. Fore wing with broad apical and marginal black; spot in area 3 very large and merged more or less completely with the marginal black; spot in 1 *b* prominent. Hind wing with apical spot well marked.

♀. *Upperside* strongly dusted with black, leaving prominent stripes of ground-colour.

Habitat.—SIKKIM: Chumbi Valley; also in Tibet. Restricted to high elevations, where it is not rare.

Pieris extensa Poujade (1888).

This species, only known previously from Western China, has been found recently in Bhutan, and forms an interesting addition to the Indian fauna.

♂♀. Normally larger than *brassicæ* (Linn.), with an expanse of about 70–80 mm.

♂. *Upperside* white. Fore wing with a narrow apical black border reaching vein 4, its inner edge slightly toothed on the veins ; a prominent black spot in the middle of area 3, sometimes obsolete, its outer and inner edges incurved, with a tendency to division of the spot into two ; veins 2 to 4 and lower edge of cell blackened, sometimes all the veins blackened, but always vein 4 more extensively ; usually a black oblique bar in the middle of area 1 *b*. Hind wing with the veins more or less defined by black scaling ; an apical black spot in area 6, usually large.

Underside of fore wing resembles the upperside ; apical and costal areas with an ochraceous tinge. Hind wing dull ochraceous, the veins darkened.

♀. Black markings as in the ♂ but more extended and brownish, the veins much darkened. Fore wing with spots in areas 3 and 1 *b* very prominent, the latter continued to the inner margin, along which it extends as a heavy line narrowly to near the base. Hind wing with apical spot forming a marginal patch ; marginal black spots on veins 3 to 5, or a complete black border.

Underside as in the ♂, the markings on fore wing more emphasized. Antennæ entirely black.

There occurs also a slightly smaller form in which the black markings are all much reduced ; this is the nominotypical form. The darker form is *eurydice* Leech (1891).

Distribution.—South-West China and BHUTAN ; a subspecies in each of the two areas.

138. **Pieris extensa bhutya**, subsp. nov.

♂. More heavily marked with black scaling than the f. *eurydice* Leech. Fore wing with marginal black reaching vein 3 ; the black spot in area 3 very large, cutting off a submarginal small, round, white spot in area 3 ; vein 4 and the distal part of vein 3, as well as the inner side of the lower edge of cell between veins 2 and 4, more heavily blackened than in the allied form. Hind wing with the veins more heavily blackened, especially in their distal part, than in the allied form.

Underside of fore wing with the veins heavily blackened ; apical and marginal area ochraceous-buff, being darker and more distinct than in *eurydice*. Hind wing ochraceous-buff ; veins edged with black mixed with the ground-colour, this edging being wider near the cell ; area 1 *c* almost entirely

blackened, whilst 1 *a* and 1 *b* are paler than the rest of the wing.

♀. Darker than in *eurydice*, the dark scaling black instead of brownish. Fore wing with marginal black reaching vein 2, only slightly interrupted by the fold. Hind wing with outer black border wider than is usual in the allied form, and extending diffusely below vein 2 to 1 *b*.

Underside as in the ♂, the hind wing of a deeper ochraceous.

Habitat.—EASTERN BHUTAN; Trashiyangsi, 8,000 feet, July 1933, 5 ♂♂, 1 ♀, and September 1934, 1 ♂; Donga La, 10,000 feet, July 1933, 1 ♂, 1 ♀. All collected by Messrs. Ludlow and Sheriff, who presented the specimens to the British Museum. Type ♂ from the first locality, July 28th, 1933; ♀ allotype from the second locality, July 26th, 1933.

Pieris naganum (Moore).

♂. *Upperside* of fore wing with black apical and marginal area reaching vein 3 or below this vein; a black submarginal spot in area 3, placed close to the black border; sometimes a spot in 1 *b* at about the outer third. Hind wing unmarked.

Underside of fore wing without marginal black, the spots more prominent. Hind wing pale yellow, unmarked.

♀. Extended black markings. Fore wing with a broad black stripe in area 3. Hind wing with marginal black border anteriorly and marginal black spots posteriorly.

Distribution.—South-West China, Hainan, and Tong-king, to ASSAM and UPPER BURMA. Three races, of which only the nominotypical form occurs in the Indian area. A very rare species, of which the female is known only of the Chinese race.

139. **Pieris naganum naganum** (Moore).

Mancipium naganum, Moore, 1884, p. 45 (♂, Naga Hills).
Danaus naganum, Moore, 1904, p. 130.
Pieris naganum, Bingham, 1907, p. 171; Fruhstorfer, 1910, p. 140; Evans, 1932 *a*, p. 67.

♂. *Upperside* white. Fore wing with basal two-thirds of costa dusted with black; outer margin bordered with black, broad at the apex and narrowing to vein 3, the inner edge of this black area curved; discocellulars with a black crescentic mark; a large elongate black spot in middle of area 3, produced distad and coalescing with the marginal black. Hind wing unmarked.

Underside of fore wing white; apical area ochraceous-yellow: the black markings of upperside show through. Hind wing ochraceous-yellow. Antennæ black, speckled with white; head, thorax, and abdomen above black, beneath white.

Expanse: ♂, 65 mm.

Habitat.—ASSAM to NORTHERN BURMA. One of the rarest of Indian butterflies. The type-specimen is in the Indian Museum, and the British Museum contains a male from Upper Burma, a male from Sadon, Northern Burma, and a male from the Naga Hills (3,000 feet, March 5th).

140. **Pieris deota** (de Nicéville). (Fig. 150, ♂).

Mancipium deota, de Nicéville, 1883 *a*, p. 82, pl. ix, fig. 10 (♂, Ladak).
Danaus deota, Moore, 1904, p. 129, pl. 518, figs. 2, 2 *a* (♂).
Pieris deota, Bingham, 1907, p. 171 ; Röber, 1907, p. 45, t. 20 *a* (♂) ; Verity, 1908, p. 162, pl. xxxv, figs. 1–5 ; Fruhstorfer, 1910, p. 139 ; Evans, 1932 *a*, p. 67.

♂. Somewhat resembles *P. brassicæ*.

Upperside of both wings with a uniform black outer marginal border. Fore wing with inner edge of black border dentate ; in area 3 an elongate narrow black spot, sometimes faint.

Underside of fore wing with apical and marginal border ashy-brown, thickly dusted with black ; black spot in area 3

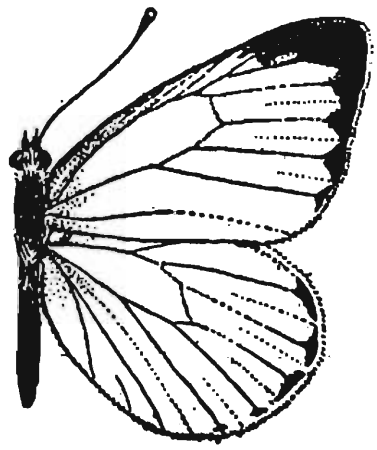


Fig. 150.—*P. deota* (de Nicév.), ♂.

prominent ; smaller spots above and below the latter in areas 5 to 7 and 1 *b* and 2. Hind wing dusted with black, and less yellow than in *brassicæ* ; a black subcostal spot, and a second one in area 3.

♀. *Upperside* as in *brassicæ*, but the marginal black border as in the ♂, and similarly dentate ; a large spot in areas 3, 1 *b*, and 1 *a*. Hind wing with marginal black border as in the ♂, but broader and divided by the white veins into inwardly diffuse and subquadrate spots ; a small black spot in area 3, another in 5, the latter joined to the subcostal black spot, which is particularly large and prominent.

Underside as in the ♂.

Expanse : ♂♀, 58–61 mm.

Fig. 150 is from a specimen in the British Museum from Khardung, 11,000 feet, June.

Habitat.—KASHMIR to LADAK, extending to the Pamirs; rare. Inhabits desolate plateaux, and occurs in single specimens.

Pieris canidia (Sparrman, 1768).

♂♀. *Upperside* of fore wing with inner edge of marginal black border dentate; a prominent black spot in area 3, and one in 1 *b* more or less distinct. Hind wing with marginal black vein-spots and a costal spot.

Underside of fore wing without marginal black; spots in areas 3 and 1 *b* large. Hind wing with uniform ground-colour.

The races of this species, of which the nominotypical form comes from South China, are only slightly differentiated. Indian specimens were divided by Evans into two races—a large, heavily marked form found in the Nilgiri Hills, and a smaller and less marked form found in other parts of India and Burma.

Distribution.—Turkestan to INDIA, extending to China, the Loo-Choo Islands, and Malay Peninsula. Six subspecies, of which two are found in the Indian area. The species is individually very variable.

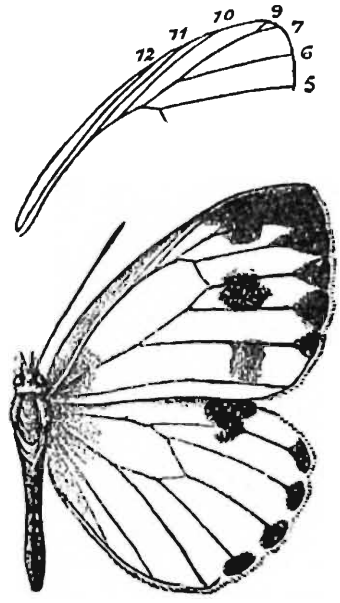


Fig. 151.—*P. canidia canis* Evans, ♂.

141 *a*. **Pieris canidia canis** Evans. (Fig. 151, ♂).

Pieris canidia canis, Evans, 1912 *a*, pp. 559, 976 (S. India); id., 1932 *a*, p. 67; Peile, 1937, p. 46.
Pieris brassicæ, Bingham (*non* Linn.), 1907, fig. 43 (♂).

Distinguished from *indica* Evans as follows:—

♂. *Upperside* with black areas slightly wider. Fore wing with the apical black entering area 5 as a short spur. Hind wing with larger marginal spots.

Underside of fore wing with a rounded black spot in area 5 above the discal spot, and some black scaling extending to the costa. Hind wing strongly dusted with black, leaving distal stripes of ground-colour, including a long stripe extending from the base through the cell and area 4 to the margin; a more prominent dusky black costal patch.

♀. More heavily marked than *indica*. Fore wing with apical black reaching to vein 5 or nearly so; cell and basal area more strongly dusted with black. Hind wing with marginal black spots much larger than is usually the case in *indica*.

Underside resembles the ♂.

Expanse: ♂♀, 50–60 mm.

Habitat.—South India: Nilgiri Hills; common.

141 *b*. **Pieris canidia indica** Evans.

Pieris canidia indica, Evans, 1926, p. 712 (nom. nov. pro *canidia* Evans, *non* Sparrm.); id., 1932 *a*, p. 67, pl. vii, fig. B 10.4 (♀); Peile, 1937, p. 46, pl. vi, fig. 44 (♂).
Danaus canidia, Adamson, 1908, p. 117 (Burma).

♂♀. The characters which distinguish this from *canis* Evans are given under that race. Slightly smaller and less strongly marked than the Chinese forms, but the spot in area 3 of the fore wing is very prominent. It is doubtfully distinct from South China specimens (*claripennis* Butler).

Habitat.—North Baluchistan and Chitral to the Dawna Range, Burma; very common. The types in the British Museum are from Kumaon (Naini Tal forest).

Pieris brassicæ (Linnæus).

A number of races, some doubtfully distinct, and many individual forms of this species have been described. The Indian race is not very sharply differentiated from European specimens.

♂. *Upperside* white. Fore wing with apical black reaching veins 3 or 4. Hind wing with a black apical spot.

Underside of fore wing white, with two discal black spots. Hind wing yellow, dusted with black.

♀. Black markings more developed. Fore wing with two rounded discal black spots, and a diffuse elongate spot on inner margin.

Specimens of the summer brood are usually larger, with the hind wing underside lighter yellow and less dusted with black. ♀ rarely with a yellow tinge on hind wing upperside.

Larva.—Bluish-green, with black dots and yellow dorsal and lateral stripes; venter grey, dotted with black. *Food-plants*: Cruciferæ.

Pupa.—Yellowish-green, with black spots and dots; head process obtuse; several small dorsal tubercles.

Larvæ and pupæ much infested by ichneumons.

Distribution.—All Europe to Turkestan, BALUCHISTAN, and HIMALAYAS.

142. **Pieris brassicæ nepalensis** Doubleday.

Pieris brassicæ var. *nepalensis*, Doubleday, 1846, p. 9, pl. vi, figs. 1–3 (imago); Moore, 1865 *a*, pp. 489–493; id., 1874 *a*, p. 273.
Mancipium nepalense, Moore, 1882, p. 256 (Kangra).
Ganoris nepalensis, Swinhoe, 1885 *b*, p. 343 (Afghanistan).
Ganoris nipalensis, Butler, 1886 *a*, p. 376.
Pieris brassicæ nepalensis, Röber, 1907, p. 45, t. 19 *e* (imago); Verity, 1908, p. 164, pl. xxxv, figs. 16, 18 (♂), 17 (♀); Fruhstorfer, 1910, p. 139; Riley, 1927, p. 122 (Darjeeling); Graham-Smith, 1930, p. 19, pl. ii, fig. 21 (imago).
Pieris brassicæ; Elwes (*non* Linn.), 1882, p. 401 (Sikkim); Lang, 1884, p. 28, pl. xv, fig. 2 (larva and pupa); Elwes, 1889, p. 416; Bingham, 1907, p. 170 (text only); Ghosh, 1914, pp. 20–6 (egg, larva, pupa, imago); Evans, 1932 *a*, p. 67, pl. vii, fig. B 4.11 (♂); Peile, 1937, p. 46.
Danaus brassicæ, Moore, 1904, p. 127, pl. 518, figs. 1, 1 *a* (♂♀).

♂. *Upperside* creamy-white with a somewhat farinaceous appearance. Fore wing dusted with black at the base and along costa for a short distance; apex and outer margin above vein 2 more or less broadly black, the inner edge of this area with a regular even curve; sometimes a small longitudinally narrow black spot in area 3. Hind wing uniform, dusted with black at the base, a large black subapical costal spot, and sometimes indications of black marginal scaling anteriorly.

Underside of fore wing white, slightly dusted with black at base of cell and along costa; apex light ochraceous-brown; a large black spot in outer half of area 1, and another quadrate black spot at the base of area 3. Hind wing light ochraceous-brown, closely dusted with black; the subcostal spot shows through. Antennæ black, club tipped with white; head, thorax, and abdomen black, with some white hairs; underside whitish.

The ♂ scarcely differs from European specimens, but the marginal black on fore wing reaches below vein 3 and often halfway to vein 2. On the underside of hind wing the black costal spot is usually more prominent.

♀. *Upperside* resembles that of the ♂, but basal black dusting more extended; black apical and marginal black broader, its inner edge less evenly curved; a conspicuous large black spot in outer half of area 1 *b*, and another near base of area 3. Hind wing with costal black spot much larger.

Underside similar to that of the ♂; apical area and whole surface of hind wing light ochraceous-yellow, not ochraceous-brown; black discal spots on fore wing much larger.

Differs from European specimens in more extended black markings, the spots on fore wing larger; marginal black reaches vein 2, and the edge of this area comes closer to the spot in area 3, the white interspace in 3 being often dusted with black; in one ♀ in the British Museum the whole of area 3 as far as the spot is merged with the marginal black.

Expanse: ♂♀, 65–75 mm.

Habitat.—BALUCHISTAN and CHITRAL to ASSAM, and the plains adjoining the Himalayas, extending into Tibet and Yunnan; very common.

Pieris rapæ (Linnæus).

A small species with markings similar to those of *brassicæ* (Linn.), but reduced, the fore wing with small apical black area of variable extent, sometimes reduced to slight black dusting.

Egg.—Yellow. Somewhat pear-shaped, narrowed at the apex, marked with ten or twelve longitudinal ribs and at least thirty fine transverse lines. Laid singly on both sides of the leaf, or even on the stalks and buds of the flowers.

Larva.—Head brownish-green. Body velvety leaf-green, with a prominent dorsal yellow stripe, and two similar lateral stripes which are interrupted on each segment; spiracles ringed with black; venter yellowish. The young larva is uniform blackish-green.

Pupa.—The head and lateral processes more pointed than in *brassicæ*. Grey, greenish, yellowish, or brownish; dotted with black, and marked with three more or less distinct yellow stripes.

Distribution.—The whole Palæarctic region, including North America, extending into NORTH-WEST INDIA.

143. **Pieris rapæ iranica** Le Cerf.

Pieris rapæ iranica, Le Cerf, 1913, p. 25 (Persia); Peile, 1921, p. 137; id., 1922, pp. 243, 244.
Ganoris rapæ, Butler (*non* Linn), 1881 *b*, p. 612.
Danaus rapæ, Moore, 1904, p. 131, pl. 519, figs. 1, 1 *a*–1 *c* (♂♀).
Pieris rapæ, Bingham, 1907, p. 169; Fruhstorfer, 1910, p. 140; Evans, 1932 *a*, p. 67; Peile, 1937, p. 47.
Pieris rapæ tochica, Peile, 1937, p. 47 (Tochi Valley).

♂. *Upperside* white; base of both wings and costa of fore wing for a short distance sparsely dusted with black. Fore wing sometimes narrowly, sometimes broadly black at the apex; a round black spot in the middle of area 3. Hind wing with a small diffuse black spot in area 7 that crosses vein 7 to the costa.

Underside of fore wing with upper half of cell and costal margin above it sparsely dusted with black; apical area tinged with ochraceous or cream; a black spot in area 3 as on upperside, and another below it in area 1 *b*. Hind wing with inner area somewhat broadly white, rest of wing cream-colour; base and cell sparsely dusted with black. Antennæ, head, thorax, and abdomen black chequered with white, and a little whitish pubescence on head and thorax; underside of head, thorax, and abdomen white.

♀. Resembles the ♂, the upperside more or less creamy-white, with the black spot in area 1 *b* present on the fore wing.

Underside with the ground-colour at apex of fore wing and of entire hind wing more strongly suffused with yellow than in the ♂.

This race is chiefly to be distinguished from European specimens by the greater extent of the apical black area on the fore wing. This is, however, not constant, and much variation occurs. Many specimens are found which show unusually narrow apical black, closely resembling *leucosoma* Schaw. from Transjordan, and others occur with only slight black scaling.

The name **tochica** Peile may be used to represent a form in which the apical black is dusted with white and extended to vein 5, with some scattered black scales in area 4; discal spot small. This represents a dry form which is not peculiar to one area.

Expanse: ♂♀ 45–55 mm.

Habitat.—Mesopotamia and North Persia to BALUCHISTAN, CHITRAL, KASHMIR, and LADAK. According to Peile (1937) the species is scarce on the North-West Frontier, but according to Leslie and Evans (1903) it is common in Chitral at between 4,000 and 8,000 feet from March to October.

Genus **PONTIA** Fabricius.

Pontia, Fabricius, 1807, p. 283; Curtis, 1824, pl. 18 (type, *daplidice* Linn.); Moore, 1904, p. 136; Fruhstorfer, 1910, p. 140; Talbot, 1931, p. 231 (type, *daplidice* Linn.); Klots, 1932, pp. 212, 213; Hemming, 1934 *a*, p. 130 (type, *daplidice* Linn.).

Mancipium, Hübner, 1806–1819, pl. 141 (*P. hellica* Linn.); Hemming, 1934 *a*, p. 130 (type, *P. hellica* Linn., 1767).

Leucochloë, Röber, 1907, p. 49 (type, *daplidice* Linn.).

Pontieuchloia, Verity, 1929, p. 347 (type, *chloridice* Hübn.).

Type of the genus, *P. daplidice* Linn.

♂♀. Partakes of the characters of both groups of *Pieris*, but the fore wing has only nine veins, veins 7+8 and 9 being fused. This condition is almost achieved in the *Callidice* group of *Pieris*. There is a further approximation to this

group in the form of the valve, which is without an apical process. The general pattern of the *Pontia* species is different from any of the true *Pieris*, and somewhat resembles certain forms of *Euchloë*.

Fore wing upperside with broad black apical area bearing prominent white spots; a large quadrate discocellular spot, and usually a spot in the middle of area 1 *b*. Hind wing underside more or less green, with a post-discal and marginal series of white spots; a rounded cell-spot, and another similar spot above it in area 7

Distribution.—The whole Palæarctic region, including North America, most of Africa, and entering the Indian area in the North-west. Three species are found in India.

Key to Species.

1. Hind wing underside with the veins concolorous with the ground-colour of the wing	2.
Hind wing underside with the veins yellow	[p. 432. *glauconome* Klug,
2. Hind wing underside in area 7 with a short sub-basal white bar, anteriorly wider .	[p. 432. *chloridice* (Hübn.),
Hind wing underside in area 7 with a sub-basal somewhat rounded spot, not wider anteriorly	[p. 430. *daplidice* (Linn.),

Pontia daplidice (Linnæus, 1758).

♂. *Upperside* of fore wing with a large discocellular black spot; apical area broadly black, bearing submarginal white spots having distal prolongations to the margin; area 1 *b* with usually a black spot near the middle.

Underside of hind wing with a rounded white cell-spot and a similar spot above it in area 7; a post-discal band of white spots, and a marginal series of smaller white spots.

♀. Similar to the ♂, but with extended black markings. Hind wing *upperside* with a black apical spot, and black submarginal band that is more or less distinct.

Larva.—Bluish-grey with two yellow lateral stripes; head yellow, venter bluish-grey. Feeds on the seeds of *Reseda*, *Turritis*, *Sisymbrium*, *Sinapis*, and *Alyssum*.

Pupa.—Green, brownish, or grey, with yellowish-white lateral stripe on abdomen.

Distribution.—Europe and North Africa to Abyssinia, extending to North-West India, China, and Siberia. One subspecies in the Indian area.

144. **Pontia daplidice moorei** (Röber).

Leucochloë daplidice moorei, Röber, 1907, p. 49 (Tibet, Kashmir, Baluchistan).
Pieris daplidice moorei, Verity, 1911, pp. 132, 327, pl. xxx, figs. 15, 16 (♂♀); Fruhstorfer, 1910, p. 141, t. 73 *a* (imago); Evans, 1932 *a*, p. 66, pl. vii, fig. B 4.3 (♂, underside); Peile, 1937, p. 44, pl. vi, fig. 41 (♀).
Pontia daplidice, Moore (*non* Linn.), 1904, p. 137, pl. 521, figs. 1, 1 *a*, 1 *b* (♂♀).
Pieris daplidice, Bingham (*non* Linn.), 1907, p. 175.

A larger and more strongly marked race than the nominotypical one.

♂. *Upperside* white. Fore wing with basal half of costa narrowly dusted with black; a broad and somewhat quadrate discocellular spot; apical and marginal area above vein 3 broadly black, bearing a series of submarginal white spots, prolonged as fine lines to the outer margin. Hind wing uniform, the markings on the underside showing faintly through; a costal spot before the apex, and in some specimens some obscure anterior marginal markings indicated by black dusting.

Underside of fore wing white; base of cell dusted with green; black discocellular spot extended to the costa, often greenish or with a green centre; apical area green, the submarginal spots obscure; a black or greenish-black spot in the outer half of area 1 *b*. Hind wing green; costa at base deep yellow; inner margin white; a rounded white spot in middle of cell, and another spot above it in area 7; a curved irregular post-discal band of conjoined spots, of which the upper two are placed more inwards; a marginal series of white spots in areas 1 to 6; the veins sometimes faintly yellow. Antennæ dusky black; head, thorax, and abdomen fuscous-black; underside of head, thorax, and abdomen white.

♀. *Upperside* of fore wing with basal area dusted with black, extending anteriorly to the large discocellular patch; a somewhat quadrate black spot in the outer half of area 1 *b*, with sometimes a short ill-defined black streak below it; apical and marginal black broader than in the ♂, the submarginal spots blurred and obscure. Hind wing with a large costal black spot before the apex; a broad, black, submarginal, inwardly diffuse curved band; a marginal series of black spots connected by thin projections to the submarginal band.

Underside resembles the ♂, the markings broader.

Expanse: ♂♀, 45–50 mm.

Habitat.—Baluchistan to Chitral and Punjab, Murree; not rare in irrigated areas at about 9,000 feet. Also found in Tibet and Yunnan.

145. **Pontia glauconome** Klug.

Pontia glauconome, Klug, 1829, pl. vii, figs. 18, 19 (imago) (Arabia); Nurse, 1896, p. 248 (early stages, Aden); Moore, 1904, p. 139, pl. 521, figs. 2, 2 *a*, 2 *b* (♂♀).
Leucochloë glauconome, Röber, 1907, p. 50, t. 20 *f*.
Pieris glauconome, Bingham, 1907, p. 176; Verity, 1908–1911, pp. 134, 328, pl. xxx, figs. 30–32 (♂♀); Evans, 1932 *a*, p. 66: Peile, 1937, p. 45, pl. vi, fig. 42 (♂).
Pieris iranica, Bienert, 1870, p. 27 (Persia).
Synchloe (sic) *iranica*, Butler, 1880 *a* (*b*), p. 410, pl. xxxix, fig. 7 (pupa); Swinhoe, 1885 *b*, p. 343.
Pieris glauconome var. *iranica*, Verity, 1908–1911, pp. 134, 328, pl. xxx, figs. 33, 34 (♂♀), pl. lxvi, figs. 15 (♂), 16, 17 (♀).
Pieris vipasa, Moore, 1872, p. 565 (♀, Punjab).

Wet-season form.—♂. *Upperside* of fore wing very similar to *daplidice*. Hind wing with four small marginal spots on veins 3 to 6, the anterior three joined on the inner side by black loops.

Underside of fore wing with apical and marginal area traversed by short lines of white that extend to the margin and are faintly lined with yellow. Hind wing with basal area dusky green; a large white cell-spot, and another above it in area 7; a broad, white, curved post-discal band, and a series of large white marginal spots between the veins.

♀. As in the ♂, the markings larger and more clearly defined. Antennæ ashy-brown; head, thorax, and abdomen whitish.

Expanse: ♂♀, 45–55 mm.

Dry-season form **iranica** (Bien.).—♂♀. Hind wing *underside* with markings narrower, greenish-yellow instead of yellowish-green, base and inner margin white, only veins 1 *a* and 1 *b* strongly yellow, the others very lightly lined with yellow.

Habitat.—BALUCHISTAN to the PUNJAB and CHITRAL; rare. Also ranging to Turkestan, Persia, Syria, and Arabia, to North and East Africa.

Pontia chloridice (Hübner).

♂. *Upperside* of fore wing with a discocellular black spot; apical black marginal spots which are distally pointed; sub-apical black spots close to the inner edge of the marginal ones.

Underside of fore wing with discocellular spot, centred with white; veins in the apical area bordered with green. Hind wing with greenish markings; spot at end of cell not joined to the costal spot; a pale elongate cell-spot; veins edged with green except where they cross a narrow post-discal band of white ground-colour.

♀. *Upperside* with extended black markings. Fore wing with a spot in middle of area 1 *b*. Hind wing with marginal

spots, and a submarginal band which thins out posteriorly and does not reach vein 2.

Distribution.—South Russia to Turkestan, North-West India, and Siberia. Three subspecies may be recognized, but are not well defined ; one occurs in the Indian area.

146. **Pontia chloridice alpina** (Verity).

Pieris chloridice var. *alpina*, Verity, 1911, p. 328, pl. lxvi, figs. 18, 19 (♂♀, Ladak) ; Bollow, 1930, p. 102.
Synchloe (sic) *chloridice*, Butler (*non* Hübner), 1872, p. 62 ; Fruhstorfer, 1910, p. 141.
Parapieris chloridice, Moore, 1904, p. 142.
Pieris chloridice, Bingham, 1907, p. 177 ; Evans, 1932 *a*, p. 66.
Euchloë chloridice, Röber (part.), 1907, p. 51.
Pontia chloridice, Peile, 1937, p. 44.
Pieris chloridice f. *flavopicta*, Verity, 1911, p. 328 (nom. nov. pro *albidice* Stgr.).

This race is distinguished from the nominotypical form by the reduced black markings, especially in the ♀. Underside of hind wing darkened, being olivaceous shaded with black. Specimens also occur having the underside of hind wing with white ground-colour and bright green markings, representing the Persian form **flavopicta** Verity (1911) (=*albidice* Staudinger).

♂. *Upperside* white. Fore wing with discocellulars edged broadly with black on each side ; a short, broad, transverse subapical black bar from costa to vein 6, and another similar short bar further distad from vein 6 to middle of area 4, followed by three distally pointed, somewhat oval, black marginal spots just below the apex. Hind wing unmarked.

Underside white. Fore wing markings as on upperside, but the apical ones green with a few scattered black scales on the upper subapical bar. Hind wing with basal area dusky green ; an oval white cell-spot ; a transverse white bar in middle of area 7, and the subcostal area edged with white above ; a post-discal, highly sinuous curved white band ; a series of longitudinally rectangular white marginal spots ; the space between the post-discal band and marginal spots dusky green, this colour continued along the veins that separate the spots as far as the margin. Antennæ, head, thorax, and abdomen fuscous ; antennal club pale at tip ; thorax with some white hairs ; underside of head, thorax, and abdomen whitish.

♀. *Upperside* of fore wing with broader black edging to the discocellulars ; a curved, post-discal, irregular, macular black band ; the posterior spot and the three anterior ones of this band are large, the spot in area 2 small, sometimes subobsolete,

the middle two spots coalescent with the marginal black spots, of which there are six. Hind wing with an anterior, post-discal, short, curved, macular black band, often subobsolete; a marginal series of vein-spots.

Underside as in the ♂.

Expanse : ♂♀, 45–50 mm.

Habitat.—BALUCHISTAN to CHITRAL and LADAK ; rare.

Genus **EUCHLOË** Hübner. (Fig. 152).

Euchloë, Hübner, 1819, p. 94 ; Butler, 1870 *a*, p. 53 (type, *belia* Cramer) ; Röber, 1907, pp. 51–53 ; Verity, 1908, p. 170 ; Swinhoe, 1909, p. 120 ; Klots, 1931, p. 160 ; Evans, 1932 *a*, pp. 63, 65 ; Hemming, 1934 *b*, p. 33 (type, *belia* Stoll) ; id., 1934 *a*, pp. 131–2 (type, *belia* Stoll, Esper, *non* Stoll, 1782 (=*Euchloë ausonia* var. *esperi* Kirby, 1871) ; Peile, 1937, p. 42.

Synchloe (sic), Bingham (*non* Hübner), 1907, p. 179, fig. 46 (venation).

Elphinstonia, Klots, 1931, p. 170 (=*Euchloë* subgenus).

Type of the genus, *E. ausonia esperi* (Kirby).

♂♀. Fore wing with costa very slightly arched, nearly straight ; apex obtuse ; outer margin oblique, short ; tornus

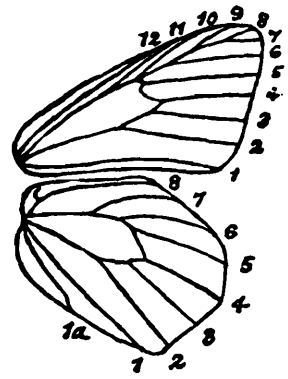


Fig. 152.—*Euchloë*, venation.

obtuse ; inner margin long, straight, more than three-fourths the length of the costa ; cell about half the length of wing ; veins 7, 8, 9 usually present*, as well as 10 and 11 ; vein 6 from the stem of 7, 8, 9, mid-way between apex of cell and origin of vein 9 ; *mdc* very short, *ldc* incurved. Hind wing long ; costa arched, bluntly angulate in the middle ; outer margin short, slightly convex ; tornus more or less angulate ; inner margin straight from tornus (in the Indian forms convex), then strongly concave near base ; cell broad ; *mdc* short, *ldc* long ; precostal vein of moderate length and well curved distad with a wide angle. Antennæ short, less than half length of fore wing ; club abrupt, broad and flat ; palpi slender, third segment comparatively long as compared with allied genera ; head and palpi very hairy in front.

* In *E. ausonia daphalis* Moore veins 7 and 8 are coincident.

Genitalia.—Valve, at about middle of dorsal margin, with a strong tooth; penis strongly curved near the base; saccus longer than wide.

Distribution.—North America and the Southern and Eastern Palæarctic region, extending into NORTH-WEST INDIA. Three species are found in India.

Key to Species.

1. Hind wing underside uniform dull green or greenish-brown .. .. [p. 435. *charlonia* (Donz.),
   Hind wing underside with prominent white spots or stripes on a green ground ... 2.
2. Hind wing underside with narrow white stripes. .. .. [p. 437. *belemia* (Esp.),
   Hind wing underside with an irregular open network of greenish-brown lines, enclosing prominent pearly spots [p. 437. *ausonia* (Hübn.),

Euchloë charlonia (Donzel, 1842).

♂. Wings yellow on both sides. Fore wing with black apical area bearing indistinct white spots; a large black discocellular spot.

Underside of hind wing greyish-green with white costal spots and a discocellular spot.

♀. Paler yellow, rarely white. Fore wing apex more rounded, and dark apical area broader.

Habits.—In writing of *lucilla* Butl. Peile says (1937, p. 42):—"They have a hurried, erratic flight, chasing one another in and out among the rocks on the hillsides, settling on the ground for a moment or two with wings open, and on plants with them closed, when the green underside appears protective. They frequent undulating, stony, almost barren hills with small bushes and tufts of coarse eucalyptus grass. They fly about a foot above the ground at from 1,000 to 4,000 feet."

Distribution.—Syria, Palestine and North Africa to Turkestan and NORTH-WEST INDIA. Three subspecies in India.

147 *a*. **Euchloë charlonia doveri** Evans.

Euchloe (sic) *charlonia doveri*, Evans, 1932 *a*, p. 65 (♂♀, Baluchistan); id., 1932 *b*, p. 198.

♂. Very pale yellow.

♀. White.

Expanse: ♂♀, 35–45 mm.

Habitat.—NORTH and WEST BALUCHISTAN: Nushki and Toba; rare.

147 *b*. **Euchloë charlonia pila** Evans.

Euchloe (sic) *charlonia pila*, Evans, 1932 *a*, p. 65 (♂♀, Baluchistan); id., 1932 *b*, p. 198.

♂♀. Very pale yellow. Fore wing *underside* with inner margin white.

Habitat.—BALUCHISTAN (Zhob); rare.

147 *c*. **Euchloë charlonia lucilla** Butler.

Euchloë lucilla, Butler, 1886 *a*, p. 376, pl. xxxv, fig. 4 (imago, Campbellpore); id., 1888 *a*, p. 205.
Anthocharis lucilla, G. T. Baker, 1889, p. 525; Röber, 1907, p. 53.
Synchloe (sic) *lucilla*, Bingham, 1907, p. 180.
Euchloë charlonia var. *lucilla*, Verity, 1908–1911, pp. 187, 340, pl. l, fig. 21 (♂), pl. lxviii, figs. 22, 24 (♂ type), 23 (♀ type).
Euchloë lucilla, Swinhoe, 1909, p. 121, pl. 590, figs. 3 (♂), 3 *a* (♀).
Euchloe (sic) *charlonia lucilla*, Evans, 1932 *a*, p. 65, pl. vii, fig. B 3.1 (♂); Peile, 1937, p. 42, pl. vi, fig. 38 (♂).
Euchloë charlonia lucilla ab. *lucillides*, Verity, 1911, p. 341, pl. lxviii, fig. 25 (♂).

♂. *Upperside* lemon-yellow; base of wings dusted with black. Fore wing with a broad, short, transversely oblique discocellular bar that does not extend to the costal margin; apical area broadly black, traversed obliquely by a more or less obscure maculate narrow band of the ground-colour; cilia yellow, alternated with black. Hind wing unmarked.

Underside duller paler yellow. Fore wing with the discocellular mark shorter; apical black area showing through and dusted minutely with black, often an obscure pink line along the costal and outer margins; costa towards apex with a series of small white spots, each spot inwardly defined by a minute black dot. Hind wing densely dusted with black; a small white discocellular spot, and a series of white transverse spots along the costal margin as on the fore wing, but more distinct. Antennæ yellowish-brown, head fuscous, collar pinkish, thorax fuscous; abdomen black laterally and yellow ventrally.

♀. *Upperside* very pale sulphur-yellow. Fore wing black markings as in the ♂, but discocellular bar broader and longer; the subapical band of ground-colour more distinct. Hind wing immaculate.

Underside as in the ♂.

The form **lucillides** Verity has the underside of hind wing and apical area of fore wing densely dusted with dark grey.

Habitat.—BALUCHISTAN and NORTH-WEST FRONTIER to PUNJAB; rare, but locally common in some places. Peile remarks (1937):—"It probably occurs all along the N.W. Frontier in cold and hot season forms, although occurring only in the cooler half of the year, from October to May."

Euchloë belemia (Esper, 1800).

♂♀. *Upperside* of fore wing with apical area blackish spotted with white; a large discocellular spot; costa spotted with black.

Underside of fore wing with a white costal bar across middle of cell; apical area with green markings. Hind wing with broad green regular stripes between which are narrow white stripes.

The summer form has more rounded wings, more developed black markings, and more diffuse white areas; fore wing costa without black dots on both sides.

Underside with the markings more yellow than green, the bands less regular, the white spaces without pearly gloss.

Distribution.—Spain and Portugal, Canary Islands, North Africa to Somaliland, to Syria, Persia, and BALUCHISTAN.

148. **Euchloë belemia palæstinensis** Röber.

Euchloë belemia form *palæstinensis*, Röber, 1907, p. 51; Verity, 1908, p. 173, pl. xxxvi, fig. 15 (♂, Syria).

Euchloe (sic) *belemia*, Evans (*non* Esp.), 1932 *a*, p. 65, pl. vii, fig. B 3.2 (♂); id., 1932 *b*, p. 198; Peile, 1937, p. 43.

♂♀. This race may be distinguished from nominotypical specimens found in Spain, Portugal, and North Africa by the markings of the hind wing underside. The outer (or fourth) short silvery costal band is usually joined to the post-discal band, forming the outer arm of a Y. In the nominotypical race the two bands are usually well separated; occasional specimens occur which show an intermediate condition.

Expanse: ♂♀, 40–50 mm.

The name *palæstinensis* was founded upon the summer form.

Habitat.—Palestine to BALUCHISTAN. Only known from Baluchistan by a number of specimens obtained by Mr. W D. Cumming at Ormarah on the Mekran coast, and now in the British Museum.

Euchloë ausonia (Hübner, 1799).

♂♀. *Upperside* without any yellow colouring. Fore wing with apical area and discocellular spot black.

Underside of hind wing with an irregular network of greenish-brown lines, enclosing prominent pearly spots.

Egg.—At first brownish-yellow, later leaden-grey.

Larva.—Greenish, with three paler green stripes, spiracles white. *Food-plants*: Cruciferæ.

Pupa.—Brown, with small black dots; strongly tapering at both ends. The emergence is sometimes delayed for two years.

Distribution.—The Alps and Southern Europe to North Africa, east to NORTH-WEST INDIA, Turkestan, and Siberia. A number of subspecies are recognized, of which two are found in the Indian area.

149. **Euchloë ausonia daphalis** (Moore). (Fig. 153, ♂).

Synchloe (sic) *daphalis*, Moore, 1865 *a*, p. 491, pl. lxxi, fig. 14 (♂, Kunawar); id., 1874 *a*, p. 273 (Kashmir); Leslie & Evans, 1903, p. 676 (Chitral); Hannyngton, 1910, p. 363 (Kumaon).
Synchloe belia daphalis, Bingham, 1907, pp. 180–181, fig. 47 (♂ and venation).
Euchloë daphalis, Röber, 1907, p. 52.
Euchloë belia form *daphalis*, Verity, 1908–1911, pp. 181, 338, pl. l, fig. 14 (♂), pl. lxviii, figs. 1, 2 (♂♀, Chitral), 3 (♂ type), 4 (♂, Chitral).
Euchloe (sic) *ausonia daphalis*, Evans, 1932*a*, p. 66, pl. vii, fig. B 3.3 (♂); Peile, 1937, p. 44.
Euchloe ausonia pulverata, Evans (*non* Christoph), 1932 *a*, p. 65 (West Baluchistan); id., 1932 *b*, p. 198 (Baluchistan).

This subspecies can be distinguished from other forms of *ausonia* by having veins 7 and 8 of the fore wing coincident.

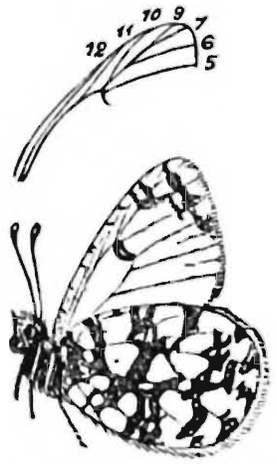


Fig. 153.—*E. ausonia daphalis* (Moore), ♂.

It is also distinguished from the allied *pulverata* Christoph by the larger silvery areas on underside of hind wing (see Verity, pl. 68, fig. 4). Occasional specimens are found with veins 7 and 8 separate.

♂. *Upperside* white, the base of wings dusted with black. Fore wing with basal half of costa spotted with black; a lunate black discocellular spot; apical area black, bearing a subapical band of four white spots. Hind wing immaculate, but underside pattern showing through.

Underside of fore wing creamy-white; costa dotted with black; a discocellular lunate spot, black centred with white; apical area with dark brown mottling, mixed with greenish-yellow, the interspaces silvery. Hind wing with a network of irregular, more or less transverse bands and lines of dark

brown overlaid with greenish-yellow scales, the interspaces shining silvery-white. Antennæ white; head and thorax dark fuscous-grey; abdomen white; underside of head, thorax, and abdomen white.

♀. Resembles the ♂, but apex of fore wing distinctly more rounded.

Expanse: ♂♀, 40–45 mm.

Habitat.—NORTH BALUCHISTAN (Zhob area) to CHITRAL and KUMAON. Frequents rocky places. Noted by Leslie and Evans (1903) as being fairly common in Chitral during March and April, between 5,000 and 8,000 feet. Evans tells me that the butterfly is local, and has one brood, which is short-lived and appears in the latter half of April.

Genus **IXIAS** Hübner. (Fig. 154).

Ixias, Hübner, 1819, p. 95; Butler, 1870 *a*, pp. 37, 48 (type, *pyrene* Linn.); id., 1871 *b*, p. 252 (monograph); id., 1898 *b* (*b*), pp. 133–43 (revision); Moore, 1881 *a*, p. 125; Watson, 1894 pp. 502, 524, pl. ii (seasonal forms); Bingham, 1907, p. 192; Röber, 1907, p. 58; Swinhoe, 1909, p. 97; Fruhstorfer, 1910, p. 158; Klots, 1931, p. 197; Evans, 1932 *a*, pp. 64, 81; Dixey, 1932, p. 58, figs. 1–9 (plume-scales); Hemming, 1934 *a*, p. 125 (type, *pyrene* Linn., 1764).

Thestias Boisduval, 1836, p. 590; Hemming, 1934 *a* (type, *pyrene* Linn.).

Type of the genus, *I. pyrene* (Linn.).

♂♀. Fore wing with costa regularly arched; apex rounded or obtuse; outer margin straight; tornus rounded; inner

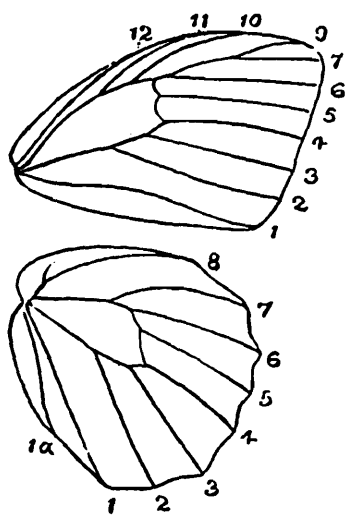


Fig. 154.—*Ixias*, venation.

margin very slightly sinuous; cell comparatively broad, about half length of wing; veins 10 and 11 from cell; 7+8 and 9 stalked and comparatively long; 6 shortly stalked with 7+8 and 9; *udc* absent; *mdc* not half as long as *ldc*.

Hind wing short and broad; cell broad; *mdc* about equal in length to *udc* and about half as long as *ldc*; precostal vein fairly long, at about a third bent sharply distad with a short spur projecting basad from the angle; outer margin more or less obtusely pointed at apex of vein 2. Antennæ about half length of fore wing; club gradually spatulate, blunt at apex. Palpus with third segment short and oval; eyes naked; legs slender, claws very small, strongly curved.

The species of *Ixias* are white or yellow, the ♂ at least with an orange or yellow apical area on the fore wing. They are subject to much seasonal variation. In the wet-season forms the black markings on the upperside are more prominent, and on the underside the ocelli and other markings are obsolete or absent. Individual variation is also very great, and many such forms have received names.

The male is a fast flier, and congregates at wet places. The female is more sluggish, and usually frequents flowers. Most species inhabit the hot plains, but some occur in the mountains up to between 4,000 and 5,000 feet. Only a few forms are really rare.

The early stages of *pyrene* (Linn.) and of *marianne* (Cram.) have been described by Bell, *q.v.*

Distribution.—INDIA, BURMA, CEYLON, and ANDAMAN ISLANDS to South and West China, extending south and east to Celebes and the Lesser Sunda Islands. Three species are found in the Indian area.

Key to Species.

a. Upperside ground-colour pure white	*marianne* (Cram.), p. 440.
b. Upperside ground-colour chrome-yellow	*pyrene* (Linn.), p. 443.
c. Upperside ground-colour creamy-white. Fore wing apical black area edged on inner side with lemon-yellow	*verna* Druce, p. 448.

150. **Ixias marianne** (Cramer). (Fig. 155, ♂; Pl. II, figs. 13, larva, 14, pupa).

Papilio marianne, Cramer, 1779, p. 41, pl. ccxvii, figs. C, D (♀), E (♂) (Coromandel).

Thestias marianne, Moore, 1865 *a*, p. 491; id., 1865 *b*, p. 759 (Bengal).

Ixias marianne, Butler, 1871 *b*, p. 253; Moore, 1881 *a*, p. 126; Aitken, 1887, p. 38; Watson, 1890 *b*, p. 36; id., 1894, pp. 507, 508, pl. ii, figs. 17–19; Butler, 1898 *b* (*b*), p. 143; de Rhé-Philipe, 1902, p. 492; Bingham, 1907, p. 196; Witt, 1909, p. 570; Swinhoe, 1909, p. 115, pl. 589, figs. 1, 1 *a* (♂♀); Evans, 1910 *a*, p. 385 (Palni Hills); Hannyngton, 1910, p. 363 (Kumaon); Fruhstorfer, 1910, p. 159, t. 72 *a*; Peile, 1911, p. 874 (Fatehgarh); Bell, 1913, p. 326, pl. i, fig. 62 *a* (♂), pl. J, fig. 62 *b* (♀) (life-history); Ormiston, 1924, p. 92 (Ceylon); Yates, 1931, p. 1007 (Coorg); Evans, 1932 *a*, p. 81.

Ixias agnivena, Moore, 1877 *b*, p. 50 (Bengal); Butler, 1880 *a* (*a*), p. 150; Swinhoe, 1885 *a*, p. 141 (Poona); 1909, p. 116, pl. 589, figs. 1 *f*, 1 *g* (♂♀).
Ixias marianne f. *agnivena*, Fruhstorfer, 1910, p. 159, t. 72 *b* (dry form).
Ixias depalpura, Butler, 1883, p. 153, pl. xxiv, figs. 6, 7 (♂♀) (Depalpur); Swinhoe, 1909, p. 116.
Ixias meridionalis, Swinhoe, 1885 *a*, p. 140, pl. ix, fig. 5 (♀) (Poona); id., 1909, p. 116, pl. 589, figs. 1 *b* (♂), 1 *c–e* (♀).
Ixias cumballa, Swinhoe, 1885 *a*, p. 141, pl. ix, figs. 13, 14 (♂♀) (Bombay).
Ixias marianne f. *cumballa*, Fruhstorfer, 1910, p. 159, t. 72 *b* (wet-season form).
Ixias nola, Swinhoe, 1889, p. 399 (W. Ghats); Watson, 1894, p. 504; Butler, 1898 *b* (*b*), p. 143; Bingham, 1907, p. 197; de Rhé-Philipe, 1908, p. 885; Swinhoe, 1909, p. 117, pl. 590, figs. 1, 1 *a–e* (♂♀).
Ixias marianne f. *nola*, Fruhstorfer, 1910, p. 160, t. 72 *b* (♀) (dry-season form); Bell, 1913, p. 228.

