

THE  
BUTTERFLIES  
OF  
INDIA,  
BURMAH AND CEYLON.

A DESCRIPTIVE HANDBOOK OF ALL THE KNOWN SPECIES OF RHOPALOCEROUS  
LEPIDOPTERA INHABITING THAT REGION, WITH NOTICES OF ALLIED  
SPECIES OCCURRING IN THE NEIGHBOURING COUNTRIES ALONG  
THE BORDER, WITH NUMEROUS ILLUSTRATIONS.

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"HOW MUCH KNOWLEDGE IS LOST BY THE SCATTERED FORMS IN WHICH IT IS USHERED  
INTO THE WORLD ! HOW MANY SOLITARY STUDENTS SPEND HALF THEIR LIVES  
IN MAKING DISCOVERIES WHICH HAD BEEN PERFECTED A CENTURY  
BEFORE THEIR TIME, FOR WANT OF A CONDENSED EXHIBITION  
OF WHAT IS KNOWN !"

TO  
HIS EXCELLENCY  
*The Most Honourable The Marquess of Ripon,*  
K.G., G.M.S.I., G.M.I.E., &c., &c.,  
VICEROY AND GOVERNOR-GENERAL OF INDIA,  
WHO HAS DEIGNED TO TAKE A KINDLY  
INTEREST IN THE PROSECUTION OF THE WORK,  
**THIS BOOK**  
18  
BY PERMISSION  
MOST RESPECTFULLY DEDICATED.

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# VOL. I.

## NYMPHALIDÆ.

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# GLOSSARY OF TECHNICAL TERMS.

—o—

- ABDOMEN**, the section of the body behind the thorax. See p. 10.
- ABDOMINAL MARGIN**, the inner edge of the hindwing next the body. See p. 11.
- ACUMINATE**, angled or angular, in contradistinction to rounded. See Pl. XIII, f. 30, ♀, apex of forewing of *Cyllogenus suradeva*.
- ACUTE**, pointed, less than a right angle.
- ADRESSED**. See "Appressed."
- ÆNESCENT**, bronzed, (*ἄνελος*, of bronze).
- ANAL**, near or pertaining to the hinder end of the abdomen, (*ἄνις*, the fundament).
- ANAL ANGLE**, the angle formed by the inner (or abdominal) with the outer margin in the hindwing. See p. 11 and Pl. I.
- ANASTOMOSING**, the opening of one vessel or channel into another, (*αναστομύων*, to furnish with a mouth or opening).
- ANNULAR**, in the form of a ring.
- ANNULATIONS**, rings, (*αννυλάτις*, furnished with a ring).
- ANNULATED**, ringed.
- ANTENNÆ**, long, slender appendages of the head. See p. 10 and Pl. I.
- ANTERIOR MARGIN**, the fore margin of either wing. See p. 11 and Pl. I.
- APEX**, the tip or summit of either wing, where the anterior and outer margins meet. See p. 11 and Pl. I.
- APICAL**, at or pertaining to the apex.
- APPRESSED**, pressed close, (*αππρίμνεν*, to press to).
- AREOLETS**, an obsolete term for the spaces between the nervules in the wings.
- ARTICULATION**, connection by joints; one of the sections of a jointed series, (*articulāre*, to divide into joints; *articūlus*, a little joint, a knuckle).
- ATROPHIED**, died away, withered, (*ἀρροφίω*, to have no food, to pine away).
- BAND**, a broad, even stripe.
- BASAL**, at or pertaining to the base.
- BASE**, of the wings, the part at or near junction with the body.
- BIFID**, cleft in two; opening with a cleft, (*βί-φιδνεν*, to cleave in two).
- BIFURCATE**, having two prongs like a fork.
- BIPUPILED**, with reference to an ocellus, having two central spots or pupils.
- BLIND OCELLUS**, an eye-like mark on the wing, with the central spot wanting.
- BLOTCH**, a large, irregular marking.
- CARINATE**, keeled, (*καρίνα*, a keel).
- CARTILAGINOUS**, tough, of the nature of gristle.
- CAUDAL**, at or pertaining to the tail, (*cauda*, a tail).
- CAUDATE**, tailed; furnished with an appendage like a tail.
- CELL**. See "Discoidal Cell;" also p. 11 and Pl. I. Also occasionally used with reference to the space between any two nervules or nervures.
- CHALYBEATE**, steely, (*χαλκός*, steel).
- CHRYSLIS**. See p. 9.
- CILIA**, fine hair-like fringes, chiefly on outer margin of wing, (*cilia*, eyelashes).
- CINEREOUS**, ashy grey, (*cinis*, ashes).
- CLAVATE**, club-shaped, (*κλᾶνα*, a club).
- CLUB**, the knob at the tip of an antenna.
- COCOON**, the case formed by many caterpillars in which to change into pupæ.
- COMMON**, when applied to markings as bands, fasciæ, &c., means that they extend to both wings.
- COMPRESSED**, flattened from side to side, as if by lateral pressure, in contradistinction to depressed or flattened downwards.