Wet-season form (fig. 155).—♂. *Upperside* chalk-white. Fore wing with apical half black; a broad apical patch of

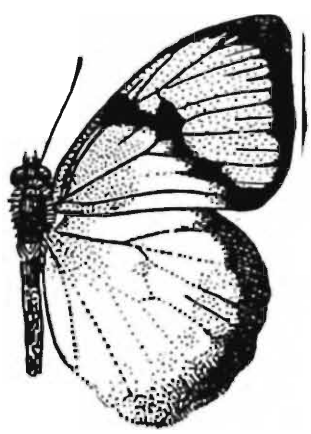


Fig. 155.—*I. marianne* (Cram.), ♂, from Kumaon.

rich orange, which extends to the upper angle of cell, is narrowed posteriorly, and spread above the tornus into area 1; this patch is very broad opposite the apex of the cell, and leaves only the apex of the wing and a comparatively narrow band along outer margin and costa black; base of wing dusted with black.

Underside rich sulphur-yellow, irrorated with short, transverse, fusco-ferruginous strigæ and minute dots. Fore wing with orange patch showing through; a broadly triangular area below the cell white; discocellular spot large and prominent, centred with white. Both wings with a discal transverse series of reddish-brown spots centred with white, more or less conspicuous; these spots are characteristic of the dry-season forms in other species; fore wing with patch above the tornus prominent and in some specimens very large. Antennæ reddish-brown; head and thorax anteriorly

with reddish-brown hairs; thorax above with white hairs; abdomen black; underside of head, thorax, and abdomen white.

♀. *Upperside* resembles that of the ♂. Fore wing with orange patch narrower, posteriorly truncate, not extended below area 2; an outer transverse series of four black spots on the orange patch in areas 2 to 5.

Underside as in the ♂, the markings slightly larger.

Fig. 155 is from a specimen in the British Museum from the Naini Tal Forest.

Dry-season form **agnivena** Moore.—♂. Smaller. Fore wing with paler and comparatively larger orange patch. Hind wing with much narrower black border.

Underside markings much more pronounced than in the wet form.

♀. *Upperside* with a yellowish tinge. Fore wing with orange patch as in ♂, but slightly smaller, and not edged with black between lower angle of cell and tornal black; four black dots on the orange patch in areas 2 to 5.

Extreme dry-season form **nola** Swinh.—♂. Fore wing with orange patch narrow, not reaching the cell, the black bordering it on the inner side subobsolete below vein 4. Hind wing with very narrow black border, which fades out posteriorly.

Underside as in *agnivena* Moore.

♀. Fore wing with orange patch still narrower, the black on inner side completely interrupted between veins 3 and 4; black spots on orange area reduced to one in area 3 and another in area 4. Hind wing as in the ♂.

Underside as in *agnivena* ♀.

Expanse: ♂♀, 50–55 mm.

Early stages and habits (from *Bell*, 1913):—

Egg.—Bottle-shaped, with very short neck; rather slight, with eleven longitudinal fine ridges, of which about six show as teeth on the somewhat thickened ring round the narrow top. Light yellow when laid, turning flesh-colour.

Larva.—4th and 5th instars. Surface of body covered with very minute brown bristles, nearly all of one size. Grass-green, with a spiracular, yellow, narrow band bordered narrowly by red-brown below and more faintly above; abdomen bluish-green. When full-fed length 28 mm., breadth nearly 5 mm.

Pupa.—Head process slightly curved back (sometimes straight), rather long, cylindrical, with conical base. Cremaster square, bifid; ventral extensor ridges parallel, each ending in a small free point. Livid bone-colour, speckled, dotted, and slightly blotched with ochreous-brown; lateral line much darker, especially along segments 3 to 5 and 10 to 14;

snout, apex of thorax, and a dorsal line dark; cell-spot on wings deep brown; the broad, square-ended, strong, lateral extensor ridges of cremaster, as well as snout, pinkish, dotted black. Coloration sometimes green marked with dark reddish-brown. Length, 19 mm.; breadth, 5 mm.

Habits.—Eggs laid singly on the wood, or on a thorn or leaf. The larva lives generally on the upperside of a leaf in the normal manner, but feeds lying along the side or along the part previously eaten. In the last two stages it wanders about a good deal and rests on stalks and branches; it feeds on tender leaves, and is sluggish in its movements. Pupation in a fairly open position, unlike *I pyrene*.

The butterfly frequents open places much more than does *I pyrene*. It is never so plentiful as its neighbour where they are found together, but is plentiful where it occurs. Frequents flowers, and has a stronger and faster flight than *pyrene*. The female is not nearly so common as the male, perhaps one to twelve males.

Food-plants: Capers. Has been bred upon *Capparis sepiaria* Linn., *C. divaricata* Lam., *C. aphylla* Roth., and *C. grandis* Linn. f.

The species is subject to much variation, and all transitional forms occur between the extreme wet-season and extreme dry-season ones, A melanic example of the ♂ is figured by Ormiston in 'Spolia Zeylanica,' ix, pl. xxxiii.

Habitat.—CEYLON to PENINSULAR INDIA, PUNJAB, and KUMAON; common.

Ixias pyrene (Linnæus, 1764).

♂. *Upperside* yellow. Fore wing with costal border and more than outer half black; a large orange band, placed nearer the cell than to apex, and entering the end of the cell. Hind wing with a black outer border, which in dry forms is reduced or absent.

Underside paler yellow, speckled with fuscous-brown; both wings with a discocellular spot, and a submarginal row of blackish-brown spots, more or less in the form of ocelli; these spots reduced or absent in wet forms. Fore wing usually with a black tornal spot of variable size.

♀. *Upperside* yellow as in the ♂, or white, in the latter case the band on fore wing also white. Fore wing with the band usually interrupted at vein 4, the patches in areas 2 and 3 more elongate and bearing each a small black spot; outer black area sometimes extended over the whole wing. Hind wing with the outer black border wider than in the ♂.

This species is the most variable and most widely distributed of the genus, and many names have been given to its varieties.

Early stages (from *Bell*, 1913, as observed in the race from South India) :—

Egg.—Pearl-white and shiny when first laid, turning pale cream-colour, with pink blotches and spots. Somewhat bottle-shaped, with 12 longitudinal ribs, of which 6 or less form teeth at the apex, the teeth forming a narrow ring or crown.

Larva.—5th instar. Dark grass-green, covered with small dull red dots ; a more or less interrupted, spiracular, narrow white band, bordered above and below by brownish-red, which forms an interrupted line, broadening and darkening on segments 5 to 7 ; the white band very distinct on segments 10 to end of 14, and along the hind margin of 14. Length, 27 mm. ; breadth, 4·5 mm.

Pupa.—Very like that of *I. marianne*. Light green, with darker mottlings of round dots and spots ; or may be bone-colour with the markings black or dusky. The snout, lateral cremastral extensor ridges, dorsal line of thorax (generally slightly carinate), shoulder-points, a lateral dot or spot at front margin of each segment (most prominent, sometimes a little patch) on segments 4 and 9 ; a more or less obsolescent, dorsal, spiracular and ventral line ; some ventral abdominal dots ; a fascia along inner edge of apical orange wing-patch ; a discocellular spot and some powdering on wing-surface ; all these some shade of brown, some being nearly black and others quite light. Length, 20 mm. ; breadth at the middle, 5 mm. ; snout, 1 mm.

Distribution.—Japan and Formosa to China, INDIA, ANDAMAN ISLANDS, CEYLON, and south to Malay Peninsula. Six subspecies in the Indian area.

151 *a*. **Ixias pyrene cingalensis** Moore.

Ixias cingalensis, Moore, 1881 *a*, p. 126, pl. L, figs. 2, 2 *a* (♂♀) ; Butler, 1898 *b* (*b*), p. 138 ; Manders, 1904 *a*, p. 79 ; Swinhoe, 1909, p. 108, pl. 585, figs. 1, 1 *a*, 1 *b* (♂♀, wet form), 1 *c–f* (♂♀, dry form) ; Ormiston, 1924, p. 91.

Ixias pyrene cingalensis, Fruhstorfer, 1910, p. 159, t. 71 *d* ; Evans, 1932 *a*, p. 81.

Ixias pyrene cingalensis ♀ f. *connectens*, Fruhstorfer, 1910, p. 159, t. 71 *d*.

Ixias pyrene cingalensis ♀ f. *nivescens*, Fruhstorfer, 1910, p. 159, t. 71 *d*.

♂. A small form. Fore wing with orange band narrow ; base of area 3 yellow, and half of area 2 yellow. Hind wing with narrow outer border.

♀. Forewing with orange band narrower than in the ♂, bearing a small spot in area 3, the lower spot incomplete ; base of area 3 with more extended yellow than in the ♂.

The ♀ exists in three forms : (*a*) the typical orange-banded form ; (*b*) pale yellow, with similarly coloured band

(**connectens** Fruhst.) ; (*c*) white, with similarly coloured band (**nivescens** Fruhst.).

Expanse : ♂♀, 50–60 mm.

Habitat.—CEYLON ; common.

151 *b*. **Ixias pyrene sesia** (Fabricius).

Papilio sesia, Fabricius, 1777, p. 257.
Ixias sesia, Butler, 1869 *a*, p. 217 (Bengal) ; id., 1871 *b* (*a*), p. 253.
Ixias pyrene sesia, Watkins, 1923, p. 208 (type from S. India).
Ixias pirenassa, Wallace, 1867, p. 395, pl. ix, fig. 4 (♂, Madras) ; Swinhoe, 1909, p. 106, pl. 583, figs. 1, 1 *a–c* (♂♀, wet form), 1 *d–g* (♂♀, dry form).
Ixias frequens, Butler, 1880 *a* (*a*), p. 151, pl. xv, figs. 6, 7 (♂♀, Bengal) ; id., 1898 *b* (*b*), p. 138 ; Swinhoe, 1909, p. 107, pl. 584, figs. 1, 1 *a–f* (♂♀).
Ixias pyrene pirenassa f. *frequens*, Fruhstorfer, 1910, p. 159.
Ixias pyrene f. *frequens*, Yates, 1931, p. 1007 (Coorg).
Ixias pyrene frequens, Evans, 1932 *a*, p. 81.
Ixias ganduca, Moore, 1884, p. 29 (♂♀, Calcutta) ; de Nicéville, 1885 *b*, p. 50 ; Swinhoe, 1909, p. 108, pl. 584, figs. 1 *f*, 1 *g* (♂♀) (dry form).
Ixias pyrene pirenassa f. *ganduca*, Fruhstorfer, 1910, p. 159.
Ixias jhoda, Swinhoe, 1885 *a*, p. 142, pl. ix, figs. 3 (♂), 4 (♀) (Bombay) ; id., 1909, p. 105, pl. 582, figs. 1 *f*, *g* (dry form).
Ixias pyrene pirenassa f. *jhoda*, Fruhstorfer, 1910, p. 159.
Ixias colaba, Swinhoe, 1885 *a*, p. 142, pl. ix, fig. 6 (♂) (Bombay) ; 1909, p. 104, pl. 582, figs. 1, 1 *a* (♂♀) (wet form).
Ixias pyrene pirenassa f. *colaba*, Fruhstorfer, 1910, p. 159.
Ixias pyrene, Aitken (*non* Linn.), 1887, p. 38 ; Bingham, 1907, pl. xviii, fig. 118 (♂) (wet form *colaba* Swinh.) ; Evans, 1910 *a*, p. 385 (Palni Hills) ; Bell, 1913, p. 320, pl. J, figs. 65 (♂), 65 *a* (♀)) life-history).
Ixias alana, Swinhoe, 1890, p. 357 (Maldah).

♂. Very similar to *cingalensis*. Fore wing with orange band broader ; black area broader and reaching base of area 3. Hind wing with outer black border wider than in *cingalensis*.

♀. Yellow, the band of fore wing yellow, sometimes tinged with orange.

The wet form **sesia** (Fabr.) has also been named *frequens* Butl., *colaba* Swinh., and *alana* Swinh., all representing slight variations.

The dry form can be called **pirenassa** Wall., with *ganduca* Moore as a synonym.

The name **jhoda** Swinh. refers to an extreme dry-season form.

Habits (from *Bell*, 1913) :—A single egg is laid on a leaf, dead stick, or withered part of the plant ; most generally a shaded place is chosen, low down on the plant, and often amongst the stems and branches, for the plant grows in thickets and very often amongst prickly-pear and *Lantana*. The newly-hatched larva eats the egg-shell. It then wanders away and takes up its position on a leaf, always eating mature

leaves, and often those that are partially withered. The larva is usually found to be attacked by ichneumons. It pupates in a secluded place, and the chrysalis is attached very strongly by the tail. An egg laid on September 14th hatched on the morning of the 18th, and reached the last instar on the morning of the 29th. The larva feeds on *Capparis sepiaria* Linn., and will not readily eat any other caper.

The butterfly is a fairly fast flier, with a hurried, more or less straight flight. It delights in the sun, frequents flowers, and rests on leaves for rather long intervals. It is found in open country and about the bases of hills in scrub-jungle where there is much tangled vegetation; it seems to be particularly partial to places where prickly-pear (*Opuntia dillenia* Haw., family Cactaceæ) abounds.

Habitat.—PENINSULAR INDIA to BENGAL; common.

151 *c*. **Ixias pyrene kausala** Moore.

Ixias kausala, Moore, 1877 *b*, p. 49 (♂♀, Kasauli); id., 1882, p. 254; Butler, 1883, p. 153; Swinhoe, 1885 *a*, p. 143 (Bombay); id., 1886, p. 432 (Depalpore); id., 1909, p. 102, pl. 581, figs. 1, 1 *a–d* (♂♀).

Ixias pyrene pirenassa f. *kausala*, Fruhstorfer, 1910, p. 159, t. 71 *d* (dry form).

Ixias satadra, Moore, 1877 *b*, p. 50 (Simla); Waterhouse, 1883, pl. cxxviii, fig. 1 (♂); Butler, 1898 *b* (*b*), p. 139; Swinhoe, 1909, p. 100, pl. 580, figs. 1, 1 *a–d* (♂♀).

Ixias pyrene pirenassa f. *satadra*, Fruhstorfer, 1910, p. 159 (dry form).

Ixias pyrene satadra, Evans, 1932 *a*, p. 81, pl. ix, fig. B 17.2 (♂♀).

Ixias watti, Butler, 1880 *a* (*a*), p. 151, pl. xv, fig. 1 (♂, Bengal; err. loc., recte N.W. Himalayas); Moore, 1882, p. 254.

Ixias pyrene pirenassa f. *watti*, Fruhstorfer, 1910, p. 159 (dry form).

Ixias dharmsalæ, Butler, 1880 *a* (*a*), p. 150, pl. xv, figs. 8, 9 (♂♀); id., 1898 *b* (*b*), p. 139; Swinhoe, 1885 *a*, p. 143 (Bombay); id., 1909, p. 104, pl. 582, figs. 1 *a*, *e* (♂♀, typical form), 1 *b*, *c* (♂♀, intermed. form).

Ixias pygmæa, Moore, 1882, p. 254, pl. xii, fig. 1 (♂, Kangra); Butler, 1886 *a*, p. 374; Swinhoe, 1909, p. 101, pl. 580, figs. 1 *e*, *f* (♂), *g* (♀) (extreme dry form).

Ixias pyrene pirenassa f. *pygmæa*, Fruhstorfer, 1910, p. 159 (dry form).

♂♀. Very similar to *sesia* (Fabr.). The yellow ground-colour rarely extends into the base of area 3 on the fore wing, but fills a half to two-thirds of area 2. ♀ often white.

The wet form is **satadra** Moore, of which *watti* Butl. is a synonym. The name *dharmsalæ* Butl. refers to an intermediate form.

The dry form is **kausala** Moore, and **pygmæa** Moore is an extreme dry form.

Habitat.—BALUCHISTAN, SIND, PUNJAB, and UNITED PROVINCES to CHITRAL and KUMAON; common.

151 *d*. **Ixias pyrene familiaris** Butler.

Ixias familiaris, Butler, 1874 *a*, p. 432 (♀, Darjeeling).
Ixias pyrene pirenassa, Fruhstorfer, 1910, p. 159; Evans, 1932 *a*, p. 81.
Thestias rhexia, Butler (*non* Fabricius), 1869 *a*, p. 216, pl. 1, fig. 5 (♀); id., 1898 *b* (*b*), p. 136.
Ixias pyrene f. *rhexia*, Röber (*non* Fabr.), 1907, p. 58, t. 23 *g* (wet form); Fruhstorfer, 1910, p. 159, t. 71 *b* (♂), 71 *c* (♀).
Ixias pyrene, Watson, 1891, p. 52; id., 1894, pp. 503–8; Mackinnon & de Nicéville, 1898, p. 591; de Nicéville, 1898 *b*, p. 152, pl. AA, figs. 29, 30 (gynandromorph, Sikkim); Bingham, 1907, p. 193 (part.), pl. xviii, fig. 120 (dry form).

♂. Usually larger than the preceding races.

Upperside of fore wing with the orange band entering lower angle of cell; the yellow ground-colour does not enter the base of area 3 and only the extreme base of area 2.

♀. Very variable. Sometimes nearly entirely suffused with black on a white ground, with the apical band white (typical form); or the ground-colour may be yellow and the band white.

Habitat.—SIKKIM to ASSAM; common.

151 *e*. **Ixias pyrene latifasciata** Butler.

Ixias latifasciata, Butler, 1871 *a*, p. 252, pl. xix, fig. 3 (♂, Moulmein); id., 1898 *b* (*b*), p. 137; Swinhoe, 1909, p. 111, pl. 587, figs. 1, 1 *a–c* (♂♀).
Ixias pyrene latifasciata, Fruhstorfer, 1910, p. 159, t. 71 *e* (♂) (dry form).
Ixias moulmeinensis, Moore, 1878 *a*, p. 837 (♂♀, Moulmein to Meetan); Watson, 1894, p. 505, pl. ii, fig. 26; id., 1897 *a*, p. 669; Butler, 1898 *b* (*b*), p. 139; Swinhoe, 1909, p. 113, pl. 588, figs. 1 *b* (♂), 1 *c* (♀, dry form), 1 *a*, 1 *d* (♂, extreme dry form).
Ixias pyrene latifasciata f. *moulmeinensis*, Fruhstorfer, 1910, p. 159, t. 72 *a* (♂♀).

♂. Smaller than *familiaris* Butl., and more or less intermediate between this and *kausala* Moore. The orange band does not enter the lower edge of the cell.

♀. The band is yellow or orange and the ground-colour often white.

The name **moulmeinensis** Moore refers to the dry form.

Habitat.—NORTHERN BURMA to the Dawna Range; common.

151 *f*. **Ixias pyrene meipona** Grose-Smith.

Ixias meipona, Grose-Smith, 1887 *b*, p. 296 (Burma); Smith & Kirby, 1889, *Pieris*, ii, figs. 4, 5 (♂).
Ixias pyrene meipona, Evans, 1932 *a*, p. 82.

♂. A much paler race, with lemon-yellow ground-colour. Fore wing with orange area often clouded, presenting a dull frosted appearance.

♀. The band is orange, and the cell of fore wing more or less black.

This race is more constant than is usual in *pyrene*.

Habitat.—The Dawna Range to SOUTHERN BURMA; common.

Ixias verna Druce.

♂. Creamy-white, with yellow tinge. Fore wing with the inner edge of black area bordered with lemon-yellow; the subapical band is distinctly yellow and dull.

♀. Creamy-white or with restricted yellow tinge. Fore wing with narrow band.

In the race from the Andamans the band on the fore wing is orange.

The specific distinctness of this species, separated from *pyrene* by Bingham (1907), has been recently confirmed by Corbet (1937). No differences in the genitalia or scent-scales are to be found in the two species, but they occur together and the pattern is sufficiently distinct.

Distribution.—LOWER BURMA and the ANDAMAN ISLANDS to the Malay Peninsula, Siam, and Sabanga Island. Three subspecies, two of which occur in the Indian area.

152 *a*. **Ixias verna verna** Druce.

Ixias verna, Druce, 1874, p. 108, pl. xvi, figs. 5, 6 (♂♀, Siam); Moore, 1886, p. 49 (Mergui Islands); Watson, 1894, pp. 503–567; Butler, 1898 *b* (*b*), p. 142; Bingham, 1907, p. 195.

Ixias pyrene verna, Fruhstorfer, 1910, p. 159, t. 71 *e*.

Ixias verna verna, Corbet, 1937, p. 49.

Ixias citrina, Moore, 1878 *a*, p. 837 (♂, Tenasserim); id., 1886 *b*, p. 48 (King Island).

Ixias verna f. *citrina*, Bingham, 1907, p. 195; Swinhoe, 1909, p. 114, pl. 588, figs. 2 (♂), 2 *a* (♀) (wet form), fig. 2 *b* (♂, dry form).

Ixias pallida, Moore, 1878 *a*, p. 837 (Upper Tenasserim); Butler, 1898 *b* (*b*), p. 142; Swinhoe, 1909, p. 111, pl. 587, figs. 1 *d*, *e*, *f*, *g* (♂♀).

Wet-season form.—♂. *Upperside* white, apical half of fore wing and outer margin of hind wing black. The white ground-colour suffused with very pale sulphur-yellow; this colour deepens to a pure sulphur along the margins of the areas occupied by the ground-colour. Fore wing with base shaded with blackish scales; apical half with a large oblique orange patch that occupies the middle of area 2, the basal two-thirds or more of areas 3 to 6, 10 and 11, and extends into the apex of cell, where it is interrupted by a black discocellular spot; this in some specimens (*I. pallida* Moore) entirely fills the lower angle of cell.

Underside sulphur-yellow, the fore wing posteriorly below the cell much paler; both wings with sparsely scattered

fusco-ferruginous strigæ and minute dots; the discocellular spot the most prominent.

♀. Somewhat similar to the ♂.

Upperside with pale sulphur-yellow ground-colour much restricted; on the fore wing it extends only over the basal two-thirds of areas 1 *a* and 1 *b* and the basal fourth of area 2; the orange patch much narrower and irregular, forming beyond apex of cell a short curved band that does not quite reach the costal margin; a large elongate orange spot, bearing a small black spot in its outer part, in area 3; a smaller orange spot, proximally deeply incurved, in area 2. Hind wing with black outer border wider than in the ♂.

Underside similar to that of the ♂, the strigæ more numerous, the discocellular spots much larger, and an obscure discal series of transverse reddish spots on both wings; fore wing with a very large and prominent patch of reddish-brown above the tornus.

Dry-season form **citrina** Moore.—♂♀. *Upperside* of fore wing with orange patch slightly wider. Hind wing with narrower marginal border.

Underside of both wings with more or less prominent transverse discal series of reddish-brown spots, centred with white, the strigæ and dots more abundant. Antennæ deep reddish-brown, head and thorax anteriorly with a little reddish-brown pubescence; abdomen above black, pale yellowish-white beneath.

Expanse: ♂♀, 50–60 mm.

The name *pallida* Moore refers to an intermediate form which approaches the wet form.

Habitat.—Lower Burma and Malay Peninsula; rare.

152 *b*. **Ixias verna andamana** Moore.

Ixias andamana, Moore, 1877 *a*, p. 590 (♂♀, South Andamans); Wood-Mason & de Nicéville, 1881 *b*, p. 251; Smith & Kirby, 1889, *Ixias*, p. 1, pl. 1, figs. 1–3 (♂♀); Watson, 1894, pp. 503–7; Butler, 1898 *b* (*b*), p. 142; Swinhoe, 1909, p. 109, pl. 586, figs. 1, 1 *a*, *b* (♂♀, wet form).

Ixias verna andamana, Bingham, 1907, p. 195.

Ixias pyrene andamana, Fruhstorfer, 1910, p. 159, t. 72 *a*; Evans, 1932 *a*, p. 82.

Ixias lena, Swinhoe, 1890 *a*, p. 357 (Andamans); Watson, 1894, pp. 507–24; Swinhoe, 1909, p. 110, pl. 586, figs. 1 *c*, *d* (♂♀, dry form), 1 *e*, *f*, *g* (♂♀, extreme dry form).

Ixias pyrene andamana f. *lena*, Fruhstorfer, 1910, p. 159.

♂♀. Closely resembles the nominotypical form both in wet- and dry-season specimens, but is larger, with brighter colours. The orange band is a rich orange-red and proportionately narrower than in the nominotypical form.

Dry-season form **lena** Swinh.—The ferruginous discal series of spots, and on the fore wing the reddish-brown tornal patch characteristic of dry-season specimens, very conspicuous and prominent.

Habitat.—ANDAMAN ISLANDS ; common.

Genus **COLOTIS** Hübner. (Fig. 156).

Colotis, Hübner, 1819, p. 97 ; Scudder, 1875, p. 146 (type, *amata* Fabricius) ; Bingham, 1907, p. 259 ; Bell, 1912, p. 1138 (Key to Indian species) ; Evans, 1923, p. 259 ; Talbot, 1931, p. 228 (type, *amata* Fabr.) ; Klots, 1931, p. 194 (type, *amata* Fabr.) ; Evans, 1932 *a*, pp. 64, 82 ; Hemming, 1934 *a*, p. 133 (type, *calais* Stoll, 1781, =*amata* Fabr., 1775) ; Peile, 1937, p. 71.

Aphrodite, Hübner, 1819, p. 95 ; Hemming, 1934 *c*, p. 38 (nom. præocc. ; type, *eborea* Stoll. =*danæ* Fabr.).

Teracolus, Swainson, 1833, pl. cxv ; Butler, 1870 *a*, pp. 36, 47, pl. ii, fig. 6 (venation) ; id., 1876 *b*, pp. 127–65 (revision) ; id., 1897 *b*, pp. 385, 451, 495 (revision) ; Watson, 1894, p. 517 ; Röber, 1907, p. 56 ; Fruhstorfer, 1910, p. 173 ; Hemming, 1934 *a*, p. 133 (type, *subfasciatus* Swains.).

Idmais, Boisduval, 1836, p. 584 ; Hemming, 1934 *a*, p. 134 (type, *chrysonome* Klug, 1829).

Callosune, Doubleday, 1847, p. 57 ; Moore, 1881 *a*, p. 128 ; Hemming, 1934 *a*, p. 134 (type, *danæ* Fabricius, 1775).

Madais, Swinhoe, 1909, p. 152 (type, *fausta* Oliv.) ; Klots, 1931, p. 194 (=subgenus).

Type of the genus, *C. calais* (Cram.) [=*C. amata* (Fabr.)].

♂. Fore wing with costa very slightly arched ; apex obtuse,

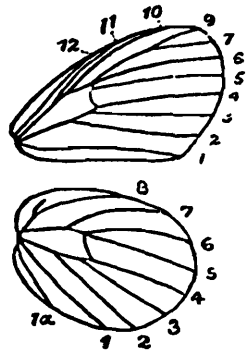


Fig. 156.—*Colotis*, venation.

rounded, slightly convex ; tornus obtuse but well marked ; inner margin slightly or moderately convex or sinuate, about three-fourths the length of costa ; cell about half length of wing ; veins 10 and 11 from the cell, emitted moderately close together ; 7+8 and 9 stalked at more than half-way from end of cell to apex ; 6 from upper angle of cell or from near base of stalk of 7+8 and 9 ; *udc* absent, *mdc* usually at least half as long as *ldc*. Hind wing with costa arched ; apex rounded ; outer margin slightly arched ; tornus obtuse but well marked ; inner margin slightly convex ; cell not

half length of wing ; precostal vein long, bent distad ; vein 7 from the cell well distad ; 5 and 6 either from the cell separately or connate or stalked ; *ldc* oblique, concave, usually more than twice as long as *mdc*. Antennæ short, not half the length of the fore wing, club abrupt and spatulate ; head tufted anteriorly ; palpus with third segment short, slender, acute at apex ; eyes naked ; body moderately robust.

The forms arranged under this genus, with the exception perhaps of those that belong to the genus *Eurema*, are, of all Pieridæ, the most variable, seasonal and sexual dimorphism being very pronounced. As in *Ixias*, all transitions are found between the extreme wet-season and dry-season broods. The genus has its headquarters in Africa, where it is no less variable than in India.

The species frequent hot and dry districts, and fly restlessly over the plains in the hot sunshine, or sail up and down rocky slopes. Many species are very abundant.

Distribution.—North Africa ; Africa, south of the Sahara ; Palestine and Arabia to Persia, North-West India, Peninsular India, and Ceylon. Over 60 species are known in the genus, and of these seven are found in the Indian area.

Key to Species.

1. Upperside of fore wing with a prominent discocellular spot which connects with the dark costal border	2.
Upperside of fore wing with the discocellular spot, if present, not connected with the dark costal border	4.
2. Upperside of fore wing with the outer border shifted in area 1 *b* so as to enclose a large pale spot ; ♀ may be white .. .	*calais* (Cram.), p. 452.
Upperside of fore wing with outer marginal border regular to inner margin, bearing no pale spot below vein 3...	3.
3. Upperside ground-colour salmon-pink in both sexes ; hind wing with broad immaculate outer black border .. .	*phisadia protractus* [(Butl.), p. 456.
Upperside ground-colour white. Fore wing with a white submarginal spot on the black border in area 3	*vestalis* (Butl.), p. 457.
4. Upperside orange-pink ; ♀ may be white. Hind wing upperside unmarked except for dark marginal spots or border .	*fausta* (Oliv.), p. 460.
Upperside white ; apical area of fore wing crimson or orange. ♀ with hind wing upperside bearing a more or less distinct dark discal band, always indicated at costa	5.
5. Fore wing apical area crimson. ♀ with apical patch crimson to pale red, divided by a dark macular band	*danæ* (Fabr.), p. 469.
Fore wing apical area orange	6.

6. Fore wing with orange patch edged with black on the inner side .. .. . *etrida* (Boisd.), p. 464.
Fore wing in ♂ with orange patch not edged with black on inner side, or only very faintly .. .. 7.
7. Fore wing upperside with a discocellular dot. ♀ with fore wing bearing a post-discal band from costa to vein 3, strongly angled at vein 5 . ... *eucharis* (Fabr.), p. 467.
Fore wing upperside without a discocellular dot. ♀ fore wing without a post-discal band *liagore* (Klug), p. 472.

Colotis calais (Cramer, 1775).

♂♀. *Upperside* ground-colour salmon-pink. Fore wing with a dark costal border which reaches a prominent discocellular spot; a pale submarginal spot in area 1 *b*, where the black border projects inwards. Hind wing with a broad outer black border bearing more or less distinct spots of the ground-colour.

A second form of ♀ occurs in which the ground-colour is pale primrose-yellow to pure white.

This species is, perhaps, better known as *amata* Fabr., but both were described in the same year, and preference is given to Cramer, who figured the insect.

Distribution.—Africa south of the Sahara, Arabia, Syria to Persia, NORTH-WEST INDIA, BOMBAY, and UNITED PROVINCES. Four subspecies, of which two are found in the Indian area.

153 *a*. **Colotis calais modestus** (Butler). (Fig. 157, pupa).

Teracolus modestus, Butler, 1876 *b*, p. 137 (Ceylon); Watson, 1894, pp. 519, 526.
Idmais modestus, Moore, 1881 *a*, p. 131, pl. xlix, figs. 2 (♂), 2 *a* (♀ form).
Colotis modesta, Swinhoe, 1909, p. 143, pl. 598, figs. 3 (♂), 3 *a* (♀) (wet form), 3 *b* (♂, dry form); Ormiston, 1924, p. 92.
Teracolus amata modesta, Fruhstorfer, 1910, p. 173, t. 73 *b* (imago).
Colotis amata modesta, Yates, 1931, p. 1007 (Coorg); Evans, 1932 *a*, p. 82, pl. ix, fig. B 18.1 (♂); Peile, 1937, p. 71.
Colotis amata, Bingham (*non* Fabr.), 1907, p. 261 (part.); Evans, 1910 *a*, pp. 385, 426 (Palni Hills); Ormiston, 1917, p. 137; Bell, 1914, p. 73, pl. J, fig. 68 (♂) (early stages).
Colotis amata ♀ f. *albina*, Evans, 1912 *a*, pp. 559, 980.
Colotis amata modesta ♀ f. *albina*, Evans, 1932 *a*, p. 82.
Papilio calais, Stoll (*non* Cramer, 1775), 1781, p. 118, pl. cccli, figs. A–D (Coromandel).

♂. Distinguished from the nominotypical form by the fore wing upperside having the tornal spot in area 1 *b* smaller and not quadrate; the pale marginal spots are also small.

♀. In two forms. One resembles the ♂ and the other has a white upperside (**albina** Evans).

Early stages and habits (from *Bell*, 1914) :—

Egg.—A truncated cone, with longitudinal channels, and fine, transverse striæ. White at first, turning yellow later.

Larva.—5th instar. Bright grass-green, with a broad white dorsal line, generally showing the transverse lines of the segments as slight depressions throughout its length ; sometimes a fine, light, very thin spiracular line. Length, 20 mm. ; breadth, 3 mm.

Pupa.—The snout conical, equilateral, its base being reckoned as the whole pupal diameter at the front margin of segment 2 ; the real snout is only the very extremity of this cone, and it is very short. Cremaster nearly square, gently concave at the end, depressed dorsally between slightly prominent subdorsal ridges, slightly depressed ventrally between the rounded marginal ridges, each slightly prominent extensor-ridge ending anteriorly in a little point or sharp tooth ; the suspensory hooklets are arranged in a dense

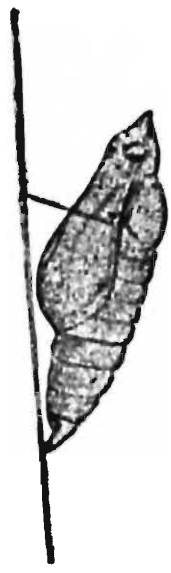


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Fig. 157.—*C. calais modestus* (Butl.), pupa (after Bell).

mass all along the posterior margin. Colour green, with the lateral outline along the wings yellow. Length, 16 mm. ; breadth, 3.5 mm.

Habits.—The eggs are laid on the upperside of a leaf, there being from 50 to 60 in a batch. The larvæ are gregarious, eat voraciously, and grow very fast. Eggs obtained on 25th July emerged next day ; larvæ pupated on 2nd August ; imago emerged on 6th August. The caterpillars feed in rows along the edge of a leaf, lying close pressed one against the other, and continue thus up to the last stage, when they become more independent though still keeping in batches. Each larva goes off to pupate separately. The first meal is the egg-shell. Food-plants : *Salvadora persica* Linn. and *S. oleoides* Decne., *Azima tetracantha* Lam., all of the family Salvadoraceæ.

The butterfly has a fluttering flight, fairly straight and

horizontal. It does not often frequent flowers, and keeps usually near the ground, being fond of open sunny places. The food-plant grows especially in waste desert places.

In a brood of about 50 there will always be a couple of white females, and this seems to be quite independent of climate. In damp areas the black markings on the upperside are larger and more intense.

Habitat.—CEYLON and PENINSULAR INDIA to BENGAL; not rare.

153 *b*. **Colotis calais amata** (Fabricius). (Fig. 158, ♂).

Papilio amata, Fabricius, 1775, p. 476.
Teracolus amata, Butler, 1876 *b*, p. 138; Nurse, 1896, p. 245 (early stages); Davidson, Bell, & Aitken, 1897 *a*, p. 572; Marshall, 1897, p. 9; Bingham, 1907, p. 261 (part.); Fraser, 1911, pp. 867–9 (Sind); Peile, 1911, p. 874 (Fatehgarh).
Colotis amata, Bingham, 1907, p. 261 (part.); Fraser, 1911, pp. 867–9 (Sind); Peile, 1911, p. 874 (Fatehgarh).
Teracolus amata amata, Fruhstorfer, 1910, p. 173.
Colotis amata amata, Evans, 1932 *a*, p. 82; id., 1932 *b*, p. 200 (Baluchistan); Peile, 1937, p. 47, pl. vii, fig. 47 (♂).
Papilio cypræa, Fabricius, 1787, p. 22.
Teracolus cypræa, Butler, 1876 *b*, p. 138 (Bombay); Davidson & Aitken, 1890, p. 359; Watson, 1894, pp. 519, 526.
Teracolus calais, Yerbury (*non* Cramer), 1892, p. 214; Watson, 1894, pp. 519, 526.
Teracolus carnifer, Butler, 1876 *b*, p. 138, pl. vii, figs. 8, 9 (♂, Punjab); Swinhoe, 1884 *b*, p. 509 (Karachi); Watson, 1894, pp. 519, 526.
Colotis carnifer, Swinhoe, 1909, p. 145, pl. 598, figs. 2 *b* (♂), 2 *c* (♀).
Teracolus kennedii, Swinhoe, 1884 *a*, p. 440 (Ahmadnagar); id., 1885 *a*, p. 143; Watson, 1894, pp. 518, 526.
Colotis kennedii, Swinhoe, 1909, p. 143, pl. 598, figs. 1 *e* (♂), 1 *f* (♀).
Idmais dynamene, Aitken (*non* Klug), 1887, p. 39 (Cutch); Swinhoe, 1887, p. 277 (Karachi); id., 1909, p. 144, pl. 598, figs. 2 (♂), 2 *a* (♀) (wet form).

♂. *Upperside* salmon-pink. Fore wing with costa black, thickly overlaid with greyish or pinkish scales; a black discocellular spot, which may be large and quadrate or smaller and lunate; outer margin broadly black, bearing a double series of spots of the ground-colour; the inner series of these spots consists of a large spot in area 1 *b*, two very small spots in 2 and 3, one in each, and four large anterior spots placed in a curve; the spots in the outer series are variable in number, usually one in each area, and more or less linear in shape. Hind wing with a band of dense black specialized scales (androconia) on the costal margin, extended to just within the upper edge of the cell; this band joins a broad, similarly coloured marginal band of ordinary scales that becomes more or less diffuse posteriorly, and encloses a double

series of small spots of the ground-colour; the inner series of these spots is often obsolescent or sometimes absent; inner area heavily dusted with fuscous, extending to the disc, which has therefore generally a greyish appearance.

Underside greenish-yellow; an anticiliary fine black line on both wings; the black markings of the upperside show through. Fore wing with a black discocellular spot, variable in size and sometimes absent; a submarginal quadrate black spot in area 1 *b*, and another (sometimes faintly marked or absent) further outwards in area 2; disc faintly and inner margin very broadly salmon-pink. Hind wing sparsely dusted with black; a small black discocellular spot. Cilia of both wings pale salmon-pink. Antennæ, head, thorax, and abdomen black, the antennæ speckled with white, the head and thorax covered with greenish-fuscous hairs; underside of palpi green, of thorax and abdomen white.

♀. *Upperside* resembles the ♂, but paler and duller. Hind wing without the black band of androconia.

Underside similar to that of the ♂, but the ground-colour

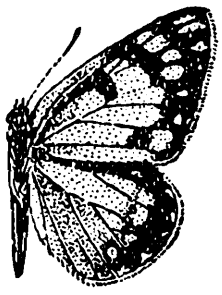


Fig. 158.—*C. calais amata* (Fabr.), ♂, from Sind.

very much paler and more ochraceous than green. Some specimens have on the fore wing an anterior post-discal curved fuscous band. Hind wing with discocellular spot larger than in the ♂, and annular; a curved discal series of reddish spots from costa to inner margin.

The name **carnifer** (Butl.) may be applied to the dry-season form.

Expanse: ♂♀, 35–45 mm.

Habitat.—BOMBAY to SIND, BALUCHISTAN, and UNITED PROVINCES; not rare. Also extends to Persia and Syria. According to Fraser (1911) the insect is common in Sind all the year round, and has been taken "*in cop.*" with *vestalis* (Butl.) and *protractus* (Butl.).

Colotis phisadia (Godart, 1819).

♂♀. *Upperside* of fore wing salmon-pink. Both wings with a broad black outer border, which on the hind wing is without markings. Both wings with bluish-grey basal suffusion.

♂. Hind wing with a large salmon-coloured patch of modified scales at the base of area 7. ♂ fore wing underside with a small patch of modified scales near base of area 1 *b*.

Distribution.—Algeria to Kenya and Arabia, Palestine to Persia and NORTH-WEST INDIA. One subspecies in the Indian area.

154. **Colotis phisadia protractus** (Butler).

Teracolus protractus, Butler, 1876 *b*, p. 137 (Punjab); id., 1880 *b*, p. 222 (Baluchistan); id., 1881 *b*, p. 609; Aitken, 1887, p. 40; Watson, 1894, p. 520; Marshall, 1897, p. 10; Sharpe, 1898, p. 9, pl. ii, figs. 1, 1 *a*–1 *c*; Nurse, 1899, p. 513; Fruhstorfer, 1910, p. 173

Colotis protractus, Bingham, 1907, p. 263; Swinhoe, 1909, p. 146, pl. 599, figs. 1, 1 *b* (♂), 1 *a* (♀); Fraser, 1911, p. 868 (early stages, Sind); Bell, 1914, p. 76; Evans, 1932 *a*, p. 82; id., 1932 *b*, p. 200 (Baluchistan).

Teracolus semiramis, Grum-Grshimaïlo, 1902, p. 190 (Persia).

♂. *Upperside* rich salmon-pink. Fore wing with base bluish-grey; a costal black border joined to a marginal black area occupying the outer fourth of the wing; inner edge of this outer area irregular, extended slightly and squarely inwards in areas 1 *a*, 1 *b*, and 3; a prominent oval discocellular black spot, connected anteriorly with the costal spot; subapical bluish-grey spots in areas 3, 4, 5, 6, and 9. Hind wing with distal half black; inner margin white; an inner posterior band of somewhat diffuse bluish-grey scaling from base to the outer black area.

Underside light greenish-yellow; discal area tinged with salmon-pink, which is more conspicuous on the fore wing. Fore wing with a prominent black discocellular spot; three submarginal black spots, more or less quadrate, decreasing in size anteriorly, in areas 1 *b*, 2, and 3, the spot in 1 *b* extended into 1 *a* and lengthened posteriorly outward to outer margin. Hind wing unmarked. Cilia of both wings pale salmon-pink. Antennæ brownish-black, ringed or spotted with white; head, thorax, and abdomen black, the thorax anteriorly with whitish hairs at the sides; underside of palpi, thorax, and abdomen pale yellow.

♀. *Upperside* resembles the ♂, the black areas dark silky brown; on the fore wing edged interiorly along the costa and along outer margin from vein 2 anteriorly with jet-black; discocellular spot on fore wing much larger than in the ♂.

Underside of fore wing with base and cell anteriorly greenish-yellow; disc salmon-pink; apex and outer margin broadly dull ochraceous-pink; other markings much as in the ♂. Hind wing ochraceous-pink.

Expanse: ♂♀, 40–45 mm.

Early stages (from *Fraser*, 1911) :—

Egg.—The eggs are pure white and strongly ribbed. They are laid singly, and hatch on the third day.

Larva.—At first grass-green with crimson stippling along the sides. Final instar grass-green, sprinkled with white dots and tiny bristles. A white dorsal line, with or without yellow edging. The only Indian species in which the head is not black in the first instar.

Pupa.—Stout, with a short snout. Creamy, flesh-coloured, or pale green without markings.

Food-plant : *Salvadora persica* Linn.

Habitat.—CUTCH and SIND to BALUCHISTAN and PUNJAB ; not rare. According to Fraser (1911) this insect is common in Sind all the year round. Also occurs in Persia.

The nominotypical form does not occur in India, and the supposed records of such are not properly authenticated.

Colotis vestalis (Butler).

♂♀. Distinguished by its white *upperside* with broad outer marginal black borders, the fore wing bearing a prominent submarginal white spot in area 3.

Distribution.—Kenya to Abyssinia ; the Persian Gulf to WEST and NORTH-WEST INDIA. Two subspecies, one African, and the other, the nominotypical form, found in India. It will be noted that the distribution is discontinuous.

155. **Colotis vestalis vestalis** (Butler). (Fig. 159, ♂).

Teracolus vestalis, Butler, 1876 *b*, p. 135, pl. vii, fig. 10 (♂, Scind) ; id., 1880 *b*, p. 222 (Baluchistan and Karachi) ; id., 1881 *b*, p. 608 (Karachi) ; id., 1883, p. 152 (Karachi) ; id., 1897 *b*, p. 390 ; Watson, 1894, pp. 520, 526 ; Marshall, 1897, p. 11 ; Sharpe, 1898, p. 18, pl. vi, figs. 1, 1 *a*, 1 *b*, 1 *c*, 1 *f* ; Fruhstorfer, 1910, p. 174, t. 73 *e*.

Colotis vestalis, Bingham, 1907, p. 265, fig. 69 (♂) ; Evans, 1910 *b*, p. 426 ; Fraser, 1911, p. 868 (Sind, early stages) ; Bell, 1914, p. 78 (early stages) ; Evans, 1932 *a*, p. 82, pl. ix, fig. B 18.3 (♂) ; id., 1932 *b*, p. 200 ; Peile, 1937, p. 72, pl. vii, fig. 48 (♂).

Teracolus puellaris, Butler, 1876 *b*, p. 136 (Punjab) ; id., 1880 *b*, p. 222 (Baluchistan) ; id., 1881 *b*, p. 608 (W. India) ; id., 1883, p. 152 (Karachi) ; Swinhoe, 1887, p. 276 (Karachi) ; Aitken, 1887, p. 40 (Kharaghora) ; Watson, 1894, p. 521 ; Marshall, 1897, p. 10 ; Sharpe, 1898, p. 16, pl. v, figs. 1, 1 *a*–1 *d* ; Dixey, 1902, p. 157, pl. vii, figs. 13 (♂), 14 (♀) (wet form).

Colotis puellaris, Swinhoe, 1909, p. 149, pl. 599, figs. 3, 3 *b* (♂), 3 *a*, *c* (♀).

Teracolus ochreipennis, Butler, 1876 *b*, p. 136 (Punjab) ; id., 1881, p. 609 (Karachi) ; id., 1883, p. 152 (Karachi) ; Watson, 1894, pp. 521, 526 ; Dixey, 1902, p. 157, pl. vii, figs. 15 (♂), 16 (♀).

Colotis ochreipennis, Swinhoe, 1909, p. 149, pl. 599, figs. 3 *d* *f* (♂), *e*, *g* (♀).

Teracolus intermissus, Butler, 1883, p. 152, pl. xxiv, fig. 4 (♂, Karachi); Watson, 1894, pp. 521, 526.
Colotis intermissus, Swinhoe, 1909, p. 151, pl. 600, figs. 2, 2 *b* (♂), 2 *a*, *c* (♀) (wet form), 2 *d*, *f* (♂), 2 *e*, *g* (♀) (dry form).
Teracolus rorus, Swinhoe, 1884 *a*, p. 438, pl. xxxix, fig. 8 (♂, North Sind); id., 1909, p. 149 (=*ochreipennis* Butl.).
Teracolus peelus, Swinhoe, 1884 *a*, p. 439, pl. xxxix, fig. 9 (♂, Karachi); id., 1884 *b*, p. 509; id., 1909, p. 151.
Teracolus vestalis ab. *peelus*, Fruhstorfer, 1910, p. 171.
Teracolus dubius, Swinhoe, 1884 *a*, p. 439 (Karachi).
Colotis dubius, Swinhoe, 1909, p. 150, pl. 600, figs. 1, 1 *b* (♂), 1 *a*, 1 *c* (♀) (=wet form).

Wet-season form.—♂. *Upperside* white; both wings with broad outer black borders. Fore wing with the base, costal margin broadly, and the cell, except at its lower angle, heavily dusted with dusky grey; a short black streak at upper angle of cell joined to a large discocellular black spot; two small white subapical spots; a large submarginal white spot in area 3; minute marginal white specks, more or less obsolescent, in the areas. Hind wing more uniform, very

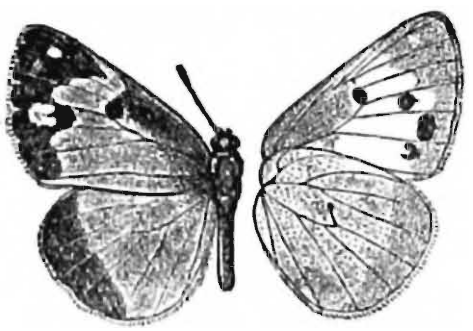


Fig. 159.—*C. vestalis vestalis* (Butl.), ♂, wet-season form.

slightly dusted with grey at the base, the black outer border immaculate.

Underside greenish-yellow sparsely sprinkled with black. Fore wing with pale yellow discal area, fading to white along inner margin; a discocellular black spot; three black submarginal posterior spots, placed in a curve; the lowest spot of these three sometimes extended to inner margin (*F puellaris*). Hind wing uniform, with a very small annular discocellular spot. Cilia white. Antennæ, head, thorax, and abdomen black; antennæ speckled and tipped with white, thorax clothed with long bluish-grey hairs; underside of palpi, thorax, and abdomen white.

♀. *Upperside* resembles the ♂, the marginal borders more brownish than black.

Underside of fore wing with base and area of cell white suffused with greenish-yellow; costa and apex pale ochraceous; black spots as in the ♂. Hind wing pale ochraceous; sometimes an anterior, discal, somewhat obscure, macular, incomplete band.

Dry-season form **ochreipennis** (Butl.).—♂♀. Similar to the wet form, but on the *upperside* the black markings are duller and narrower.

Underside with costal and apical areas on fore wing and whole surface of hind wing pale ochraceous to dark reddish-ochraceous.

Expanse : ♂♀, 40–50 mm.

The names *puellaris* Butl. and *dubius* Swinh. are synonyms of the nominotypical form. The names *rorus* Swinh. and *intermissus* Butl. are synonyms of the dry form *ochreipennis* Butl.

The form **peelus** (Swinh.) is a dry-season form, and has the *upperside* ground-colour pale canary-yellow.

There is a symmetrical gynandromorph from Karachi in the British Museum (ex coll. Oberthür).

Early stages (from *Bell*, 1914) :—

Egg.—The eggs are laid singly, generally near the base of the plant on old leaves. White at first, turning yellowish, with three broad reddish lateral bands. Long, dome-shaped, with 16 to 18 longitudinal ribs, the points of twelve forming a low crown round the micropyle.

Larva.—Segments 2, 13, and 14 somewhat more narrowed than those of *amata* ; segments 4 to 12 stout and cylindrical. Early instars grass-green with an indication of a spiracular light line. Anal flap rather large, dorsally somewhat flattened, and somewhat flanged round the edges. The yellow spots on the body are minute tubercles. Final instar identical with that of *protractus*.

In the first instar, according to Fraser (1911), the head is shining jet-black ; body grass-green with crimson stippling laterally, which on the posterior three segments spreads upwards and meets that of the opposite side so as to form a more or less prominent crimson patch.

Pupa.—Rather stout, the snout shorter than usual in this genus, and somewhat bluntly rounded at the tip. A dorsal and lateral constriction behind thorax. Cremaster with the subdorsal ridges more clearly defined than in *amata*. Colour pinkish-bone, with a dark dorsal line and some dark marks on the dorso-lateral region of abdomen as well as at the apices of wing-veins. Fraser (1911) notes that the pupa is "identical with that of *protractus*, usually flesh-coloured and without markings."

Habitat.—SIND to BALUCHISTAN and UNITED PROVINCES, extending to the Persian Gulf ; not rare. According to Fraser (1911) the butterfly is common in Sind all the year round.

Colotis fausta (Olivier). (Fig. 160).

♂. *Upperside* pale to deep salmon-buff. Fore wing with a black discocellular spot which is not connected with a dark costal border ; a broad black distal border, narrowing posteriorly to a point at vein 2 or the tornus, and enclosing spots of the ground-colour ; a series of small marginal spots. Hind wing with or without marginal black spots.

Underside of fore wing with an oval patch of modified scales, placed in the proximal area above vein 1 ; this brand is more or less prominent on the upperside as a small raised spot.

♀. Dimorphic. One form resembling the ♂, but without the sex-patch. Hind wing costal area on upperside not paler than the rest of the wing. The second form is white or partly white and partly salmon-buff.

Early stages (from *Bell*, 1914) :—

Egg.—Bottle-shaped, with 18 longitudinal ridges meeting in a thickened ring round the top. White at first, but soon turning yellowish, with three red irregular bands.

Larva.—Rich green ; sometimes a yellow narrow dorsal band, continued to the vertex ; usually three large patches, light pinkish-brown with darker margins, in the spiracular

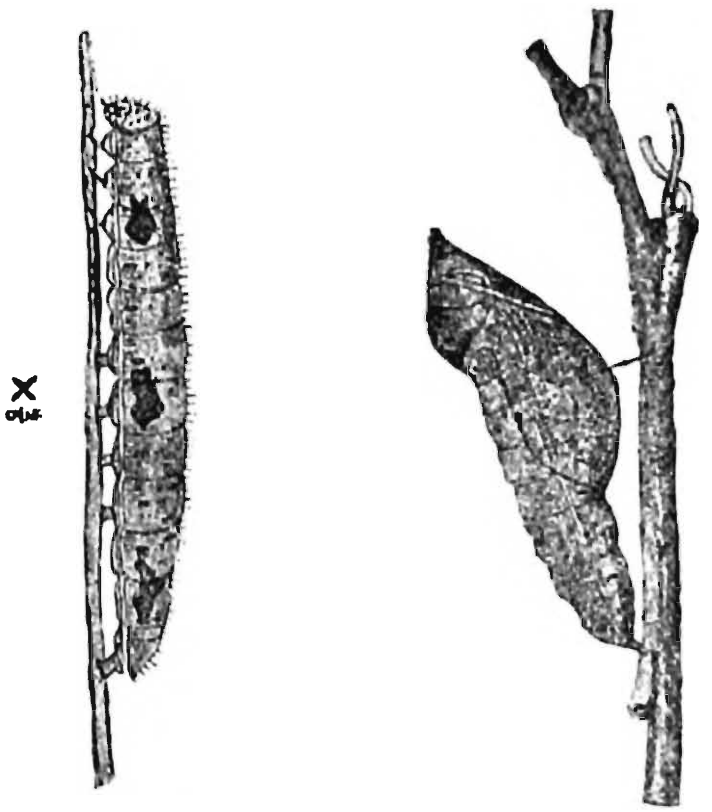


Fig. 160.—*C. fausta* (Oliv.), larva and pupa (from Bell).

region of segments 2, 8, and 11 ; sometimes there are eleven patches, which form a chain from segments 2 to 12. Length, 25 mm. ; breadth, 4 mm.

Pupa.—The longitudinal axis of the body is quite straight from the tip of the short, conical snout to the end of segment 13. The cremaster is as long as segment 13, and is trapeze-shaped, narrowing backwards, the hind margin or extremity being very distinctly concave. Usually livid bone-colour; a black dot laterally near the front margin of each segment, and sometimes a larger dorsal one near the hind margin of segments 8 and 9; the pupa is sometimes light green with the lateral line faintly yellow. Length, 19 mm.; breadth, 5 mm. at the broadest part.

Distribution.—Palestine to Arabia, Somaliland, Persia, WESTERN INDIA and CEYLON. Three subspecies, of which two are found in the Indian area.

156 *a*. **Colotis fausta fausta** (Olivier).

Papilio fausta, Olivier, 1801, pl. xxxiii, figs. 4 *a*, 4 *b* (♀, Asia Minor).
Idmais fausta, Moore, 1857 *a*, p. 68.
Teracolus fausta, Butler, 1880 *a* (*b*), p. 409 (Kandahar); Swinhoe, 1884 *b*, p. 508 (Sind, Baluchistan, S. Afghanistan); id., 1887, p. 275 (Karachi); Marshall, 1897, p. 8; Butler, 1897 *b*, p. 498; Röber, 1907, p. 56, t. 23 *c*; Verity, 1908, p. 197, pl. xxxix, figs. 9 (♂), 10, 11 (♀).
Colotis fausta, Bingham, 1907, p. 266 (part.).
Teracolus fausta fausta, Fruhstorfer, 1910, p. 174.
Colotis fausta fausta, Evans, 1932 *a*, p. 83; id., 1932 *b*, p. 200 (Baluchistan); Peile, 1937, p. 72, pl. vii, fig. 49 (♂).

In this, the nominotypical form, the black marginal border of the fore wing does not reach the tornus. ♀ resembles the ♂.

♂. *Upperside* pale salmon-buff, paler in specimens from desert areas, darker in those occurring in regions where there is a regular though not heavy rainfall. Fore wing with basal and costal areas more or less dusted with black; an oval annular discocellular spot of variable size; a broad black apical area bearing a macular band of the ground-colour, usually posteriorly merged with the ground-colour; this macular band varies in width, being wider in specimens from desert areas; similarly the marginal spots of ground-colour are either large or small. Hind wing with marginal black vein-spots; costa broadly pale, fading to white.

Underside pale yellowish-white, in many specimens from moist localities suffused with a beautiful rosy flush; the markings in such specimens prominent, in those from dry localities more or less obsolescent. Fore wing with discocellular spot not annular; in some specimens a post-discal, dark ochraceous-brown, narrow, curved band from costa to middle of area 2. Hind wing with a small discocellular spot in the form of an oval light brown ring, always much smaller than the spot on the fore wing; a post-discal, curved, more

or less sinuate band, similar to and in continuation of the band on the fore wing, from the costa to vein 1 *b*. Antennæ, head, thorax, and abdomen dusky black, the antennal club on underside, the hairs that cover the head and thorax, and the scaling of the abdomen salmon-buff; underside much paler, fading to white in specimens from dry localities.

♀. Resembles the ♂, with similar but very much broader markings. Fore wing with basal and costal areas heavily dusted with greyish-blue. Hind wing with marginal vein-spots large and quadrate, often united into a continuous band enclosing small marginal spots of ground-colour. Sometimes there is a trace of a post-discal macular black band, and more rarely is this band prominent and complete.

Underside white; markings as in the ♂, but broader, darker, and more prominent.

Habitat.—BALUCHISTAN and N.W FRONTIER PROVINCES (Tochi Valley), extending west to Turkey, Egypt, and South Arabia; not rare.

156 *b*. **Colotis fausta faustina** (C. & R. Felder).

Idmais faustina, C. & R. Felder, 1865, p. 190.
Teracolus oriens, Butler, 1876 *b*, p. 134, pl. vii, fig. 7 (♀) (Kalka).
Teracolus fausta, Watson, 1894, pp. 517, 525; Nurse, 1899, p. 513.
Colotis fausta, Bingham, 1907, p. 266 (part.); Fraser, 1911, p. 867 (Sind); Bell, 1914, p. 80 (early stages).
Madais fausta, Swinhoe, 1909, p. 153, pl. 600, figs. 1, 1 *b* (♂♀, wet form), 1 *c*, *d* (♂♀, dry form), 1 *e* (albino ♀).
Colotis fausta faustina ♀ f. *œsypera* Talbot, 1939 (Jan.), Trans. R. Ent. Soc. Lond. vol. lxxxviii, pt. 7, p. 215 (Deesa).

♂♀. A darker race than the nominotypical one. *Upperside* of fore wing with the costa more dusted with grey-black; the submarginal salmon-coloured spots are smaller, and usually have some grey dusting on their outer edges. ♀ with the outer dark border of hind wing more developed than in the nominotypical race.

♀ form **œsypera** Talbot.—*Upperside* white, often more or less irregularly suffused on parts of the wing with salmon-buff; fore wing dusted with black over the basal fourth. *Type* from Deesa, August 1897 (ex Coll. Nurse); in the British Museum.

Habitat.—The PUNJAB to SIND and KARWAR.

156 *c*. **Colotis fausta fulvia** (Wallace). (Fig. 161, ♂).

Idmais fulvia, Wallace, 1867, p. 392, pl. ix, fig. 5 (♂♀) (S. India).
Teracolus fulvia, Swinhoe, 1885 *a*, p. 143 (Poona); Aitken, 1887, p. 40; Watson, 1894, pp. 518, 525.
Madais fulvia, Swinhoe, 1909, p. 154, pl. 601, figs. 2, 2 *b* (♂), 2 *a* (♀).
Teracolus fausta fulvia, Fruhstorfer, 1910, p. 174; Yates, 1931, p. 1007 (Coorg).

Colotis fausta fulvia, Evans, 1932 *a*, p. 83, pl. ix, fig. B 18.4 (♂); Peile, 1937, p. 72.
Idmais tripuncta, Butler, 1868, p. 221, pl. xvii, fig. 9 (♂); Moore, 1881 *a*, p. 130, pl. xlix, figs. 3, 3 *a* (♂♀); Manders, 1904 *a*, p. 79 (Ceylon).
Colotis fausta tripuncta, Bingham, 1907, p. 267.
Idmais tripunctatus, Butler, 1880 *a* (*a*), p. 149, pl. xv, fig. 4 (♀) (Nilgiris) (nom. nov.).
Teracolus tripunctata, Aitken, 1887, p. 40; Watson, 1894, pp. 518, 525.
Teracolus rosaceus, Butler, 1876 *b*, p. 134, pl. vii, fig. 6 (♂) (Akote).
Teracolus solaris, Butler, 1876 *b*, p. 135 (♂, Sind); Swinhoe, 1884 *a*, p. 437, pl. xxxix, fig. 5 (♀, Deesa).
Idmais surya, Moore, 1884, p. 45 (♂, Orissa).
Teracolus palliseri, Butler, 1888 *b*, p. 418 (Khandesh); Watson, 1894, pp. 518, 525.
Colotis fulvia f. *palliseri*, Swinhoe, 1909, p. 154, pl. 601, figs. 2 *c*, *e* (♂), 2 *d* (♀) (dry form).
Teracolus fausta f. *palliseri*, Fruhstorfer, 1910, p. 174.

This subspecies is distinguished by the fore wing upperside having the marginal black area extended to the tornus. ♀ white.

♂. *Upperside* ground-colour almost orange-yellow. Fore wing with costa heavily dusted with black; discocellular spot large, not annular; apical and marginal area black, enclosing not more than three moderately large subapical

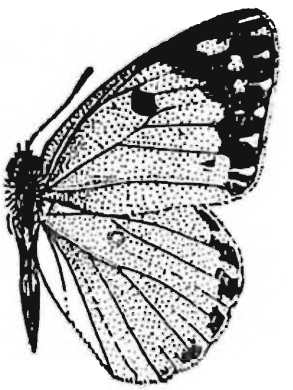


Fig. 161.—*C. fausta fulvia* (Wall.), ♂, from Madras Pres.

spots and a series of minute marginal specks of the ground-colour. Hind wing with the marginal black spots rather large.

Underside more richly yellow than in the nominotypical form; fore wing markings dusky black, those on hind wing rose-pink.

♀. *Upperside* white. Fore wing with basal and costal areas heavily dusted with greyish-blue; marginal border broad, and with three subapical spots as in the ♂. Hind wing with black marginal border and white marginal spots.

Underside of fore wing white, sometimes with faint yellow

suffusion ; apical and marginal areas anteriorly light to dark ochraceous-yellow ; discocellular spot very large ; a broad post-discal, macular, dark reddish-brown band. Hind wing pale ochraceous-yellow, sparsely powdered with black ; post-discal macular reddish-brown band as broad as on the fore wing.

Expanse : ♂♀, 45–55 mm.

The dry-season form is **rosaceus** (Butl.), of which *pulliseri* Butl. is a synonym.

Habits (from *Bell*, 1914).—The eggs are laid separately, generally on an old leaf, sometimes on a dry twig or leaf-scar. The food-plant is *Mærua arenaria* Hook. f. & Thoms., family Capparidaceæ, a climbing shrub confined to places where the vegetation is comparatively scanty, and to more or less desert localities.

The males fly fast, generally near the ground. They frequent flowers among the grass, as also do the females, which are less commonly seen. A sun-loving butterfly, characteristic of the plains and desert regions.

Habitat.—CEYLON (northern part) and PENINSULAR INDIA ; not rare. Between Bombay and Kanara *fulvia* overlaps the range of *faustina*.

Colotis etrida (Boisduval).

An Indian species occurring in two races. To be recognized by its white ground-colour, the fore wing bearing an apical orange patch which is edged with black on the inner side.

Early stages (from *Bell*, 1914) :—

Egg.—Longer than broad, the apical third conical ; eight longitudinal ridges, which are transversely striate. Surface shiny, at first yellowish and changing to reddish, caused by profuse blotching.

Larva.—Resembles that of *Eurema hecabe* (Linn.), but the anal segment ends in two short and obscure knobs. A broad white spiracular band touched with orange above each spiracle, and bordered below by a slightly less broad purplish-chocolate band ; venter green. Length, 19 mm. ; breadth, 3 mm.

Pupa.—Also of the type of *Eurema hecabe* (Linn.). Snout slightly upturned, and cremastral extremity distinctly bifid. Ground-colour pinkish-bone ; a prominent green-sepia band above the spiracular line from segments 6 and 7 to 13 ; a similarly coloured dorsal band from the head to the same segment ; abdomen streaked with three similar light-coloured lateral bands. When the pupa is formed among leaves the green colour is more strongly developed. Length, 18 mm. ; breadth, 3·5 mm.

Distribution.—CEYLON and PENINSULAR INDIA to the HIMALAYAS and BALUCHISTAN.

157 *a*. **Colotis etrida etrida** (Boisduval).

Anthocharis etrida, Boisduval, 1836, p. 576 (S. India); Lang 1864, p. 103 (Lucknow).

Callosune etrida, Moore, 1857 *a*, p. 69; Wallace, 1867, p. 390 (Punjab); Swinhoe, 1909, p. 132, pl. 594, figs. 1 *f*, *g*, *h*, *i*, *l*, *m* (♂♀).

Teracolus etrida, Butler, 1870 *b*, p. 726 (Murree); id., 1876 *b*, p. 160 (Sind, Masuri, Kanara); id., 1881 *b*, p. 609 (Karachi); Swinhoe, 1884 *b*, p. 510 (Karachi); id., 1885 *a*, p. 144 (S. India); Aitken, 1887, p. 38; Hampson, 1889, p. 362; Davidson & Aitken 1890, p. 359; Watson, 1894, pp. 522, 526; Marshall, 1897, p. 26; Butler, 1897 *b*, p. 456; Mackinnon & Nicéville, 1898, p. 591 (Mussooree); Sharpe, 1898, p. 104, pl. xxxiii, figs. 1, 1 *a*–1 *m* (♂♀); Nurse, 1899, p. 513.

Colotis etrida, Bingham, 1907, p. 270; Bell, 1909, pl. ii, figs. 20, 20 *a* (larva, pupa); Evans, 1910 *a*, pp. 385, 426 (Palni Hills); Fraser, 1911, p. 867 (Sind); Peile, 1911, p. 874 (Fatehgarh); Bell, 1914, p. 89, pl. J, fig. 67, 67 *a* (♂♀) (early stages); Yates, 1931, p. 1007 (Coorg).

Teracolus etrida etrida, Fruhstorfer, 1910, p. 174, t. 73 *b*.

Colotis etrida etrida, Evans, 1932 *a*, p. 83, pl. ix, fig. B 18.5 (♂); id., 1932 *b*, p. 200 (Baluchistan); Peile, 1937, p. 73, pl. vii, fig. 50 (♀).

Teracolus pernotatus, Butler, 1876 *b*, p. 159, pl. vii, fig. 1 (♂♀, Punjab); Swinhoe, 1909, p. 132, pl. 594, figs. 1, 1 *a*–1 *c* (♂♀) (wet form).

Teracolus farrinus, Butler, 1876 *b*, p. 159, pl. vii, fig. 2 (♂♀, N.W. Himalaya); Swinhoe, 1909, p. 132, pl. 594, figs. 1 *d*, *e* (♂♀) (interm. f.).

Teracolus purus, Butler, 1876 *b*, p. 160, pl. vii, figs. 14, 15 (♂♀, Punjab); Swinhoe, 1909, p. 132.

Teracolus etrida f. *purus*, Fruhstorfer, 1910, p. 174, t. 73 *b*, figs. 3, 4 (imago).

Teracolus bimbura, Butler, 1876 *b*, p. 161, pl. vii, figs. 3, 4 (imago) (Cashmere); Swinhoe, 1909, p. 132, pl. 594, figs. I, J, K (♂♀) (winter form).

Teracolus casimirus, Butler, 1876 *b*, p. 161, pl. vii, fig. 5 (♂, Kashmir).

♂. *Upperside* white, the base of both wings sparsely dusted with black. Fore wing with a small black discocellular spot; apical area broadly black, bearing an oval, curved, rich orange patch placed obliquely and traversed by the veins, which are black; inner edge of black area diffuse. Hind wing with a subapical short diffuse black streak from the costa, sometimes absent, and a series of marginal black spots that in specimens from moist localities are very large.

Underside white. Fore wing with cell and apical area suffused with sulphur-yellow; the orange patch shows through, its inner edge margined anteriorly by a very obscure oblique fuscous band. Hind wing with the subapical streak obscurely indicated.

♀. Resembles the ♂. *Upperside* of fore wing with orange patch narrower; a small black spot in middle of area 1 *b*,

and another in 3. Hind wing with marginal spots slightly larger.

Underside with apex of fore wing and whole surface of hind wing suffused lightly, or in specimens from very dry localities heavily, with ochraceous. Fore wing with spots in areas 1 *b* and 3 as on upperside. Hind wing with a discal, curved, almost complete series of fuscous spots ; otherwise,as in the ♂. In both sexes the antennæ vary from white to pale brownish ; head, thorax, and abdomen black, head and thorax with short greyish-brown hairs ; underside of palpi, thorax, and abdomen white.

The name **casimirus** (Butl.) (=*bimbura* Butl.) refers to specimens from dry localities, in which the orange patch is paler and the black markings obsolescent. On the *underside* the hind wing and apical area of fore wing are more or less ochraceous.

Habits (from *Bell*, 1914).—The eggs are laid singly. Pupation nearly always on the underside of a leaf near the ground, so that the chrysalis is exposed to the soil or a dead leaf or other light object, and this probably accounts for the majority of those found being bone-coloured instead of green. The larva feeds upon capers, and has been bred most commonly upon *Cadaba indica* Lam.

Habitat.—Peninsular India to the Himalayas and Baluchistan ; common.

157 *b*. **Colotis etrida limbatus** (Butler).

Teracolus limbatus, Butler, 1876 *b*, p. 161 (♂, Ceylon) ; id., 1897, p. 456 ; Watson, 1894, pp. 522, 526 ; Sharpe, 1898, p. 110, pl. xxxiv, figs. 1, 1 *a–g* (♂♀).
Callosune limbata, Moore, 1881 *a*, p. 129, pl. xlix, fig. 5 (♂) ; Swinhoe, 1909, p. 135, pl. 595, figs. 1 (♂), 1 *a* (♀).
Colotis etrida limbata, Bingham, 1907, p. 270 ; Ormiston, 1924, p. 93 ; Evans, 1932 *a*, p. 83 ; Peile, 1937, p. 73.
Teracolus etrida limbata, Fruhstorfer, 1910, p. 174.

♂♀. Distinguished from the nominotypical form as follows :—*Upperside* of fore wing with apical area darker and broader, occupying about a third of the wing ; the orange patch proportionately narrower, so that the black on its inner margin has the appearance of being broader ; this inner edge of the orange area is often bordered by a suffusion of sulphur-yellow, and sometimes is extended inwards in area 3. Hind wing with marginal black spots united to form a continuous band. Occasional specimens occur with the hind wing border as in the nominotypical form.

Expanse : ♂♀, 25–45 mm.

Habitat.—Ceylon ; common.

158. **Colotis eucharis** (Fabricius). (Fig. 162, egg).

Papilio eucharis, Fabricius, 1775, p. 472.
Callosune eucharis, Moore, 1857 *a*, p. 68; id., 1881 *a*, p. 128, pl. xlix, fig. 4 (♂); Swinhoe, 1909, p. 129, pl, 593, figs. 1 *e* (♂), 1 *f*, *h* (♀) (dry form).
Teracolus eucharis, Butler, 1876 *b*, p. 164; Swinhoe, 1885 *a*, p. 144 (Bombay); Hampson, 1889, p. 362; Watson, 1894, pp. 522, 526; Marshall, 1897, p. 26; Butler, 1897 *b*, p. 455; Nicéville, 1899 *c*, p. 214; Sharpe, 1900, p. 97, pl. xxxi, figs. 1, 1 *a*–1 *m* (♂♀); Manders, 1904 *a*, p. 79 (Ceylon); Fruhstorfer, 1910, p. 174, t. 73 *b*.
Colotis eucharis, Bingham, 1907, p. 268; Evans, 1910 *a*, p. 386 (Palni Hills); Bell, 1914, p. 86, pl. ii, figs. 20 (larva), 20 *a* (pupa) (early stages); Ormiston, 1924, p. 94 (Ceylon); Yates, 1931, p. 1007 (Coorg); Evans, 1932 *a*, p. 83; Peile, 1937, p. 73.
Papilio aurora, Cramer, 1780, p. 18, pl. ccxix, figs. A, B (Coromandel).
Pieris titea, Godart, 1819, p. 124 (Coromandel).
Teracolus titea, Watson, 1894, pp. 522, 526.
Teracolus pseudevanthe, Butler, 1876 *b*, p. 164, pl. vii, fig. 16 (♂♀, Bombay); Swinhoe, 1909, p. 129, pl. 593, figs. 1, 1 *a*, 1 *c*, 1 *d* (♂♀), 1 *b* (♂ albino) (wet form).
Teracolus pallens, Moore, 1877 *b*, p. 49 (Bombay; North Kanara); Watson, 1894, p. 523; Swinhoe, 1909, pp. 129, 131, pl. 593, figs. 1 *i*, *j*, *k*, *l* (♂♀) (extreme dry form).
Teracolus eucharis f. *pallens*, Fruhstorfer, 1910, p. 174.

This is very probably conspecific with two African forms.

♂. *Upperside* pure white. Fore wing with base and costa for a short distance generally sparsely dusted with black; a broad apical orange-yellow patch, with its inner edge straight and margined with gamboge-yellow; this patch is sometimes immaculate, but generally bears a black diffuse spot on its lower inner edge which may or may not extend to the outer margin below the orange; costa and outer margin bordered with black, which is much reduced in specimens from dry areas. Hind wing with marginal black vein-spots, varying in size, and a diffuse subapical black costal spot.

Underside usually pure white, suffused, except on disc of fore wing, with pinkish-yellow, and at base of same wing with pure sulphur-yellow; the orange patch and marginal black show through from the upperside, the former crossed by a sinuous fuscous band that ends in a black diffuse spot. Hind wing shaded with ochraceous at the base, and with a subapical fuscous costal spot, also a few scattered transverse fuscous striæ and small spots. Many specimens have the subapical spot continued as an obscure fuscous band across the wing, and bear a series of large marginal fuscous spots. Both wings with black discocellular dots. Antennæ, head, thorax, and abdomen black; antennæ speckled with white

on the sides, head and thorax clothed with short greyish-brown hairs; underside of palpi, thorax, and abdomen white.

♀. *Upperside* of fore wing with base and costa more heavily dusted with black; discocellular spot larger than in the ♂; apical area black, with three enclosed elongate orange spots; inner edge of black area irregularly sinuate and diffuse, extended shortly inwards in area 3; a transverse black spot across the middle of area 1 *b*. Hind wing with sparse greyish-black basal dusting; subapical spot and marginal spots much larger than in the ♂: sometimes there is an obscure transverse posterior discal band.

Underside with markings much broader and more prominent than in the ♂; the fuscous striæ and dots more numerous.

The dry-season form **aurora** (Cram.) (=*pallens* Moore) has reduced black markings, and the hind wing underside is rose-red.

Expanse: ♂♀, 40–45 mm.

In the British Museum are 2 ♂♂, probably of the dry season, in which the orange apical area is absent. They are creamy-white instead of chalky-white; hind wing underside immaculate. (Bombay, 1887, January and November) (ex Coll. Swinhoe).

Early stages and habits (from *Bell*, 1914) :—

Egg.—Shape almost like a bell-jar, with 17 longitudinal ribs, some of which form a crown of teeth round the top;

Fig. 162.—*Colotis eucharis* (Fabr.), egg (after Bell).

each rib is cross-rayed many times, producing a beaded appearance. Orange, with subcutaneous dull blotches.

Larva.—The tubercles of the body are comparatively large and conspicuous as compared with *C. danæ*. Dark green to yellowish-green, with a light dorsal band generally present, body obscurely darker spotted; in some individuals there is a large, more or less triangular pinkish-brown white patch, including the spiracles of segments 6 to 8, the anterior one generally the smallest, increasing backwards, the largest never reaching the line of the dorso-lateral tubercles, and never extended posteriorly to farther than the centre of the segment. Length, 20 mm.; breadth, 3·5 mm.

Pupa.—Shape more like that of *Valeria* than other *Colotis* species. Snout conical and very rugose. Glaucous-green with a yellow shade, the whole surface vermiculate with little short, whitish lines; a yellow-white lateral wing-line from the shoulders, continued along abdomen to cremaster. The colour may be darker green or light yellowish-brown, marbled and blotched with white and darker brown. Length, 17 mm.; breadth, 4 mm.

Habits.—The eggs are laid singly, often on a dead thorn or twig. The larvæ turn pink before pupation, and are much subject to the attacks of parasites, over 50 per cent. dying from this cause. The food-plant is usually *Cadaba indica* Lam., a shrub common in waste places and hedges in the Deccan. The butterfly emerges in about a week.

The butterfly is a weak flier, keeping near the ground, and generally found in numbers near the food-plant to the flowers of which it is attracted. The male rests frequently on the ground, and likes the sun. The female is not often seen.

Habitat.—CEYLON to CENTRAL INDIA; common.

Colotis danæ (Fabricius).

This species resembles *etrida* (Boisd.), from which it can be distinguished by the apical patch of the fore wing being crimson, and in the ♀ this patch is traversed by a dark macular band.

Early stages (from (*Bell*, 1914) :—

Larva.—Resembles in appearance a small *Hebomoia*. Usually glaucous-green, with many indistinct whitish spots or short lines; a broad spiracular white line, which may be bordered above by plum-colour or brown-orange. Length, 20 mm.; breadth, 3·5 mm.

Pupa.—Stout, with a short, thickly conical head process, a prominent ventral wing-bulge, and thorax moderately humped. Green or bone-colour, with slight marblings and transverse lines, which in the green form may be absent. Length, 15–16 mm.; breadth, 4·5 mm. at the shoulders.

Distribution.—CEYLON and PENINSULAR INDIA to SIND, BALUCHISTAN, and Persia; extending to Africa south of the Sahara. Two subspecies in the Indian area.

159 *a*. **Colotis danæ danæ** (Fabricius). (Pl. II, figs. 11, larva, 12, pupa).

Papilio danæ, Fabricius, 1775, p. 476; Donovan, 1800, pl. xxvi, fig. 2 (♂).

Callosune danæ, Moore, 1857 *a*, p. 69; id., 1881 *a*, p. 129; Wallace, 1867, p. 389; Swinhoe, 1909, p. 136, pl. 595, figs. 2

2 *b* (♂), 2 *a*, *c* (♀) (wet form), 3 (♂), 3 *a* (♀) (dry form), 4, 4 *b* (♂), 4 *a*, *c* (♀) (extreme dry form).

Teracolus danæ, Butler, 1876 *b*, p. 157; Swinhoe, 1885 *a*, p. 143 (S. India); Aitken, 1887, p. 38 (S. India); Watson, 1894, pp. 521, 526; Butler, 1897 *b*, p. 498.

Colotis danaë, Bingham, 1907, p. 271, pl. xvi, fig. 107 (♂); Evans, 1910 *a*, p. 386 (Palni Hills); Ormiston, 1924, p. 95 (Ceylon); Yates, 1931, p. 1007 (Coorg).

Teracolus danaë, Fruhstorfer, 1910, p. 174, *t.* 73 *b* (imago).

Colotis danæ danæ, Evans, 1932 *a*, p. 83, pl. ix, fig. B 18.7 (♀); Peile, 1937, p. 74, pl. v, fig. 31 (♂).

Teracolus sanguinalis, Butler, 1876 *b*, p. 158 (Ceylon): Watson, 1894, pp. 521, 526.

Callosune sanguinalis, Moore, 1881 *a*, p. 129.

Teracolus danaë f. *sanguinalis*, Fruhstorfer, 1910, p. 174 (intermed. form).

Teracolus taplini, Swinhoe, 1884 *a*, p. 444, pl. xl, figs. 8, 9 (♂♀, Bombay); Watson, 1984, pp. 522, 526.

Teracolus danaë f. *taplini*, Fruhstorfer, 1910, p. 174 (dry form).

This subspecies is very variable, especially in the ♀.

♂. *Upperside* white, the base of wings dusted with black to a variable extent, and sometimes not at all. Fore wing with or without a minute discocellular black spot; apical area broadly carmine, edged proximally and distally with black, both edges meeting on the costa and outer margin, and sometimes extending as a black line to the tornus. Hind wing with marginal black spots, varying in size and sometimes reduced to more or less obsolescent, unconnected dots.

Underside white. Fore wing with base of cell washed with sulphur-yellow; discocellular spot as on upperside; an ochraceous-pink apical patch, not margined with black, but similar in shape and position to the patch on the upperside, and sometimes more or less suffused with greyish; this patch is crossed near its inner edge by an obliquely placed series of four or five spots that vary in colour from pale ferruginous to black; in some specimens there are two marginal diffuse black spots, one each at the ends of veins 2 and 3. Hind wing sometimes pure white, but usually suffused with ochraceous-pink to a greater or less extent; a small discocellular spot, pale ferruginous to black, sometimes annular and centred with carmine; a discal, curved, macular band, varying from pale ferruginous to black, the posterior spots often obsolescent or entirely absent; a series of marginal black vein-dots which are sometimes connected by a fine marginal line. Antennæ pale brown, speckled with white; head, thorax, and abdomen black; head and thorax anteriorly clothed with brown, sometimes greyish-black hairs; underside of palpi, thorax, and abdomen white.

♀. *Upperside* white, the base of wings more or less heavily dusted with greyish-black, sometimes extended as a broad

band parallel to the inner margin of the hind wing. Fore wing with carmine patch smaller than in the ♂, sometimes reduced to a row of pale, rosy, subapical streaks, but always bordered distally, and generally proximally also, by black of varying width ; sometimes the inner black border is very narrow, in others broad, and in a very few entirely absent ; discocellular spot larger than in the ♂ ; a post-discal, anterior, macular, curved black band, the upper spots of which cross the carmine area, or where this is reduced it crosses the black proximal edging ; a black, transverse, somewhat diffuse spot in areas 1 *b* and 2. Hind wing with a dusky discocellular spot ; a discal, black, macular, curved band, more or less incomplete ; marginal black spots, sometimes connected to form a continuous band. All these markings are generally diffuse.

Underside of fore wing white, suffused with sulphur-yellow at base of cell and with an ochraceous, sometimes with a greyish or reddish, tinge over the apical area ; discocellular spot, post-discal band, and spots in areas 1 *b* and 2 as on upperside, but more clearly defined, the spots that compose the post-discal band sometimes annular. Hind wing white, suffused to a greater or less degree with ochraceous, sometimes pink ; discocellular spot and discal band as on upperside, but more clearly defined, annular, and generally centred with carmine ; marginal black specks which may or may not be connected by a fine marginal line.

Expanse : ♂♀, 40–50 mm.

The name **taplini** (Swinhoe) refers to an extreme dry-season form with much reduced black markings, and the *underside* with apical area of fore wing and entire hind wing reddish-ochraceous. An intermediate form is **sanguinalis** (Butler), and this name should be applied to the dry-season form as a whole.

Habits (from *Bell*, 1914).—The eggs are laid singly on an old leaf or its stalk. Larva turns pink before pupating. It is much subject to the attacks of parasites, and the pupa is attacked by flies. The pupal stage lasts about a week. The food-plants are capers, and the butterfly has been bred on *Cadaba indica* Lam., *Capparis sepiaria* Linn., and *C. divaricata* Lam., also on *Mærua arenaria* Hook. f. & Thoms.

With the exception of the male of *C. fausta* (Oliv.) the butterfly flies straighter than other Indian species of the genus. It keeps to the ground, and is never found in the jungles and regions of heavy rainfall. Both sexes are found in about equal numbers.

Habitat.—CEYLON and PENINSULAR INDIA ; not rare. According to Evans (1910) the butterfly is common in the Palni Hills from April to June and August to October.

159 *b*. **Colotis danæ dulcis** (Butler).

Teracolus dulcis, Butler, 1876 *b*, p. 157, pl. vii, fig. 13 (♂♀, Kattywur); id., 1881 *b*, p. 610 (W. India); Swinhoe, 1884 *b*, p. 509 (Karachi); id., 1887, p. 277; Watson, 1894, pp. 521, 526.
Callosune dulcis, Swinhoe, 1909, p. 138, pl. 596, figs. 14 *i*, *j* (♂), 14 *k*, *l* (♀) (dry season).
Colotis danæ dulcis, Evans, 1932 *a*, p. 83; id., 1932 *b*, p. 200 (Baluchistan); Peile, 1937, p. 74.
Teracolus dirus, Butler, 1876 *b*, p. 157, pl. vii, fig. 11 (♀, Sind); id., 1880 *b*, p. 222 (Karachi); id., 1881 *b*, p. 610 (Karachi).
Callosune dirus, Swinhoe, 1909, p. 138, pl. 596, figs. 1 *d*, 1 *f* (♂), 1 *e* (♀) (intermed. form).
Teracolus eboreides, Butler, 1876 *b*, p. 158, pl. vii, fig. 12 (imago).
Callosune eboreides, Swinhoe, 1909, p. 138, pl. 596, figs. 1, 1 *b* (♂), 1 *a*, *c* (♀).
Teracolus subroseus, Swinhoe, 1884 *a*, p. 443, pl. xl, figs. 6, 7 (♂♀, Karachi); Watson, 1894, pp. 521, 526.
Callosune subroseus, Swinhoe, 1909, p. 140, pl. 597, figs. 1 *d*, *f* (♂), 1 *e*, *g* (♀).
Teracolus danaë f. *subroseus*, Fruhstorfer, 1910, p. 174 (dry form).
Teracolus immaculatus, Swinhoe, 1884 *a*, p. 443; id., 1884 *b*, p. 510 (Karachi); Watson, 1894, pp. 521, 526.
Callosune immaculatus, Swinhoe, 1909, p. 139, pl. 596, fig. 1 *g* (imago).
Callosune alberta, Swinhoe, 1890, p. 356 (Karachi); id., 1909, p. 140, pl. 597, figs. 1, 1 *b*, 1 *h* (♂), 1 *a*, *c*, *i* (♀).
Colotis danæ, Fraser (*non* Fabr.), 1911, p. 867 (Sind).

♂♀. A slightly differentiated race, even more variable than the preceding one, and with markings more characteristic of the dry season.

Upperside with narrow black inner edging to the crimson tip, and with the black border of the hind wing formed of separate spots.

In the dry-season form **subroseus** (Swinh.), of which *alberta* (Swinh.) is a synonym, the hind wing *underside* is sandy rose colour, the dark spots with red centres. The name **dirus** (Butl.) applies to a ♀ form which has a narrow subapical band, usually of short stripes, pinkish-white or red.

The name **immaculatus** (Swinh.) refers to a ♂ form in which the hind wing *underside* is scarcely marked.

Habitat.—KATHIAWAR and SIND to BALUCHISTAN; not rare.

160. **Colotis liagore** (Klug).

Pontia liagore, Klug, 1929, t. vi, figs. 5, 6 (♂, Ambukohl).
Teracolus liagore, Aurivillius, 1910, p. 59, t. 19 *a* (♂).

A peculiar and uncommon species which hitherto was recorded only from Africa. It may be mistaken for a small specimen of *eucharis* (Fabr.), but the apical area of the fore

wing upperside is orange, not orange-yellow, and on the underside of this area there is an orange subapical band.

♂. *Upperside* white. Fore wing with broad apical orange area reaching to vein 2 at the margin ; this area is edged along its outer and costal borders by a black line that is very slightly produced to short streaks at the veins, and is usually thickened at about the middle of the costa and at vein 2 ; the inner edge of the orange area is without black scaling, and is evenly defined ; there is no discocellular dot. Hind wing usually with small triangular black marginal spots on the veins, but these are not constantly present ; basal area more or less dusted with black ; no discocellular dot.

Underside white. Fore wing with a subapical orange band, which is sometimes not very distinct, formed of short bars in areas 3, 4, 5, 6, and 8 ; apical area pale yellow or buff, extending slightly proximad of the orange band, and occupying the same area as on the upperside ; some slight basal black scaling. Hind wing white, yellowish or pinkish, without markings except for the costal edge, which is yellow or orange along the basal fourth or more, and for some slight black dusting over the proximal area.

♀. *Upperside* of fore wing without a black marginal line, but with short marginal vein-streaks more distinct than in the ♂.

Underside of fore wing with a slight black discocellular mark, and sometimes a small spot of sparse black scaling in the post-discal area below vein 2. In other respects similar to the ♂.

Expanse : ♂♀, 33–38 mm.

Distribution.—Northern Nigeria to Senegal, and the Egyptian Sudan to Muscat and South Arabia.

A single ♂ in the British Museum from SOUTH BALUCHISTAN, taken at Pasni, 9. iv. 1935, and presented by the Imperial Institute of Entomology.

The ♀ appears to be very rare, as only two examples, with 23 ♂♂, are in the British Museum.

Genus **HEBOMOIA** Hübner. (Fig. 163).

Hebomoia, Hübner, 1819, p. 95 ; Butler, 1870 *a*, pp. 37, 48 (type, *glaucippe* (Linn.)) ; id., 1898 *b* (*c*), pp. 289–93 (revision) ; Fruhstorfer, 1907 *b*, pp. 89–109 (revision) ; Bingham, 1907, p. 273, fig. 70 (venation) ; Swinhoe, 1909, p. 122 ; Fruhstorfer, 1910, p. 174 ; Klots, 1931, p. 174 (type, *glaucippe* (Linn.) ; Dixey, 1932, p. 59, figs. 61–9 (plume-scales) ; Evans, 1932 *a*, pp. 64, 83.
Iphias, Boisduval, 1836, p. 595.

Type of the genus, *H. glaucippe* (Linn.).

♂♀. Fore wing triangular ; costa arched ; apex more or less acute ; outer margin oblique, slightly sinuate ; tornus

well marked, obtuse; inner margin bisinuate; cell slightly more than half length of wing; veins 10 and 11 from the cell, close together, running almost parallel for most of their length; 7+8 and 9 on a long stalk; 6 from the cell, forming a short *udc*; *mdc* about half the length of *ldc*, which is angled. Hind wing suboval, broad; apex and tornal angle boldly rounded; precostal vein long, bent sharply distad. Antennæ not more than half the length of fore wing, club gradual; eyes naked, prominent; palpi somewhat flattened, scaly,

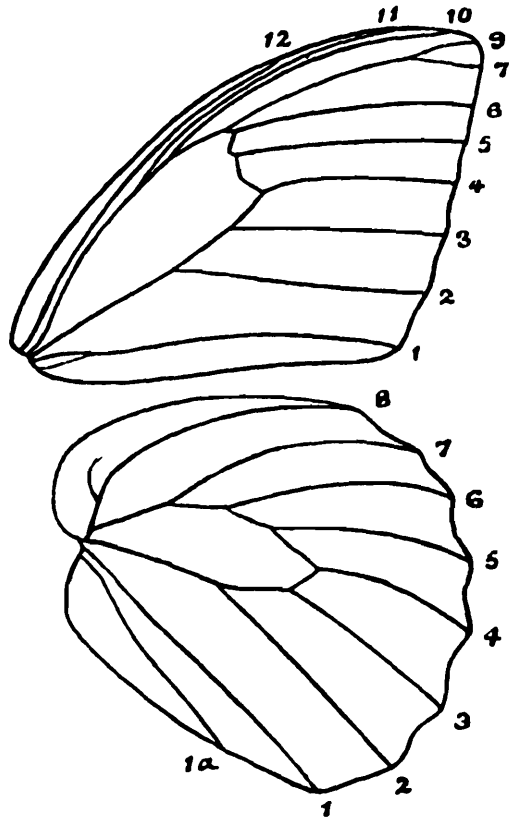


Fig. 163.—*Hebomoia*, venation.

clothed with stiff hairs anteriorly and at the apex, third segment short and oval; thorax and abdomen robust; legs slender.

Genitalia (from *Klots*, 1931).—Penis without a basal prong; saccus slender, about as long as tegumen; uncus short, curved, bifurcate; a well chitinized area immediately beneath base of uncus and above anus; juxta well developed, hollowed out; valve with a dorsal and a distal process; harpe of medium size, with a dorsal point.

The *Hebomoia* are the largest Pierids found in the Oriental Region. The males usually fly in the morning, frequenting the edges of paths and woods and open thickets, coming also to *Lantana* flowers; during the hotter hours they settle on moist sand. The females are sluggish and remain in the thickets.

The species of this genus, like those of *Ixias* and *Colotis*, possess a brightly coloured apical area on the fore wing upperside, whilst the underside of hind wing and apical area of fore wing possess a cryptic coloration. In *Hebomoia* these characters are more strongly developed than in the two other genera. When at rest the underside blends well with the surroundings, as the proximal area of the fore wing is covered by the hind wing, the margin of which adjoins the apical area of the fore wing.

Distribution.—CEYLON, INDIA (except the North-West), BURMA, ANDAMAN ISLANDS, north to South China and the Loo Choo Islands, south to the Moluccas. Only two species known. One species with four subspecies occurs in the Indian area.

Hebomoia glaucippe (Linnæus).

♂. *Upperside* white or yellow, the latter colour only found on the hind wing in one Indian race. Fore wing with apical half black, bearing a large orange patch which usually enters the end of the cell ; the extension of the black area proximally of the orange patch is variable, and is often absent in specimens from dry areas. Hind wing with a few anterior marginal black spots or sometimes a very narrow marginal black border.

Underside of fore wing with proximal area white ; apical area mottled brown or reddish. Hind wing similar to apical area of fore wing ; a prominent deep brown or blackish line from base to outer margin, passing through middle of cell.

♀. Similar to the ♂. *Upperside* of fore wing with smaller orange patch, the black spots on its distal part enlarged and often cutting off a series of submarginal orange spots ; proximal area often yellowish, with black basal dusting. Hind wing with black dentate outer border and a post-discal row of prominent black spots.

Distribution.—The whole area of the genus, excepting the South Moluccas. Three subspecies in the Indian area.

Key to Subspecies.

1. Hind wing upperside with distal half suffused with pure sulphur-yellow [p. 478. *g. roepstorfii* W.-M.,
   Hind wing upperside entirely white..... 2.
2. Fore wing upperside with inner black edging to the orange area represented as follows :— [p. 477.
   a. Narrow or obsolete .. *g. australis* Butl.,
   b. Broad .. .. .. *g. glaucippe* (Linn.). [p. 476.

161 *a*. Hebomoia glaucippe glaucippe (Linnæus).

Papilio glaucippe, Linnæus, 1758, p. 469.
Hebomoia glaucippe, Moore, 1865 *b*, p. 759 (Bengal); id., 1878 *a*, p. 837 (Houndaran); id., 1886, p. 49 (Elphinstone Island); Wood-Mason & de Nicéville, 1887, p. 371 (Cachar); Elwes & de Nicéville, 1887, p. 431 (Tavoy); Bingham, 1907, p. 274; Butler, 1898 *b* (*c*), p. 290; Swinhoe, 1909, p. 123, pl. 591, figs. 1 (♂), 1 *a* (♀) (wet form), 1 *b* (♂), 1 *c* (♀) (dry form).
Hebomoia glaucippe glaucippe, Fruhstorfer, 1907 *b*, p. 91; id., 1910, p. 175, t. 70 *a*, *b* (imago); Klots, 1932, pl. vii, fig. 27 (genitalia); Evans, 1932 *a*, p. 84, pl. ix, fig. 19.1 (♂); Peile, 1937, p. 74.
Hebomoia glaucippe aturia, Fruhstorfer, 1910, p. 176 (Singapore to Tenasserim).

Wet-season form.—♂. *Upperside* creamy-white. Fore wing with costa narrowly, the apex and outer margin to middle of area 1 *b*, black; an irregular, somewhat sinuous, black band extends obliquely from beyond the middle of costa across upper angle of cell, and meeting the marginal black in area 1 *b*; within the triangle thus formed is enclosed a rich orange-red patch that is traversed by the black veins and bears in areas 3 to 6 a post-discal series of black inwardly-elongate spots. Hind wing with more or less defined anterior marginal black spots; a conspicuous post-discal black spot in area 7, and sometimes smaller spots below this.

Underside white; apical third of fore wing and entire hind wing mottled with more or less prominent brown strigæ and spots. Fore wing with costa brown. Hind wing with a fine brown line from the base through the cell to the middle of outer margin. Antennæ dark brown; head and thorax anteriorly with reddish-brown pile; upperside of thorax greyish-blue, abdomen white with a bluish tinge; underside of head and thorax more or less brownish, of abdomen white.

♀. Similar to the ♂. *Upperside* ground-colour with a slight greenish tinge. Fore wing with orange patch consisting of a series of broad stripes in areas 3 to 6 and 10, the outer apices of which are deeply incised by black; a distal row of hastate orange spots in areas 2 to 6. Hind wing with a post-discal series of large triangular black spots; a marginal black border, strongly toothed at the veins, formed of a connected series of large triangular spots.

Underside similar to the ♂, the strigæ and spots more numerous; costa of fore wing and median line of hind wing prominently brown.

Dry-season form.—♂♀. Fore wing with slightly more falcate apex. *Upperside* ground-colour purer white. Hind wing in ♂ with black markings obsolete, in ♀ with smaller spots.

Underside mottlings of brown strigæ and spots more numerous and dense.

I can find no reason for preserving the name *aturia* Fruhst.

Habitat.—NEPAL to BURMA ; common.

161 *b*. **Hebomoia glaucippe australis** Butler. (Fig. 164, egg ; pl. II, figs. 9, larva, 10, pupa).

Hebomoia australis, Butler, 1898 *b* (*c*), p. 290 (S. India) : Manders, 1904 *a*, p. 79 (Ceylon) ; Swinhoe, 1909, p. 125, pl. 592, figs. 1, 1 *a*, (♂♀).

Hebomoia glaucippe australis, Bingham (part.), 1907, p. 275 : Fruhstorfer, 1907 *b*, p. 93 ; de Rhé-Philipe, 1908, p. 885 (Konkan) ; Fruhstorfer, 1910, p. 175 ; Ormiston, 1924, p. 99 (Ceylon) ; Yates, 1931, p. 1007 (Coorg) ; Evans, 1932 *a*, p. 83 ; Peile, 1937, p. 74.

Hebomoia glaucippe, Aitken (*non* Linn.), 1887, p. 38 ; Davidson, Bell, & Aitken, 1897 *a*, p. 572 ; Evans, 1910 *a*, p. 386 (Palni Hills) ; Bell, 1914, p. 95, pl. J, figs. 66 (♂), 66 *a* (♀), pl. 1, figs. 19, 19 *a* (larva and pupa).

Hebomoia glaucippe ceylonica, Fruhstorfer, 1907 *c*, p. 4 (Ceylon) : id., 1907 *b*, p. 93 ; id., 1910, p. 175, t. 70 *a* (imago) ; Evans, 1932 *a*, p. 83 ; Peile, 1937, p. 74.

Hebomoia glaucippe, Moore (*non* Linn.), 1881 *a*, p. 127, pl. xlix, figs. 1, 1 *a*, 1 *b* (♂♀, larva, pupa).

A slightly differentiated race, distinguished by the reduced black markings on the upperside in both sexes.

♂. *Upperside* of fore wing with the orange area on its inner side edged narrowly with black, or without any black edging (dry-season form); black distal spots smaller. Hind wing with prominent black costal spot, absent in dry-season specimens.

Underside of hind wing with dark brown mottling ; in the dry-season form much paler and less strongly mottled with brown.

♀. *Upperside* with the black markings less extended than in the nominotypical ♀, the inner black edging to the orange area more expecially reduced. Seasonal variation slight, but the dry-season form paler on the underside.

Expanse : ♂♀, 80–100 mm.

The type of *australis* Butl. belongs to the dry-season form, and both sexes are labelled " Trincomalee."

Early stages and habits (from *Bell*, 1914) :—

Egg (fig. 164).—Elongate, three times as long as broad ; 11 or 12 longitudinal ribs, of which each alternate one forms a sharp tooth at the top of the egg. At first shining white with a pink shade, turning yellow later.

Larva.—Body with the dorsal half-segments convex, the ventral ones flattened ; anal segment projecting over the anal claspers, narrowed, truncate, with a slight indentation in the centre of extreme margin. Body glaucous-green, lighter in

the spiracular region, with a beaded, white, subspiracular line from segment 13 to the head; the lower half of the beads on this line is orange except on segment 3, where it is blue; through each one of the transverse tubercles (each row of such reaching to the spiracular line on each side) runs a short, longitudinal, purple line. Length, 47 mm.; breadth, at segment 3, nearly 8 mm.

Pupa.—The shape is that of *Catopsilia*. Head process conical at base, cylindrical anteriorly, slightly up-turned at tip, and very rugose. Cremaster narrow-triangular, bifid at end, extensor ridges rugose, strong and ventral. Ground-colour dark yellowish-green; dorsum and a lateral head-band purple; a large dorsal spot on segments 4, 5, and 9. Length, 37·5 mm.; breadth, 9·4 mm. at the shoulders.

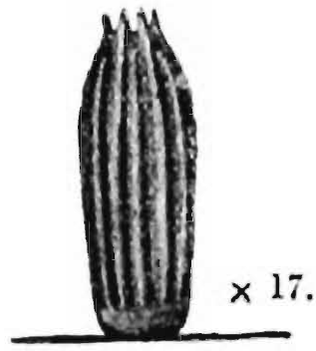


Fig. 164.—*H. glaucippe australis* Butl., egg. (After Bell).

Habits.—The eggs are laid singly on the upperside of a leaf, usually on an old one close to the ground. The newly-hatched larva eats the egg-shell. The larva pupates on the underside of a leaf well hidden near the ground or close to the stem. The food-plants are Capparidaceæ, the larva being commonly found on *Cratæva religiosa* Forst. f., also often upon the large climber *Capparis moonii* Wight.

The butterfly has a very strong and powerful flight. It is fond of the sun, often rests on the ground, goes to damp places, and comes freely to flowers. When at rest on the ground among leaves or rubbish the insect is quite invisible, the colour and pattern blending so well with the surroundings.

Habitat.—CEYLON and PENINSULAR INDIA; common.

161 *c*. **Hebomoia glaucippe roepstorfii** Wood-Mason.

Hebomoia roepstorfii, Wood-Mason, 1880, p. 134 (♂♀, South Andamans); Wood-Mason & de Nicéville, 1881 *b*, p. 251, pl. xvi, figs. 3–5 (♂♀): Swinhoe, 1909, p. 126, pl. 592, figs. 2 (♂), 2 *c* (♀) (wet form), 2 *b* (♂), 2 *a* (♀, dry form).

Hebomoia glaucippe roepstorfi (sic), Fruhstorfer, 1907 *b*, p. 93: id., 1910, p. 175, t. 71 *a* (imago).

Hebomoia roepstorfi, Bingham, 1907, p. 276, pl. xviii, fig. 122 (♂).

Hebomoia glaucippe roepstorfii, Evans, 1932 *a*, p. 84.

♂♀. Markings similar to those of *australis* Butl. *Upperside* of fore wing with sulphur-yellow suffusion along the inner margin of the orange patch and over the tornal area; the orange patch extends well into the end of the cell. Hind wing with distal half suffused with sulphur-yellow, and in the ♀ with more or less distinct orange stripes between the veins: ♀ with a series of small post-discal black spots placed on the orange stripes, which are more prominent above vein 3.

Underside as in the preceding races.

Habitat.—ANDAMAN ISLANDS; common.

Genus **VALERIA** Horsfield. (Fig. 165).

Valeria, Horsfield, 1829 (June), p. 139 (type, *valeria* Cram.); Roepke, 1935, p. 42.

Pareronia, Bingham, 1907, p. 276, fig. 71 (venation) (type, *valeria* Cram.); Swinhoe, 1909, p. 174; Fruhstorfer, 1910, p. 177; Klots, 1931, p. 192 (type, *valeria* Cram.); Dixey, 1932, p. 59, figs. 71–84 (plume-scales); Evans, 1932 *a*, pp. 64, 84.

Type of the genus, *V valeria* (Cram.).

♂♀. Fore wing with costa strongly arched; apex blunt; outer margin slightly sinuate, concave in the middle; tornus rounded; inner margin straight, about three-fourths length

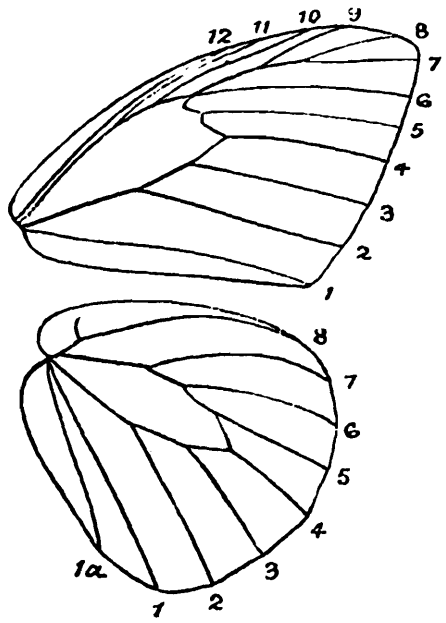


Fig. 165.—*Valeria*, venation.

of costa; cell about half length of wing; veins 10 and 11 from the cell; 7, 8, 9 stalked; 6 from upper angle of cell; *mdc* more than half as long as *ldc*. Hind wing subtriangular; cell long, over half length of wing; discocellulars subequal and very oblique; precostal vein long, turned slightly distad.

Antennæ much longer than half length of fore wing, club gradual, long and slender, palpi very short, third segment short, almost truncate at apex; eyes large, naked; thorax and abdomen particularly long. The males of the Indian forms, with the exception of *V avatar* (Moore), have a band of androconia over the apical and marginal black border of the hind wing upperside.

This genus is closely allied to *Eronia* Butler, the species of which are found throughout Africa. The two genera are apparently connected by *V avatar* (Moore), which by pattern and genitalia approximates to *Eronia*.

The males are bluish-white to bluish-green, with the veins blackened on both sides, more so on the upperside, where there is a tendency to the formation of a striped pattern. A distinctly striped pattern is found in the females, which are black, with stripes and spots of green, white, brownish or yellow. They resemble Danaines very strongly, not only in pattern but also in flight. The female may be monomorphic, dimorphic, or trimorphic, the pattern in each case resembling particular Danaines found in the same locality.

Larvæ on Capparidaceæ.

Distribution.—CEYLON, INDIA, BURMA, and ANDAMAN ISLANDS, to Hainan, south and east to the Papuan region. Seven species, of which three are found in the Indian area.

Key to Males.

1. Upperside bluish-white, the veins not prominently darkened	[p. 481. *avatar* (Moore),
Upperside bluish-green, the veins strongly darkened	2.
2. Upperside of fore wing usually without submarginal spots, but when present the spots very small and not larger anteriorly.	[p. 483. *ceylanica* (Feld.),
Upperside of fore wing with prominent submarginal spots which increase in size anteriorly.	[p. 485. *valeria* (Cram.),

Key to Females.

1. Fore wing upperside with the submarginal spots and outer ends of discal streaks in line.	[p. 481. *avatar* (Moore),
Fore wing upperside with the submarginal spot and discal streak in area 3 shifted inwards.	2.
2. Upperside markings bluish-green; hind wing submarginal spots small, the spot in area 7 larger	[p. 483. *ceylanica* (Feld.),
Upperside markings bluish-white or yellow; hind wing submarginal spots prominent.	[p. 485. *valeria* (Cram.),

Valeria avatar (Moore).

♂. The hind wing is entirely without androconia. *Upperside* almost white, with a bluish tinge. Hind wing with a narrow outer black border which in dry-season specimens is reduced to a line. Both wings with the veins lightly blackened.

Underside pale silvery blue, the veins distinctly blackened.

♀. *Upperside* markings white. Fore wing with a regular row of five submarginal spots.

Underside darker than in the ♂, with the veins more strongly darkened.

Distribution.—SIKKIM to BURMA, Siam, and Annam. Two subspecies, both found in the Indian area.

162 *a*. Valeria avatar avatar (Moore). (Fig. 166, ♀).

Eronia avatar, Moore, 1857 *a*, p. 61, pl. ii *a*, fig. 1 (♂, Sikkim); id., 1865 *b*, p. 760; Elwes, 1888, p. 419; Swinhoe, 1893, p. 311.

Nepheronia avatar, de Nicéville, 1882, p. 64.

Pareronia avatar, Bingham, 1907, p. 277; Swinhoe, 1909, p. 174, pl. 606, figs. 1, 1 *b* (♂), 1 *a*, 1 *c* (♀) (wet form), 1 *d* (♂), 1 *e* (♀) (dry form).

Pareronia avatar avatar, Fruhstorfer, 1910, p. 178, t. 66 *a* (♂♀, ♀ as *sumbawana*); Evans, 1932 *a*, p. 84, pl. ix, fig. B 20.1 (♂); Peile, 1937, p. 75.

Pareronia avatar avatar f. *tarina*, Fruhstorfer, 1910, p. 178, t. 66 *a* (♂) (dry form).

♂. *Upperside* very pale blue. Fore wing with the costal,

Fig. 166.—*V avatar avatar* (Moore), ♀.

apical, and outer marginal areas black, broad at the apex, the marginal black narrowing to the tornus, and strongly

dentate on the veins; veins lightly blackened. Hind wing with the veins more or less lined with black; a narrow black marginal border.

Underside pale silvery blue, the veins more or less brownish or black and conspicuous, the parts that are black on the upperside a much darker silvery blue. Antennæ, head, thorax, and abdomen dusky brownish-black; underside of palpi, thorax, and abdomen very pale blue.

♀. *Upperside* with blackish-brown ground-colour and white markings. Fore wing with three cell-stripes, the middle one broad, narrowing to a point near the base, and proximally dusted with the ground-colour; discal stripes in areas 1 *a* to 6, that in area 3 shorter than the others, and that in 6 reaching to the level of the submarginal spots; these latter spots somewhat rounded and placed near the edges of the discal stripes. Hind wing with the costa above the cell, the cell and inner margin below vein 1 *b* white; a thin dark cell-streak; vein 1 *a* lightly darkened; post-cellular white stripes in areas 1 *c* to 6; two long narrow ones in 1 *c*, short bars in 2 to 4, and two longer and narrower stripes in 5 and 6; submarginal spots in areas 5 and 6, and sometimes one in 4, more or less connected with the stripes next them.

Underside silvery white, the veins more prominently darkened than in the ♂.

Expanse: ♂♀, 60–90 mm.

Fig. 166 is from a specimen from Sikkim, 3000 feet, June, in the British Museum.

Dry-season form **tarina** (Fruhst.).—♂. Smaller than the wet form. *Upperside* with outer marginal black narrower.

♀. *Upperside* with the white stripes broader than in the wet form. Hind wing with submarginal spots more developed.

Habitat.—Sikkim to Northern Burma; rare.

162 *b*. **Valeria avatar paravatar** (Bingham).

Pareronia avatar var. *paravatar*, Bingham (de Nicéville, *in litt.*), 1907, p. 278 (hills of Middle and Southern Tenasserim).
Pareronia avatar paravatar, Fruhstorfer, 1910, p. 178, t. 66 *d* (♀); Evans, 1932 *a*, p. 84.

♂. *Upperside* of fore wing with broader apical and marginal black, which is more strongly produced on the veins. Hind wing with broader marginal black border than in the nominotypical form.

♀. *Upperside* with the submarginal spots and white stripes more strongly developed than in the nominotypical form.

Expanse: ♂♀, 60–70 mm.

Habitat.—Southern Burma, Siam, and Annam; rare.

Valeria ceylanica (Felder).

♂. *Upperside* with bluish-green markings, the veins prominently black; outer black border on both wings broad, rarely marked with submarginal spots.

♀. *Upperside* with bluish markings submarginal spots small, the spot in area 3 of fore wing shifted inwards.

Genitalia —Valve not sharply narrowed to the apex, which is more or less obtuse; ventral projection and harpe placed more distad than in *valeria*.

Early stages (from *Bell*, 1914) :—

Egg.—Resembles that of *V hippia* (Fabr.).

Larva.—Surface smooth, the usual tubercles hardly perceptible. Dark green, each tubercle a small brown spot, except the green subspiracular ones; a diagonal chequered brown band runs up and forwards from behind each spiracle on to the preceding segment; segments 5 and 12 with a large spiracular brown patch bearing two or three white spots. Length, 41 mm.; breadth, 6 mm.

Pupa.—Head process long, sharp at extremity, up-curved; a very prominent ventral wing-bulge; cremaster parallel-sided, rather flattened, hind margin concave. Dull light green, somewhat glaucous, with some small brown, black, and yellow markings and spots. Length, 30 mm.; breadth, 6 mm. at the shoulders.

Distribution.—CEYLON, PENINSULAR INDIA, ANDAMAN ISLANDS. Two subspecies.

163 *a*. **Valeria ceylanica ceylanica** (C. & R. Felder). (Pl. II, figs. 17, larva, 18, pupa).

Eronia ceylanica, C. & R. Felder, 1865, p. 191 (♂, Ceylon).

Nepheronia ceylanica, Moore, 1881 *a*, p. 138; Manders, 1904, p. 79.

Pareronia ceylanica, Bingham, 1907, p. 281; Swinhoe, 1909, p. 180, pl. 610, fig. 1 (♂ type), 1 *b* (♂), 1 *a*, 1 *c* (♀) (wet form), 1 *d*, 1 *f* (♂), 1 *e*, 1 *g* (♀) (dry form); Evans, 1910 *a*, p. 386 (Palni Hills).

Pareronia pingasa ceylanica, Fruhstorfer, 1910, p. 179, t. 66 *e* (imago); Yates, 1931, p. 1007.

Pareronia valeria ceylanica, Ormiston, 1924, p. 100.

Pareronia ceylanica ceylanica, Evans, 1932 *a*, p, 84; Peile, 1937, p. 75, pl. v, fig. 35 (♂).

Eronia pingasa, Moore, 1872, p. 656 (Kanara).

Nepheronia pingasa, Butler, 1881 *b*, p. 612 (Nilgiri Hills); Hampson, 1889, p. 363; Davidson & Aitken, 1890 *a*, p. 357; Davidson, Bell, & Aitken, 1897 *a*, p. 573, pl. vi, figs. 4, 4 *a* (larva, pupa) (early stages, Kanara).

Pareronia pingasa, Bingham, 1907, p. 280, pl. xviii, fig. 124 (♂); Swinhoe, 1909, p. 177, pl. 608, figs. 1, 1 *b*, (♂), 1 *a*, 1 *c* (♀) (wet form), 1 *d*, 1 *f* (♂), 1 *e*, 1 *g* (♀) (dry form), 1 *h* (larva), 1 *i* (pupa); Bell, 1914, p. 101, pl. 1, fig. 63 (♂) (early stages).

Pareronia pingasa pingasa, Fruhstorfer, 1910, p. 179, t. 66 *e* (imago).
Nepheronia compacta, Butler, 1874 *b*, p. 235 (Centr. India).
Nepheronia fraterna, Moore, 1881 *a*, p. 139, pl. liv, figs. 3 (♂), 3 *a* (♀); Hampson, 1889, p. 363; Davidson, Bell, & Aitken, 1897 *a*, p. 573 (Kanara).
Pareronia fraterna, Swinhoe, 1909, p. 181, pl. 611, figs. 1, 1 *b*. (♂), 1 *a*, 1 *c* (♀) (wet form), 1 *d*, 1 *f* (♂), 1 *e*, 1 *g* (♀) (dry form).
Pareronia pingasa ceylanica f. *fraterna*, Fruhstorfer, 1910, p. 179, t. 66 *d* (imago) (dry form).
Nepheronia spiculifera, Moore, 1881 *a*, p. 139 (Ceylon).
Pareronia pingasa ceylanica f. *spiculifera*, Fruhstorfer, 1910, p. 179 (intermed. form).
Pareronia ceylanica f. *spiculifera*, Ormiston, 1924, p. 101.

Resembles *V hippia* (Fabr.) in colour and disposition of the markings, but differs as follows:—♂. *Upperside* ground-colour of a deeper blue. Fore wing with outer black border much broader generally, without submarginal spots, or only one or two present. Hind wing with outer black border very broad, narrowing slightly to the tornus.

Underside as in *hippia*.

♀. Closely resembles the ♀ of *V hippia*, but on the *upperside* the outer black margins beyond the discal markings on both wings are proportionately much broader, the submarginal spots placed further from the margin.

Underside with marginal black borders broader and darker, the submarginal spots on apex of fore wing and on hind wing absent or very indistinct and blurred. Antennæ, head, thorax, and abdomen in both sexes much as in *V hippia*.

Expanse: ♂♀, 65–80 mm.

Dry-season form **fraterna** (Moore).—♂. *Upperside* with narrower black borders and less heavy vein-streaks.

Underside with the outer borders scarcely less darkened than the rest of the wing, and black markings on fore wing much smaller.

♀. *Upperside* markings broader and more bluish. *Underside* of fore wing with apical area bluish; hind wing bluish, the outer border darker, and submarginal spots prominent.

The name **pingasa** (Moore) may be used to denote a large form of the extreme wet-season type in which the black ground-colour is greatly extended.

Habits (from *Bell*, 1914).—The eggs are deposited usually in evergreen jungle at above 100 feet. They are laid singly, and often very close to the ground. Pupa attached to the underside of a leaf or thin twig. The food-plant is *Capparis heyneana* Wall.

The butterfly is a strong flier, but keeps to the shade of the underwood. The female may be found more often at rest than the male; it does not usually frequent flowers, and is never found at water. The female is never found flying

in the same way as the male, and is generally seen fluttering around in the underwood, looking like a *Danaus aglea* (Cram.).

Habitat.—CEYLON and PENINSULAR INDIA ; not rare.

163 *b*. **Valeria ceylanica naraka** (Moore).

Eronia naraka, Moore, 1877 *a*, p. 591 (S. Andamans).
Pareronia naraka, Swinhoe, 1909, p. 179, pl. 609, figs. 1, 1 *b* (♂), 1 *a*, 1 *c* (♀) (wet form), 1 *d*, 1 *f* (♂), 1 *e*, 1 *g* (♀) (dry form).
Pareronia pingasa naraka, Fruhstorfer, 1910, p. 179.
Pareronia ceylanica naraka, Evans, 1932 *a*, p. 84.

♂. *Upperside* similar to the nominotypical form. Fore wing with one (wet form) or two (dry form) white subapical spots.

♀. *Upperside* markings whiter than in the nominotypical form.

Underside of hind wing with larger and lighter markings. In the dry form the wing is brownish-white, excepting the darker border, and the veins are only lightly brown.

Habitat.—ANDAMAN ISLANDS ; common.

Valeria valeria (Cramer, 1776).

I am indebted to Dr. A. S. Corbet for some enlightenment on this species, which he is investigating. *V valeria* can be divided into two groups, which may be termed the *Hippia* and *Valeria* groups. These groups are especially distinguished by the form of the genital armature. The valve is furnished with a small ventral process which is apparently the harpe. In the *Hippia* group this process is well rounded and broad ventrally, and projects beyond the edge of the valve. The ædeagus is strongly curved posteriorly. In the *Valeria* group the harpe is long and narrow, does not project ventrally, and is directed dorsad, lying entirely within the valve. The ædeagus is straight or only slightly curved, and is anteriorly broader than in the *hippia* forms. Only the *Hippia* group is known to occur in the Indian area.

♂. *Upperside* bluish-white, paler than in *ceylanica* (Feld.). *Underside* also whiter ; all the veins strongly defined by black. Fore wing with submarginal spots which are also well marked on the underside of both wings.

♀. Dimorphic in the Indian subspecies, and trimorphic in some other areas. The principal form resembles *ceylanica* (Feld.), but is whiter, with more prominent submarginal spots. The second and rarer form has the hind wing upperside with yellow discal area.

Early stages (from *Bell*, 1914) :—

Egg.—A pointed oval, the apex crowned with a circle of 7 or 8 small, pointed teeth ; 17 longitudinal, minutely beaded

ribs. White at first, and later with four bands of faded rose. Laid in batches of six and over on the upperside of a leaf. (Colonel Coleridge, who has bred *hippia*, says that the eggs are laid in batches of four and more, *teste* Peile, in MS.).

Larva and *pupa*.—Closely resembling *P. ceylanica* (Feld.), the larva less marked. The food-plant is *Capparis heyneana* Wall.

The butterfly does not frequent heavy jungle, and likes the sun.

The habits of the ♀ are thus described by Fruhstorfer (1910) :—"The females by their sluggish flight resemble the Danaids to such an extent that in Tenasserim I was constantly taking them for *Danais grammica*, often as they had already deceived me. In Sumatra and Java the yellow females mimic the likewise yellow *Danais aspasia* and *philomela*, but yellow females also occur in South India, where there is no yellow Danaid model."

Distribution.—INDIA to BURMA and Hainan, south to Flores and the South Philippines. A number of subspecies, of which only one occurs in the Indian area.

164. **Valeria valeria hippia** (Fabricius). (Pl. II, fig. 19, larva).

Papilio hippia, Fabricius, 1787, p. 55 ; Donovan, 1800, pl. xxv, fig. 1 (♀).

Nepheronia hippia, Swinhoe, 1885 *a*, p. 139 (Bombay) ; Davidson, Bell, & Aitken, 1897 *a*, p. 573 (Kanara) ; Mackinnon & de Nicéville, 1898, p. 591 (Mussooree) ; de Rhé-Philipe, 1902, p. 492.

Eronia hippia, Elwes, 1888, p. 419 ; Manders, 1890, p. 535 ; Baker, 1891, p. 1, pl. i (genitalia).

Pareronia hippia, Bingham, 1907, p. 278 ; Swinhoe, 1909, p. 175, pl. 607, figs. 1, 1 *b* (♂), 1 *a*, 1 *c* (♀) (wet form), 1 *f* (♀ form), 1 *h* (larva), 1 *i* (pupa) ; Hannyngton, 1910, p. 364 (Kumaon) ; Evans, 1910 *a*, p. 386 (Palni Hills) ; Peile, 1911, p. 874 (Fatehgarh) ; Bell, 1914, p. 99, pl. i, figs. 63 (♂), 63 *a* (♀) (early stages) ; Yates, 1931, p. 1007 (Coorg).

Pareronia valeria hippia, Fruhstorfer, 1910, p. 178 ; Evans, 1932 *a*, p. 84, pl. ix, fig. B 20.3 (♀) ; Peile, 1937, p. 75, pl. xxi, fig. 208 (♂).

Papilio philomela, Fabricius, 1793, p. 57 ; Donovan, 1800, pl. xxv, fig. 3 (♀).

Pareronia valeria hippia ♀ f. *philomela*, Fruhstorfer, 1910, p. 178 ; Evans, 1932 *a*, p. 84.

Eronia gea, C. & R. Felder, 1865, p. 190 (♂♀, Bengal).

Nepheronia gea, Rothney, 1882, p. 35 (Barrackpore) ; de Nicéville, 1885 *b*, p. 51 ; Swinhoe, 1885 *a*, p. 139 (♀, Poona, Bombay) ; id., 1886, p. 431 (Mhow) ; Elwes & de Nicéville, 1887 *a*, p. 431 (Tavoy) ; Aitken, 1887, p. 41 (Bombay) ; Hampson, 1889, p. 363 ; Watson, 1891, p. 29 (Pauk and Tilin).

Pareronia gea, Swinhoe, 1909, p. 175, pl. 607, figs. 1 *d* (♂), 1 *e* (♀) (dry form), 1 *g* (♀, extreme dry form).

Pareronia valeria hippia f. *gea*, Fruhstorfer, 1910, p. 178, t. 66 *c* (♂), *b* (♀) (dry form).

Nepheronia lutescens, Elwes & de Nicéville (*non* Butl.), 1887, p. 431 (Tavoy) (=*philomela* Fabr.).

♂. *Upperside* ground-colour a clear pale blue of a much deeper tint than in *V avatar* (Moore); all the veins defined with black. Fore wing with costa broadly, apex and outer margin very broadly, black, the marginal black narrowed towards the tornus, and bearing a series of submarginal bluish-white spots that are variable in number; the spot in area 3 shifted inwards; sometimes the posterior two spots are all but joined on to the discal stripes. Hind wing with costal and inner margins broadly whitish; outer margin broadly black, especially at apex, the black area covered, except at the tornus, with androconia.

Underside paler blue, the outer margins obscurely fuscous; a submarginal series of very indistinct whitish lunulate spots. Fore wing with the veins more or less broadly bordered with black, which widens towards the margin; apex broadly, outer margin decreasingly to the tornus, suffused with a somewhat obscure pearly-white lustre. Hind wing with veins 6, 7, and 8 broadly, the rest of the veins very narrowly, edged with black; a very fine black line in area 1 *c*. Cilia of both wings very narrow and white. Antennæ black; head, thorax, and abdomen fuscous, the thorax clothed with long bluish hairs; underside of palpi, thorax, and abdomen pale silvery bluish-white.

♀. *Upperside* black with bluish-white markings. Fore wing with two streaks in the cell, the anterior one from the extreme base, the posterior one from the end of the basal third, but extending beyond the anterior streak; a series of post-cellular stripes, very irregular in length; the stripe in area 1 *c* the longest, angulate anteriorly and divided longitudinally from near its base, the stripe in area 3 short and broad, forming an elongate spot, those in the anterior areas more or less obliquely placed; a submarginal series of spots, of which the spot in area 3 is shifted inwards, and those opposite the apex curved backwards. Hind wing with costa and inner margin broadly white; cell with two narrow streaks, joined at the base; post-cellular stripes and submarginal spots much as on the fore wing, but more regular.

Underside similar to the upperside, but the ground-colour dull, dusky, and diffuse, the margins broader but less clearly defined; apical area of fore wing dusted with whitish. Antennæ, head, thorax, and abdomen much as in the male but darker.

♀ form **philomela** (Fabr.).—Markings on both sides much as in the principal form. Hind wing *upperside* at base of area 1 *a*, over the whole of areas 1 *b* and 1 *c*, area of the cell, and at base of area 2 suffused with bright yellow.

Underside with the above areas dull ochraceous. The

extent of this yellow area is variable, in some specimens more restricted, in others it spreads further towards the costa.

Dry-season form **gea** (Feld.).—♂. *Upperside* with more extended white area, the veins less darkened.

♀. *Upperside* markings white and more extended, the hind wing cell almost entirely white.

Underside with apex of fore wing and entire hind wing pale reddish-brown, the latter with veins finely lined, and with deep brown submarginal and marginal spots.

Expanse: ♂♀, 65–80 mm.

Habitat.—INDIA to BURMA and Siam; common, less so in Sikkim.

Subfamily COLIADINÆ Aurivillius.

Coliadinæ, Aurivillius, 1910, p. 63; Talbot, 1935, p. 408.
Rhodocerini, Klots, 1931, pp. 152, 157 (=tribe of Pierinæ).

Wing-coloration usually yellow or orange. Fore wing with vein 6 always emitted from 7; 7 and 8 coincident. Hind wing with the precostal vein greatly reduced or absent. Body robust. Palpus with third segment very short; underside of palpus smoothly scaled or rarely clothed with bristles and hairs; antennal club gradual, a raised line present.

Genitalia (from *Klots*, 1931).—Tegumen short, usually considerably shorter than the uncus; juxta usually bar-like, and expanded at the tip; harpe minute or absent.

The food-plants of the larvæ, as far as is known, belong mostly to the family Leguminosæ, besides which *Gonepteryx* feeds upon *Rhamnus* (Rhamneæ), and some *Colias* upon *Vaccinium* (Ericaceæ). No species of the Pierinæ appear to feed upon any of these plants.

Key to Genera.

1. Hind wing with precostal vein short and directed basad ... ... 2.
   Hind wing with precostal vein absent or obsolete. 4.
2. Fore wing with margin between veins 6 and 7+8 falcate or pointed . .... [p. 501. DERCAS Doubl.,
   Fore wing with apical margin rounded . . 3.
3. Hind wing with precostal vein thick and rather short. ♂ with oval sex-patch at base of vein 7 on upperside .. . ... [p. 489. CATOPSILIA Hübn.,
   Hind wing with precostal vein thin; no sex-patch ... . [p. 511. GANDACA Moore,
4. Fore wing with vein 10 from the cell. ... . 5.
   Fore wing with vein 10 from the stem of 7+8 and 9 . . .. [p. 540. COLIAS Fabr.,
5. Hind wing produced to a sharp tooth at vein 4. Palpi with short hair .... [Leach, p. 505. GONEPTERYX
   Hind wing rounded. Palpi not hairy EUREMA Hübn., [p. 513.

Genus **CATOPSILIA** Hübner. (Fig. 167).

Catopsilia, Hübner, 1819, p. 98; Scudder, 1872, p. 58 (type, *crocale* Cramer); Moore, 1881 *a*, p. 121; Bingham, 1902, p. 363 (migration); Manders, 1904 *b*, pp. 701–6 (migration); Moore, 1907, p. 80; Bingham, 1907, p. 218, figs. A–C (venation and sex-marks); Röber, 1907, p. 59; Verity, 1909, p. 275; Fruhstorfer, 1910, p. 161; Williams, 1919, pp. 147–53 (migration); Klots, 1929, pp. 203–14, pl. xx (genitalia); id., 1931, p. 177; Evans, 1932 *a*, pp. 64, 75; Hemming, 1934 *a*, p. 142 (type, *crocale* Cramer, 1775); Peile, 1937, p. 58.

Murtia, Hübner, 1819, p. 98; 1934 *a*, p. 142 (type, *minna* Herbst).

Type of the genus, *C. crocale* (Cramer).

♂♀. Fore wing elongate; costa regularly and widely arched; apex moderately acute; outer margin short, slightly concave; tornus obtuse; inner margin long, about four-fifths the length of costa; cell less than half the length of

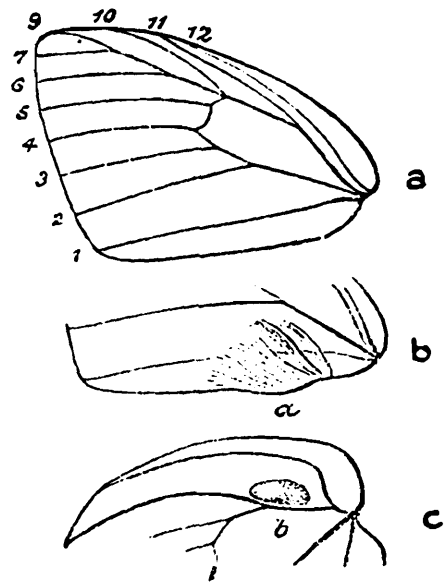


Fig. 167.—*Catopsilia*. *a*, venation of fore wing; *b*, ♂ fore wing underside, inner area with tuft; *c*, ♂ hind wing upperside, costal area with sex-mark.

wing; vein 11 from the cell well basad; vein 10 from near end of cell; 7+8 and 9 on a long stalk; 6 from the stem of 7+8 and 9, at about a third from end of cell to apex; 5 from the cell, with *mdc* oblique and at least half as long as *ldc*. Hind wing very broad; costa strongly arched; apex not well marked; outer margin very slightly arched; tornus angular, well marked; inner margin almost straight from base, slightly concave near apex; cell short and broad; *mdc* and *ldc* slightly oblique, the latter attenuate in its upper half; precostal vein short, curved slightly basad; vein 8 strongly angular near base. Antennæ short and stout, not half length of fore wing; club long and gradual, truncate at apex. Palpus with third segment short and oval

Male with secondary sexual characters. Fore wing underside, near base of inner margin, with a long hair-pencil directed forwards; hind wing upperside, in area 7 near the base, with an oval patch of androconia.

Genitalia.—Penis long and curved, bearing chitinized teeth, and with a long basal prong; saccus thick, shorter than the tegumen and uncus combined; tegumen short, usually with a mid-dorsal lobe; uncus slender, free part long; valve with a rounded dorsal process, and an angulate, somewhat rounded distal process (from *Klots*, 1931). The genus agrees with *Colias* in the long basal prong of the penis, the short saccus, and the dorsal lobe of the tegumen.

Habits.—The species are very common and sometimes congregate in swarms. Migratory flights often take place, and 75 per cent. of the individuals are males, but the females often lay eggs during migration. Both sexes are easily caught at flowers, where they settle to rest with the wings closed; they are also partial to wet places. The larvæ are sometimes in such numbers as to constitute a pest.

Distribution.—The whole Indo-Australian Region and Africa; allied groups are found in South America. Five species are found in the Indian area.

Key to Species.

1. Underside: at all seasons not marked with any transverse reddish-brown strigæ . . . . . 2.
   Underside: at all seasons marked with transverse reddish-brown strigæ . . . . 4.
2. Hind wing upperside pale yellow or white . . . 3. [p. 495. *scylla* (Linn.),
   Hind wing upperside entirely orange . . . . . .
3. Antennæ black. Fore wing upperside below apex with a continuous marginal black line; underside without discal ocelli. ♀ with costa black from base to apex . . . . [p. 490. *crocale* (Cram.),
   Antennæ red. Fore wing upperside below apex with a macular marginal black border. Underside of both wings with a small reddish-brown discocellular ocellus. ♀ with costa only black near the apex . . . . . [p. 493. *pomona* (Fabr.),
4. Fore wing upperside below apex with marginal dark border continuous and often broad . . [p. 497. *pyranthe* (Linn.),
   Fore wing upperside below apex with a macular marginal dark border, always narrow, sometimes brown [p. 499. *florella* (Fabr.),

Catopsilia crocale (Cramer).

The question whether this species and *pomona* (Fabr.) are or are not conspecific remains still a puzzle to lepidopterists. In the Indian area there is no difficulty in separating them, but in the Malayan islands, and in Australia and New Guinea, the characters, so constant in India, become intermixed, and much difficulty is experienced in separating the two

forms. It is true that no difference can be found between the male genitalia of *crocale* and *pomona*, but this is not a proof of their conspecificity. They are not seasonal forms of one species, for both occur throughout the year in the same area. Corbet (1937 *a*, p. 50) in Malaya observed that specimens found *in copula* were always *crocale*×*crocale* and *pomona*×*pomona*. Large collections of larvæ from a single *Cassia* bush produced all *crocale*. Corbet remarks: "I feel certain that *pomona* and *crocale* are not conspecific in Malaya, whatever may be the position in more easterly parts of their range."

C. crocale can be distinguished by the characters given in the key. In other respects the species is very variable. In the Indian area two forms of each sex can be distinguished.

A good account of the two species in Sumatra is given by Dr. Martin in de Nicéville & Martin, 1896, pp. 357–555.

Early stages and habits (from *Bell*, 1913) :—

Egg.—White at first, turning yellow later.

Larva.—Bright green, with a dark dorsal line and a spiracular broad white line suffused with yellow on segments 2 to 5; tubercles green, frequently dark metallic blue, increasing in size towards the spiracular region, where they often form a broad supra-spiracular band; in individuals with blue tubercles the head tubercles are also blue. Length, 41 mm.; breadth, 5 mm.

Pupa.—Of the normal smooth type, with slight ventral wing-bulge and tail suspension. Snout conical, continued smoothly and evenly into the outlines of the head. Cremaster a truncated triangle as broad at the base as it is long, much hollowed out ventrally, with low, dorsal, parallel extensor ridges. Colour green; tip of snout, edge of cremaster, and supra-spiracular line along abdomen, yellow. Length, 28 mm.; breadth, 7 mm. at segment 7; snout, 2 mm.

Habits.—The eggs are laid singly on the upperside of a leaf or on a bud or shoot. The larva lies along and over the midrib. It is able to jump, and can clear a space of several inches. It can exude a green, rather strong-smelling liquid from the mouth when attacked; this may be the reason why it is less liable to parasitic attack than many others of the family. The species has been bred on most species of *Cassia*, upon *Bauhinia racemosa* Lam. and *Butea frondosa* Roxb.; the favourite, however, is *Cassia siamea* Lam.

The butterfly is a fast flier, rises high in the air, and can cover long distances; the flight is straight, in powerful, long, up-and-down curves.

Distribution.—The whole Indo-Australian Region from South China to the Solomon Islands. Only the nomino-typical race occurs in the Indian area.

165. **Catopsilia crocale crocale** (Cramer).

Papilio crocale, Cramer, 1775, p. 87, pl. lv, figs. C, D (♀).
Callidryas crocale, Butler, 1869–74, p. 22, pl. ix, figs. 1, 2, 3, 6 (♂♀); Moore, 1877 *a*, p. 591 (Andamans and Nicobars); Butler, 1879 *a*, p. 2 (Cachar).
Catopsilia crocale, Wood-Mason & de Nicéville, 1881 *b*, pp. 237, 251 (Andamans); Moore, 1881 *a*, p. 122, pl. xlviii, figs. 1, 1 *a*, 1 *b* (♂♀, larva, pupa); id., 1882, p. 253 (N.W. Himalayas); id., 1886, p. 49 (Mergui); Wood-Mason & de Nicéville, 1887, p. 371 (Cachar); Swinhoe, 1886, p. 432 (Mhow); Doherty, 1886 *a*, p. 135; Elwes & de Nicéville, 1887, p. 431 (Tavoy); Elwes, 1888, p. 411; Hampson, 1889, p. 361; Davidson & Aitken, 1890, p. 360 (early stages); Martin, 1896, p. 490 (bionomic notes); Davidson, Bell, & Aitken, 1897 *a*, p. 570; Mackinnon & de Nicéville, 1898, p. 586; de Nicéville & Kühn, 1898, p. 271, pl. i, figs. 5, 5 *a*, 5 *b* (larva and pupa); Moore, 1907, p. 84, pl. 576, figs. 1 *b*, 1 *c*, 1 *d* (larva and pupa); Bingham, 1907, p. 219 (part.); Röber, 1907, p. 60, t. 24 *a* (imago); Fruhstorfer, 1910, p. 162, t. 69 *c*, *d* (♂♀); Hannyngton, 1910, p. 363 (Kumaon); Evans, 1910 *a*, p. 385 (Palni Hills); Peile, 1911, p. 874 (Fatehgarh); Bell, 1913, p. 517, pl. 1, figs. 72, 73 (♂), 72 *a*, 73 *a* (♀) (early stages); Dixey, 1924, p. 9 (? conspecific with *pomona*); id., 1924, p. 65 (bionomics); id., 1924, p. 84 (pupa); Ormiston, 1924, p. 83; Klots, 1929, pl. xxii, figs. 14 *b*, *c* (genitalia); id., 1932, pl. vii, fig. 30 (genitalia); Yates, 1931, p. 1007 (Coorg); Evans, 1932 *a*, p. 75, pl. ix, fig. B 11.1 (♀); id., 1932 *b*, p. 199 (Baluchistan); Peile, 1937, p. 58, pl. viii, figs. 66, 67 (♂♀).
Papilio alcmeone, Cramer, 1777, p. 71, pl. cxli, fig. E (♂, Coromandel).
Catopsilia crocale crocale f. *alcmene* (sic), Fruhstorfer, 1910, p. 162, t. 69 *c* (♂).
Catopsilia crocale, Moore, 1907, pl. 576, fig. 1 (♂).
Papilio jugurtha, Cramer, 1777, p. 138, pl. clxxxvii, figs. E, F (♀, Coromandel).
Catopsilia crocale crocale ♀ f. *jugurtha*, Fruhstorfer, 1910, p. 162, t. 69 *c* (♀).
Catopsilia crocale, Moore, 1907, pl. 576, fig. 1 *a* (♀).
Colias jugurthina, Godart, 1819, pp. 86, 96 (Bengal and Coromandel).
Catopsilia crocale crocale ♀ f. *jugurthina*, Fruhstorfer, 1910, p. 163, t. 68 *e* (2) (♀).
Catopsilia heera, Swinhoe, 1885 *a*, p. 140 (♂♀, Poona).
Catopsilia crocale crocale ♂ f. *flavescens*, Fruhstorfer, 1910, p. 162, t. 69 *c* (♂).

♂. *Upperside* ground-colour chalky-white, with either proximal yellow areas or entirely suffused with yellow. Fore wing with costa narrowly black to the base; outer margin with narrow black border, wider at the apex and narrowing posteriorly to about vein 2 or sometimes to the tornus. Hind wing unmarked, rarely with marginal black vein-dots.

Underside without markings, yellow or yellowish-white. Fore wing often white in the posterior distal area.

♀. *Upperside* creamy-white to yellow. Fore wing with a black discocellular spot, usually forming a bar to the costa; costal margin black from base to apex; an outer marginal

black border, wide at the apex, reaching the tornus, its inner edge more or less dentate; an anterior post-discal black band, reaching vein 3, and sometimes continued as two spots in 2 and 1 *b*; this band is sometimes rather broad at the costa, cutting off two subapical spots of ground-colour. Hind wing with outer marginal black border, more or less dentate on its inner edge; a blackish submarginal line, more or less heavily marked, and usually formed of more or less distinct lunules, cutting off submarginal spots of the ground-colour.

Underside similar to the ♂, varying to ochraceous-buff. Antennæ black.

♂ form **alcmeone** (Cram.).—*Upperside* with proximal third of fore wing and proximal half of hind wing yellow, the distal areas white. The commonest form.

♂ form **flavescens** Fruhst.—*Upperside* entirely yellow.

♀ form **crocale** (Cram.).—*Upperside* pale to deep yellow, the black markings heavy.

♀ form **jugurtha** (Cram.).—*Upperside* white; both wings with yellow proximal areas, more extended on hind wing. Hind wing with or without a submarginal black line.

♀ form **jugurthina** (Godt.).—Resembles *jugurtha*, but is without yellow colouring.

Expanse: ♂♀, 55–75 mm.

Habitat.—CEYLON, INDIA, BURMA, ANDAMAN ISLANDS, to South China, the Philippines, Borneo, Sumatra, and Java. Common, but is rare on the Andaman Islands.

166. **Catopsilia pomona** (Fabricius).

Papilio pomona, Fabricius, 1775, p. 479 (New Holland); Donovan, 1805, pl. xvii, fig. 3 (imago).

Catopsilia pomona, Röber, 1907, p. 60; Fruhstorfer, 1910, p. 163, t. 69 *b* (♀); Ormiston, 1924, p. 83; Yates, 1931, p. 1007 (Coorg); Evans, 1932 *a*, p. 75; id., 1932 *b*, p. 199 (Baluchistan); Drosihn, 1933, p. 30, text-fig. 5, t. 3–5 (genitalia) (conspecific with *crocale*); Dixey, 1933, p. 20 (evidence that *pomona* may be conspecific with *crocale*); Peile, 1937, p. 58, pl. viii, fig. 68 (♀), fig. 69 (♀ f. *catilla* Cram.).

Papilio catilla, Cramer, 1779, p. 63, pl. ccxix, figs. D, E (♀, Coromandel).

Callidryas catilla, Butler, 1869 *a*, p. 222 (Ceylon); id., 1869–74, p. 24, pl. ix, figs. 7–10 (♂♀); id., 1870 *b*, p. 727 (Gujerat).

Catopsilia catilla, Moore, 1877 *a*, p. 591 (Andamans); id., 1878 *a*, p. 837 (Burma); Butler, 1879 *a*, p. 2 (Cachar); id., 1879 *b*, p. 551; Moore, 1881 *a*, p. 122, pl. xlvii, figs. 3, 3 *a* (♂♀); Wood-Mason & de Nicéville, 1881 *b*, p. 251 (Andamans); Swinhoe, 1885 *a*, p. 140; id., 1886, p. 432 (Mhow); Moore, 1886, p. 49 (Mergui); Elwes & de Nicéville, 1887, p. 431 (Tavoy); Elwes, 1888, p. 411; Davidson & Aitken, 1890, p. 361; Manders, 1890, p. 533; Martin, 1896, p. 490; de Nicéville, 1900, p. 251.

Catopsilla pomona ♀ f. *catilla*, Fruhstorfer, 1910, p. 163, t. 69 *b* (♀); Evans, 1932 *a*, p. 75; Peile, 1937, p. 59, pl. viii, fig. 69 (♀).
Papilio hilaria, Stoll, 1781, p. 95, pl. cccxxxix, figs. A, B (♂, Coromandel).
Callidryas hilaria, Moore, 1865 *a*, p. 493; id., 1865 *b*, p. 760.
Catopsilia hilaria, Moore, 1907, p. 84, pl. 576, figs. 1 *e*, *f* (♂, dry form).
Catopsilia pomona ♂ f. *hilaria*, Fruhstorfer, 1910, p. 163, t. 69 *c* (♂).
Catopsilia pomona ♀ f. *nivescens*, Fruhstorfer, 1910, p. 163, t. 69 *b* (♀).
Catopsilia pomona ♀ f. *siscia*, Fruhstorfer, 1910, p. 163.
Catopsilia pomona ♀ f. *bidotata*, Fruhstorfer, 1910, p. 163.

♂. Closely resembles *crocale* (Cram.). *Upperside* of fore wing with costal margin only black at the apex, and outer marginal narrow border macular. Ground-colour of both wings white, the proximal areas yellow.

Underside greenish-white; both wings with a discocellular silvery spot ringed with reddish-brown. Fore wing sometimes with a post-discal irregular reddish-brown line, more or less distinct, that runs from the costa obliquely outwards to vein 7, and then obliquely inwards to vein 2. Hind wing at the base of area 5 with a second spot like the one on the discocellular; sometimes a post-discal series of small reddish-brown spots, more or less distinct, most specimens with marginal reddish-brown vein-dots. Antennæ red.

♀. *Upperside* sulphur-yellow to white. Fore wing with costa only black for about the apical third or less; outer marginal black border narrower than is usual in *crocale*, and more dentate on its inner edge, sometimes macular; an anterior post-discal series of blackish-brown spots, sometimes reaching area 1 *b*; a prominent rounded discocellular blackish-brown spot. Hind wing with small blackish or reddish-brown marginal vein-spots.

Underside ground-colour variable, reddish-brown, ochraceous, deep yellow to greenish-yellow or white; markings as in the ♂ but more prominent. Fore wing, in the darker forms, with reddish-brown apical and marginal border. Hind wing often with reddish-purple blotches.

♂ form **hilaria** (Stoll).—*Upperside* with yellow proximal and white distal areas. The usual form in India, where the entirely yellow form appears to be absent.

♀ form **catilla** (Cram.).—*Underside* of both wings with a reddish-purple discal patch, which is particularly large on the hind wing; ground-colour yellow to ochraceous.

♀ form **bidotata** Fruhst.—Hind wing *underside* with two large subcostal reddish-purple patches.

♀ form **siscia** Fruhst.—Markings as in *catilla*, but the ground-colour white; a rare form.

♀ form **nivescens** Fruhst.—Ground-colour white on both sides ; rare.

Expanse : ♂♀, 55–80 mm.

Early stages (from *Bell*, in de Nicéville, 1900, p. 251) :—

Larva.—" The head is round, green, clypeus edged with brown, covered with small shiny black tubercles which do not hide the colour of the head ; the anal flap is rounded, but looks square at the extremity, and is covered with rows of small black tubercles of which only the row along the spiracular line is conspicuous. The spiracles are oval, shiny, and white. The colour is green, with a spiracular white band touched with bright yellow on segments 2 to 5, and these segments, especially 3 and 4, are distinctly flanged on the spiracular line as in the larva of *Hebomoia australis* Butler, though not to so great an extent. Length, 51 mm."

Pupa.—" The pupa is the same as that of *C. crocale* at first sight, but the dorsal line of the thorax is absolutely parallel to the longitudinal axis of the pupa for two-thirds of its length, consequently the hind part just before the margin is perpendicular to this part, *i. e.*, is raised suddenly but very slightly above the front margin of segment 4, and the front end of this parallel dorsal line is at an angle, and a sharpish angle, with the front slope of the thorax the cremaster is distinctly bifid at the extremity, and has some shiny, very stout, black suspensory hooks dorsally as well as at the extremity. There is a dorsal rugose black tip to the snout terminating the head, which snout is cylindrical in its apical half ; there is no black line round the eye as in *C. crocale*, and there is a dark green-blue dorsal line which is yellow on the thorax as well as the supra-spiracular yellow line. Length, 34 mm. ; length of snout, 3 mm. ; breadth at segment 7, 9 mm. ; height at apex of curve of wings (segment 6), 10 mm. ; height at the apex of the thorax, 8 mm."

The above account was first published by de Nicéville, and is taken from Bingham, 1907.

According to Bell, the food-plant is *Cassia fistula* L.

Habitat.—CEYLON, INDIA, BURMA, ANDAMAN ISLANDS, and NICOBAR ISLANDS ; South China to the Solomon Islands and Australia ; common.

Catopsilia scylla (Linnæus).

This species is easily recognized by the hind wing upperside being entirely yellow.

It is a Malayan species which has spread northwards into Burma. It is less common than the other species of the genus, being rather local.

Larva.—" Dark velvety green, with a yellowish-white lateral streak and some very minute black spots anterior to the streak, the whole surface delicately ringed or indented like a leech " (*Martin*, 1896).

Pupa.—" Has a pointed head like that of *C. crocale*, but is shorter and more convex than the slender pupa of that species " (*Martin*, 1896).

Also figured by Moore, 1857 *a*, pl. 1, figs. 9, 9 *a* (larva and pupa).

Distribution.—SOUTHERN BURMA to the Moluccas, North Australia, Celebes, and Luzon. About ten subspecies have been named, of which one is found in Southern Burma.

167 **Catopsilia scylla scylla** (Linnæus).

Papilio scylla, Linnæus, 1763, p. 20.
Catopsilia scylla, Distant, 1885, p. 298, pl. xxiv, figs. 1 (♂), 2 (♀) (Malay Peninsula); de Nicéville & Martin, 1896, p. 493 (Sumatra); Bingham, 1907, p. 224; Moore, 1907, p. 95, pl. 578, figs. 2 (♂), 2 *a*, *b* (♀); Evans, 1932 *a*, p. 75, pl. ix, fig. B 11.3 (♂).
Catopsilia scylla scylla, Fruhstorfer, 1910, p. 163, t. 68 *a* (figs. 3, 4, imago); Corbet & Pendlebury, 1934, p. 105, pl. iv, fig. 36 (♂, Malay Peninsula).
Papilio cornelia, Fabricius, 1787, p. 21 (♂, Tranquebar).

♂. *Upperside* of fore wing white; costa edged with black; outer margin with a narrow black border, wider at the apex, its inner edge dentate, from apex to tornus, and of nearly even width throughout. Hind wing rich cadmium-yellow, slightly paler towards the base, usually with small marginal black spots towards the veins.

Underside rich cadmium- or chrome-yellow. Fore wing with the posterior area below the cell and vein 2 pure white, the yellow, however, extends down to the tornal angle in a curve. Both wings with a discocellular spot, pinkish and ringed with darker brownish-pink; similar spots on the hind wing usually in the base of the cell and in areas 7 and 5, and below the origin of vein 2; usually a post-discal series of lunular diffuse markings of similar brownish-pink scales. Antennæ and upperside of head reddish-brown; thorax clothed with fuscous-grey hairs, abdomen yellow; underside of palpi, thorax, and abdomen yellow.

♀. Resembles the ♂. *Upperside* of fore wing dull creamy-white, marginal black broader; a post-discal series of ill-defined diffuse black spots curved strongly inwards anteriorly; often a small discocellular diffuse black ring. Hind wing as in the ♂, the yellow of a duller shade that turns to pale pinkish-white towards basal area above the cell; a post-discal series, sometimes obsolescent, of dull brownish-black lunular markings; marginal spots much larger and duller in colour than in the ♂.

Underside as in the ♂, but all black markings of upperside replaced by rich pinkish-red tints.

Expanse : ♂♀, 60–65 mm.

Habitat.—SOUTHERN BURMA ; common. Also found in the Malay Peninsula, Siam, Indo-China, Sumatra, and Java.

Catopsilia pyranthe (Linnæus).

♂. *Upperside* chalky-white or greenish. Fore wing with apical and marginal narrow black border ; a black discocellular spot which may be absent. Hind wing either unmarked or with a marginal series of black vein-dots or spots which may form a continuous line.

Underside of hind wing and anterior part of fore wing pale ochraceous mottled with brown strigæ.

♀. As in the ♂, but black margins a little broader. Fore wing with a black discocellular spot and black costal border ; usually a short anterior, post-discal, macular black band,

Underside usually with prominent discocellular ring-spots.

Early stages (from *Bell*, 1913) :—

Egg.—Spindle-shaped, narrowly truncate at the top ; 12 longitudinal ridges which, however, do not form teeth at the top, although they all reach the edge. White at first, turning yellow.

Larva.—Very similar to that of *crocale* except that there are tubercles on the venter. Dark gras -green, the head lighter, and venter of a green which is between the two.

Pupa.—The counterpart of that of *crocale*. Head produced into a short, perfectly straight snout, short and pyramidal in shape. Dark green, lighter on venter ; a yellow dorsal line on thorax ; a similarly yellow supra-spiracular line from end to end. Length, 22·5 mm. ; breadth, nearly 6 mm. at segment 7.

Distribution.—South China to Australia and the Pacific. Four subspecies, of which the nominotypical one is found in the Indian area.

168. **Catopsilia pyranthe pyranthe** (Linnæus). (Fig. 168 *b* ; Pl. II, figs. 15 (larva), 16 (pupa)).

Papilio pyranthe, Linnæus, 1758, p. 469 ; Donovan, 1798, pl. xxxii, fig. 1 (♂).

Callidryas pyranthe, Moore, 1857 *a*, p. 56, pl. 1, figs. 8, 8 *a* (larva and pupa) ; id., 1865 *a*, p. 493 ; id., 1865 *b*, p. 759 (Himalayas) ; Butler, 1869–74, p. 36, pl. xv, figs. 8–10 (♂♀) ; id., 1870 *b*, p. 727 (Gujerat).

Catopsilia pyranthe, Moore, 1881 *a*, p. 124, pl. xlvii, figs. 2, 2 *a* (♂♀) (Ceylon) ; id., 1882, p. 253 (N.W. Himalayas) ; Swinhoe, 1884 *b*, p. 511 (Karachi) ; id., 1885 *a*, p. 139 ; id., 1886, p. 432 (Mhow) ; Doherty, 1886 *a*, p. 135 ; Wood-Mason & de Nicéville,

1887, p. 371 (Cachar); Aitken, 1887, p. 41; Swinhoe, 1887, p. 279 (Karachi); Hampson, 1889, p. 361; Elwes, 1888, p. 411; Davidson & Aitken, 1890, p. 360; Mackinnon & de Nicéville, 1898, p. 586 (Mussooree, Dehra Dun); Dixey, 1902, p. 193 (dimorphism); Manders, 1904 *b*, p. 701, pl. xxxiv (breeding in Ceylon); Bingham, 1907, p. 221, fig. 56 *b*; Moore, 1907, p. 90, pl. 577, figs. 1, 1 *a* (♂♀); Kershaw, 1907, p. 100, pl. vii, fig. 9 (♀), pl. xi, fig. 5 (♂), pl. xiii, fig. 9 (♂), pl. 3 *a*, figs. 21, 22 (egg, larva, pupa) (Hong Kong); Evans, 1910 *a*, p. 385 (Palni Hills); Hannyngton, 1910, p. 363 (Kumaon, up to 6,000 feet); Peile, 1911, p. 874 (Fatehgarh); Bell, 1913, p. 520, pl. J, figs. 64 (♂), 64 *a* (♀), text-figs. of larva and pupa; Ghosh, 1914, pp. 29–32 (life-history); Ormiston, 1924, p. 84 (Ceylon); Klots, 1929, pl. xxii, fig. 13 (genitalia); Drosihn, 1933, p. 24, text-fig. 2, t. 1 (genitalia).

Catopsilia pyranthe pyranthe, Fruhstorfer, 1910, p. 162.

Papilio minna, Herbst, 1792, p. 74, pl. lxxxix, figs. 1, 2 (♀).

Catopsilia pyranthe minna, Evans, 1932 *a*, p. 75; id., 1932 *b*, p. 199 (Baluchistan); Peile, 1937, p. 59, pl. viii, fig. 70 (♂♀, as *pyranthe*).

Papilio alcyone, Cramer, 1775, p. 89, pl. lviii, figs. A, B, C (♀).

Catopsilia alcyone, Moore, 1907, p. 94, pl. 578, figs. 1 (♂), 1 *a*, *b* (♀) (wet form).

♂. *Upperside* chalky white, slightly tinted in some specimens with green. Fore wing with a discocellular black spot; costa edged with black; an outer marginal black border, wide at the apex and narrowing slightly to the tornus, its inner edge slightly produced on the veins. Hind wing with marginal black vein-dots or with a continuous narrow border.

Underside greenish, with reddish-brown strigæ and small discocellular spots.

♀. Resembles the ♂, all black markings broader, and discocellular spot on fore wing larger. Fore wing with an

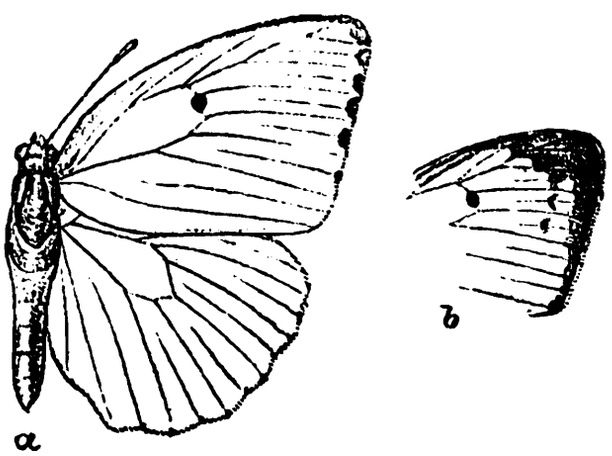


Fig. 168.—*a*, *C. florella gnoma* (Fabr.), ♂: *b*, *C. pyranthe pyranthe* (Linn.), ♀ fore wing.

anterior, short, black, post-discal band, sometimes much widened and partly or completely coalescing with the marginal border. Hind wing with a marginal narrow black band; usually some anterior post-discal spots.

Underside as in the ♂, the discocellular spots better defined, with an outer red ring that encircles a silvery spot; hind wing with one or two similar spots on each side of the discocellulars. Both wings with a post-discal series of reddish-brown spots. Both sexes with antennæ reddish, head and thorax anteriorly brown, thorax clothed posteriorly with long white hairs, abdomen white; underside of palpi, thorax, and abdomen white.

Expanse: ♂♀, 50–70 mm.

The name **minna** Herbst applies to a form, typically ♀, in which the *upperside* of fore wing bears a heavy post-discal line, and the *underside* of the hind wing is more greenish, and is without discocellular or other spots. Apparently an extreme wet-season form.

Habits (from *Bell*,1913).—The food-plant is usually *Cassia tora* Linn.; the larva feeds also upon other leguminous plants, and in the Deccan the chief one is *Cassia auriculata* Linn. The butterfly is not quite such a powerful flier as *crocale*, and keeps nearer to the ground as a rule.

Habitat.—CEYLON, INDIA, BURMA, and ANDAMAN ISLANDS, extending to Hainan, Formosa, and South China, south and east to Borneo, Java, Celebes, and the Philippines. Rare in the Andaman Islands, but common elsewhere in the Indian area.

Catopsilia florella (Fabricius, 1775).

C. florella (Fabr.) and *C. pyranthe* (Linn.) are very closely allied, and in India they often present forms which are very similar and difficult to separate. If there are two species, *C. florella* must be considered as an African one which has extended its range eastward. The nominotypical race is very common over the African continent, and is easily distinguished from the Indian race; an intermediate subspecies is found in Arabia. Seasonal dimorphism is not very marked.

It appears very possible that this is only the dry-season form of *pyranthe*. The dated specimens in the British Museum were taken from December to April, whilst those of *pyranthe* were taken from June to October. Although I have followed Bingham in keeping these separate, I am rather disposed to think they are seasonal forms.

♂. *Upperside* white. Fore wing with or without a black discocellular spot; outer marginal reddish-brown or blackish spots which are free or connected only at the margin.

Hind wing *underside* as in *pyranthe* (Linn.), but with larger discocellular spots having prominent silvery centres.

♀. *Upperside* yellow to white. Fore wing with prominent discocellular spot.

Underside as in the ♂, the markings reddish-brown and more prominent.

Distribution.—Africa to Arabia, Persia, INDIA, CEYLON, ANDAMAN ISLANDS (rare), BURMA to Indo-China, Hainan, and South China. Three subspecies, one in India.

169. **Catopsilia florella gnoma** (Fabricius). (Fig. 168 *a*, ♂).

Papilio gnoma, Fabricius, 1776, p. 828.
Callidryas gnoma, Butler, 1869–74, p. 43, pl. xvi, figs. 1–4 (♂♀).
Catopsilia gnoma, Moore, 1881 *a*, p. 123, pl. xlviii, figs. 2, 2 *a* (♀, larva, pupa); id., 1882, p. 253 (N.W. Himalayas); id., 1886, p. 49 (Mergui); id., 1907, p. 90, pl. 577, figs. 1 *e*, *f*, *g* (♂♀) (extreme dry form).
Catopsilia pyranthe f. *gnoma*, Fruhstorfer, 1910, p. 162, t. 69 *e* (♂♀).
Catopsilia florella gnoma, Evans, 1932 *a*, p. 75, pl. ix, fig. B 11.5 (♀); Peile, 1937, p. 60, pl. viii, figs. 71, 72 (♂♀).
Papilio philippina, Stoll, 1781, p. 139, pl. ccclxi, figs. C, D (♀, Coromandel).
Catopsilia philippina, Moore, 1907, pp. 91, 92, pl. 577, figs. 1 *e*, *f*, *g* (♂♀) (extreme dry form).
Papilio ilea, Fabricius, 1798, p. 426.
Catopsilia ilea, Moore, 1881 *a*, p. 124, pl. xlvii, figs. 1, 1 *a*, *b* (♂♀) (Ceylon); Swinhoe, 1885 *a*, p. 139 (Poona); id., 1887, p. 279 (Karachi); Moore, 1907, p. 91 (dry form).
Callidryas thisorella, Boisduval, 1836, p. 609 (Bengal).
Catopsilia thisorella, Moore, 1907, p. 91, pl. 577, figs. 1 *c*, *d* (♂♀) (dry form).
Catopsilia chryseis, Butler (*non* Drury), 1879 *b*, pp. 551, 557; Moore, 1877 *a*, p. 591 (Andamans); id., 1881 *a*, p. 124, pl. xlvii, figs. 2, 2 *a* (♂♀, Ceylon); Wood-Mason & de Nicéville, 1881 *b*, p. 252 (Andamans); Moore, 1886, p. 49 (Mergui); id., 1907, p. 97.
Catopsilia pyranthe f. *chryseis*, Fruhstorfer, 1910, p. 162, t. 69 *e* (♂) (wet form).
Catopsilia florella, Bingham (*non* Fabr.), 1907, p. 223; de Rhé-Philipe, 1908, p. 885 (Konkan); Fruhstorfer, 1910, p. 162, t. 69 *d* (imago); Hannyngton, 1910, p. 363 (Kumaon, up to 6,000 feet); Evans, 1910 *a*, p. 385 (Palni Hills); Peile, 1911, p. 874 (Fatehgarh); Bell, 1913, p. 522 (early stages); Ormiston, 1924, p. 84 (Ceylon).

♂. *Upperside* white, with reddish-brown markings. Fore wing with slight apical costal edging and marginal vein-spots reaching veins 3 or 2; a prominent black discocellular spot; these markings variable in size and sometimes quite absent. Hind wing usually with a marginal yellowish-pink line.

Underside as in *pyranthe* (Linn.), but with more prominent and silvery discocellular spots.

♀. *Upperside* greenish-yellow; reddish-brown markings as in the ♂, but more distinct and always present; discocellular spot larger. Hind wing sometimes with small reddish-brown marginal spots.

Underside as in the ♂, the strigæ and other markings more prominent and reddish-brown. Hind wing with three discal silvery spots, including a large one in the end of the cell.

The name **thisorella** (Boisduval) applies to an extreme dry-season form with the marginal markings on the fore wing *upperside* vestigial or absent, and the discocellular spots on both sides minute. The *underside* strongly yellowish-brown.

Expanse : ♂♀, 50–70 mm.

Habitat.—CEYLON, INDIA, BURMA ; common. ANDAMAN ISLANDS ; rare.

Genus **DERCAS** Doubleday.

Dercas, Doubleday, 1847, p. 70 (*verhuelli* Hoev.) ; Butler, 1870 *a*, p. 45, pl. ii, fig. 1 (venation) ; de Nicéville, 1898 *c*, p. 478 (revision) ; Bingham, 1907, p. 225 ; Röber, 1907, p. 62 ; Fruhstorfer, 1910, p. 160 ; Klots, 1931, p. 180 ; Evans, 1932 *a*, pp. 64, 76 ; Hemming, 1934 *a*, p. 140 (type, *Colias verhuelli* Hoev., 1839).

Type of the genus, *D. verhuelli* (Hoeven).

♂♀. Fore wing with costa strongly arched, apex shortly produced into an acute point, much more so in the ♀ than in the ♂ ; outer margin below apex concave, dentate at apices of veins 4, 5, and 6 ; tornus forms a blunt right angle ; outer margin short, about half length of costa ; inner margin long, slightly sinuate ; cell short and broad, not half length of costa ; veins 10 and 11 from the cell, 10 from the end of the cell ; 7+8 and 9 stalked half-way from cell to apex ; 6 from the stem of 7+8 and 9, nearer the fork of these veins than to the cell ; *mdc* about half as long as *ldc*, both incurved. Hind wing very broad, veins well apart ; costa arched ; outer margin angulate and shortly tailed at apex of vein 4, sloped obliquely outwards to that vein, thence obliquely inwards to tornus and again at an angle to middle of inner margin ; cell very short and broad ; precostal vein very short ; *udc* about equal to *mdc*, less than half as long as *ldc*, the latter incurved and oblique. Antennæ very short, less than one-third length of costa of fore wing ; club elongate, very gradual, roundly truncate at apex ; palpi short, third segment very short and oval ; eyes large and prominent.

A small genus, comprising only four species, with seven subspecies. The species inhabit mountainous districts up to about 4,000 feet.

Distribution.—China and the HIMALAYAS to BURMA, Sumatra, and Borneo. Two species are found in the Indian area.

Key to Species.

a. Hind wing with a conspicuous tooth or short tail at apex of vein 4 .. .. .. [p. 502. *verhuelli* (Hoev.),

b. Hind wing slightly angulate at apex of vein 4, but never produced into a tooth or short tail. [p. 503. *lycorias* (Doubl.),

Dercas verhuelli (Hoeven).

♂. *Upperside* yellow. Fore wing with a large, dark, apical patch which extends below vein 5; an outer dark narrow border ending in a point at or before vein 2, its inner edge crenulate.

♀. Resembles the ♂, but is paler, with less distinct markings. Fore wing marginal border not reaching below vein 3.

Distribution.—South China to Tong-king, Annam, and Siam, SIKKIM to BURMA and the Malay Peninsula. Two subspecies in the Indian area.

170 *a*. **Dercas verhuelli doubledayi** Moore. (Fig. 169, ♂).

Dercas doubledayi, Moore, 1905 *b*, p. 31.
Dercas verhuelli doubledayi, Fruhstorfer, 1910, p. 160, t. 67 *d* (as *menandrus*); Evans, 1932 *a*, p. 76, pl. ix, fig. B 13.1 (♂).
Dercas verhuelli, Moore (*non* Hoev.), 1865 *b*, p. 760 (Bengal); Wallace, 1867, p. 398 (Silhet); Bingham, 1907, p. 226, fig. 57 (♂).
Dercas verhuelli pallidus, Fruhstorfer, 1910, p. 161, t. 67 *d* (♀) (Assam).

♂. *Upperside* rich gamboge-yellow. Fore wing with discocellulars bordered on each side broadly with orange; a large

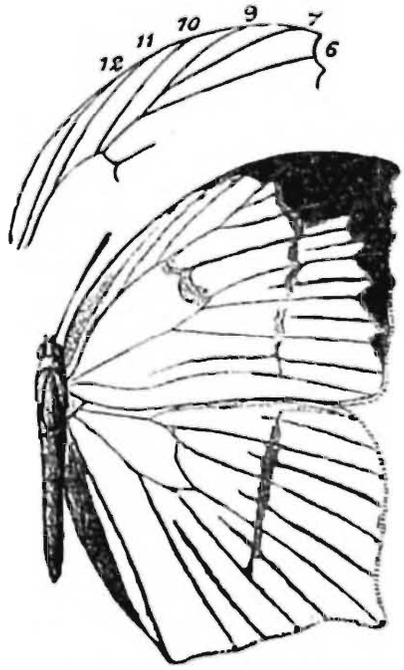


Fig. 169.—*D. verhuelli doubledayi* Moore, ♂.

apical patch of dark sienna-brown which is narrowed posteriorly and continued to a point at vein 1 *a*; inner edge of this dark area angulate in area 5, and narrowly edged along its whole length with orange; a narrow post-discal orange

band, inclined slightly inwards, from the angle in area 5 to vein 1 *a*. Hind wing slightly paler along the costal and inner margins ; marginal sienna-brown vein-dots ; indications of an orange band in continuation of the one on the fore wing, but very faint.

Underside paler and duller yellow. Fore wing markings much as on the upperside, but the edging to the discocellulars, the post discal band, the square apical patch and outer border are blood-red, and on the margin this colour has a washed-out appearance ; three red costal spots, and a more or less triangular streak of silvery scales that crosses the apical patch obliquely. Hind wing with the veins at base of cell, a looped line around the discocellulars, a faint transverse bar near apex of area 7, and the post-discal band reddish, this last extending from vein 1 *a* to vein 7 and sharply angulate or bent at vein 2. Antennæ brown, head and palpi above pink, thorax and abdomen pale yellow.

♀. Resembles the ♂, but the ground-colour is a pale sulphur-yellow. Fore wing *upperside* with the discal and post-discal markings only indicated by transparency from the *underside* ; marginal border not extended below vein 3, but a spot of the same colour in the area below.

Expanse : ♂♀, 60–70 mm.

The name **pallidus** Fruhst. refers to females with pure white coloration.

Habitat.—Sikkim to Northern Burma ; not rare.

170 *b*. **Dercas verhuelli parva** Evans.

Dercas verhuelli parva, Evans, 1924, p. 972 (Burma) ; id., 1932 *a*, p. 76.

♂♀. A much smaller race. Fore wing not produced at the apex ; outer margin only slightly crenulate. ♀ white.

Expanse : ♂♀, 50–60 mm.

Habitat.—Dawna Range to Southern Burma ; rare.

Dercas lycorias (Doubleday).

♂♀. *Upperside* of fore wing usually with a prominent dark spot in area 3 ; other markings as in *verhuelli*, but the apical patch much smaller. Hind wing not produced at vein 4. A form occurs with the discal spot absent on the fore wing.

Distribution.—China to Tibet, Sikkim, Assam, Tong-king, and Annam. The nominotypical race is found in the Indian area.

171. **Dercas lycorias lycorias** (Doubleday).

Rhodocera lycorias, Doubleday, 1842, p. 77 (♂, *non* ♀) (Mt. Kasiyae).
Dercas lycorias, Bingham, 1907, p. 227; Evans, 1915, p. 543 (Tibet: Lower Tsang Po); id., 1932 *a*, p. 76, pl. ix, fig. B 13.2 (♂).
Dercas lycorias lycorias, Fruhstorfer, 1910, p. 161, t. 67 *e* (Sikkim and Assam).
Gonepteryx wallichi, Doubleday, 1848, p. xlvii.
Rhodocera wallichi, Butler, 1866, p. 452.
Dercas wallichi, Elwes, 1882, p. 402 (Sikkim); id., 1888, p. 415.
Gonepteryx urania, Butler, 1865, p. 458, pl. xxvi, fig. 5 (♀, N. India).
Dercas decipiens, de Nicéville, 1898 *c*, p. 483 (♂, Assam).
Dercas lycorias f. *decipiens*, Bingham, 1907, p. 228; Fruhstorfer, 1910, p. 161, t. 67 *e* (♂); Evans, 1932 *a*, p. 76.
Dercas brindaba, Swinhoe, 1899, p. 107 (Assam).

♂. *Upperside* of fore wing sulphur-yellow, darker and a richer yellow on the outer half, especially towards the apex; a small square apical patch, trisinuate on its inner edge, the middle sinus deep, the other much slighter, dark sienna-brown; a similarly coloured large round spot in area 3 and much smaller marginal spots or dots on veins 1 to 3 and 10 to 12. Hind wing pale yellow, paler along the costal and inner margins; veins 1 to 7 with minute dark sienna-brown marginal dots.

Underside paler duller yellow, sprinkled with ferruginous dots; discocellulars on both wings marked with a geminate ferruginous spot bipupilled with silver. Fore wing with a short, oblique, silvery, costal streak just before apex, from which a ferruginous narrow band inclined obliquely inwards crosses the disc, passing through a comparatively large, similarly coloured round spot in area 3. Hind wing with a post-discal band as on fore wing, reaching neither the costa nor tornus; marginal dots as on upperside. Antennæ dark reddish-brown, palpi in front and head pinkish, thorax dark bluish-grey, abdomen pale yellow; underside of thorax and abdomen pale yellow.

♀. Similar to the ♂, but the ground-colour much paler; the ferruginous spot in area 3 of fore wing larger, especially on the underside.

Expanse: ♂♀, 50–60 mm.

Form **decipiens** de Nicév.—The spot in area 3 of the fore wing is absent on both sides. This form appears to be confined to the ♂.

Habitat.—Sikkim to Assam, South-East Tibet, Tong-king, and Annam. Generally rare.

Genus **GONEPTERYX** Leach. (Fig. 170).

Gonepteryx, Leach, 1815, pp. 128, 716 (*rhamni* Linn.); Butler, 1870 *a*, p. 45 (type, *rhamni* Linn.); Röber, 1907, p. 60; Bingham, 1907, p. 228, fig. 58 (venation); Verity, 1909, p. 277; Fruhstorfer, 1910, p. 161; Klots, 1929, p. 135; id., 1931, p. 179; Evans, 1932 *a*, pp. 64, 76; Hemming, 1934 *a*, p. 140 (type, *Papilio rhamni* Linn., 1758).

Rhodocera, Boisduval & Leconte, 1830, p. 70; Blanchard, 1840, p. 481 (type, *rhamni* Linn.); Hemming, 1934 *a*, p. 140 (type, *Papilio rhamni* Linn.).

Type of the genus, *G. rhamni* (Linn.).

♂♀. Fore wing with costa strongly bowed before the apex, slightly incurved or straight in the middle, and rounded at the base; apex acute and falcate; outer margin incurved below apex, posteriorly excurved; tornus broadly rounded; inner margin bisinuate; cell more than half length of wing; veins 10 and 11 from the cell, wide apart; 7+8 and 9 on a

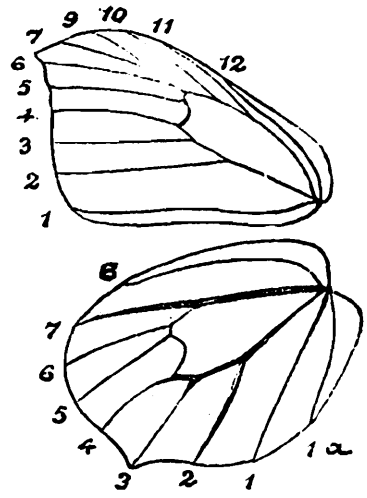


Fig. 170.—*Gonepteryx*, venation.

long stalk; 6 from the stem of 7+8 and 9, well beyond apex of cell; 5 from near upper angle of cell; *mdc* very short, not a quarter the length of *ldc*, which is strongly incurved. Hind wing broadly oval; outer margin at vein 3 produced to a prominent tooth, and at veins 2 and 4 very slightly dentate; precostal vein much reduced or absent; veins 8 and 7 swollen, prominent; median vein and veins 1 to 4 towards base and *ldc* less conspicuously swollen and prominent; cell more than half length of wing; *udc* longer than *mdc*, the latter very short; *ldc* longer than *udc*, incurved. In cell of fore wing three, in that of hind wing two, of the lost longitudinal veins conspicuously indicated. Antennæ short, about one-third length of fore wing; club compressed, gradual but well marked; palpi densely clothed with scales and short hairs, third segment short and oval; eyes prominent; head tufted above in a peak; tarsus without a pulvillus. Wings without sex-patches.

Distribution.—The whole Palæarctic Region, the HIMALAYAS, and BURMA. An allied genus in South America. Five species, including three in the Indian area.

Key to Species.

1. Hind wing with outer margin not dentate between veins 1 *b* and 4, excepting the projection at vein 4 .. .. . 2.
   Hind wing with outer margin dentate between veins 1 *b* and 4 .. . . [p. 509. *mahaguru* (Gist.),
2. ♂. Upperside uniform sulphur-yellow. ♀ creamy-white; fore wing with orange discocellular spot. .. .. [p. 506. *rhamni* (Linn.),
   ♂. Upperside of fore wing with proximal area yellow, distal area white; hind wing white. ♀ chalky-white; fore wing discocellular spot very small or absent [p. 508. *farinosa* (Zell.),

Gonepteryx rhamni (Linnæus).

♂. *Upperside* sulphur-yellow; an orange discocellular spot on both wings.

Underside pale yellowish-green.

♀. *Upperside* creamy-white. Hind wing with discocellular spot prominent, not dark-edged.

Underside greenish-white.

Early stages (from *Verity*, 1909):—

Egg.—Cylindrical-conical, with four longitudinal ribs. At first yellow, becoming darker, with the apex black.

Larva.—The young larva is uniform dark green. When full-fed it is thin, elongate, cylindrical, slightly flattened dorso-ventrally; anal plate spread over the two end segments. Colour dull green, darker dorsally, the upper surface minutely tuberculate, the tubercles black, and each bearing a fine short hair; a greenish-white lateral stripe, its upper edge merging with the ground-colour; spiracles ringed with dark green; head lighter than the rest of the body. Length, 45–50 mm.

Pupa.—Bright apple-green; a longitudinal whitish stripe on the sides of the abdomen; sparsely dotted with black and marked with fine strigæ; region of head, base of wings, and anal extremity tinged with reddish.

Habits.—The eggs are deposited one at a time on the underside of the leaves, and hatch in about 15 days. When not feeding the larva rests on a bed of silk in the middle of the upperside of a leaf. The pupal stage ordinarily lasts from 10 to 15 days, but it is supposed that many pupæ lie dormant during the cold season. The larvæ feed upon various species of *Rhammus*, and rarely upon *Vaccinium*.

The butterfly is usually everywhere common and frequents

all types of country where the food-plant may grow. In Europe it hibernates during the winter.

Distribution.—The whole Palæarctic Region, except the Canary Islands, extending to Japan and the Liukiu (or Riu Kiu) Islands, south to BURMA, the HIMALAYAS, and BALUCHISTAN. Four out of the eight known subspecies occur in the Indian area.

172 *a*. **Gonepteryx rhamni rhamni** (Linnæus).

Papilio rhamni, Linnæus, 1758, p. 470.
Goniapteryx rhamni, Humphrey & Westwood, 1841, p. 13, pl. i, figs. 7–10 (♂♀).
Gonepteryx rhamni, Lang, 1884, p. 65, pl. xiv, figs. 4 (♂♀), pl. xvi, fig. 4 (larva, pupa); Buckler, 1886, p. 145, pl. 1, fig. 2 (larva, pupa); Bingham, 1907, p. 229 (part.); Röber, 1907, p. 60, t. 24 *b*, *c* (♂♀); Verity, 1909, pp. 281, 359, pl. xlvii, figs. 35–8 (♂♀); Klots, 1929, p. 142, pl. xx, fig. 2 (genitalia), fig. 5 (venation).
Gonepteryx rhamni rhamni, Fruhstorfer, 1910, p. 161; Evans, 1932 *a*, p. 76; id., 1932 *b*, p. 199 (Baluchistan); Peile, 1937, p. 60.

♂. *Upperside* pale, clear cadmium-yellow. Both wings with marginal reddish-brown vein-dots, and cilia of fore wing reddish-brown from vein 4 to apex; a deep orange discocellular spot on both wings, the spot on the hind wing the larger.

Underside pale yellowish-green, fore wing with posterior discal and basal areas usually sulphur-yellow; discocellular spots on both wings dull ferruginous. Antennæ, palpi, and head above reddish-brown; thorax with dull yellowish-grey hairs; abdomen above black, yellow on the sides; underside of palpi, thorax, and abdomen yellowish-white.

♀. *Upperside* pale creamy-white; reddish-brown markings and discocellular spots as in the ♂.

Underside greenish-white, the posterior two-thirds of fore wing white; discocellular spots duller than on upperside. Abdomen black above, white at the sides.

Expanse: ♀♂, 60–70 mm.

The butterfly is very variable within narrow limits, and the literature is burdened with many names given to these insignificant European forms. There is a tendency to gynandromorphism, and many such examples have been recorded; these are usually the result of breeding, but faked examples are not unknown in collections. The larva is much subject to the attack of hymenopterous parasites.

Habitat.—BALUCHISTAN and NORTH WAZIRISTAN; not rare. Extending over the whole of Europe to Central Asia and West Siberia. According to Evans (1932 *b*) it is not uncommon in North Baluchistan.

172 *b*. **Gonepteryx rhamni nepalensis** Doubleday.

Gonepteryx nepalensis, Doubleday, 1847, p. 71 ; Moore, 1857 *a*, p. 59 ; Lang & Moore, 1864, p. 103 ; Moore, 1865 *a*, p. 493 ; id., 1882, p. 253.

Gonepteryx rhamni nepalensis, Röber, 1907, p. 61, t. 24 *c* ; Verity, 1909, p. 284, pl. xlviii, figs. 9, 10 (♂♀) ; Fruhstorfer, 1910, p. 161 ; Evans, 1932 *a*, p. 76, pl. ix, fig. B 14.1 (♂) ; Peile, 1937, p. 61.

Rhodocera rhamni var., Gray, 1846, p. 9, pl. v, fig. 1 (♂) (Nepal) ; Mackinnon & de Nicéville, 1898, p. 589 (Mussooree).

Gonepteryx rhamni, Hannyngton (*non* Linn.), 1910, p. 364 (Kumaon, 3,000–9,000 feet).

♂. Usually smaller than the nominotypical race, and richer yellow. Fore wing with apex more falcate ; marginal dots more distinct, forming a continuous line ; discocellular spots on both wings larger and brighter.

♀. Less greenish than the nominotypical ♀, but otherwise very similar.

Habitat.—CHITRAL to NORTHERN BURMA ; common. According to Peile (1937) the butterfly is abundant at Mussooree and at Murree, from end of April to June, and in August and October, frequenting especially open patches of grass in thistle-covered ground between woods ; taken also at damp spots.

172 *c*. **Gonepteryx rhamni gilgitica** Tytler.

Gonepteryx rhamni gilgitica, Tytler, 1926, p. 252 (♂♀, Gilgit ; Astor ; Chilas) ; Bollow, 1930, p. 106 ; Evans, 1932 *a*, p. 76 ; Peile, 1937, p. 61.

♂. Apparently not different from *nepalensis* Doubl.

♀. *Upperside* of fore wing with extreme base of costa and apex of fore wing tinged with ochre-yellow. Hind wing with inner area and outer margin to vein 4 also tinged with the same colour.

Habitat.—GILGIT, ASTOR, and CHILAS ; common.

172 *d*. **Gonepteryx rhamni burmensis** Tytler.

Gonepteryx rhamni burmensis, Tytler, 1926, p. 252 (♂♀, South Shan States) ; Evans, 1932 *a*, p. 76 ; Peile, 1937, p. 61.

♂. *Upperside* of fore wing darker yellow than on the hind wing.

♀. *Upperside* entirely yellow.

Habitat.—SOUTHERN SHAN STATES ; not rare.

Gonepteryx farinosa (Zeller, 1837).

♂. Fore wing with apex less produced than in *rhamni* (Linn.), the yellow ground-colour stronger than on the hind wing ;

surface of wing with a mealy appearance, due to vertically placed filiform scales interspersed among the normal ones. Both wings with yellow or pale orange discocellular dots, often absent on the fore wing.

Underside dull yellow. Fore wing with outer part of discal area whitish, basal area sulphur-yellow.

♀. *Upperside* chalky white. Fore wing without the mealy appearance of the ♂.

Underside very pale yellow.

Distribution.—Greece and Turkey to North-West Persia, Turkestan, and CHITRAL. Two subspecies, one confined to Chitral.

173. **Gonepteryx farinosa chitralensis** (Moore).

Colias chitralensis, Moore, 1905 *b*, p. 27.
Gonepteryx rhamni chitralensis, Bingham, 1907, pp. 229, 230; Verity, 1909–11, pp. 284, 359, pl. lxxii, fig. 13 (♂ type), 14 (♀).
Gonepteryx zaneka chitralensis, Fruhstorfer, 1910, p. 161.
Gonepteryx farinosa chitralensis, Evans, 1932 *a*, p. 77; Peile, 1937, p. 61.

♂. *Upperside* of fore wing with proximal half yellow merging into the white distal area. Hind wing white, yellow at the base.

Underside of hind wing pale salmon-buff, with a granular appearance.

♀. Chalky-white. *Upperside* of fore wing without a discocellular spot, this on hind wing brown and obscure. Hind wing with the tooth at vein 3 twice as long as the tooth on vein 2.

Underside pale yellow without greenish tinge; small post-discal brown spots prominent towards the apex of fore wing and on the hind wing.

Expanse: ♂♀, 55–60 mm.

Habitat.—CHITRAL; rare.

Gonepteryx mahaguru (Gistel).

The butterfly described by Gistel under this name is identical with *zaneka* Moore, which, therefore, sinks as a synonym, whilst *mahaguru* becomes the specific name for all the races previously cited under *aspasia* Ménétries.

♂♀. Fore wing with vein 6 nearer the fork of 7+8 and 9 than to apex of cell; veins 11 and 12 close together; *mdc* almost straight. Hind wing with outer margin prominently toothed at vein 1 *b*, between veins 1 *b* and 2, at vein 2, and with a long tooth at veins 3 and 4.

The characters given above apply only to the Indian races of this species. In general the ♂ has the upperside of fore wing yellow and the hind wing greenish-white ; ♀ yellowish-white.

Distribution.—The Amur, Ussuri, Korea to Japan, Formosa, China, Tibet, North Yunnan, UPPER BURMA, and NORTH-WEST INDIA. Seven subspecies, including two in the Indian area.

174 *a*. **Gonepteryx mahaguru mahaguru** (Gistel).

Rhodovera (sic) *mahaguru*, Gistel, 1857, p. 605 (p. 93 in separate) (Himalaya).
Gonepteryx mahaguru, Hemming, 1935, p. 121 (=*zaneka* Moore).
Gonepteryx zaneka, Moore, 1865 *a*, p. 493, pl. xxxi, fig. 18 (♂, Simla) ; Doherty, 1886 *a*, p. 136 ; Butler, 1888 *a*, p. 199 ; Mackinnon & de Nicéville, 1898, p. 589 (Mussooree) ; Bingham, 1907, p. 230, pl. xviii, fig. 123 (♂).
Gonepteryx aspasia zaneka, Verity, 1909–11, pp. 280, 359, pl. lxxii, figs. 8, 9 (♂♀) ; Hannyngton, 1910, p. 364 (Kumaun, 6,000–10,000 feet) ; Evans, 1932 *a*, p. 77 ; Peile, 1937, p. 61, pl. vi, fig. 45 (♂).
Gonepteryx zaneka zaneka, Fruhstorfer, 1910, p. 161, t. 73 *a* (imago).

♂. *Upperside* of fore wing sulphur-yellow ; marginal reddish-brown vein-dots as in *rhamni* (Linn.), but restricted to the anterior veins ; cilia pale yellow, alternated anteriorly with reddish-brown. Hind wing cream-coloured ; outer margin posteriorly with reddish-brown vein-dots. Both wings with ferruginous discocellular spots, much smaller than in *rhamni*.

Underside darker cream-colour, with a slightly greenish tint. Fore wing with posterior two-thirds paler, almost white ; anterior third from base through middle of cell to margin below apex, and whole surface of hind wing with a delicately roughened appearance.

♀. *Upperside* cream-coloured, with a slightly yellowish tint.

Underside greenish-white, otherwise as the ♂. In both sexes on underside there are some minute black dots ; a post-discal series of them anteriorly on fore wing and across the hind wing indicate the folds. Antennæ, palpi, head, thorax, and abdomen as in *rhamni*, but the long hairs on the thorax above silky greenish-white ; underside of thorax and abdomen paler than in *rhamni*.

Expanse : ♂♀, 50–55 mm.

Habitat.—KASHMIR to KUMAON ; not rare. According to Peile (1937) the butterfly is common at Murree, Mussooree and Naini Tal from March to middle of June and in October.

174 *b*. **Gonepteryx mahaguru zanekoides** de Nicéville.

Gonepteryx zanekoides, de Nicéville, 1897 *a*, p. 564, pl. l. figs. 2 (♂), 7 (♀) (Upper Burma : South Chin Hills, 7,000 feet).
Gonepteryx zaneka zanekoides, Bingham, 1907, p. 231 ; Fruhstorfer, 1910, p. 161.
Gonepteryx aspasia zanekoides, Verity, 1909, p. 280 ; Evans, 1932 *a*, p. 77 ; Peile, 1937, p. 61.

♂. Fore wing broader than in the nominotypical race, the costal margin not constricted at half its length but straight, the apex not so produced. Hind wing distinctly broader than in the nominotypical race, almost the same shade of yellow as the fore wing ; distal area slightly paler than the proximal area.

♀. Fore wing agrees with the ♂ in shape. Coloration pale yellowish-white.

Habitat.—Upper Burma ; Southern Chin Hills ; rare.

Genus **GANDACA** Moore.

Gandaca, Moore, 1906 *b*, p. 33 (type, *harina* Horsf.) ; Fruhstorfer, 1910, p. 172 ; Klots, 1931, p. 185 ; Evans, 1932 *a*, p. 76.

Type of the genus, *G. harina* (Horsfield), from Java.

♂♀. Wings broad, somewhat rounded, the ♂ without sex-patches. Fore wing cell not quite half the length of wing ; veins 10 and 11 from the cell ; 7+8 and 9 stalked ; 7+8 as long as the distance from end of cell to the fork of 7+8 and 9 ; 6 from the stem of 7+8 and 9 at about a quarter the distance from end of cell to apex of wing ; *mdc* at least half as long as *ldc*. Hind wing with precostal vein rather thin and directed basad ; vein 7 from well before the end of the cell ; *udc* and *mdc* about equal in length, slightly shorter than *ldc*. Antenna short, club gradual ; palpus short, third segment short and oval.

This genus is a monotypical one, and bears a close though superficial resemblance to *Eurema*. The development of the precostal vein, the position of vein 7 of the hind wing, and the distinctive genitalia combine to render this genus sufficiently distinct from *Eurema*. The species frequents woods and likes the shade, whilst *Eurema* is usually found in more open country and likes the sun.

Distribution.—The single species ranges from Hainan, North-East India, and Burma to New Guinea. It is never abundant.

Gandaca harina (Horsfield, 1829).

♂. Both wings pale yellow on both sides. Fore wing with a black marginal border of variable extent. Hind

wing unmarked. Antennæ black, annulated with white; head and thorax dusky greenish; abdomen yellow; underside of palpi dusky black, of thorax and abdomen yellow.

♀. White to pale yellow, otherwise resembling the ♂.

The species is said to comprise 17 races, of which four are found in the Indian area.

175 *a*. **Gandaca harina assamica** Moore.

Gandaca assamica, Moore, 1906 *b*, p. 33, pl. 563, figs. 1, 1 *a* (♂♀, wet form), 2, 2 *a* (♂♀, dry form) (Assam, Sikkim).
Gandaca harina assamica, Fruhstorfer, 1910, p. 173; Evans, 1932 *a*, p. 76.
Terias harina, Wood-Mason & de Nicéville, 1887, p. 370; Elwes, 1888, p. 414; Swinhoe, 1893, p. 307; Watson, 1894, p. 509; Bingham, 1907, p. 249 (part.).

♂. *Upperside* pale primrose-yellow. Fore wing with narrow apical and marginal black border, not extended below vein 4 or 3.

Underside paler, without markings.

♀. Almost white.

In specimens of the dry-season the black margin is narrower.

Expanse: ♂♀, 35–45 mm.

Habitat.—Sikkim to Assam; not rare.

175 *b*. **Gandaca harina burmana** Moore.

Gandaca burmana, Moore, 1906 *b*, p. 34, pl. 563, figs. 3, 3 *a*, *b*, *c* (♂♀, Burma).
Gandica (sic) *burmana*, Adamson, 1908, p. 120.
Gandaca harina burmana, Fruhstorfer, 1910, p. 173; Evans, 1932 *a*, p. 76, pl. ix, fig. B 12.1 (♀).
Terias formosa, Moore (*non* Hübn.), 1878 *a*, p. 836; id., 1886, p. 45 (Mergui); Elwes & de Nicéville, 1887, p. 431 (Burma).
Terias harina, Wood-Mason & de Nicéville (*non* Horsf.), 1887, p. 370 (Cachar); Watson, 1888, p. 25; id., 1891, p. 51; id., 1897 *a*, p. 669.

♂♀. Only differs from *assamica* in the marginal black border being wider, especially in the ♀, and reaching vein 3 or inner margin.

Habitat.—Burma, Siam, Annam, and Tong-king; not rare, but less common in Lower Burma.

175 *c*. **Gandaca harina andamana** Moore.

Gandaca andamana, Moore, 1906 *b*, p. 35, pl. 563, figs. 4, 4 *a*, *b*, *c* (♂♀).
Gandaca harina andamana, Fruhstorfer, 1910, p. 173; Evans, 1932 *a*, p. 76.
Terias harina, Wood-Mason (*non* Horsf.), 1880, p. 235; Wood-Mason & de Nicéville, 1881 *b*, p. 251.

♂♀. Differs from *burmana* in its larger size, the black border being of moderate width.

Habitat.—Andaman Islands; not rare.

175 *d*. **Gandaca harina nicobarica** Evans.

Gandaca harina nicobarica, Evans, 1932 *a*, p. 76.

♂. Paler than the preceding races, the marginal border reduced.

♀. Pale yellow.

Habitat.—NICOBAR ISLANDS; occurs on all the islands, but is rare.

Genus **EUREMA** Hübner.

Eurema, Hübner, 1819, p. 96; Hemming, 1934 *a*, p. 135 (type, *demoditas* Hübn., 1819=*daira* Godart, 1819); id., 1937, p. 152 (has priority over *Terias* Swains.).

Terias, Swainson, 1821, pl. 22 (*hecabe* Linn.); Doubleday, 1847, p. 76; Wallace, 1867, p. 320; Butler, 1870 *a*, pp. 34, 44; Moore, 1881 *a*, p. 118; Watson, 1894, pp. 508–17; Butler, 1898 *b* (*a*), pp. 56–82 (revision); Marshall, 1901, pp. 398–403 (dimorphism); Bingham, 1907, p. 244; Röber, 1907, p. 58; Fruhstorfer, 1910, p. 165; Klots, 1931, pp. 186, 188; Evans, 1932 *a*, pp. 64, 77; Corbet & Pendlebury, 1932, pp. 143–93, pl. v (revision of Indo-Australian species); Corbet, 1934, pp. 277–9 (revisional notes); Hemming, 1934 *a*, p. 135 (type, *hecabe* Linn., 1758); id., 1937, p. 152 (synonym of *Eurema* Hübn.); Peile, 1937, p. 62.

Kibreeta, Moore, 1906 *b*, p. 36 (type, *libythea* Fabr.).

Nirmula, Moore, 1906 *b*, p. 40 (type, *venata* Moore).

Type of the genus, *E. daira* (Godt.).

♂♀. Fore wing with costa arched; apex generally more or less rounded, in a few forms acutely pointed but not produced; outer margin straight; tornus rounded; inner margin bisinuate, very long, about seven-tenths the length of costa; cell not quite half the length of wing; veins 10 and 11 from the cell, the former given off just before upper angle of cell; 7+8 and 9 short, the stalk long; 6 from the stem of 7+8 and 9, nearer the fork of these veins than to end of cell; *mdc* more than half as long as *ldc*, both incurved. Hind wing broad, broadly oval or slightly pear-shaped; costa arched; apex and outer margin continuous and strongly curved; tornus obtusely angular, the angle distinct; inner margin broadly arched; cell short, broad at apex; precostal vein absent or very greatly reduced; vein 7 from or from just before end of cell; discocellular veins not oblique; *udc* very short; *mdc* less than half as long as *ldc*; *ldc* incurved. Antennæ short, not heavily scaled, club gradual; palpi not very hairy, third segment short. ♂ with or without patches of androconia. One group has on the fore wing underside a narrow elongate brand above and below the basal part of vein 3. Another group has a small patch on the hind wing upperside at the base of vein 7, and a similar patch on the fore wing underside at the base of area 1 *b*.

The species of this genus are small, the fore wing not exceeding about 28 mm. in length. The genus contains a great number of very distinct species which may be assembled into groups on secondary sexual and other characters. Some species closely resemble one another, especially *hecabe* (Linn.) and *blanda* Boisd., but the genitalia afford good distinguishing characters. The Indo-Australian species have been the subject of an excellent revision by Corbet and Pendlebury, and their results are largely followed here.

The butterflies are slow fliers. They are found everywhere in the tropics in open places, in gardens and about the edges of woods. They are attracted to wet places and often congregate in swarms.

Distribution.—The whole Indo-Australian Region, including China and Japan, throughout Africa south of the Sahara, and over the whole of South America and in parts of North America. Ten species are known to inhabit the Indian area.

Key to Groups.

1. Underside of both wings without discocellular ring-spots; fore wing without cell-spots. Upperside of fore wing with black border not continued along vein 1 *a* ... . 2.

   Underside of both wings with large discocellular ring-spots. Upperside of fore wing with black border often continued along vein 1 *a*. ♂ with a median sex-brand on fore wing underside ... . HECABE Group [p. 521.

2. Fore wing underside with two small black discocellular spots. Upperside of both wings with black borders usually broad, with inner edge regular. ♂ without a sex-brand .. .. BRIGITTA Group (*Kibreeta* Moore), p. 514.

   Fore wing underside with a single small discocellular spot. ♂ with a sex-brand on hind wing upperside at base of area 7, and a similar one on fore wing underside at base of area 1 *b* . LÆTA Group (*Nirmula* Moore), p. 517.

Brigitta Group.

The nominotypical race of the species from which this group takes its name is confined to Africa. It was found by Corbet (1934) to be conspecific with the forms previously classed with *libythea* Fabr. Corbet (1933) pointed out that *libythea* Fabr. was preoccupied by *Appias libythea* (Fabr.), so, therefore, this name can no longer be used in *Eurema*, as it is a primary homonym, both having been described originally as *Papilio*.

The group is represented in the Indo-Australian Region only by the species *brigitta* (Cramer).

Eurema brigitta (Cramer, 1780).

Besides the characters mentioned in the key, it can be added that the fore wing is more elongate and narrowed towards the apex than in other species of the genus, and the black outer border is well marked and not excavated. The ♂ clasper of this species possesses five hook-like appendages which have the same arrangement in both the Indian and African races.

Distribution.—The whole Æthiopian and Indo-Australian Regions, extending north to Formosa and South China. A single subspecies in the Indian area.

176. **Eurema brigitta rubella** (Wallace). (Fig. 171, ♂).

Terias rubella, Wallace, 1867, p. 323 (Calcutta); Moore, 1882, p. 253 (N.W. Himalayas); de Nicéville, 1885 *b*, p. 50; Moore, 1886, p. 45 (Mergui); Elwes, 1888, p. 413; Hampson, 1889, p. 361; Watson, 1894, p. 515; Corbet, 1933, p. 249 (=*libythea* auct.).

Kibreeta rubella, Moore, 1906 *b*, p. 38, pl. 564, figs. 2, 2 *a* (♂), 2 *b*, *c* (♀) (wet form), figs. 2 *d* (♂), 2 *e* (♀) (types), figs. 2 *f* (♂), 2 *g* (♀) (dry form).

Terias libythea f. *rubella*, Fruhstorfer, 1910, p. 166 (dry form).

Papilio libythea, Fabricius, 1798, p. 427 (Kanara).

Terias libythea, Watson, 1894, p. 515; Davidson, Bell, & Aitken, 1897 *a*, p. 571; Butler, 1898 *b* (*a*), p. 58; Mackinnon & de Nicéville, 1898, p. 588 (Mussooree, Dehra Dun); Bingham, 1907, p. 247; Fruhstorfer, 1910, p. 166; Evans, 1910 *a*, pp. 385, 425 (Palni Hills); Hannyngton, 1910, p. 364 (Kumaon); Peile, 1911, p. 874 (Fatehgarh); Bell, 1913, p. 525 (Bombay, early stages); Ormiston, 1924, p. 85, pl. iii, fig. 1 (summer form), fig. 2 (winter form); Yates, 1931, p. 1007 (Coorg); Evans, 1932 *a*, p. 77, pl. ix, fig. B 15.1 (♂); Peile, 1937, p. 62, pl. vii, fig. 57 (♂).

Kibreeta libythea, Moore, 1906 *b*, p. 36, pl. 564, figs. 1 *f*, *g* (♂♀).

Eurema libythea libythea, Corbet & Pendlebury, 1932, p. 149.

Terias drona, Moore (*non* Horsfield), 1865 *b*, p. 760 (Bengal); Butler, 1871 *b* (*b*), p. 534 (Punjab); Moore, 1881 *a*, p. 120, pl. xlvi, figs. 3, 3 *a* (♂♀, Ceylon); Wood-Mason & de Nicéville, 1881, p. 236 (Nicobars); Moore, 1882, p. 253 (N.W. Himalayas); Swinhoe, 1885 *a*, p. 135 (Poona); id., 1886, p. 430 (Mhow); Hampson, 1889, p. 361; Doherty, 1886 *a*, p. 135.

Kibreeta drona, Moore (*non* Horsf.), 1906 *b*, pp. 36, 37, pl. 564, figs. 1, 1 *a–e* (♂♀).

The seasonal forms of this race are not so well marked as in some other species of the genus.

♂. *Upperside* gamboge-yellow. Fore wing with apical third and outer border black, the inner edge of this area more or less regularly incurved from costa to inner margin, and slightly toothed on veins 1 *a* to 3; basal area dusted with black. Hind wing with a black outer border that is broader anteriorly; basal area dusted with black. Specimens

of the wet season have broader black areas than those of the dry season; sometimes in the latter the marginal band of the hind wing is broken into linear spots posteriorly.

Underside of similar ground-colour. Fore wing with costa narrowly edged with pink; two well-marked discocellular spots and some obscure subapical black specks. Hind wing with a spot at the base, followed by three transversely placed spots and an elongate, delicate, loop-like discocellular spot, black; above and below the discocellular spot are small diffuse black spots; post-discal short diffuse black bands

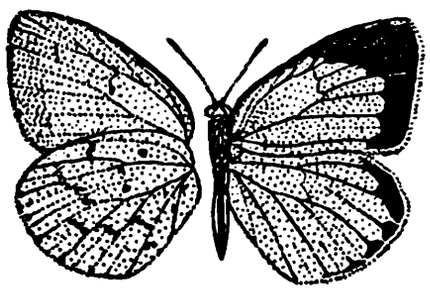


Fig. 171.—*E. brigitta rubella* (Wall.), ♂, from the Nilgiris.

placed *en échelon*. Both wings with black marginal vein-dots; cilia salmon-pink. Antennæ, head, thorax, and abdomen dusky black, the thorax with some yellow hairs; underside of palpi, thorax, and abdomen whitish-yellow.

♀. Resembles the ♂, but the black marginal borders proportionately broader in both seasonal forms.

Expanse: ♂♀, 30–40 mm.

The name **rubella** (Wall.) applies to the dry-season form, and the form of the wet season may not deserve a name.

Early stages and habits (from *Bell*, 1913) :—

Larva.—Grass-green, with a darker green dorsal line, and on segments 2 to 12 a white spiracular band tinged with yellow. Length, 19 mm.; breadth, 2·6 mm.

Pupa.—Snout short and conical; cremaster square at the end, flat dorsally and slightly thickened at the extreme posterior corners. Body green, with a white spiracular band, a subdorsal and lateral brownish spot on each segment, a large spot in front of the spiracle of segment 7, a group of seven lateral spots in front of the spiracle of segment 2; snout pink and wrinkled. Length, 16 mm.; breadth, 2·7 mm. at shoulders.

Habits.—The eggs are laid singly, generally on the upper-sides of the leaves, often on the young folded leaf-buds. The food-plant is *Cassia kleinii* Wight & Arn., a rather small annual growing in damp places.

The butterfly is very plentiful in dry weather in the hot rocky beds of rivers in Kanara, where the willow-like *Homoia*

grows. It keeps much to the bushes close to the ground; in certain places it congregates amongst the undergrowth. Flight weak and not sustained. Fond of flowers near the ground.

Habitat.—CEYLON, INDIA, BURMA, and NICOBAR ISLANDS, extending to South China; very common.

Læta Group.

A small group of two or, perhaps, three species confined to the Indo-Australian Region, one species occurring in the Indian area. This species exhibits well-marked seasonal dimorphism, and it is now known that *venata* Moore, previously considered distinct, is the wet-season form of *læta* Boisduval.

Eurema læta (Boisduval).

To the characters given in the key it can be added that the apex of the fore wing is more pointed than in other Indian species of the genus, especially in dry-season specimens. Seasonal dimorphism is so strongly marked that the two forms *læta* and *venata* were considered to be distinct species until, in 1931, Colonel Mosse proved them to be conspecific.

Both wings in the wet-season form with well-developed black borders, not much indented. In the dry-season form the border on the fore wing does not usually reach the tornus, and on the hind wing it is reduced to apical spots or is absent.

Underside of hind wing in both forms with a more or less distinct and more or less complete oblique post-discal diffuse band from apex to inner margin, in dry-season specimens much more distinct and reddish.

Distribution.—CEYLON, INDIA, and BURMA, north to China, Japan, and the Amur, south to Hainan, Tong-king, Annam, Java, Philippines, Timor to Kei Islands. Apparently absent from the Malay Peninsula, Sumatra, and Borneo. Two subspecies in the Indian area.

177 *a*. **Eurema læta læta** (Boisduval). (Figs. 172 *a*, *b*, ♂).

Terias læta, Boisduval, 1836, p. 674 (Bengal); Moore, 1865 *a*, p. 493 (Kasauli); Wallace, 1867, p. 320; Butler, 1871 *b* (*b*), p. 533; Moore, 1878 *a*, p. 836 (Burma); Butler, 1881 *b*, p. 608 (Belgaum); Swinhoe, 1884 *b*, p. 507; id., 1885 *a*, p. 135; id., 1886, p. 429 (Mhow); id., 1887, p. 274 (Karachi); Aitken, 1887, p. 41 (Bombay); Hampson, 1889, p. 361; Elwes, 1888, p. 413; Watson, 1894, p. 514; Davidson, Bell, & Aitken, 1897 *a*, p. 571; Mackinnon & de Nicéville, 1898, p. 588; Butler, 1898 *b* (*a*), p. 65; Bingham, 1907, p. 248; Hannyngton, 1910, p. 364 (Kumaon); Evans, 1910 *a*, p. 385 (Palni Hills); Peile, 1911, p. 874 (Fatehgarh);

Bell, 1913, p. 524, pl. K, figs. 69 (♂), 69 *a* (♀) (early stages); Mosse, 1931, p. 1094 (*venata*=*læta*); Yates, 1931, p. 1007 (Coorg).

Nirmula læta, Moore, 1906 *b*, p. 44, pl. 566, figs. 1, 1 *a–f* (♂♀, wet form), 1 *g*, *h*, *i* (♂♀, dry form).

Terias læta læta, Fruhstorfer, 1910, p. 166, t. 73 *d* (imago); Evans, 1932 *a*, p. 77; Peile, 1937, p. 62, pl. vii, figs. 54 (♂, dry form), 55, 56 (♂♀, wet form).

Eurema læta læta, Corbet & Pendlebury, 1932, p. 150.

Terias venata, Moore, 1857 *a*, p. 65, pl. ii *a*, fig. 2 (imago, N. India); Wallace, 1867, p. 320; Butler, 1871 *b* (*b*), p. 534 (Punjab); Swinhoe, 1885 *a*, p. 135 (Poona, Bombay); id., 1886, p. 430 (Mhow); Doherty, 1886 *a*, p. 135; Swinhoe, 1887, p. 275 (Karachi); Watson, 1894, p. 515; Butler, 1898 *b* (*a*), p. 64; Mackinnon & de Nicéville, 1898, p. 588 (Mussooree); Bingham, 1907, p. 246; Evans, 1910 *a*, p. 385 (Palni Hills); Hannyngton, 1910, p. 364 (Kumaon); Fruhstorfer, 1910, p. 166; Peile, 1911, p. 874 (Fatehgarh); Bell, 1913, p. 523, pl. K, figs. 70, 70 *a–c* (♂♀); Mosse & Bell, 1929, p. 727; Mosse, 1931, p. 1094 (=*læta* Boisd.); Yates, 1931, p. 1007 (Coorg); Klots, 1932, pl. viii, fig. 46 (genitalia).

Nirmula venata, Moore, 1906 *b*, p. 40, pl. 565, figs. 1, 1 *a* (♂), 1 *b* (♀).

Terias santana, C. & R. Felder, 1865, p. 211 (Bengal).

Terias vagans, Wallace & Moore, 1866, p. 357 (♂, *non* ♀, N. India); Butler, 1871 *b* (*b*), p. 534 (N. India); id., 1886 *a*, p. 372 (♀, Chuttar).

Terias rama, Moore, 1872, p. 566 (♀, Ceylon); id., 1881 *a*, p. 121, pl. xlvi, figs. 5, 5 *a* (♂♀); Ormiston, 1924, pp. 86, 87, pl. iii, figs. 5, 6 (♂♀, Ceylon).

Nirmula rama, Moore, 1906 *b*, p. 42, pl. 565, figs. 3 *c*, *d* (♂♀).

Terias venata rama, Fruhstorfer, 1910, p. 166.

Eurema læta rama, Corbet & Pendlebury, 1932, p. 151 (Ceylon).

Terias cingala, Moore, 1877 *b*, p. 48 (Ceylon); id., 1881 *a*, p. 120, pl. xlvi, figs. 4, 4 *a* (♂♀).

Nirmula venata f. *cingala*, Moore, 1906 *b*, p. 42, pl. 565, figs. 3, 3 *a*, *b* (♂♀, wet form).

Terias venata f. *cingala*, Ormiston, 1924, p. 86, pl. iii, figs. 3, 4 (♂♀).

Terias pallitana, Moore, 1877 *b*, p. 48 (Bombay).

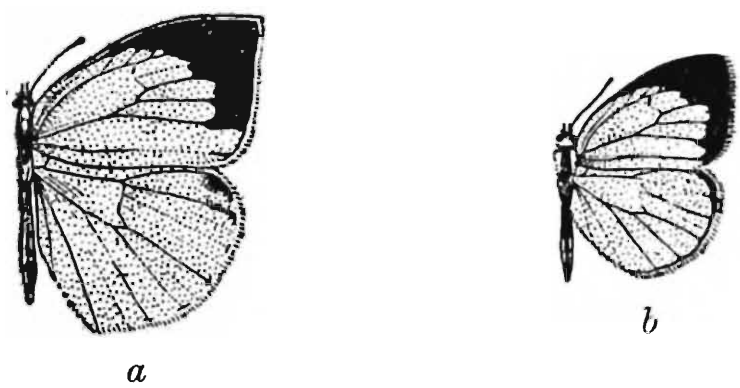
Nirmula pallitana, Moore, 1906 *b*, p. 41, pl. 565, figs. 2, 2 *a*, *b* (♂♀, types).

Terias venata f. *pallitana*, Fruhstorfer, 1910, p. 166 (dry form.)

Wet-season form **venata** (Moore) (fig. 172 *b*).—♂. *Upperside* gamboge-yellow. Fore wing apical third black, this colour extended along the costa in a gradually narrowing line to the base; inner edge of black outer border oblique and sinuate from middle of costa to vein 4, thence continued outwards along that vein for a short distance and vertically downwards to vein 2, thence obliquely outwards to the tornal angle; the portion of the area between veins 2 and 4 of even width, slightly produced angularly inwards at veins 2 and 3; basal two-thirds of wing dusted with black, most dense at extreme base; a black linear discocellular speck. Hind wing with an outer even black border; an area of black dusting from base to tornal angle, not spreading on to the disc nor reaching

inner margin; a small patch of salmon-coloured androconia at base of area 7. Cilia of both wings pale yellow.

Underside with somewhat duller ground-colour. Both wings evenly but sparsely dusted with black, not extending to the disc, cell, nor dorsal margin of fore wing. Fore wing paler yellow; a patch of salmon-coloured androconia below the median vein in area 2; a linear discocellular speck. Hind wing with a black dot in area 7; two very obscure, parallel, short, blackish post-discal bands. Both wings with marginal black vein-dots. Antennæ, head, thorax, and abdomen dusky black; underside of antennæ with a line of white dots; palpi, thorax, and abdomen whitish.



a *b*

Fig. 172.—*a*, *E. læta* dry f. *læta* (Boisd.), ♂; *b*, *E. læta* wet f. *venata* (Moore), ♂.

♀. Resembles the male. Both wings with denser black dusting and broader outer black borders; on fore wing the border narrowed generally abruptly below the middle of area 1 *b*, and continued thence to tornal angle as a mere line; on hind wing very broad anteriorly and attenuated rapidly towards the tornus.

Underside as in the ♂.

The names *santana* C. & R. Feld., *vagans* Wall. & Moore, *rama* Moore, and *cingala* Moore are synonyms of *venata*.

Dry-season form **læta** (Boisd.) (fig. 172 *a*).—♂♀. Fore wing much more pointed at apex, outer margin sharply cut and straight. *Upperside* a richer brighter yellow. Fore wing with basal half of costa broadly dusted with black; outer black border stopping abruptly at vein 2; the tornus, except for a very fine black anticiliary line, yellow. Hind wing with black border reduced to a black subapical patch and posteriorly to a series of black spots, or the latter or all these markings absent.

Underside of both wings with pale yellow ground-colour. Fore wing with apical area and basal half of costa dusted with fleshy pink and brownish scales. Hind wing densely shaded

with fleshy pink and brownish; two post-discal, somewhat diffuse, straight, ferruginous-brown bars, the inner one the longer; above these bars are a few brown, somewhat obscure specks and dots on upper basal part of wing. Antennæ mealy yellow, with scattered dusky scales; head with pinkish pubescence; thorax and abdomen black, with scattered yellow hairs and scales; underside of palpi, thorax, and abdomen pale yellowish-white.

Expanse: ♂♀, 30–40 mm.

Various transitional forms occur between the extreme wet and dry forms.

Colonel Mosse (1931) succeeded in breeding both forms from a single batch of eggs laid by a *venata* ♀. The seven specimens studied included two *venata* (one of the typical dusky type, the other approximating to *læta*) and five *læta* (two with hind wing underside yellow, two with hind wing underside brownish-buff, one with hind wing underside creamy-buff, the commonest form).

Habits (from *Bell*, 1913):—

Wet-season form.—Not rare in the Bombay Presidency in the drier parts. It is common round Belgaum, in Dharwar, Bijapur, Sholapur, and Poona in grass-lands. Always keeps close to the ground and hardly ever flies far without settling. Flight weak and fluttering. Fond of flowers, which the male seeks amongst the grass, generally on the very surface of the ground.

Dry-season form.—Flight weak but not fluttering. Fond of resting on dead grass-stems and blades; the pinkish-yellow colour of the underside blends very well with the withered surroundings. In Kanara it appears about October, about the end of the monsoon, and is quite common from November to June. It is more abundant than *venata*.

It should be mentioned that Bell strongly suspected *venata* to be the wet form of *læta*.

Habitat.—Ceylon, Peninsular India to Western Himalayas; very common.

177 *b*. **Eurema læta sikkima** (Moore).

Nirmula sikkima, Moore, 1906 *b*, p. 43, pl. 565, figs. 4, 4 *a*, *b* (♂♀, Sikkim, Bhutan).
Terias venata sikkimica (sic), Fruhstorfer, 1910, p. 166.
Eurema læta sikkima, Corbet & Pendlebury, 1932, p. 151.
Terias læta sikkima, Evans, 1932 *a*, p. 77.
Terias pseudolæta, Moore, 1906 *b*, p. 44, pl. 566, figs. 1 *j–m* (♂, Mergui).
Terias læta f. *pseudolæta*, Fruhstorfer, 1910, p. 166 (dry form).

♂♀. A larger race than the preceding. In the male type

the distal border on fore wing does not reach the inner margin, but in the female type it extends to the tornus.

The dry-season form is **pseudolæta** Moore. It differs from *læta læta* in the less pointed apex of fore wing and less reddish colouring of the underside.

Expanse : ♂♀, 35–45 mm.

Habitat.—SIKKIM to BURMA ; very common. Also in Hainan, Tong-king, Annam, Siam, and Java.

Hecabe Group. (Fig. 173, genitalia).

The males of this group may be recognized by the narrow grey sex-brand placed on either side of the median vein,

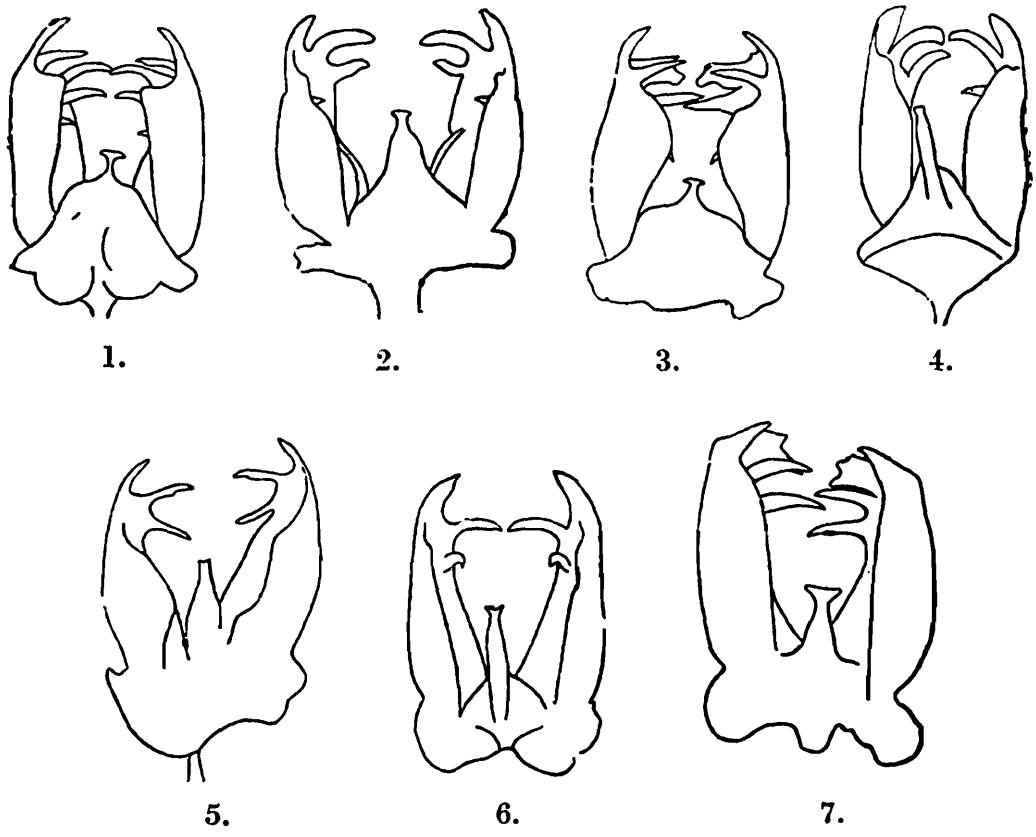


Fig. 173.—Genitalia (valve) of *Hecabe* Group (after Corbet & Pendlebury, 1932). (1) *hecabe* (Linn.); (2) *simulatrix* (Stgr.); (3) *blanda* (Boisd.); (4) *andersoni* (Moore); (5) *ada* (Dist. & Pry.); (6) *sari* (Horsf.); (7) *tilaha* (Horsf.).

on the fore wing underside, from the base to the origin of vein 2. Fore wing in both sexes with outer black border continued to the tornus and, except in dry-season forms, excavated between veins 2 and 4. The group contains eight species inhabiting the Indian area.

Key to Species.

1. Fore wing upperside with black border continued along inner margin to base. .. [p. 539. *tilaha* (Horsf.),
   Fore wing upperside with black border not continued along inner margin to base. .. 2.
2. Fore wing underside with 3 spots in the cell. Hind wing underside usually with a spot at base of area 7; marginal dots between the veins usually present. Dry form with rusty spots on underside . .... [p. 522. *blanda* (Boisd.),
   Fore wing underside with 2 spots in cell, but one or even both may be absent. Dry form with rusty spots on underside . .. .. 3.
   Fore wing underside with a single zigzag spot in the cell, and a spot towards the tornus in area 1 *b*. Underside not speckled with black, never with rusty spots. . .. 5.
3. Hind wing underside with a transverse streak in area 7 in line with the discocellular spot. ♂ sex-brand not reaching to origin of vein 3. [p. 537. *ada* (Dist. & Pryer),
   Hind wing underside without a transverse streak in area 7. ♂ sex-brand reaches to origin of vein 3 ... ... 4.
4. Fore wing underside with apical area not entirely brown. ♂ sex-brand broad and prominent .. .. [p. 526. *hecabe* (Linn.),
   Fore wing underside with a large, cleft, reddish-brown apical spot. Hind wing underside with a figure-of-eight spot at the base of area 1 *c* .. .. [p. 533. *simulatrix* (Stgr.),
5. Fore wing upperside with black border continued along half the inner margin, narrowing proximally .. .. [p. 534. *jordani* C. & P.,
   Fore wing upperside with black border not continued along inner margin . . 6.
6. Fore wing underside with apex never entirely dark . .. . [p. 535. *andersoni* (Moore),
   Fore wing underside with apex entirely and broadly dark chocolate *sari* (Horsf.), p. 538.

Eurema blanda (Boisduval), 1836.

The species is sufficiently characterized in the key. The female is often extremely like *hecabe* (Linn.), female, in having a broad, deeply excavated margin on the fore wing.

Genitalia (fig. 173 (3)) (Corbet & Pendlebury, 1932, p. 153, fig. 3).—Valve posteriorly with four appendages, of which three are simple, rather slender, slightly curved, spine-like processes, whilst the fourth is broad, flat, and larger than the others. A fifth simple appendage is situated in the interior of the valve as in *hecabe* and *simulatrix*.

Early stages (as observed in *E. blanda davidsoni* (Moore), from *Bell*, 1913) :—

Larva.—Very similar to that of *hecabe*, but is always found in companies of many individuals. Body dorsally of a dark bluish-green, with a pale yellowish-green, often somewhat indistinct, spiracular line; venter yellow-green. When not

quite full-grown the colour is greenish-yellow all over. Length, 26 mm. ; breadth up to 3 mm.

Pupa.—Resembles that of *hecabe*, but is dark yellowish-green brown with top of snout yellow ; snout sharply pointed and often slightly upturned at the end. The pupæ are almost invariably found strung up in companies, one behind the other, along the underside of a twig or midrib of a leaf.

Habits.—The eggs are laid on the upperside of a leaf or young shoot in clusters of 20 or 30 each. The larvæ are gregarious and much subject to the attack of hymenopterous parasites. The food-plant is *Wagatea spicate* Dalz. (family Leguminosæ), a large climber with long spikes of orange and red flowers, a striking object in the jungle-landscape of the Bombay Western Ghats. The larva also feeds upon some species of *Cassia* and upon *Delonix* (*Poinciana*) *regia* Raf., the gold-mohur tree. The butterfly flies high up round trees.

Distribution.—CEYLON, INDIA, BURMA, ANDAMAN ISLANDS, NICOBAR ISLANDS to South China and Formosa, south to New Guinea and the Bismarck Islands. Six subspecies occur in the Indian area.

178 *a*. **Eurema blanda silhetana** (Wallace). (Fig. 174 *a*, *b*, *c*, ♂ ; fig. 175, ♂).

Terias silhetana, Wallace, 1867, p. 324 (♂, Silhet) ; Butler, 1871 *b* (*b*), p. 536 ; Moore, 1878 *a*, p. 836 (Burma) ; id., 1886, p. 45 (Mergui) ; Watson, 1894, p. 509, pl. ii, figs. 8–16 (♂♀) ; Davidson, Bell, & Aitken, 1897 *a*, pl 571, pl. vi, figs. 6, 6 *a* (larva, pupa) ; Butler, 1898 *b* (*a*), p. 71 ; Bingham, 1907, p. 257, fig. 65 (♂) ; Evans, 1910 *a*, p. 385 (Palni Hills) ; Manders, 1910, p. 245 ; de Rhé-Philipe, 1911, p. 767 (Bhutan) ; Bell, 1913, p. 530 ; Yates, 1931, p. 1007 (Coorg).

Terias blanda silhetana, Fruhstorfer, 1910, p. 169, t. 73 c (imago) ; Evans, 1932 *a*, p. 78 ; Corbet & Pendlebury, 1932, p. 172 (*Eurema*) ; Peile, 1937, p. 63.

Terias citrina, Moore, 1881 *a*, p. 119, pl. xlv, figs. 4, 4 *a* (♀, Ceylon) ; id., 1907 *a*, p. 65, pl. 571, figs. 1 (♂, wet form), 1 *a* (♀, intermed. form), 1 *b*, *c* (♀, dry form), *d* (♀, extreme dry form).

Terias rotundalis, Moore, 1881 *a*, p. 120, pl. xlvi, figs. 1, 1 *a* (♂ only, Ceylon).

Terias uniformis, Moore, 1881 *a*, p. 120, pl. xlvi, figs. 2, 2 *a*, 2 *b* (♂♀, Ceylon).

Terias silhetana f. *uniformis*, Bingham, 1907, p. 258, fig. 66 *b* (♂).

Terias heliophila, Butler, 1885, p. 338, pl. viii, fig. 2 (imago).

Terias silhetana f. *heliophila*, Bingham, 1907, p. 258, fig. 65 *a* (♀).

Terias templetoni, Butler, 1886 *b*, p. 218 (Ceylon).

Terias davidsoni, Moore, 1906 *a*, p. 63, pl. 570, figs. 1, 1 *a* (♂♀, types, wet form), 1 *b*, 1 *c* (♂♀, intermed. form), *d*, *e* (♂♀, dry form), *f*, *g* (♂♀, extreme dry form) (Karwar).

Terias grandis, Moore, 1907 *a*, p. 67 (Khasi Hills).

Terias roepstorffi, Moore, 1907 *a*, p. 76, pl. 575, fig. 3 (♂, Andamans).

Terias cadelli, Moore, 1907 *a*, p. 77, pl. 575, fig. 4 (♂, Andamans).

It will be seen that this race of *blanda* has received many names, indicating its great variability. I am unable to find

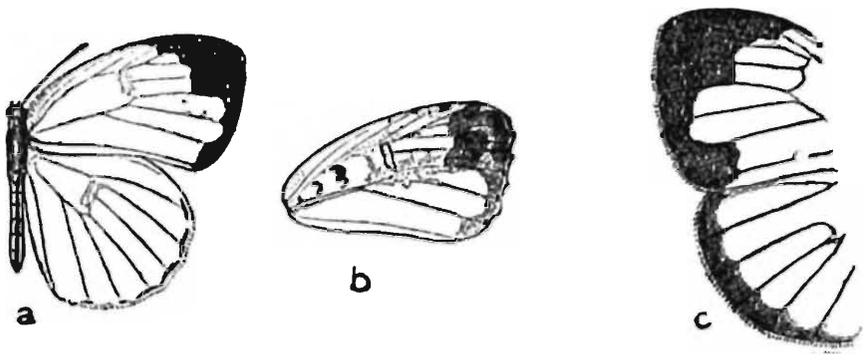


Fig. 174.—*E. blanda silhetana* (Wall.), ♂.
a, upperside ; *b*, fore wing underside ; *c*, f. *heliophila* (Butl.).

Fig. 175.—*E. blanda silhetana* f. *rotundalis* (Moore), ♂.

any constant characters for retaining any of these names, but the following summary may be useful to those who wish to investigate the variation :—

E. b. rotundalis (Moore) (fig. 175) applies to the dry-season form from Ceylon, of which *uniformis* (Moore), *templetoni* (Butler), and *citrina* (Moore) are wet forms.

E. b. davidsoni (Moore) applies to the wet form in Peninsular India.

E. b. heliophila (Butler) (fig. 174 *c*) applies to the wet form from the area Sikkim–Assam–Burma, *grandis* (Moore) being an extreme wet form from Assam with very broad borders.

E. b. roepstorffi (Moore) applies to the dry form in the Andamans, *cadelli* (Moore) being the wet form.

The oldest name for the wet-season form appears to be **uniformis** (Moore).

Dry-season form.—♂♀. *Upperside* rich citron-yellow. Fore wing with black outer border rather broad in the apical area,

narrowing posteriorly, and strongly excavated below vein 4, resembling *hecabe* (Linn.). Hind wing with a marginal narrow black line which may be interrupted, or increased to a narrow band.

Underside with slightly paler ground-colour. Markings much as in dry-season specimens of *hecabe*, but fore wing always with an additional minute reddish-brown dot at extreme base of cell, and in all typical specimens the apical reddish-brown patch is much larger and spreads diffusely outwards to the margin.

Wet-season form **uniformis** (Moore).—♂♀. *Upperside* of fore wing with broader black border. Hind wing with a narrow black border, wider in the ♀.

Underside markings more distinctly defined than in the dry form.

The extreme wet form of ♀ has very broad borders on both wings, and the fore wing has a prominent discocellular mark. Hind wing with a diffuse but strongly dentate edge to the black border. A specimen in the British Museum from Travancore has white ground-colour, only the anterior half of hind wing being yellow.

Expanse : ♂♀, 40–50 mm.

Habitat.—CEYLON and PENINSULAR INDIA to SIKKIM, ASSAM, BURMA, and the ANDAMAN ISLANDS ; common.

178 *b*. **Eurema blanda moorei** (Butler).

Terias moorei, Butler, 1886 *b*, p. 216, pl. v, fig. 1 (imago) (Nicobars : Camorta) ; id., 1898 *b* (*a*), p. 72 ; Bingham, 1907, p. 259 (part.) ; Moore, 1907 *a*, p. 77, pl. 575, fig. 5 (♂) ; Fruhstorfer, 1910, p. 169.

Eurema blanda moorei, Corbet & Pendlebury, 1932, p. 173 ; Evans, 1932 *a*, p. 78 (*Terias*).

Terias roepstorffi, Moore, ♀, 1907 *a*, p. 76, pl. 575, fig. 3 *a* (♀).

Terias cadelli, Moore, ♀, 1907 *a*, p. 76, pl. 575, fig. 4 *a* (♀).

♂♀. *Upperside* rich deep sulphur-yellow. Fore wing elongate and narrower than in *E. b. silhetana* (Wall.) ; apex and outer margin with a narrow, black, inwardly dentate border that broadens slightly on the apex and is continued as a slender line along costal margin to base, close to which it becomes somewhat diffuse and dusky ; the border is broader in specimens from Car Nicobar. Hind wing with indications of a slender marginal black anticiliary line, which in most specimens is reduced to a series of marginal black vein-dots.

Underside with similar ground-colour, the markings very similar to those in the wet-season form of *silhetana*.

Habitat.—CAR NICOBAR and CENTRAL NICOBAR ISLANDS ; rare.

178 *c*. **Eurema blanda grisea** (Evans). (Fig. 176, ♂).

Terias blanda grisea, Evans, 1932 *a*, p. 78 (South Nicobars); Corbet & Pendlebury, 1932, p. 173 (*Eurema*).
Terias moorei, Bingham (*non* Butl.), 1907, p. 259 (part.), fig. 67 (♂).

♂♀. *Upperside* of fore wing with the black border narrower

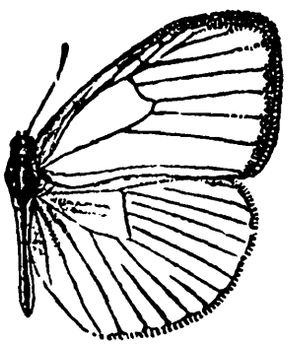


Fig. 176.—*E. blanda grisea* (Ev.), ♂.

than in *moorei*, and scaled with grey between the veins. The border is much wider in the ♀.

Habitat.—South Nicobar Islands; not rare.

Eurema hecabe (Linnæus, 1758).

This widely distributed species is the most variable *Eurema* in the Indo-Australian Region, and many names have been bestowed upon its variations. Transitional forms are so common that most of these names represent no constant form, and cannot properly be recognized now.

Normally the species has two cell-spots on the fore wing underside, but examples with no cell-spots are not uncommon; specimens with a single cell-spot or with three cell-spots are rare. The male can be easily separated from its congeners by the sex-brand on the fore wing underside; this is absent but rarely. The ♀ resembles the ♂, but a white form of this sex occasionally occurs.

Genitalia (fig. 173 (1)) (Corbet & Pendlebury, 1932, p. 152, text-fig. 1).—Valve with five rather long, slender, slightly curved, spine-like appendages. The anterior one, situated in the centre of the valve, is not always prominent.

Early stages and habits (as observed in *simulata* (Moore), from *Bell*, 1913) :—

Egg.—Spindle-shape, the top bluntly pointed; many very fine longitudinal ribs, and many fine transverse striæ. White when laid, quickly becoming yellow.

Larva.—Dark green, mostly glaucous on the sides, with a spiracular narrow white band from head to end of anal flap. Length, 22 mm.; breadth, 3 mm.

Pupa.—Like that of *E. libythea rubella* (Wall.). Snout conical, not long, rather sharply pointed. Cremaster rather

longer than broad, strong, trapeze-shaped, the nearly square extremity, as well as the adjacent ventral surface, set with short suspensory hooklets. Usually green, with a rather dark violet-grey dorsal line; dorsal margin of wing also violet-grey, this colour continued along abdomen above spiracles; a faint white spiracular line; the line of suture of wings near abdominal end dark. Some pupæ are much marked with smoky grey, especially on the wings. Length, 17 mm.; breadth, 3·5 mm.

Habits.—The eggs are laid singly on young shoots and leaves. Larva feeds upon Leguminosæ: *Cassia*, *Wagatea*, *Acacia*, *Serbania*, *Cæsalpinia*, *Albizzia*, etc.

The butterfly is a stronger flier than the others and keeps on the wing for some time, often ascending high in the air. It comes freely to flowers, and frequents damp places in the hot months, being equally abundant in the shady extensive forests of the hills and in the open hot plains.

According to Manders (1910) the food-plant in Ceylon is usually the "Madras Thorn," *Pithecelobium dulce* Benth.

Distribution.—The whole Æthiopian Region and the whole Indo-Australian Region, northwards to Korea and Japan. Five subspecies occur in the Indian area.

179 *a*. **Eurema hecabe contubernalis** (Moore). (Fig. 177 *a–e*, ♂♀).

Terias contubernalis, Moore, 1886, p. 46 (Mergui); id., 1906 *b*, pp. 51, 52, pl. 567, figs. 1 *h*, *i* (types, ♂♀) (dry form).

Terias hecabe f. *contubernalis*, Bingham, 1907, p. 253 (dry form).

Terias hecabe, Moore, 1857 *a*, p. 63, pl. 1, figs. 11, 11 *a* (larva and pupa); id., 1865 *b*, p. 760 (Bengal); Butler, 1870 *b*, p. 727 (Gujerat); Moore, 1878 *a*, p. 836 (Burma); Wood-Mason & de Nicéville, 1881 *a*, p. 236; id., 1887, p. 370 (Cachar); Elwes, 1888, pp. 412, 413 (variation); Watson, 1894, pp. 508–14, pl. ii, fig. 12 (imago); Watson, 1896, p. 283; Davidson, Bell, & Aitken, 1897 *a*, p. 570, pl. vi, figs. 5, 5 *a* (larva and pupa); Butler, 1898 *b* (*a*), p. 69; de Nicéville, 1899 *c*, p. 212; id., 1902 *a*, p. 26; Moore, 1906 *b*, p. 50, pl. 567, figs. 1, 1 *a–e* (♂♀, wet form), figs. *h*, *i* (♂♀, dry form); Röber, 1907, p. 59, t. 23 *f* (imago); Bingham, 1907, p. 250, pl. xvi, fig. 106 (♂); Manders, 1910, p. 245; Klots, 1932, pl. viii, fig. 47 (genitalia).

Terias hecabe hecabe, Fruhstorfer, 1910, p. 166, t. 73 *f* (imago); Evans, 1932 *a*, p. 78; Peile, 1937, p. 64, pl. vii, fig. 51 (♂), 52 (♀, dry form), 53 (♀, wet form).

Eurema hecabe hecabe, Corbet & Pendlebury, 1932, pp. 144, 145, 152, 153, text-fig. 1 (genitalia), pl. v, figs. 1, 2 (♂♀).

? *Papilio rahel*, Fabricius, 1787, p. 22.

? *Terias hecabeoides*, Ménétries, 1855, p. 85, pl. ii, fig. 2 (♂, "Haiti").

? *Terias æsiope*, Ménétries, 1855, p. 85, pl. ii, fig. 3 (♀, "Haiti").

Terias patruelis, Moore, 1886, p. 46, pl. iv, fig. 5 (♂, Mergui); id., 1907, pl 73, pl. 574, figs. 2 (♂, wet form), 2 *a*, *b* (♀, dry form), 2 *c* (♂, intermed. dry form), 2 *d* (♂, extreme dry form).

Terias hecabe var. *patruelis*, Bingham, 1907, p. 253, fig. 62 *c* (♂, dry form).
Terias fraterna, Moore, 1886, p. 46, pl. iv, fig. 6 (♂, Mergui) (dry form); id., 1907, p. 72, pl. 574, figs. 1 (♂, wet form), 1 *a*, *b* (♂♀, dry form).
Terias merguiana, Moore, 1886, p. 47, pl. iv, fig. 7 (♂, Mergui); id., 1907, p. 71, pl. 573, fig. 3 (♂, wet form), 3 *a*, *b* (♂♀, dry form), *c*, *d* (♂♀, extreme dry form).
Terias hecabe var. *merguiana*, Bingham, 1907, p. 253, fig. 62 *a* (♀, wet form).
Terias hecabe merguiana, Fruhstorfer, 1910, p. 167.
Terias kana, Moore, 1886, p. 48, pl. iv, fig. 9 (♂, Mergui); id., 1907, p. 69, pl. 573, figs. 1 *b*, *c* (♂♀, dry form).
Terias hecabe var. *kana*, Bingham, 1907, p. 253, fig. 61 (♀) (wet form).
Terias hecabe grandis f. *sarinoides*, Fruhstorfer, 1910, p. 167 (dry form).
Terias lacteola, Distant, 1886, p. 466, fig. 129 (♀, Singaporo).
Terias hecabe ♀ f. *lacteola*, Corbet & Pendlebury, 1932, pp. 145, 155, 157, pl. v, fig. 4 (♀).

Wet-season form.—♂. *Upperside* yellow, variable in tint from sulphur- to rich lemon-yellow according to locality,

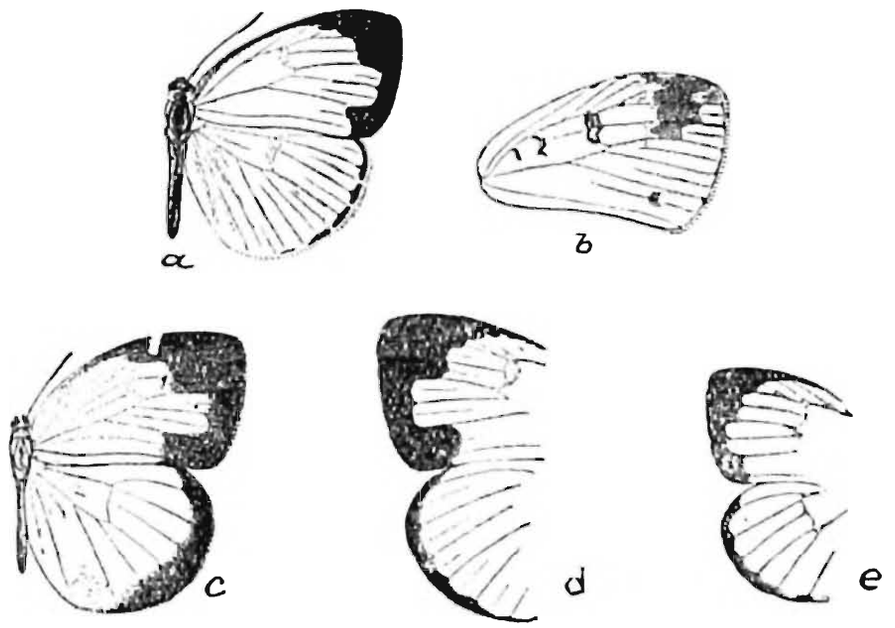


Fig. 177.—*E. hecabe contubernalis* (Moore). *a*, typical dry form, ♂; *b*, dry form, fore wing underside; *c*, wet form, ♀ (*kana* Moore); *d*, wet form, ♀ (*merguiana* Moore); *e*, dry form, ♂ (*patruelis* Moore).

with a light or heavy rainfall. Fore wing with a deep black outer border, continued narrowly along costal margin to base; inner edge of the border from costa to vein 4 very oblique and irregular, excavated between veins 2 and 4, this excavation outwardly rounded between the veins, and inwardly toothed on vein 3; below vein 2 the black area is suddenly dilated into a square spot which occupies the whole of the tornal angle; the inner edge of this projection is normally slightly incurved. Hind wing with an outer narrow black border which is attenuated anteriorly and posteriorly; this

border varies in width, and its inner edge is sinuate; inner margin broadly paler than the ground-colour.

Underside ground-colour usually paler than that of the upperside, with the following reddish-brown markings:— Fore wing with two small spots or specks in basal half of cell, and a reniform discocellular spot or ring. A sex-brand on both sides of the median vein, extending from the base of wing to the origin of vein 2; this brand is broader than in any other Indian species of the *hecabe*-group. Hind wing with a slightly curved subbasal series of three small spots; a discocellular, slender, irregular ring or spot; a post-discal series of highly irregular curved streaks, some or all of which are often obsolescent; the streak in area 7 is out of line with the others and directed to mid-way between these and the discocellular spot. Both wings with minute reddish-brown costal and outer marginal vein-specks. Antennæ greyish-yellow, club black; head, thorax, and abdomen yellow, shaded with fuscous; underside of palpi, thorax, and abdomen yellowish-white.

♀. Black marginal borders slightly broader, the inner edge of the band on hind wing often diffuse. *Underside* as in the ♂.

The form **lacteola** (Dist.) is white.

Dry-season form.—♂♀. *Upperside* very similar to wet-season specimens, the hind wing border sometimes narrower and diffuse inwardly.

Underside similar to that of the wet-season form, but the spots larger, more clearly defined, darker, and therefore far more conspicuous; often with greater or less black dusting. Fore wing with a subapical, very prominent, elongate spot or short bar of reddish-brown extended downwards from the costa; this spot is irregular in shape and of variable width, but *never reaches the margin*; sometimes there is also a small reddish-brown spot in area 1 *b* near the tornus.

Expanse: ♂♀, 40–50 mm.

The nominotypical *hecabe* Linnæus is restricted to the Philippine Islands (Luzon), and is represented by the figure in Petiver, 1702–11, 'Gazophylacii naturæ,' pl. 28, fig. 9. This insect is in the Petiver Collection in the British Museum.

Papilio rahel Fabricius may belong to *hecabe*, but the type is not known, and the description is quite insufficient to make identity certain.

The names *hecabeoides* Ménétries and *æsiope* Ménétr. apply to *hecabe* forms, but they do not appear typical of Indian and came probably from China.

Owing to the uncertainty as to what insects the names given above really represent, it is considered that *contubernalis*

(Moore) should be taken as being the oldest name for the subspecies in North-East India and Burma. It represents the dry-season form.

The name for the wet-season form can be taken as **merguiana** (Moore).

Habitat.—BENGAL to SIKKIM, BURMA, and the Malay Peninsula; very common. The ♀ form *lacteola* is very rare in India.

179 *b*. **Eurema hecabe simulata** (Moore). (Fig. 178 *a*, *b*, ♂).

Terias simulata, Moore, 1881 *a*, p. 119, pl. xlv, figs. 2, 2 *a*, *b* (♂♀, Ceylon); Rothney, 1882, p. 35 (Barrackpore); Watson, 1894, p. 510; Butler, 1898 *b* (*a*), p. 70.

Terias hecabe f *simulata*, Bingham, 1907, p. 253 (dry form).

Terias hecabe simulata, Fruhstorfer, 1910, p. 167; Yates, 1931, p. 1007 (Coorg); Evans, 1932 *a*, p. 78 (Ceylon and South India); Peile, 1937, p. 63.

Eurema hecabe simulata, Corbet & Pendlebury, 1932, p. 160.

Terias hecabeoides, Moore (*non* Ménétr.), 1881 *a*, p. 119, pl. xlv, figs. 3, 3 *a*, *b* (♂♀, Ceylon); Butler, 1881 *b*, p. 608 (♀, Karachi); Swinhoe, 1884 *b*, p. 508 (♂♀, Karachi); id., 1886, p. 430 (Mhow).

Terias æsiope, Butler, (*non* Ménétr.), 1883, p. 150 (Mhow); Forsayeth, 1884, p. 385, pl. xiv, figs. 1, 1 *a* (larva and pupa, Mhow).

Terias hecabe, Butler (*non* Linn.), 1883, p. 150 (Mhow); Swinhoe, 1884 *b*, p. 507 (Karachi); Davidson & Aitken, 1890, p. 359 (early stages); Evans, 1910 *a*, p. 385 (Palni Hills); Bell, 1913, p. 527, pl. K, figs. 71, 71 *a–c* (♂♀) (early stages).

Terias asphodelus, Butler, 1883, p. 151, pl. xxiv, fig. 13 (♂, Mhow; ♀, Depalpur); Swinhoe, 1884 *b*, p. 508 (Karachi); id., 1885 *a*, p. 136 (Poona); id., 1886, p. 430 (Mhow); id., 1887, p. 275 (Karachi); Watson, 1894, p. 510; Butler, 1898 *b* (*a*), p. 71; Moore, 1906 *b*, p. 62, pl. 569, figs. 3, 3 *a* (♂♀, wet form), 3 *b* (♂, dry form), 3 *c* (♀, extreme dry form).

Terias hecabe f. *asphodelus*, Bingham, 1907, p. 253, fig. 62 *b* (♀).

Terias hecabe fimbriata f. *asphodelus*, Fruhstorfer, 1910, p. 167 (intermed. form).

Terias narcissus, Butler, 1883, p. 151 (dry var., Mhow); Swinhoe, 1885 *a*, p. 136 (Poona); Butler, 1898 *b* (*a*), p. 71; Moore, 1906 *b*, p. 62, pl. 569, figs. 4, 4 *a* (♂♀).

Terias hecabe fimbriata f. *narcissus*, Fruhstorfer, 1910, p. 167 (intermed. form).

Terias curiosa, Swinhoe, 1884 *b*, p. 508, pl. xlvii, fig. 3 (imago, Karachi); id., 1887, p. 275 (Karachi); Butler, 1898 *b* (*a*), p. 73.

Terias hecabe ab. *curiosa*, Moore, 1906 *b*, pp. 51, 52, pl. 567, fig. 2 (imago).

Terias sari ab. *curiosus*, Bingham, 1907, p. 256; Fruhstorfer, 1910, p. 170.

Terias swinhoei, Butler, 1886 *b*, p. 216 (Bombay); id., 1898 *b* (*a*), p. 71; Moore, 1906 *b*, p. 61, pl. 569, fig. 2 (♂, wet form), 2 *a*, *b* (♂♀, dry form), 2 *c* (♀, extreme dry form).

Terias hecabe swinhoei, Fruhstorfer, 1910, p. 167.

Terias suava, Butler (*non* Boisd.), 1886 *a*, p. 371 (Campbellpore).

Terias æsiopioides, Moore, 1906 *b*, p. 60, pl. 569, figs. 1 (♂, wet form), 1 *a*, *b*, *c*, *d* (♂♀, dry form) (Karachi).

Terias hecabe æsiopioides, Fruhstorfer, 1910, p. 167.

♂♀. Not sharply differentiated. A smaller race, with the ground-colour darker yellow than in the nominotypical race.

Underside of fore wing with a prominent brown subapical patch from the costa; hind wing markings more or less

Fig. 178.—*E. hecabe simulata* (Moore).
a, dry f. *asphodelus* (Butl.), ♂; *b*, wet form of ♂.

reddish-brown. In the more extreme wet forms these brown markings are absent; such specimens do not differ from *contubernalis* (Moore).

The dry-season form may be called **asphodelus** (Butler). *Upperside* with slightly narrower borders, in extreme forms much narrower.

Expanse: ♂♀, 40–50 mm.

Dr. A. S Corbet tells me that he saw in the Colombo Museum a gynandromorph from Ceylon in which the ♀ side was of the pale *lacteola* form.

Habitat.—CEYLON, PENINSULAR INDIA, and CENTRAL PROVINCES; very common.

179 *c*. **Eurema hecabe fimbriata** (Wallace). (Fig. 179 *a*, *b*, ♂).

Terias fimbriata, Wallace, 1867, p. 323 (♂, Mussooree); Moore, 1882, p. 253 (N.W. Himalayas); Butler, 1898 *b* (*a*), p. 71.
Terias hecabe f. *fimbriata*, Bingham, 1907, p. 253.
Terias hecabe fimbriata, Fruhstorfer, 1910, p. 167; Evans, 1932 *a*, p. 78, pl. ix, fig. B 15.5 (♂, underside); Peile, 1937, p. 63.
Eurema hecabe fimbriata, Corbet & Pendlebury, 1932, p. 160.
Terias hecabe, Moore (*non* Linn.), 1874 *a*, p. 273 (Cashmere); id., 1882, p. 252 (N.W. Himalayas); Mackinnon & de Nicéville, 1898, p. 586; Hannyngton, 1910, p. 364 (Kumaon); Peile, 1911, p. 874 (Fatehgarh).
Terias excavata, Moore, 1882, p. 252 (Kangra); Butler, 1989 *b* (*a*), p. 70; Moore, 1906 *b*, pl. 568, figs. 3, 3 *a* (♂), 3 *b* (♀).
Terias hecabe var. *merguiana* f. *excavata*, Bingham, 1907, p. 253.
Terias hecabe fimbriata f. *excavata*, Fruhstorfer, 1910, p. 167 (wet form).
Terias purrea, Moore, 1882, p. 252 (♂, Kangra); Butler, 1898 *b* (*a*), p. 70; Moore, 1906 *b*, p. 56, pl. 568, figs. 1, 1 *a* (♂), 1 *b* (♀) (wet form), 2, 2 *a*, *b* (♂♀, dry form).
Terias hecabe var. *purrea*, Bingham, 1907, p. 253.
Terias apicalis, Moore, 1882, p. 253, pl. xii, fig. 2 (imago, Kangra); Butler, 1898 *b* (*a*), p. 71; Moore, 1906 *b*, p. 59.

Terias hecabe var. *apicalis*, Bingham, 1907, p. 253, fig. 62*f* (♀, dry form).
Terias hecabe grandis f. *apicalis*, Fruhstorfer, 1910, p. 167.
Terias irregularis, Moore, 1882, p. 253, pl. xii, fig. 3 (imago, Kangra); Butler, 1898 *b* (*a*), p. 71; Moore, 1906 *b*, p. 58, pl. 568, figs. 5, 5 *a* (♂, dry form).
Terias hecabe var. *irregularis*, Bingham, 1907, p. 253.
Terias hecabe fimbriata f. *irregularis*, Fruhstorfer, 1910, p. 167 (intermed. form).
Terias simplex, Butler, 1886 *b*, p. 217, pl. v, fig. 2 (imago, N.W. Himalayas); id., 1898 *b* (*a*), p. 71.
Terias hecabe var. *simplex*, Bingham, 1907, p. 253, fig. 62*e* (imago, dry form).

♂♀. *Upperside* of fore wing with very narrow black border, somewhat dentate. Hind wing with marginal dots. In the extreme dry-season form **apicalis** (Moore) the black border of the fore wing is restricted to the apex, and posteriorly is represented only by black vein-dots.

The wet-season form, for which the name **excavatus** (Moore) may be used, appears to be less prevalent in the area, and

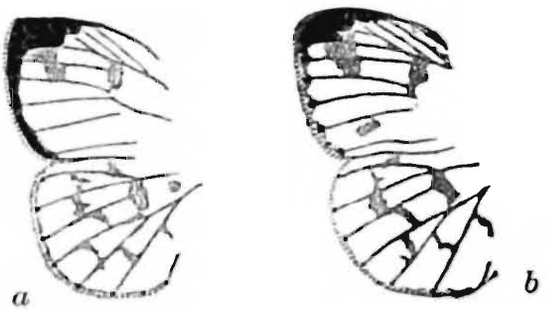


Fig. 179.—*E. hecabe fimbriata* (Wall).
a, typical form; *b*, f. *apicalis* (Moore).

is not distinguishable from many *contubernalis*; it has similar broad borders, and on the fore wing has a similar strong excavation of the border in areas 2 and 3.

Habitat.—PUNJAB to CHITRAL and KUMAON; very common.

179 *d*. **Eurema hecabe blairiana** (Moore).

Terias blairiana, Moore, 1907, p. 75, pl. 575, figs. 1 (♂), 1*a* (♀). (Andamans).
Terias hecabe blairiana, Fruhstorfer, 1910, p. 167.
Eurema hecabe blairiana, Corbet & Pendlebury, 1932, p. 161.
Terias andamana, Moore, 1907, p. 75, pl. 575, figs. 2 (♂), 2 *b*, *c* (♂).
Terias hecabe, Wood-Mason (*non* Linn.), 1881 *a*, p. 235; id., 1881 *b*, p. 251.

♂♀. *Upperside* of fore wing with broad black outer border and very narrow black costal edging.

Underside of fore wing with narrow subapical bar in the ♂, only indicated in the ♀.

Closely resembles wet-season specimens from Burma, and is doubtfully distinct.

Habitat.—ANDAMAN ISLANDS.

179 *e*. **Eurema hecabe nicobariensis** (Felder).

Terias nicobariensis, C. Felder, 1862, p. 480 ; Moore, 1877 *a*, p. 590 ; Wood-Mason & de Nicéville, 1881 *a*, pp. 236, 251 ; Butler, 1898 *b* (*a*), p. 71 ; Moore, 1907, p. 74, pl. 574, figs. 3, 3 *a*, *b* (♂♀, wet form), 3 *c* (♂, dry form).
Terias hecabe nicobariensis, Fruhstorfer, 1910, p. 167 ; Evans, 1932 *a*, p. 78.
Eurema hecabe nicobariensis, Corbet & Pendlebury, 1932, p. 161.

♂♀. Colour paler, and black border of fore wing narrower than in the nominotypical race. The narrower bordered specimens somewhat resemble the dry form in South India, the border being much narrower below vein 4, its inner edge forming a fairly regular curve. Specimens with broader borders are very like the dry form in Burma or the wet form in South India. *Underside* of fore wing with or without sparse red-brown markings.

Specimens in the British Museum from Car Nicobar have much narrower and less indented borders than those from the South Nicobars.

Habitat.—NICOBAR ISLANDS ; very common.

Eurema simulatrix (Staudinger), 1891.

The nominotypical race was described from the Philippine Islands.

♂♀. *Underside* of fore wing with a large rusty brown, cleft, apical spot. Hind wing with a distinct black spot at the base of area 7 and a figure-of-eight spot at the base of area 1 *c*.

Genitalia (fig. 173 (2)) (Corbet & Pendlebury, 1932, p. 153, text-fig. 2).—The only species with four simple appendages on the valve. The posterior three are stout and curved, whilst the fourth, situated inside the valve, is smaller and more slender.

Distribution.—BURMA to Java, the Philippines, and Celebes. One of the rarer species of the genus. One subspecies in the Indian area.

180. **Eurema simulatrix stockleyi** Corbet & Pendlebury. (Fig. 180, ♂).

Eurema simulatrix tecmessa f. *stockleyi*, Corbet & Pendlebury, 1932, p. 167 (♂, Upper Tenasserim).
Terias lacteola sarinoides, Evans (*non* Fruhst.), 1932 *a*, p. 78 (part.).

♂ (original description, compared with *tecmessa* de Nicév., from Penang and Sumatra). "Above paler yellow and of a more greenish hue than *tecmessa*, and the distal margins of both wings are distinctly serrate. The fore wing black distal border is broad towards the apex and tapers until

it is almost obsolete at the tornus, and the hind wing border is barely traceable. The markings on the underside are larger and more distinct than in *tecmessa*, and in the prominent fore wing apical spot the yellow zone is almost obsolete;

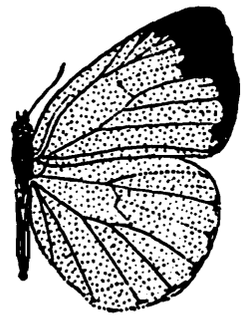


Fig. 180.—*E. simulatrix stockleyi* Corb. & Pend., ♂.

the angle formed by the two inner edges of this spot is very acute and not approximating a right angle as in *tecmessa*. Wing expanse, 40 mm."

The ♀ of this subspecies does not appear to be known.

Habitat.—BURMA. The British Museum possesses five specimens from Upper Tenasserim (Tasok Plateau, 3,000 feet, January); Dawna Range (western slopes, January); "Upper Tenasserim" and "Upper Burma." Fig. 180 represents the Dawna specimen referred to above.

181. **Eurema jordani** Corbet & Pendlebury.

Eurema andersoni jordani, Corbet & Pendlebury, 1932, p. 180 (♀, Sikkim).
Terias jordani, Corbet, 1936, p. 168 (♂, Sikkim).

♂ (original description). "*Upperside.*—Fore wing as in typical *andersoni*, but the lowest portion of the black distal border is continued along the inner margin for about half the length of the wing, decreasing from less than 1 mm. in width to vanishing point, and becoming inwardly diffuse. The hind wing black border increases in width from the apex to the anal angle, where it becomes very diffuse and attains a width of 5 mm.

Underside.—Colour and markings as in typical *andersoni*, except that the fore wing apex is unmarked beyond a slight, reddish-brown, diffuse dusting at the points where the veins enter the wing-margins. Wing expanse, 35 mm."

♀ (original description). "Above yellow, but not of the deep hue usual in *andersoni*. On the *upperside* the fore wing black distal border is broad and deeply excavated, and vein 3 is tinged with black immediately before entering the border. This border is broadly continued along the basal margin; the distal third is clearly defined, then it becomes broader and very diffuse, and terminates about ½ cm. before reaching

the wing-base. The hind wing border increases in width from the apex to the tornus, and is continued for some distance along the basal margin; at the widest part this border is about 7 mm. broad. Both wings are rather heavily dusted with black at the bases. The *under surface* is a rather brighter yellow than above; the markings are rather lighter than in typical *andersoni* but of the usual character, and the tornal spot on the fore wing is small but distinct. Wing expanse, 42 mm."

Genitalia as in *andersoni*.

Habitat.—SIKKIM and BHUTAN; very rare. At present known by 1 ♂ and 3 ♀♀. Holotype ♀ in the Tring Museum from Sikkim, 15th October, 1888 (O. Möller). Neallotype ♂ from Sikkim, June 1906 (the late Brig.-Gen. E. R. B. Stokes-Roberts), in the British Museum. A second ♀ from Sikkim, 5th September, 1888 (O. Möller), and a ♀ from Chumbi, Bhutan, May 1894 (G. C. Dudgeon). The latter ♀ has the fore wing more elongate, with a wing expanse of 44 mm.

An allied species is found in Java and Sumatra, where *andersoni* also occurs.

Terias andersoni (Moore).

This species has the facies of *hecabe*, with which it may be confused.

♂♀. *Underside* of fore wing with two dark transverse subapical streaks, a single spot in the cell (*hecabe* has two spots), and traces of a dark streak in area 1 *b*. Hind wing, in area 7, with a long streak directed towards and almost contiguous with the discocellular spot.

Genitalia (fig. 173 (4)) (Corbet & Pendlebury, 1932, p. 153, text-fig. 4).—Valve with three distal simple appendages which are stout and curved, the more distal or apical one being somewhat flattened.

Distribution.—CEYLON and PENINSULAR INDIA to SIKKIM, BHUTAN, BURMA, and ANDAMAN ISLANDS, south to West Java; also on Formosa. Three subspecies in the Indian area.

182 *a*. **Eurema andersoni andersoni** (Moore). (Fig. 181, ♂).

Terias andersoni, Moore, 1886, p. 47, pl. iv, fig. 8 (♂, Mergui); Watson, 1896, p. 282; Butler, 1898 *b* (*a*), p. 70; Bingham, 1907, p. 254, fig. 63 (♂); Moore, 1907, p. 71, pl. 573, figs. 2 (♂, wet form), 2 *a*, *b* (♂♀, dry form).

Terias andersoni andersoni, Fruhstorfer, 1910, p. 169; Evans, 1932 *a*, p. 78, pl. ix, fig. B 15.7 (♂); Peile, 1937, p. 64.

Eurema andersoni andersoni, Corbet & Pendlebury, 1932, p. 177, pl. v, fig. 12 (♂), p. 153, text-fig. 4 (genitalia).

♂♀. *Upperside* rich greenish-yellow. Fore wing marginal border intensely black, its inner edge anteriorly sharply angulate on vein 7, just before the upper angle of the cell,

whence the edge of the black area is carried vertically upwards and joins the narrow black edging on the costal margin, and is posteriorly strongly incurved to its angulation on vein 4 ; the tornal projection of the black border is sloped obliquely outwards on its inner side. Hind wing with a narrow outer black border, slightly broader anteriorly, and more catenate than in *hecabe*.

Underside ground-colour slightly paler than on upperside. Fore wing with a single cell-spot ; sometimes traces of a dark streak in area 1 *b* as in *sari* ; two transverse, sinuous, apical streaks, one situated in the centre of the apical area and the other against the outer margin. Hind wing markings as in *hecabe*, but the long streak in area 7 is directed towards and almost contiguous with the discocellular mark, and the discal

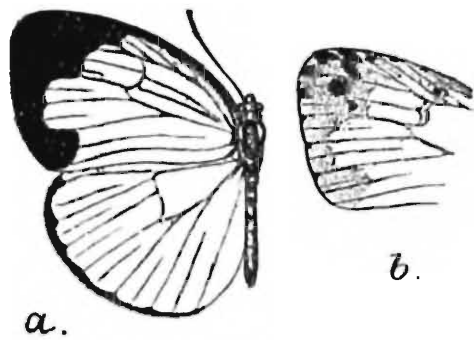


Fig. 181.—*E. andersoni andersoni* (Moore), ♂.
a, upperside ; *b*, fore wing underside.

streaks are connected to form a catenate band. The sex-band of the ♂ resembles that of *blanda*. The ♀ is paler on both sides, with more rounded fore wing than the ♂.

Expanse : ♂♀, 42–45 mm.

Habitat.—SIKKIM to SOUTHERN BURMA ; not rare. Also extending to Sumatra and North Borneo.

182 *b*. **Eurema andersoni ormistoni** (Watkins).

Terias sari ormistoni, Watkins, 1925, p. 714 (Ceylon) ; Yates, 1931, p. 1007 (Coorg).
Terias andersoni ormistoni, Evans, 1932 *a*, p. 78 ; Peile, 1937, p. 64.
Eurema andersoni ormistoni, Corbet & Pendlebury, 1932, p. 179.
Terias rotundalis, Ormiston (*non* Moore), 1924, p. 90.
Terias rotundalis, Moore (part.), 1881 *a*, pl. xlvi, fig. 1 *b* (♀).

♂♀. *Upperside* of hind wing with the outer black border very narrow and discontinuous. Both sexes smaller than the nominotypical race. The usual apical markings on the fore wing underside are barely visible in Ceylonese specimens, but are more distinct in examples from South India.

Expanse : ♂♀, 38–42 mm.

Habitat.—CEYLON and PENINSULAR INDIA ; rare.

182 *c*. **Eurema andersoni evansi** Corbet & Pendlebury.

Eurema andersoni evansi, Corbet & Pendlebury, 1932, p. 179 (nom. nov. pro *andamana* Moore, part.).
Terias andamana, Moore (part.), 1907, p. 75, pl. 575, fig. 2 *a* (type of dry-season form).
Terias andersoni andamana, Evans, 1932 *a*, p. 78.

♂. *Upperside* paler than the nominotypical race, and the underside markings show through. Hind wing with a marginal black line formed of vein-dots.

Underside with the fore wing apical markings and the streak in area 7 of hind wing very distinct. The apical markings on the fore wing comprise an anterior, rather broad and very distinct, dark brown transverse stripe, on which the veins show yellow, united by a costal stripe with a short stripe on the outer margin. Hind wing with very distinct markings ; the streak in area 7 is contiguous with the discocellular spot.

♀. *Upperside* very like the Andaman *hecabe* ♀ on the fore wing. Hind wing as in the ♂, the linear black border heavier, with a broader border of black dusting which widens posteriorly

Underside of fore wing with brown apical patch more extensive than in the ♂, and enclosing three obscure subapical yellow marks ; the inner edge of this patch is incurved and projects proximad at lower angle.

Expanse : ♂♀, 36–40 mm.

Habitat.—ANDAMAN ISLANDS ; not rare. The type came from Port Blair, and is in the British Museum.

Eurema ada (Distant & Pryer), 1887

A small and uncommon species which is confined chiefly to the hill jungles. The female is much rarer than the ♂.

♂♀. *Underside* of fore wing with two cell-spots ; sex-brand not reaching to the origin of vein 3. Hind wing with the streak in area 7 comma-shaped, and directed towards and almost contiguous with the discocellular spot.

Genitalia (fig. 173 (5)) (Corbet & Pendlebury, 1932, p. 153, text-fig. 5).—Valve with three distal appendages as in *andersoni* and *sari*, but they are of nearly equal length and are slender and more angulate than in the two allied species.

Distribution.—SOUTHERN BURMA to Java, North Borneo, and Palawan. One subspecies in the Indian area. The nominotypical race is from Borneo.

183. **Eurema ada iona,** subsp. nov.

This race is slightly differentiated from *toba* de Niceville, from Sumatra.

♂. *Upperside* lemon-yellow as in *toba*. Fore wing very much like *andersoni* Moore, and differing from *toba* and the

nominotypical race in having the inner edge of the black border below vein 2 curved distad to near the tornus. Hind wing with the black marginal border narrower than in *toba* and with only a slight linear dusting. A specimen from Rangoon and another from Tong-king have a much narrower border on the fore wing, whilst the hind wing has only a faint marginal dusting.

♀. Specimens from Burma resemble the ♂. Those from the Malay Peninsula have a broader black border on both wings; on the hind wing the border is almost as wide as in the nominotypical race; the inner edge of this border is diffuse.

Expanse: ♂♀, 27–37 mm.

Habitat.—Burma and Tong-king to the Malay Peninsula; very rare. 1 ♂, Dawna Range, April (ex Coll. Fawcett); 1 ♀, Karen Hill Tracts, October, 1924 (ex Coll. Archibald); also Rangoon, 1 ♂; Tenasserim, 1 ♂; Toungoo, 1 ♀. Malay Peninsula: Selangor-Pahang, Ginting Simpah, 2,080 feet, June 1st, 1930, June 3rd, 1929, 2 ♂♂ (♂ holotype, June 1st); Selangor, Ampang, April 15th, 1928, Dec. 25th, 1928, 2 ♀♀ (♀ allotype, April 15th); Selangor, Gombak Valley, 900 feet, June 23rd, 1929, 1 ♂; Pahang, Bentong, 770 feet, June 16th, 1929, 1 ♂; Fraser's Hill, 4,250 feet, March 3rd, 1930, 1 ♀. The above Malayan specimens collected by Dr. A. S. Corbet and presented by him to the British Museum. Also from Perak, 1 ♂, 1 ♀ (Jan. 13th, 1924, H. G. Graham), 1 ♀ (no date, H. G. Graham); Malacca, July 21st, 1907, 1 ♂ (E. W Wickham), Tong-king, 1 ♂. Described from the above specimens in the British Museum.

Eurema sari (Horsfield), 1829. (Fig. 182).

This species is easily recognized by the markings on the fore wing underside. This shows a large, black, quadrate

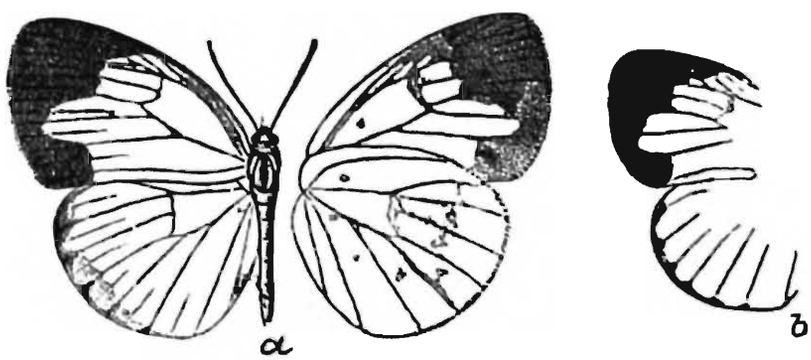


Fig. 182.—*E. sari* Horsf. *a*, form ?, ♀; *b*, ♂.

spot covering the whole of the apical area, a single cell-spot, and a black streak in area 1 *b*.

Genitalia (fig. 173 (6)) (Corbet & Pendlebury, 1932, p. 153, text-fig. 6).—Valve as in *andersoni*, but the more proximal

one of the three appendages is much shorter than the others, which also are more widely separated.

Distribution.—SOUTHERN BURMA to Java, Borneo, and the Philippines. One subspecies in the Indian area.

184. **Eurema sari sodalis** (Moore).

Terias sodalis, Moore, 1886, p. 45 (♂♀, Mergui).
Terias sari sodalis, Fruhstorfer, 1910, p. 170; Evans, 1932 *a*, p. 78; Peile, 1937, p. 64, pl. v, fig. 34 (♀, *non* ♂, as dry-season form, ex Bingham).
Eurema sari sodalis, Corbet & Pendlebury, 1932, p. 181, pl. v, fig. 7 (♀, *non* ♂).
Terias sari, Bingham (*non* Horsf.), 1907, p. 255, figs. 64 *a* (♀), 64 *b* (♂) (? dry-season form).
Terias kana, Moore (part.), 1907, p. 69, pl. 573, figs. 1 *d*, *e* (♂♀).

♂. *Upperside* deep bright yellow, markings as in *hecabe*, but marginal border more intensely black and with broader apical area; the inner edge of the excavated area, between veins 2 and 4, is directed towards the distal margin at a point just above the tornus, a character not found in other Indian *Eurema*.

Underside paler. Fore wing with a single cell-spot, a discocellular spot, a broad, dark brown streak at the tornus, and a large quadrate spot covering the apical area. Hind wing marked as in *hecabe*, but the circular cell-spot is obsolete, the markings all faint and ill-defined. The sex-brand is pale, long, and narrow as in *blanda*.

♀. Resembles the ♂, but hind wing border broader and more diffuse.

Expanse: ♂♀, 40–45 mm.

Fig. 182 *a*, reproduced from Bingham, represents a form of which no specimen exists in the British Museum. It is remarkable for the absence of the marginal band on the hind wing.

Habitat.—DAWNA RANGE to SOUTHERN BURMA, extending to the Malay Peninsula, Sumatra and North Borneo; not rare.

Terias tilaha (Horsfield), 1829.

This species is easily recognized by the fore wing upperside having the inner margin bordered with black.

Genitalia (fig. 173 (7)) (Corbet & Pendlebury, 1932, p. 153, text-fig. 7).—The valve differs considerably from that of any other Indian species. There are four appendages, which are very stout and thick; three of these are simple and spine-like in appearance, whilst the fourth is very broad, flat, and bicuspid.

Distribution.—SOUTHERN BURMA to Java, Borneo, the Philippines, Celebes, and Sula Islands. A number of subspecies, of which one occurs in the Indian area.

185. **Eurema tilaha nicévillei** (Butler).

Terias nicévillei, Butler, 1898 *b* (*a*), p. 79 (Sumatra).
Terias tilaha nicévillei, Fruhstorfer, 1910, p. 170.
Eurema tilaha nicévillei, Corbet & Pendlebury, 1932, p. 182, pl. v, fig. 14 (♂).
Terias tilaha, Evans (*non* Horsf.), 1932 *a*, p. 78.

♂. *Upperside* bright yellow. Fore wing with outer black border which extends from just beyond middle of costa to tornus, and continues along inner margin to base; the inner edge of this border is fairly regular, and the veins which traverse the basal part of the border are yellow. Hind wing with narrow black outer border, which becomes broader and more diffuse towards the tornus.

Underside rather paler than the upperside, the markings much sparser than in *hecabe*. Fore wing with a single mark in the cell, the usual discocellular spot, and faint apical markings recalling *andersoni*. Hind wing marked as in *hecabe*, but the cell-spot is either missing or very faint, and the discal markings are reduced to spots. The sex-brand is long, rather narrow, and prominent.

♀. Resembles the ♂, but hind wing *upperside* with a broader marginal border.

Expanse: ♂♀, 40–45 mm.

Habitat.—SOUTHERN BURMA (Mergui District) to North-East Sumatra; not common, very rare in Burma.

Genus **COLIAS** Fabricius. (Fig. 183).

Colias, Fabricius, 1807, p. 284; Latreille, 1810, p. 440 (type, *Papilio rhamni* Linn.); Curtis, 1829, pl. ccxlii (type, *hyale* Linn.); Butler, 1870 *a*, pp. 43, 56 (type, *Papilio palæno* Linn.); Crotch, 1872, p. 66 (type, *P. rhamni* Linn.); Elwes, 1880, pp. 133, 146; id., 1884, pp. 1–26 (revision); Röber, 1907, p. 62; Bingham, 1907, p. 232, fig. 59 (venation); Verity, 1908, p. 205; Fruhstorfer, 1910, p. 164; Bollow, 1930, p. 107; Klots, 1931, pp. 175–7; Evans, 1932 *a*, pp. 64, 78; 1934 *a*, p. 136 (type, *hyale* Linn., 1758); Hemming, 1934 *b*, pp. 12, 16, 24 (type, *hyale* Linn., fixed by Curtis, 1829).
Eurymus, Swainson, 1829, p. 129 (type, *hyale* Linn.) (nec *Eurymus* Rafinesque, 1815); Swinhoe, 1909, p. 156.
Eriocolias, J. Watson, 1895, p. 166 (type, *edusa* Fabr.).

Type, *C. hyale* Linnæus, 1758.

♂♀. Fore wing with costa arched at base, then almost straight to apex; apex obtuse; outer margin slightly convex; tornus obtusely angulate; inner margin straight, about three-fourths the length of costa; cell about half length of wing; vein 11 from the cell; veins 7+8, 9, and 10 stalked, 7+8 and 9 on a long stalk; vein 6 from above the origin of 10; *mdc* short, about half or less than half length of *ldc*, *ldc* incurved. Hind wing broadly oval; cell more than half length of wing; precostal vein absent or minute; *mdc* and *ldc* oblique, the

latter much the longer and incurved. Antennæ less than half the length of fore wing, club gradual but well marked, obtuse at apex; head clothed with longish hairs in front; palpus stout, third segment short and oval; eyes large and prominent; body moderately stout; tarsi long and spiny, pulvillus and paronychium absent.

Colias is one of the oldest genera in the Pieridæ, and can be traced back to the Tertiary Age. It agrees with *Catopsilia* in certain features of the genitalia. Sexual dimorphism is

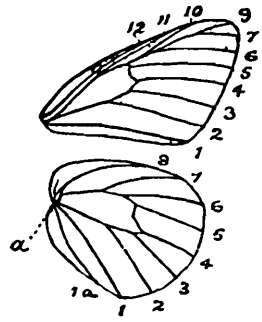


Fig. 183.—*Colias*, venation.

well developed in some species, and some females are dimorphic. Variability is very great, and numerous individual forms have received names. About 56 species are known, comprising a great many subspecies.

Distribution.—Central Asia and over the whole Palæarctic Region generally, extending to the whole of North America and along the Andes; also distributed over Africa. It occurs in SOUTH INDIA, the HIMALAYAS, South China, and Formosa, but is absent from the rest of the Indo-Australian Region.

Key to Species. (From *Evans*, 1932 *a*).

1. Upperside yellow, orange-yellow or white. 2.
   Upperside orange-red or orange .... 11.
2. Hind wing underside with discocellular spot white. Fore wing underside with discocellular spot without a pale centre 3.
   Hind wing underside with discocellular spot never entirely white. Fore wing underside with a pale centre to the discocellular spot. ... ... 5.
3. Fore wing upperside without a discocellular spot. ♂ pale sulphur-yellow, with uniform broad black border. ♀ paler, with yellow marginal spots ... . [p. 543. *marcopolo* Gr.-Grsh.,
   Fore wing upperside with a dark discocellular spot. .... 4.
4. Cilia and costa of both wings white. ♂ upperside pale greenish, veins black. ♀ fore wing white to pale greenish; hind wing upperside with white discocellular spot [p. 543. *alpherakyi* Stgr.,
   Cilia and costa of both wings pinkish. ♂ upperside orange-yellow. ♀ upperside white to yellow or orange; hind wing with prominent orange discocellular spot [p. 544. *wiskotti* Stgr.,

5. Hind wing upperside with a broad pale border or a complete row of pale spots. Hind wing underside with a reddish-brown dash beyond the white cell-spot . . . . 7.
Hind wing upperside not darkened; post-discal band and submarginal yellow spots not below vein 6, the discocellular spot orange. Hind wing underside yellow, more or less black-dusted; discocellular spot circular, edged dark red . . . . . 6.
6. Fore wing upperside with submarginal spots . . . . . [p. 553. *erate* f. *glicia* Fruhst.,
Fore wing upperside without submarginal spots . . . . . *erate* (Esp.), p. 551.
7. Upperside white to greenish-yellow, more or less overlaid with black. Fore wing upperside with the submarginal spots joined to margin . . . . 8.
Upperside clear yellow or orange-yellow. 9.
8. Fore wing upperside with discocellular spot small . . . . . [p. 545. *montium* Oberth.,
Fore wing upperside with discocellular spot large. . . . . [p. 546. *cocandica* Ersch.,
9. ♂ upperside bright yellow, ♀ orange-yellow. Fore wing marginal spots large, complete, and of equal size. . . . [Feld., p. 548. *ladakensis* C. & R.
Fore wing upperside with marginal spots never complete nor equal, only upper part of spot in area 1 *b* present, and spot in area 3 small or absent . . . . . 10.
10. Fore wing upperside in ♂ clear yellow, in ♀ tinged orange. Hind wing upperside darkened, a prominent yellow discocellular spot, pale border continuous . . . . . *berylla* Fawc., p. 549.
Fore wing upperside orange-yellow. Hind wing upperside darkened, a prominent orange discocellular spot, pale submarginal spots separated . . . . . *nina* Fawc., p. 550.
11. Hind wing upperside without a sex-brand in ♂. . . . . 12.
Hind wing upperside with a yellow sex-brand at base of area 7 . . . . . *electo* (Linn.), p. 561.
12. Hind wing underside glaucous bluish-green, no crimson dash alongside the white cell-spot. . . . . [p. 557. *leechi* Gr.-Grsh.,
Hind wing underside greenish, cell-spot prominently flanked by deep crimson . . . . . 13.
13. Hind wing underside with veins pale, dark discal spots absent or obscure . . [p. 555. *eogene* C. & R. Feld.,
Hind wing underside with veins not pale, dark discal spots usually prominent. Upper-side clear orange. ♀ hind wing upperside more or less blackish . . . . . 14.
14. ♂ marginal border without spots. ♀ hind wing upperside blackish, a prominent discocellular orange spot which is distally elongate . . . . . [p. 558. *stoliczkana* Moore,
♂♀ marginal border with yellow spots. Hind wing upperside with only the discal area blackish *dubia* Elw., p. 560.

186. **Colias marcopolo** Grum-Grshimaïlo.

Colias marcopolo, Grum-Grshimaïlo, 1888, p. 304 (♀, Pamir); id., 1890, p. 318, pl. vi, figs. 1–3 (♀); Röber, 1907, p. 62, t. 25 *a* (♀); Verity, 1908–11, pp. 210, 214, 346, pl. xl, figs. 1, 3 (♂), 2 (♀), pl. lxviii, fig. 38 (♀ paratype); Tytler, 1926, p. 252 (Gilgit); Evans, 1932 *a*, p. 79.
Colias marcopolo ab. *nicopolo*, Röber, 1907, p. 62, t. 25 *d* (♂).

♂. *Upperside* pale sulphur-yellow, both wings with a moderately broad outer black border, traversed by the yellow veins. Fore wing rarely with a discocellular spot. Hind wing with a large discocellular yellow spot, not prominent.

Underside of fore wing greyish-yellow, with greyish-green outer border. Hind wing dark greyish-green; discocellular spot whitish.

♀. *Upperside* orange-yellow. Fore wing with outer dark border broader than in the ♂, and bearing small submarginal yellow spots. Hind wing with outer dark border and submarginal spots becoming obsolete posteriorly; inner area yellow.

Expanse: ♂♀, 40–45 mm.

Habitat.—GILGIT: Thui Nallah; very rare. The home of this species is in the South-Eastern Pamir.

The name **nicopolo** Röb. refers to the nominotypical ♂.

Colias alpherakyi Staudinger, 1882.

♂. *Upperside* yellow, more or less dusted with black. Fore wing with prominent discocellular black spot; outer black border of moderate width, bearing submarginal spots of variable size. Hind wing with outer dark border narrow or absent; pale disocellular spot obscure.

Underside of fore wing light yellow, with large black discocellular spot. Hind wing more or less dusted with black proximally.

♀. *Upperside* paler than the ♂, the black markings less developed. Fore wing with discocellular spot as in the ♂.

Underside of fore wing with brighter yellow apical area; hind wing dusted with greyish-green.

Distribution.—Turkestan to CHITRAL; rare. One subspecies in Chitral.

187. **Colias alpherakyi chitralensis** Verity.

Colias alpherakyi chitralensis, Verity, 1911, p. 349, pl. lxix, figs. 31, 32 (♂♀, Chitral); Bollow, 1930, p. 109; Evans, 1932 *a*, p. 79.
Colias alpherakyi, Bingham (*non* Staudinger), 1907, p. 239; Swinhoe, 1909, p. 163, pl. 604, figs. 5, 5 *a* (♂♀).

♂. *Upperside* pale sulphur-yellow. Fore wing with basal area and veins lightly dusted with black; an oval black discocellular spot; outer third of wing black, its inner edge irregular and diffuse; a submarginal series of somewhat

rectangular spots. Hind wing with basal and discal areas dusted with black; a pale discocellular ill-defined spot and some anterior marginal black markings that vary considerably in extent and are not alike in any two specimens. Cilia of both wings prominent and of the same tint as ground-colour of wings.

Underside of both wings dusted with black to a varying degree, and when very dense gives a blackish tint to the ground-colour, especially on the hind wing. Fore wing with discocellular spot larger than on upperside; some variable posterior discal black markings, generally confined to areas 1 and 2. Hind wing uniform; a prominently white round discocellular spot; outer border broadly paler, with the black dusting decreasing greatly in density. Antennæ, head, thorax, and abdomen concolorous with the ground-tint; antennal club more or less brownish, sometimes pink.

♀. *Upperside* with white ground-colour, very faintly suffused with yellow, the markings similar to those of the ♂.

Underside of fore wing white, the apex suffused with yellow and the black dusting chiefly confined to that area. Hind wing white, suffused with yellow; dusted with black except along outer margin. Antennal club usually more pink than in the ♂.

Expanse: ♂♀, 50–55 mm.

Habitat.—CHITRAL; very rare.

Colias wiskotti Staudinger.

♂. *Upperside* greenish-yellow to golden-yellow. Both wings with a broad black outer border which is more or less distinctly traversed by the yellow veins. Fore wing with a black discocellular spot; outer border more or less produced on the inner margin. Hind wing with outer border stopping at vein 2.

♀. *Upperside* orange, with broad black borders bearing yellow or white submarginal spots, veins more or less dusted with black. Hind wing with black border restricted to a broad anterior patch.

The larva is said to feed on *Oxytropis* and *Astragalus*.

Distribution.—Turkestan, the Pamirs, and CHITRAL. Very variable, and two subspecies distinguished, one in Chitral.

188. **Colias wiskotti wiskotti** Staudinger & Bang-Haas.

Colias wiskotti, Staudinger & Bang-Haas, 1882, p. 166, pl. ii, figs. 9, 10 (♂♀, Alai, Samarkand); Grum-Grshimaïlo, 1890, p. 347; Bingham, 1907, p. 240 (Chitral); Verity, 1908–11, pp. 260, 261, 357, pl. xlvi, figs. 1 (♂), 2, 3 (♀), pl. xlix, fig. 34 (♂), pl. li fig. 24 (♂); Swinhoe, 1909, p. 170, pl. 605, figs. 1, 1 *a* (♂♀).

Colias wiskotti wiskotti, Röber, 1907, p. 70, t. 27 *d* (imago); Evans, 1910 *b*, p. 424; id., 1932 *a*, p. 79.

Colias wiskotti ♀ f. *leuca*, Staudinger & Bang-Haas, 1882, p. 167 ; Röber, 1907, p. 70, t. 27 *e* (imago) ; Verity, 1909, p. 261. pl. xlvi, fig. 6 (♀), pl. xlix, fig. 35 (♀).

♂. *Upperside* with proximal half of both wings greenish-yellow, distal half opaque black. Fore wing often orange, dusted sparsely with black ; veins crossing the black area anteriorly are yellow, sometimes all the veins are bright yellow where they cross the border ; inner edge of black area more or less sinuate ; an oval, black or dark ferruginous-red discocellular spot. Hind wing more or less dusted with black ; black border almost crescentic, not extended below vein 1 ; discocellular spot pale orange, large, round and prominent ; cilia pale yellow.

Underside pale sulphur-yellow. Fore wing paler posteriorly : a posterior discal spot nearly always present, prominent and blackish-brown ; this spot sometimes forms the lower one of a discal incomplete series of ill-defined similar spots ; discocellular spot smaller than on upperside. Hind wing with uniform ground-colour ; a discocellular spot, smaller than on upperside, and paler than the ground-colour. Cilia of both wings very pale yellow, almost white.

♀. *Upperside* of fore wing generally orange, sometimes yellow or even mealy white ; outer black border much narrower than in the ♂ ; a submarginal series, often incomplete, of diffuse, ill-defined spots of the ground-colour. Hind wing with outer border very irregular, either covering only the apical portion of wing or more or less extended posteriorly, always broken and interrupted by yellow diffuse spots which sometimes coalesce and restrict the black area ; discocellular spot orange as in the ♂.

Underside as in the ♂, but fore wing with basal half usually orange. Cilia of both wings rose-pink, that colour continued very narrowly along the costal edges of both wings, and also along inner margin of hind wing. In both sexes the antennæ are rose-pink ; head, thorax, and abdomen either concolorous with the ground-colour of basal areas of wings or a little paler.

Expanse : ♂♀, 50–55 mm.

The name **leuca** Stgr. applies to white females.

Habitat.—Samarkand to CHITRAL ; very rare in Chitral.

Colias montium Oberthür, 1886.

♂. *Upperside* greenish-yellow. Fore wing with outer black border bearing five prominent submarginal spots, with a sixth minute spot in area 3 ; a small discocellular black spot. Hind wing outer border restricted by large marginal yellow spots which are smaller anteriorly where the black area is more extended.

♀. *Upperside* yellowish-white, with markings much as in the ♂. Hind wing more or less dusted with black, the pale discocellular spot prominent.

Distribution.—South-West China to North-East and South-East Tibet and BHUTAN.

189. **Colias montium irma** Evans.

Colias cocandica irma, Evans, 1924, p. 972, ♀ (Tibet: Lutsang-Po).
Colias cocandica, Evans (*non* Ersch.), 1915, p. 543, pl. 1 (♀) (Tsang-Po).
Colias montium longto, Evans, 1924, p. 973 (♀, Bhutan to Gyantse); O. Bang-Haas, 1927, p. 42; Bollow, 1930, p. 109.
Colias montium irma ♀ f. *longto*, Talbot, 1935, p. 643.

♂. Scarcely different from the nominotypical race from South-West China.

♀. Ground-colour white. Fore wing with submarginal spots, including one in area 3, larger than in the ♂; inner edge of black border more curved posteriorly; veins dusted with black; discocellular spot crescent-shaped. Hind wing much darker.

♀ form **longto** Evans.—*Upperside* of fore wing with black border much wider, the submarginal spots small. Hind wing nearly black, with large creamy-white discocellular spot and small submarginal spots.

Expanse: ♂♀, 48–54 mm.

Habitat.—BHUTAN and South-East Tibet; very rare. The type of *longto* is in the British Museum, from Tibet (between Bhutan and Gyantse); also two specimens from Bhutan (Singhi Dzong, 13,800 feet, October 1933, F Ludlow and G. G. Sheriff).

Colias cocandica Erschoff, 1874.

♂. *Upperside* greenish-yellow, dusted with black; outer black borders usually broad, with more or less irregular inner edge, and bearing prominent submarginal spots. Fore wing with prominent black discocellular spot.

Underside of fore wing greyish-yellow, with black discocellular spot and small black submarginal spots. Hind wing dark yellowish-green, with broad outer yellowish border; discocellular spot silvery, edged with reddish.

♀. *Upperside* variable, usually greenish or greyish-white.

Underside paler than in the ♂, the markings more pronounced.

Distribution.—Turkestan to Western China, HINDU-KUSH, LADAK, Tibet. Three subspecies are found in the Indian area. The species is very variable in both sexes. It occurs above 12,000 feet.

190 *a*. **Colias cocandica hinducucica** Verity.

Colias cocandica hinducucica, Verity, 1911, p. 353, pl. lxx, figs. 25, 26 (♂), 27 (♀) (Hindu-Kush); Tytler, 1926, p. 253 (Gilgit); Bollow, 1930, p. 108; Evans, 1932 *a*, p. 79.
Colias cocandica ♀ f. *galba*, Grum-Grshimaïlo, 1893, p. 381; Röber, 1907, p. 63; Verity, 1909–11, pp. 233, 354, pl. xlii, fig. 13 (♀), pl. lxx, fig. 28 (type, Hindu-Kush).
Colias cocandica hinducucica ♂ f. *integra*, Verity, 1911, p. 353, pl. lxxii, fig. 28 (♂, Beik, Hindu-Kush); Bollow, 1930, p. 108.

♂♀. Smaller than the nominotypical form; black border wider and black dusting more extended, especially over the discal areas. Hind wing much darkened. In the ♂ the submarginal spots on both wings are small.

The ♂ form **integra** Verity is very dark, and the fore wing is without submarginal spots.

The ♀ form **galba** Gr.-Grsh. has the ground-colour of the wings lemon-yellow.

Expanse: ♂♀, 35–45 mm.

Habitat.—Hindu-Kush: Misgah, Hunza; rare.

190 *b*. **Colias cocandica thrasibulus** Fruhstorfer.

Colias thrasibulus, Fruhstorfer, 1910, p. 165, t. 72 *c* (imago) (nom. nov. pro *elwesi* Röb.); Evans, 1932 *a*, p. 79.
Colias cocandica thrasibulus, O. Bang-Haas, 1927, p. 41.
Colias nastes leechi, Elwes, 1898, p. 466; Bingham, 1907, p. 238 (Ladak).
Colias cocandica elwesi, Röber, 1907, p. 63 (nom. nov.).
Colias elwesi, Verity, 1909–11, pp. 233, 352, pl. lxx, figs. 19, 21 (♂), 20 (♀); Swinhoe, 1909, p. 164.
Colias elwesi ♀ f. *fulgida*, Verity, 1911, p. 354, pl. xlii, fig. 24 (♀, Ladak).

♂♀. *Upperside* black markings similar to those of *C. ladakensis* Feld., but the ground-colour pale greenish-yellow in the ♂ and still duller in the ♀, almost a dead sullied white. Hind wing without a discocellular spot.

Underside dull greenish-white; veins of both wings white. Fore wing with conspicuous discocellular spot as on upperside; a post-discal, generally complete, series of black spots; costa, apex, and outer margin more or less dusted with black. Hind wing with proximal four-fifths densely dusted with black, and along the outer margin this generally ends in a black spot in each area; the darkened proximal area is a rich dark green colour; a pale streak near apex of cell terminates in a black discocellular spot; distal fifth dusted lightly with yellow, crossing which the terminations of the greenish-white veins stand out conspicuously. Antennæ and head pale pinkish-brown; thorax, palpi, and abdomen on both sides dusky greenish-white.

Expanse: ♂♀, 35–45 mm.

Habitat.—Ladak, 15,000 to 17,000 feet; very rare. Known from the Chonging Valley and Kardong Pass.

191. **Colias ladakensis** C. & R. Felder.

Colias ladakensis, C. & R. Felder, 1865, p. 197, t. xxvii, figs. 8, 9 (♂, Ladak); Moore, 1882, p. 254 (Baralacha Pass); Elwes, 1884, p. 24; Mackinnon & de Nicéville, 1898, p. 589 (Nilung Pass); Röber, 1907, p. 65; Bingham, 1907, p. 236; Verity, 1909, p. 229, pl. xli, figs. 30, 32 (♂), 31 (♀); Fruhstorfer, 1910, p. 165; O. Bang-Haas, 1927, p. 110; Evans, 1932 *a*, p. 79.
Colias shipkee, Moore, 1865 *a*, p. 492, pl. xxxi, fig. 13 (imago) (Tibet); Swinhoe, 1909, p. 162, pl. 603, figs. 3, 3 *a* (♂♀).
Colias ladakensis f. *flava*, Riley, 1926, p. 277, pl. i, fig. 4 (♂, Kumaon); O. Bang-Haas, 1927, p. 110 (♂♀); Bollow, 1930, p. 110, t. 7 *f* (imago); Evans, 1932 *a*, p. 79.

♂♀. *Upperside* bright yellow in the ♂, orange-yellow in the ♀. Fore wing submarginal spots not joined to the margin. Hind wing usually with an orange discocellular spot, and at least with blackish spots near the apex.

Underside of fore wing with discal black spots only in areas 1 to 3.

♂. *Upperside* bright sulphur-yellow. Fore wing with a small patch of black dusting at extreme base; a black discocellular spot; distal fourth of wing evenly black from costa to inner margin, the inner edge of this border curved and not sharply defined; a series of submarginal, large, somewhat oval yellow spots, beyond which to the margin the veins are slenderly but conspicuously yellow. Hind wing with a sparse basal clothing of long yellow hairs; the base and a broad posterior area down to the disc dusted with black; discocellular spot orange-yellow, but sometimes wanting; outer margin towards the apex with broad black border bearing yellow spots, somewhat as on the fore wing but not clearly defined; this border and the spots fade out posteriorly, and are merged in the ground-colour, which extends to the tornal angle and to the margin above it.

Underside ground-colour similar but somewhat paler. Both wings shaded with green, as follows:—Fore wing on the costa, apex, and more or less along outer margin; hind wing over the whole surface, but most densely over the proximal four-fifths. On both wings the distal ends of the veins are prominently yellow, with the green shading above and below each vein slightly cleared, giving to the wings an appearance of markings resembling a submarginal sub-lanceolate series of bright yellow spots. Fore wing with a black discocellular spot: post-discal black markings that decrease in size and become obsolete anteriorly. Hind wing with a large yellow-centred reddish discocellular spot joined to a conspicuous yellow cell-streak; a slender pink costal line on both wings; cilia of both wings pink. Antennæ and head salmon-pink; thorax and abdomen greenish-yellow; underside of palpi, thorax, and abdomen whitish-yellow, slightly shaded with dusky black.

♀. Similar to the ♂. *Upperside* with richer ground-colour. Fore wing with broader black border, only the posterior veins crossing it being yellow. Hind wing with denser dusky black shading.

Underside almost as in the ♂.

Expanse : ♂♀, 45–50 mm.

♂ form **flava** Riley.—*Upperside* with pale yellow ground-colour, the marginal markings more lemon-yellow, especially on the hind wing.

According to Riley (1926) there is no difference in the genitalia of this species and that of *nina* Fawc. from Tibet and Sikkim.

Habitat.—KASHMIR to KUMAON ; rare.

192. **Colias berylla** Fawcett.

Colias berylla, Fawcett, 1904, p. 139, pl. ix, fig. 8 (♀, Khamba Jong) ; Elwes, 1906, p. 480, pl. xxxvi, fig. 13 (♂) ; Röber, 1907, p. 66, t. 26 *e* (imago) ; Fruhstorfer, 1910, p. 165 ; Swinhoe, 1909, p. 169, pl. 604, figs. 1 (♂), 1 *a*, 2 (♀) ; Evans, 1915, p. 543 (Tibet) ; Riley, 1927, p. 123 (♀, Tibet) ; O. Bang-Haas, 1927, p. 111 ; Evans, 1932 *a*, p. 80, pl. ix, fig. B 16.7 (♀).

Colias ladakensis berylla, Bingham, 1907, p. 237.

Colias erschoffi berylla, Verity, 1909–11, pp. 253, 345, 350, pl. l, figs. 25, 26 (♂♀), pl. lxx, figs. 9–12 (♂), 13–15 (♀).

Colias berylla ♂ f. *aurantiaca*, Verity, 1911, p. 351, pl. lxx, fig. 11 (Khamba Jong).

♂. *Upperside* rich bright sulphur-yellow, very pure in tint and very different from the ground-colour of *C. hyale* ; also much richer and brighter than in *C. ladakensis*. Fore wing with base posteriorly and for a very short way along inner margin black ; costal margin slightly dusted with black ; an oval discocellular jet-black spot ; distal third of wing black, usually somewhat diffuse outwardly, the inner edge of the black area irregular and sinuate, slightly and diffusely produced inwards between the veins ; a series of submarginal, more or less elongate spots of the ground-colour in areas 1 to 6, 9 and 10, each spot with a fine linear prolongation to the margin ; the spots are well defined, with the exception of those in areas 1 and 3, which are sometimes slightly dusted with black. Hind wing with inner margin paler, the basal and median areas as far as the costal margin shaded with dusky greenish-black, overlaid near the base by long, pale, recumbent yellow hairs ; this dusky black area broken by a conspicuous large discocellular spot of the ground-colour, centred with deeper yellow, and a subapical elongate jet-black irregular patch ; outer margin very broadly beyond the dusky black area of the shade of the ground-colour, with a very obscure submarginal broad band of black dusting which, at the apex, forms a narrow, short, curved band.

Cilia yellow, of the fore wing anteriorly and of the hind wing posteriorly pink.

Underside yellow, with a rich green tint, especially on the areas that on the upperside are black. Fore wing with a discocellular spot and three posterior post-discal spots in a transverse row that decrease in size towards the costal edge of the wing, jet-black. Hind wing with discocellular spot much smaller than on upperside and silvery white, the yellow ground-colour prominent on a broad band along the outer margin. Antennæ bright reddish-pink; head, thorax, and abdomen black, the head with tufted pinkish hairs anteriorly, thorax and abdomen shaded with longish dusky hairs; underside of palpi, thorax, and abdomen greenish-yellow.

♀. Resembles the ♂. *Upperside* of fore wing rich orange-yellow; anteriorly and at the base this colour overlaid by dusky black extending broadly along the costal margin above the cell. Hind wing as in the male, but basal and median areas almost jet-black; the broad marginal yellow band much shaded with dusky black.

Underside somewhat paler than the ♂.

Expanse: ♂♀, 45–55 mm.

Habitat.—SIKKIM to the Tibet border; not rare.

Colias nina Fawcett.

♂♀. Very similar to *berylla*, but the ground-colour orange-yellow. Distinguished from *berylla f. aurantiaca* Verity by the hind wing discocellular spot being elongate instead of rounded.

Distribution.—SIKKIM to the Tibet border and region of Mount Everest. Two subspecies, one confined to the Everest region.

193. **Colias nina nina** Fawcett.

Colias nina, Fawcett, 1904, p. 140, pl. ix, fig. 9 (♀, Khamba Jong); Elwes, 1906, p. 480; Verity, 1911, p. 350, pl. lxx, figs. 3–5 (♂), 6–8 (♀); O. Bang-Haas, 1927, p. 110; Evans, 1932 *a*, p. 80.

♂. *Upperside* of fore wing orange-yellow; a prominent black discocellular spot; outer black border as in *berylla* Fawc., but its inner edge more defined; submarginal sulphur-yellow spots as in *berylla*, much larger in some specimens than in others. Hind wing black, the proximal two-thirds dusted with orange, leaving a wide outer black border, its inner edge usually diffuse; submarginal spots as on fore wing, usually smaller than in *berylla*, and when contiguous are separated by the blackened veins; these spots have the distal edge diffuse, and the three posterior spots touch the margin; inner margin (areas 1 *a* and 1 *b*) yellowish-grey as in allied

species ; a prominent orange discocellular spot, more or less elongate, produced in area 4, beyond the cell, to a point, and often extended as far as the submarginal spot ; usually a second small, oval, orange spot in the base of area 5.

Underside greenish-yellow as in the allied species. Fore wing with black discocellular spot which varies in size ; two to four black submarginal spots in areas 1 *a* to 3, that in 1 *b* the larger ; discal and median areas pale orange ; submarginal spots showing through from upperside. Hind wing with a small, rounded, silvery discocellular spot, edged with reddish-brown very broadly on its distal side ; the wing is lightly dusted with black as far as the outer border, where the submarginal spots of the upperside are lightly indicated. Antennæ head, palpi, thorax, and abdomen as in *berylla*.

♀. Resembles the ♂. *Upperside* of fore wing with broader outer border ; veins more heavily blackened. Hind wing with distal black ground-colour usually more extended, especially above vein 4.

Underside, with exception of orange discal and median areas of fore wing, more dusted with black than in the ♂, and therefore greyish-green.

Expanse : ♂♀, 45–55 mm.

Habitat.—SIKKIM to the Tibet border ; not rare. In the British Museum are specimens from Gyantse, 13,000 feet, June and July, and from Goshi, 14,000 feet, June.

Colias erate (Esper).

♂. *Upperside* yellow, rarely orange. Fore wing typically without submarginal spots, but these spots present in some localities ; when submarginal spots are present, the spot in area 2 is well separated from the inner edge of the black border, this character serving to distinguish such specimens from very similar *hyale* examples. Hind wing with an outer black border of moderate width, the veins crossing it being thinly yellow ; the border is narrower in specimens with submarginal spots on fore wing.

♀. *Upperside* yellow or white. Fore wing with submarginal spots, those in areas 1 *b* and 2 usually distinctly separated from the inner edge of the black border, the spot in 1 *b* always present, though sometimes obscure. Hind wing with outer macular border, which extends to veins 3 or 2 and is wider than in similar *hyale* females.

Genitalia.—The dorsal process of the eighth segment is very broad and short ; in *hyale* this process is longer, much narrower, and obovate. Valve anteriorly on ventral side with a deep excavation, and is on the whole rather broad ; in *hyale* the valve is much narrower, its ventral edge anteriorly incurved, with a short triangular process at about the middle.

Distribution.—South Russia to Japan and Formosa. Two subspecies occur in the Indian area.

The *glicia* form of male is very rare in Russia, not common in Turkestan, Afghanistan, and Baluchistan, but in India proper it is twice as numerous as the f. *erate*. In China and Japan only the f. *glicia* is to be found.

The white form of ♀ is very common in India, less so in Turkestan and Russia. In China and Japan it occurs a little more frequently than the yellow form.

194 *a*. **Colias erate erate** (Esper). (Fig. 184, ♂♀).

Papilio erate, Esper, 1805, p. 13, pl. cxix, fig. 3 (♂).
Colias erate, Butler, 1880 *a* (*b*), p. 409 (Kandahar); id., 1881 *b*, p. 607 (Quetta); id., 1882, p. 208 (Kandahar); Moore, 1882, p. 255 (N.W. Himalayas); Elwes, 1884, p. 23; Swinhoe, 1885 *b*, p. 344; Butler, 1886 *a*, p. 370; Mackinnon & de Nicéville, 1898, p. 588 (Mussooree, Dehra Dun); Leslie & Evans, 1903, p. 675.
Colias hyale f. *erate*, Bingham, 1907, p. 234; Evans, 1932 *a*, p. 80.
Eurymus erate, Swinhoe, 1909, p. 157, pl. 602, figs. 1, 1 *b* (♂), 1 *a* (♀) (wet form), 1 *d* (♂), 1 *e* (♀) (dry form), 1 *c* (♀, albino).
Colias lativitta, Moore, 1882, p. 255 (♂♀, Nepal).
Colias hyale lativitta, Fruhstorfer, 1910, p. 164, t. 72 *f* (imago).
Colias erate lativitta, Evans, 1932 *b*, p. 200 (Baluchistan); Peile, 1937, p. 65, pl. viii, figs. 61 (♂, spring form), 62 (♂, summer form, *glicia* Fruhst.), 63 (♂, var.).
Colias neriene var. *chrysodona*, Boisduval, 1840, p. 7.
Eurymus chrysodona, Swinhoe, 1909, p. 160, pl. 603, figs. 2 (♂), 2 *a*, *c* (♀) (wet form), 2 *b* (♂), 2 *d* (♀) (dry form).
Colias erate var. *pallida*, Staudinger, 1860, p. 3 (♀); Butler, 1880 *a* (*b*), p. 409 (Kandahar); id.,1882, p. 208 (Kandahar); Moore, 1882, p. 254 (N.W. Himalayas); Lang, 1884, p. 54, pl. xii, fig. 5 (♀); Röber, 1907, p. 66; Verity, 1909, p. 221.
Colias hyale ♀ f. *pallida*, Evans, 1932 *a*, p. 80.
Colias erate f. *chryseis*, Röber, 1907, p. 66, t. 26 *b* (♂).
Colias hyale glicia, Fruhstorfer, 1910, p. 164, t. 72 *f* (imago, Kashmir).
Eurymus glicia, Swinhoe, 1909, p. 159, pl. 602, figs. 2 (♂), 2 *a* (♀) (wet form), 2 *b*, 2 *d* (♂), 2 *c* (♀) (dry form).
Colias erate lativitta f. *glicia*, Peile, 1937, p. 65, pl. viii, fig. 62 (♂) (= wet-season form).

♂. *Upperside* lemon-yellow; costa of fore wing, base of both wings, and posterior half of hind wing dusted with black; on the hind wing the black scaling does not extend to the tornal angle. Fore wing with a small, oval, discocellular black spot; apex and outer margin broadly black, broadest at the apex and narrowing to tornus; with or without yellow submarginal spots, and sometimes these only present at the apex. Hind wing with a double, deep, orange-yellow discocellular spot; an outer black border, which is either continuous or more or less irregular, and often interrupted and broken into marginal spots; it extends from vein 2 to the apex.

Underside lemon-yellow ; base and costa of fore wing and basal half or more of hind wing very lightly dusted with black. Fore wing with discocellular spot as on upperside; a post-discal row of black spots that decrease in size, curve inwards, and become reddish in colour anteriorly. Hind wing with a double silvery discocellular spot, each spot with a slender red inner and outer ring, in some specimens each spot has only the inner ring, and the two together are encircled by an outer slender ring ; a post-discal, curved, somewhat obscure series of red spots, of which the subcostal spot is large and prominent. Both wings with cilia and a marginal line salmon-pink ; on the fore wing this line does not reach the tornal angle, and on hind wing it is not extended to basal half of inner margin. Antennæ, head, and thorax in front

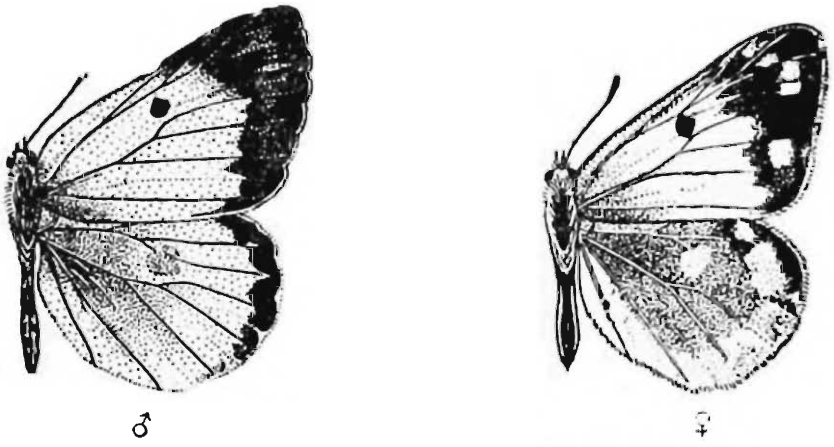


Fig. 184.—*C. erate erate* (Esp.), ♂♀.

more or less salmon-pink, rest of thorax and abdomen yellow, strongly overlaid with greenish-black ; underside pale yellow, legs pinkish.

♀. Resembles the ♂ in markings, but the ground-colour on both sides either paler yellow or white. Fore wing *upperside* with submarginal spots, usually larger and more numerous than those in the males which bear them.

Expanse : ♂♀, 45–55 mm.

Variation.—The nominotypical form occurs most frequently in the dry season from November to March. Fig. 184 represents the type-specimens of *lativitta* Moore, in the British Museum.

Form **chrysodona** Boisd.—This resembles *e. erate* except that the ground-colour in both sexes is more or less tinged with orange. This form is always rare, but occurs in all localities inhabited by the yellow *erate* form.

Form **glicia** Fruhst.—This represents the *hyale*-like form, in which the ♂ has submarginal spots on the fore wing, and the hind wing black border is not continuous.

♀. Yellow or white. This form occurs during the wet season from March to October, and is common throughout the area; the nominotypical form becomes rare in Kumaon.

♂ form **chryseis** Röb. is the orange ♂ of *glicia*.

♀ form **pallida** Stgr.—This name may be applied to white females of either *e. erate* or *glicia*. According to Peile (1937, p. 66) these females are twice as numerous as yellow ones in India.

An interesting account of the variation of this species in India is given by Peile (1937, pp. 65–8). Out of 24 males collected at Mussooree, 5,000–7,000 feet, from April to July 7th, "four are typical *lativitta*, the rest form a series completely transitional to f. *glicia*."

Habits.—According to Peile (1937) this species, on the North-West Frontier, "frequents lentil (Indian *dhal*), lucerne (*khaseel*) and young cereal crops, the last perhaps on account of *Oxalis* flowers along the irrigation channels, and often grassy slopes from 5,000 to over 9,000 feet, as on Fox's Hill and Banog at Mussooree, and Naini Tal. The flight is faster, rather higher, and ranging over much more ground than *C. fieldii*."

C. erate (Esp.) and *C. hyale* (Linn.) are two distinct species which are distinguishable not only by certain pattern characters but also, as previously described, by a wide difference in two parts of the genitalia. It is strange that *hyale* appears to be absent from India, although found in Persia and Turkestan.

The British Museum contains a long series of *erate* covering its entire range. I can detect no characters by which the Indian specimens (*lativitta* Moore) can be separated from those found in Turkestan and South Russia; the species is very variable throughout these areas.

Habitat.—BALUCHISTAN to CHITRAL and KUMAON; common. The form *chrysodona* occurs from Baluchistan to Chitral, and is rare.

194 *b*. **Colias erate nilagiriensis** C. & R. Felder.

Colias nilagiriensis, C. & R. Felder, 1859, p. 395 (Malabar); Butler, 1881 *b*, p. 607; Elwes, 1884, p. 23; Hampson, 1889, p. 362; Swinhoe, 1909, p. 161, pl. 603, figs. 1 (♂), 1 *a*, *c* (♀); Peile, 1937, p. 65, pl. viii, fig. 65 (♂).

Colias hyale nilagiriensis, Fruhstorfer, 1910, p. 164, t. 72 *f* (imago); Evans, 1910 *a*, p. 385 (Palni Hills); id., 1932 *a*, p. 80.

Colias hyale nilgiriensis (sic), Bingham, 1907, p. 234, pl. xviii, fig. 121 (♂); Verity, 1909, p. 225, pl. xl, figs. 40, 41 (♂♀).

♂. *Upperside* a deeper and brighter yellow than in the nominotypical race. Fore wing with broader outer black area and smaller submarginal spots; basal black dusting spread over most of the wing.

Underside with the ground-colour a brighter yellow than in the nominotypical race; costal and apical area of fore wing, and entire hind wing somewhat densely dusted with black, giving the wings a decidedly green tinge.

♀. *Upperside* white, densely dusted with black over the basal third of fore wing and over the whole hind wing; outer black borders of both wings broader than in the nominotypical race; fore wing with two submarginal white spots prominent in areas 2 and 4.

Underside of fore wing white, the apex broadly greenish-yellow; other markings as in the nominotypical race. Hind wing greenish-yellow, the markings very much as in the nominotypical race.

Expanse: ♂♀, 45–50 mm. On the whole smaller than the nominotypical race.

Habitat.—Peninsular India, 5,000 feet: common.

Colias eogene C. & R. Felder.

♂. *Upperside* pale golden-red; both wings with broad outer black border. Fore wing with the veins crossing the apical area of the black border yellow.

Underside yellow, fore wing orange-red in the proximal area.

♀. Resembles the ♂. *Upperside* with submarginal yellow spots on both wings. Hind wing darkened except for the red discocellular spot.

Underside of fore wing proximally more strongly orange-red than in the ♂; hind wing greenish-yellow. A white form also occurs.

Distribution.—North-West Himalayas to the Pamirs and Eastern Turkestan. Six races and several forms are recognized, of which three subspecies occur in the Indian area.

195 *a*. **Colias eogene eogene** C. & R. Felder.

Colias eogene, C. & R. Felder, 1865, p. 196, t. xxvii, fig. 7 (♂, Himalayas); Elwes, 1880, p. 136; id., 1884, p. 13 (N.W. Himalayas); Grum-Grshimaïlo, 1890, p. 329, pl. v, figs. 1 *a*, *b*, *c* (♂♀); Elwes, 1898, p. 465; de Nicéville, 1902 *b*, p. 249 pl. FF, fig. 12 (♀); Leslie &, Evans 1903, p. 675; Bingham, 1907, p. 241; Röber, 1907, p. 66, t. 26 *d* (imago); Verity, 1908–11, pp. 212, 243, 356, pl. xliii, figs. 1, 2 (♂), 3 (♀), 4 (♂), pl. xliv, fig. 1 (♀); Fruhstorfer, 1910, p. 165; Riley, 1926, p. 279, pl. ii, figs. 7, 8 (imago).

Eurymus eogene, Swinhoe, 1909, p. 165, figs. 2 (♂), 2 *a*, *b*, *c* (♀).
Colias eogene eogene, O. Bang-Haas, 1927, p. 42, t. vi, figs. 19, 20 (♂♀); Evans, 1932 *a*, p. 80.

♂. *Upperside* rich orange-vermilion. Fore wing black at the base; a black elongate discocellular spot; a broad black marginal border, wider at the apex, its inner edge curved, irregularly waved, and produced narrowly along the inner margin for a short distance. Hind wing with the base and a broad area parallel to inner margin dusky black, clothed with long, soft, pale hairs; inner margin narrowly yellowish; a broad black outer border, widest in the middle, its inner edge irregularly sinuate. Cilia of both wings salmon-pink.

Underside of fore wing orange-yellow; the veins from base, the costa somewhat narrowly, and the outer margin more broadly suffused with green; along the margin this colour forms broad expansions on the veins, but is diffuse inwardly; discocellular spot pink, centred with white; an obscure post-discal series of black spots, only the posterior two or three prominent; cilia and a narrow costal edging pink. Hind wing entirely suffused with green; a spot at base of cell, a large double discocellular spot, a narrow costal edging, and the cilia pink; veins more or less conspicuously greyish-green; a somewhat obsolescent series of post-discal dark spots. Antennæ and longish hairs on the head above pink, club of antennæ brownish; thorax and abdomen dusky black; underside of palpi, thorax, and abdomen pale green. Both wings without sex-marks.

♀. *Upperside* of fore wing similar to the ♂ but with broader black border, and a submarginal row of whitish spots tinged with pale vermilion, the series curved inwards apically to the costa; costa near apex and the cilia very broadly orange-vermilion. Hind wing dusky black; base clothed sparsely with long pale hairs; inner margin broadly yellowish; discocellular spot, and an incomplete obscure submarginal series of small spots orange-vermilion; cilia dark pink.

Underside much as in the ♂.

Expanse: ♂♀, 40–50 mm.

Habitat.—Eastern Karakoram and Ladak, along the interior Himalayas to Kumaon; rare.

195 *b*. **Colias eogene shandura** Evans.

Colias eogene shandura, Evans, 1926, p. 713 (Chitral); id., 1932 *a*, p. 80.

This is a slightly differentiated race.

♂. *Upperside* of fore wing with the discocellular spot linear; costal yellow less extended.

♀. Darker than most *eogene*. Fore wing with submarginal spots less prominent. Hind wing with only sparse orange dusting over the posterior basal area.

Expanse : ♂♀, 40–50 mm.

Habitat.—CHITRAL, HUNZA, WEST KARAKORAM ; not rare.

195 *c*. **Colias eogene francesca** Watkins.

Colias eogene francesca, Watkins, 1927 *a*, p. 99 (♂♀, Baltistan) ; id., 1927 *b*, p. 151 ; O. Bang-Haas, 1927, p. 112 ; Evans, 1932 *a*, p. 80.

Colias eogene, Bingham (*non* Felder) (part.), 1907, p. 242 (white ♀) ; Verity, 1909, pp. 243, 356 (part.), pl. xliii, figs. 1 (♂). 3 (♀), pl. xliv, fig. 1 (♀).

Colias eogene ♀ f. *cana*, de Nicéville (*non* Gr.-Grsh.), 1902, pp. 249–51, pl. FF, fig. 12.

Colias eogene francesca ♀ f. *madhii*, O. Bang-Haas, 1936, p. 346 (Baltistan : Shigar, July).

Larger than other races in the Indian area.

♂. *Upperside* a deeper orange-red than in the nominotypical race. Fore wing outer border of variable width, on vein 4 usually more than half the distance from margin to cell, and, therefore, a little wider than in *e. eogene*. Hind wing border wider than in *e. eogene*.

♀. *Upperside* orange-red to rose. Fore wing border wider than in the ♂, with yellowish submarginal spots as in *e. eogene*.

♀ form **madhii** O.B.-H.—The white form. *Upperside* of fore wing with basal area usually darker, the discal area more prominently greyish-white ; submarginal spots small. Hind wing with posterior basal area greyish ; discocellular red spot edged with pale yellow ; submarginal spots absent or very small.

Underside of fore wing grey-white, paler than the upperside ; apex greenish-yellow. Hind wing greenish-yellow.

Expanse : ♂♀, 45–55 mm.

Habitat.—BALTISTAN and KASHMIR ; not rare. The white ♀ rare ; in the British Museum only from Skoro-La.

196. **Colias leechi** Grum-Grshimaïlo.

Colias leechi, Grum-Grshimaïlo, 1893, p. 382 (Himalayas) ; Fawcett, 1904, p. 140, pl. ix, figs. 10, 10 *a* (♀) ; Swinhoe, 1909, p. 168, pl. 604, figs. 3, 3 *a* (♂♀) ; Evans, 1932 *a*, p. 80 ; O. Bang-Haas, 1937, p. 304 (North Kashmir : Chonging Valley, 5.100 m. : Saser Pass, 5,000 m., July).

Colias eogene leechi, Verity, 1909–11, pp. 248, 357, pl. lxxi, figs. 24, 25, 26 (♂, Chonging Valley), 27 (♀ type, Chonging Valley), 28 (♀, Chonging Valley).

Colias staudingeri leechi, O. Bang-Haas, 1927, pp. 43, 112, t. vi, figs. 4 (♂), 5, 6 (♀).

This insect is treated provisionally as a species. It cannot

be considered as a subspecies of *eogene* C. & R. Feld. since it flies with it. It looks very different from *staudingeri* Alpheraky, with which it was associated by Bang-Haas (1927). It may be a form of *eogene*, which it resembles very strongly, but is distinguished by the striking glaucous-grey underside of the hind wing. Watkins (1927) remarks that *leechi* "appears to be typical *eogene* exposed to arctic conditions." Bang-Haas (1937) considers *leechi* to be a distinct species. He received both *francisca* and *leechi* from the Saser Pass, 5,000 m.

♂. *Upperside* orange, not so red as most *eogene*, the veins darkened. Fore wing with costa yellow at the base; small discocellular spot as in *eogene*; outer black border inclined to be narrower than in *eogene*, and similarly dusted with yellow. Hind wing with the black border a little narrower than in *eogene*; ground-colour tends to be reduced in area 6; discocellular spot as in *eogene*, and distally elongate as in that species.

Underside of fore wing pale orange excepting the costal and outer borders, which are coloured as the hind wing. Hind wing glaucous-grey; discocellular spot and obscure dark submarginal spots as in *eogene*.

♀. *Upperside* paler than *eogene*. Fore wing with outer border wider than in the ♂, narrower than in most *eogene*, and with similar yellow submarginal spots. Hind wing less darkened than in *eogene*; the black area reaches to vein 6 and along the margin to veins 4 or 3, but the marginal black may be absent; submarginal yellow spots, more or less dusted with orange, and not conspicuous.

Underside as in the ♂.

Expanse: ♂♀, 40–50 mm.

Habitat.—KARAKORAM; rare. In the British Museum, from the Chonging Valley, 15,000–17,000 feet, July and August; "Karakoram," 17,000–18,000 feet.

Colias stoliczkana Moore.

♂. *Upperside* pale orange-yellow; both wings with broad black outer borders, on which the veins are never yellow.

Underside more or less dusted with green; submarginal dark spots well defined. The hind wing discocellular spot is reddish and has a distal prolongation.

♀. Resembles the ♂, but *upperside* of both wings with pale, large, and somewhat diffuse submarginal spots.

There is a white form of ♀ and a third form with greenish coloration.

This species is smaller than the allied *eogene* C. & R. Feld.

Distribution.—KASHMIR, LADAK, and SIKKIM; also in Amdo, and as a rarity in South Turkestan. The two subspecies so far distinguished occur in the Indian area.

197 *a*. **Colias stoliczkana stoliczkana** Moore.

Colias stoliczkana, Moore, 1878 *b*, p. 229 (♂, Ladak, 17,000 feet); id., 1879 *b*, p. 4, pl. i, fig. 1 (♂); Elwes, 1898, p. 465; Bingham 1907, p. 242;
Colias eogene var. *stoliczkana*, Röber, 1907, p. 67; Verity, 1909, p. 247, pl. xliii, figs. 22, 23 (♂), 24 (♀), pl. xliv, fig. 2 (♂).
Eurymus stoliczkana, Swinhoe, 1909, p. 166, pl. 605, figs. 3 (♂), 3 *a*, *b* (♀).
Colias stoliczkana stoliczkana, Evans, 1932 *a*, p. 80.
Colias eogene ♀ f. *alba*, Verity, 1909, p. 274, pl. xliii, fig. 25 (♀, N. Kashmir).

♂. Closely resembles in ground-colour and markings the ♂ of *C. fieldi*, but is always of smaller size.

Upperside of both wings black at the base, the black dusting on the posterior half of hind wing broader, darker, and more conspicuous than in *fieldi*.

Underside with the green edging to costa and outer margin of fore wing and green suffusion to hind wing much darker and richer in tint than in *fieldi*. Antennæ brownish-pink; head, thorax, and abdomen dusky black; underside of palpi dusky grey, thorax and abdomen greenish. No sex-mark.

♀. *Upperside* ground-colour orange-yellow or white. Fore wing with a black discocellular spot; a broad marginal black border bearing a series of more or less equal elongate submarginal spots; in the specimens that have the ground-colour orange these spots and a broad band along the costal margin are bright yellow; in the others the spots are white and there is no band of colour other than the ground-colour along the costa. Hind wing more or less diffusely dusted with black, forming also an ill-defined broad outer border which fades out posteriorly and does not reach the tornus; a submarginal curved series of elongate spots of the ground-colour; inner margin broadly pale greenish-yellow or white; discocellular spot large and bright orange. In some specimens the black dusting on the hind wing becomes so sparse in the distal area as to give the marginal area the appearance of being bright yellow or white.

Underside as in the ♂, but the green areas more greyish-green; the veins paler, distally conspicuously whitish-yellow.

Specimens with white ground-colour are form **alba** Verity.

Expanse: ♂♀, 40 mm.

Genitalia.—The dorsal lobe of the uncus is as long as the uncus itself. (See *Evans*, 1935, p. 106).

Habitat.—KASHMIR, LADAK; not rare, above 13,000 feet; also in the region of Amdo.

197 *b*. **Colias stoliczkana miranda** Fruhstorfer.

Colias eogene miranda, Fruhstorfer, 1903 *d*, p. 145 ; id., 1903 *b* (*b*), p. 48, t. 1, figs. 3, 4 (♂♀) ; id., 1910, p. 165, t. 72 *f* (imago).
Colias eogene var. *miranda*, Verity, 1909, p. 247, pl. xliii, figs. 26, 27 (♂♀ types, Sikkim).
Eurymus miranda, Swinhoe, 1909, p. 167, pl. 604, figs. 4, 4 *a* (♂♀).
Colias stoliczkana miranda, Riley, 1923, p. 466, pl. xxxvii, fig. 4 (♂) ; Evans, 1923, p. 257 (♂) ; O. Bang-Haas, 1927, p. 44 ; Evans, 1932 *a*, p. 81 ; id., 1935, pp. 106–9, pl. iv, figs. 1, 2 (♂), 3–5 (♀).
Colias dubia, Riley (*non* Elwes), 1923, pl. xxxvii, fig. 2 (♀).

♂. *Upperside* of both wings with marginal black borders narrower than in the nominotypical race.

Underside of hind wing bluish-green ; discocellular spot large.

♀. *Upperside* greenish-white, and very similar to the nominotypical ♀. Fore wing outer border slightly narrower, and with submarginal spots of variable size. Hind wing darker than in the nominotypical ♀, the discocellular orange spot smaller but very prominent.

Habitat.—SIKKIM (Chumbi Valley) to the region of Mount Everest, 15,000–17,000 feet ; rare.

198. **Colias dubia** Elwes.

Colias dubia, Elwes, 1906, p. 481, pl. xxxvi, figs. 8, 9 (♂♀, Tibet) ; Röber, 1907, p. 67 ; Bingham, 1907, p. 239 ; Riley, 1923, pl. xxxvii, fig. 1 (♂ type) ; Evans, 1932 *a*, p. 81 ; id., 1935, pp. 106–9, pl. iv, figs. 6–10 (♂).
Colias eogene var. *dubia*, Verity, 1909–11, pp. 247, 346, pl. l, figs. 23, 24 (♂♀).
Eurymus dubia, Swinhoe, 1909, p. 167, pl. 604, figs. 6, 6 *a* (♂♀).
Colias stoliczkana dubia, O. Bang-Haas, 1927, p. 44.
Colias eogene var. *leechi*, Fawcett (*non* Gr.-Grsh.), 1904, p. 140 (part.), pl. ix, fig. 10 (♂ only).
Colias miranda, Riley (*non* Fruhst.), 1923, pl. xxxvii, fig. 5 (♀).

♂. *Upperside* orange. Fore wing with base and costa narrowly black, apex and outer margin broadly black ; veins and discocellular spot black ; very slender, somewhat obscure, submarginal pale yellow streaks cross the black border in each area ; these start from a series of yellow submarginal spots that traverse the inner side of the same border ; these spots vary in size and are sometimes obsolete. Hind wing with posterior half dusky greenish, shaded by black dusting that extends downwards towards the disc under a clothing of long greenish-yellow hairs ; a submarginal yellow and a marginal black band, the latter commencing at the costa, and both crossed by the slender pale yellow veins, which are very conspicuous ; the marginal black border narrows posteriorly and becomes obsolete below vein 2. Cilia of both wings salmon-pink.

Underside of fore wing orange-yellow; costal and outer margins broadly green; discocellular spot slenderly white-centred, black; a post-discal series of black spots; veins black, their terminations crossing the green area yellow. Hind wing with basal four-fifths rich dark green, outer fifth paler brighter green; discocellular spot silvery-white, edged, broadly on the outer side, with pinkish-red; a curved post-discal series of black spots; the veins from base to margin dark green. Antennæ and head in front pink, antennal club brown, thorax and abdomen dusky black; underside of abdomen with slender transverse white lines.

♀. *Upperside* resembles the ♂, but fore wing with black basal shading extended along inner margin, almost joining the marginal border, which is very much broader and bears a somewhat obscure submarginal series of yellow irregular spots; discocellular spot and veins black. Hind wing dusky black; discocellular spot large, bright orange; a submarginal band of yellow spots; inner margin dark green.

Underside much as in the ♂, but the green colour duller and greyer; submarginal spots not so complete nor so clearly defined.

Expanse: ♂♀, 40 mm.

This species resembles *C. stoliczkana miranda* Fruhst., which flies with it, but the ♂ of *miranda* may be distinguished by the unspotted marginal border of the fore wing. The ♂ of *dubia* is very similar to the ♀ of *miranda*, and the females of both are very difficult to separate. According to Evans (1935, p. 106) the females of the two species can be distinguished as follows:—

C. s. miranda Fruhst.—Fore wing *upperside* with inner edge of the black border regular and clearly defined; veins very narrowly dark; basal dark area no more extensive than in the male of either species.

C. dubia Elwes.—Fore wing *upperside* with inner edge of the dark border more or less continued along the veins, which are broadly darkened; basal dark area suffused outwards under the median vein as far as the origin of vein 3, often meeting there the suffusion inwards from the dark border.

Genitalia.—The dorsal lobe of the uncus is about half the length of the uncus itself. (See *Evans*, 1935, p. 106).

Habitat.—SIKKIM and South Tibet at elevations from 15,000 to above 19,000 feet; very rare. A small series is in the British Museum.

Colias electo (Linnæus).

♂. *Upperside* orange-yellow to deep orange. Fore wing with discocellular spot large, most of it lying within the cell;

outer black border wide, at vein 4 about half as wide as the distance from margin to cell ; veins crossing the black border often lined with yellow ; the inner edge of the border is produced proximally on the inner margin, often to a marked degree. Hind wing slightly darkened ; outer border wide, reaching veins 2 or 1 *b* ; discocellular spot orange, very large, most of it lying outside the cell.

♀. *Upperside* orange or white, the latter form absent in India. Fore wing with outer border wider than in ♂, its edge less defined and angled at vein 4 ; submarginal yellow spots, somewhat variable in size, usually no spot in area 3, spot in 2 the larger, that in 1 *b* the smaller, the two anterior ones small and sometimes absent. Hind wing more or less darkened ; outer border wider than in ♂ ; yellow submarginal spots on edge of the border more or less defined ; discocellular spot orange, prominent.

Distribution.—Europe to West China, Tibet, and the HIMALAYAS ; nearly the whole of Africa, the Canary Islands, and Madeira. A single subspecies in the Indian area.

199. **Colias electo fieldi** Menetries.

Colias fieldi, Ménétries, 1855, p. 79, pl. i, fig. 5 (♂, Himalayas) ; Moore, 1865*b*, p. 760 ; Butler, 1870*b*, p. 726 (Murree); Moore, 1882, p. 254 (N.W. Himalayas) ; Elwes, 1884, p. 7 (N.W. Himalayas) ; Swinhoe, 1885*a*, p. 140 (Bombay) ; Butler, 1888*a*, p. 196 ; Swinhoe, 1893, p. 308 ; Mackinnon & de Nicéville, 1898, p. 588 (Mussooree, Dehra Dun) ; Leslie & Evans, 1903, p. 675; Elwes, 1906, p. 482 ; Röber, 1907, p. 68, t. 26 *g* (imago) ; Verity, 1909, p. 266, pl. xlvi, figs. 26, 27 (♂♀) ; Hannyngton, 1910, p. 364 (Kumaon, 14,000 feet) ; Peile, 1911, p. 874 (Fatehgarh).

Colias croceus fieldi, Bingham, 1907, p. 243, pl. xv, fig. 103 (♂) ; Evans, 1932*a*, p. 81.

Eurymus fieldi, Swinhoe, 1909, p. 171, pl. 605, figs. 4 (♂), 4 *a*, *b* (♀) (wet form), 4 *c*, *d* (♂♀, dry form), 4 *e* (♀, extreme dry form).

Colias fieldi fieldi, Fruhstorfer, 1910, p. 165 ; Peile, 1937*a*, p. 69

Colias edusina, C. & R. Felder, 1860, p. 100.

Colias fieldi edusina, Riley, 1927, p. 124 (Tibet) ; Peile, 1937, p. 68, pl. viii; fig. 64 (♂).

Colias croceus edusina, Evans, 1932*a*, p. 81 ; id., 1932*b*, p. 200 (Baluchistan).

Colias fieldi ♀ f. *leucania*, Röber, 1907, p. 68.

Colias edusa, Gray (*non* Linn.), 1846, p. 9, pl. v, fig. 2 (♀, Nepal).

♂. *Upperside* deep cadmium orange-yellow. Fore wing with a patch of greenish-black scales at extreme base ; a discocellular black pear-shaped spot ; a broad outer black border, its inner edge curved slightly and irregularly crenulate, broader at apex and tornus than in middle ; the distal portions of veins 6, 7, 9, and 10 submarginally pale and conspicuous on the apical black. Hind wing at the base with a thin covering of long soft hairs, beneath which is a dusting of black

scales that is continued outwards along the posterior part of the wing ; inner margin broadly pale yellow ; outer border broadly black, broadest in the middle, its inner edge crenulate ; discocellular spot large, consisting of a small patch on which the ground-colour is paler and brighter and that encloses two somewhat obscure dusky rings, the upper one minute. Cilia of both wings broadly salmon-pink.

Underside light orange-yellow, the costal margin narrowly, outer fourth of fore wing and whole hind wing overlaid with pale dull green ; costa, outer and inner margins, with cilia of both wings, salmon-pink. Fore wing with discocellular spot as on upperside, but centred with silvery white ; a post-discal series of black spots, obsolescent and curved inwards anteriorly, conspicuous and increasing in size posteriorly. Hind wing with a conspicuous silvery, double, discocellular spot circled by a diffuse salmon-pink ring, followed by a very obscure, almost obsolete, post-discal series of pinkish spots. Antennæ, head, and thorax anteriorly salmon-pink, antennal club darkening to brown ; thorax and abdomen dusky greenish-black ; underside of palpi, thorax, and abdomen yellow. A sex-patch of light yellow scales at base of area 7 on hind wing upperside.

♀. *Upperside* with basal black dusting more extensive than in the ♂, especially on the hind wing ; the outer black borders wider, with a more irregular and somewhat diffuse inner edge. Fore wing with submarginal bright yellow spots, the anterior four small, obliquely placed, the posterior one large. Hind wing with discocellular spot without the central dark rings conspicuous in the ♂ ; an obscure post-discal curved series of yellow spots bordering the outer black border.

Underside as in the ♂.

Expanse : ♂♀, 45–65 mm.

The species is very variable in the Indian area, chiefly in respect of size. The type figure of *fieldi* shows a specimen of average size. The name *edusina* C. & R. Feld. was based on smaller specimens ; such examples occur more frequently in North-West India, but the name can be used only to represent an individual form. In Assam and Burma occur the largest specimens, but similar ones may be found in the North-West. The name *leucania* Röber was founded upon a white ♀ which was either misidentified or bore a wrong locality. No white ♀ of *fieldi* is known from India.

Habitat.—Baluchistan to North Punjab, Sikkim, and Northern Burma ; more common in the Western Himalayas.

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PLATE I.

Larvæ and Pupæ from Kanara.

(Figs. 2, 3, 4, and 20 are by a native artist ; figs. 21 to 25 are by T. A. Bell ; other figures are by Miss Bell.)

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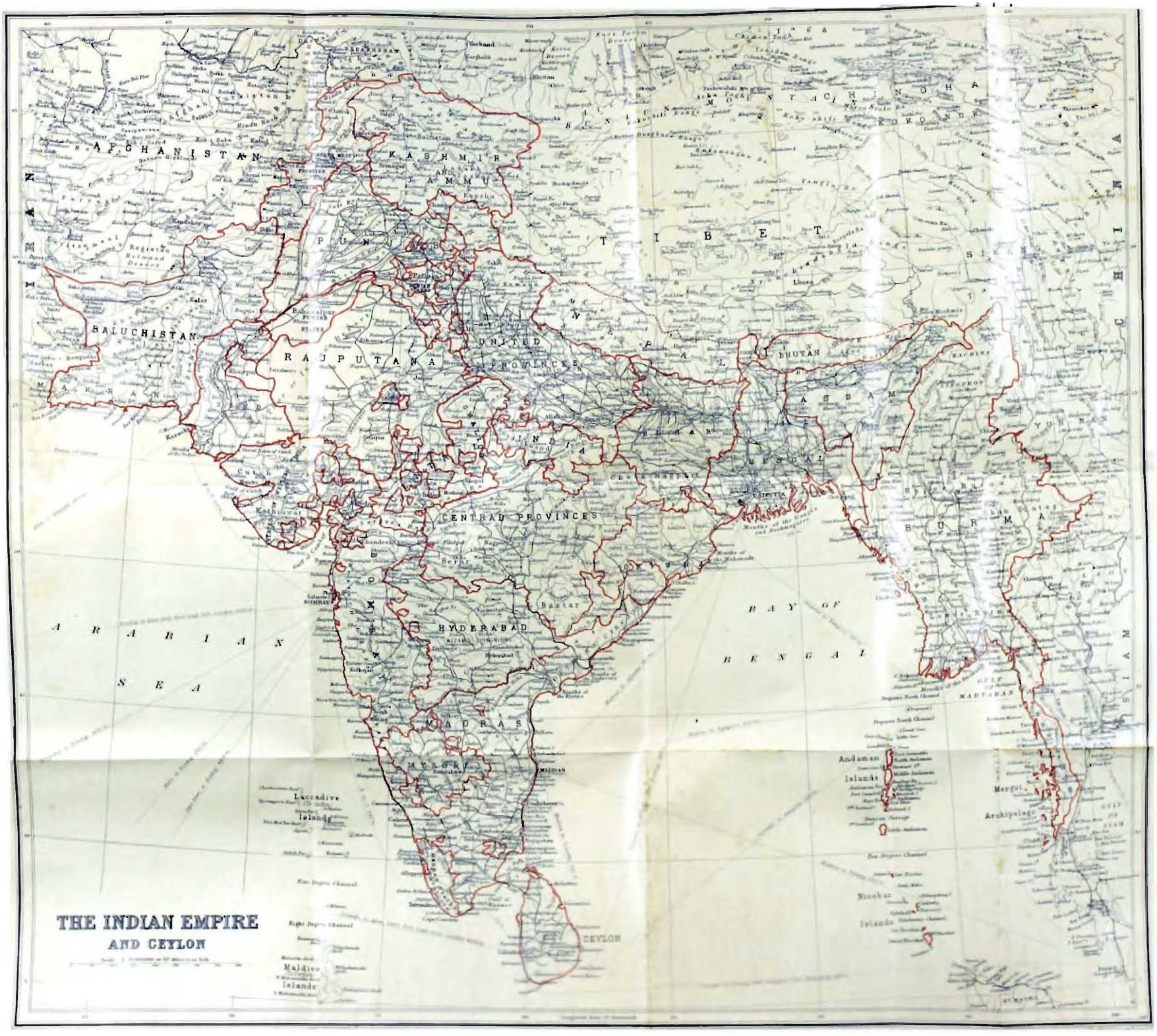
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