- CONCAVE**, curved inwards, as in the outer margin of forewing of *Calites epiminthia*, Pl. XIII, f. 32; or the scallops in the margin of hindwing of *Papilio lastrygonum*, see Frontispiece.
- CONFLUENT**, running together, (*confuens*, flowing into).
- CONGENERIC**, belonging to the same genus.
- CONSTRICTED**, drawn together, or contracted so as to be narrower or smaller at certain points like a string of beads at the intervals between the beads, (*constringere*, to draw tight, to strain).
- CONTIGUOUS**, touching, joining, (*con*, with, *tangere*, to touch).
- CONVEX**, curved outwards, as in the inner margin of forewing of *Euplaea elisa*, ♂, Pl. VIII, f. 14.
- CONVERGENT**, directed towards one point. (*con*, with; *vergere*, to incline).
- CORDATE**, heart-shaped, (*cor*, the heart).
- CORIACEOUS**, leathery, (*corium*, leather).
- CORNEOUS**, horny, hard, (*cornu*, a horn).
- COSTA**, the anterior or costal margin, (*costa*, a rib). See p. 11.
- COSTAL**, at or pertaining to the costa.
- COXA**, the hip, the first joint (see **JOINT**) of the leg from the body, projected downward. See p. 10 and Pl. I.
- CRENATED**, having the edge regularly notched whether leaving rounded or angular projections, (*crena*, a notch).
- CRENULATED**, diminutive of crenated, (*crenula*, a little notch).
- CREPUSCULAR**, affecting the twilight, (*crepusculum*, little night, dim, twilight).
- CRETACEOUS**, chalky, (*creta*, chalk).
- CUPREOUS**, coppery, (*cuprum*, copper).
- DENTATE**, toothed; used to express the outline of a wing or marking when furnished with projections.
- DENTICULATE**, small-toothed, (*denticulatus*, furnished with small teeth or prongs).
- DIAPHANOUS**, transparent, pellucid, (*diaphanely*, to let (a thing) be seen through).
- DIGONEUTIC**, having two broods in the year, (*dis* twice; *gónos*, a begetting).
- DIMORPHISM**, presenting two different forms or appearances, (*dis*, twice; *μορφή*, shape, form, appearance); thus when the sexes differ it is sexual dimorphism, and when the spring and autumn broods differ it is seasonal dimorphism.
- DISC**, a somewhat indefinite expression for a portion of the surface of the wing. See p. 12.
- DISCAL**, at or pertaining to the disc.
- DISCAL SPACES**, the spaces between the nervules on the disc.
- DISCO-CELLULAR NERVULES**, the nervules closing the discoidal cell of the wing. See p. 11 and Pl. I.
- DISCOIDAL CELL**, the part of the wing enclosed between the subcostal and median nervules and disco-cellular nervules. See p. 11.
- DISCOIDAL INTERSPACES**, the spaces above the discoidal nervules. See p. 12.
- DISCOIDAL NERVULES**, the nervules extending from the disco-cellulars to the outer margin. See p. 11 and Pl. I.
- DISCOIDAL STREAK**, a streak within the discoidal cell.
- DIURNAL**, pertaining to the day time, as opposed to nocturnal, (*diēs*, a day).
- DIVARICATED**, spread asunder, (*divaricare*, to stretch apart).
- DORSAL**, pertaining to the back; in butterflies, the upper surface of the thorax and abdomen, (*dorsum*, the back).
- DUPLEX**, two-fold; double, divided.
- EMARGINATE**, having the margin interrupted by a notch or segment apparently cut out. See inner margin of hindwing of *Epinephile davendra*, Pl. XV, f. 39. (*ē*, from or out of; *margo*, a margin).
- EMITTED**, sent out, (*emitto*, I send forth).
- ENTIRE**, used with reference to the wings, to signify that the outline is even and regular.
- ERECTILE**, capable of being erected or raised.
- EXARTICULATE**, having no joints.
- EXCISED**, cut out, (*ex*, out; *caedo*, I cut).
- EXSERTED**, protruded, (*exserto*, I put forth, thrust out).

**EXTERIOR MARGIN**, the margin of the wing furthest from the body. See p. 11 and Pl. I.

**FALCATE**, hooked or bent like a sickle. See Pl. XII, f. 29; forewing of *Melanitis nitens*, (*falx*, a sickle).

**FAMILY**, an aggregate of allied genera.

**FASCIA**, a band

**FASCIATED**, banded.

**FEMORA**, plural of femur.

**FEMUR**, the thigh; the apparent second joint (see **JOINT**) of the leg of a butterfly, directed upwards. See p. 10 and Pl. I.

**FERRUGINOUS**, dusky red, like iron rust, (*ferrugo*, iron rust).

**FILAMENT**, a thin thread-like appendage, (*filum*, a thread).

**FILAMENTOUS**, thread-like.

**FILIFORM**, thread-shaped, long, slender and of equal thickness throughout.

**FIMBRIATE**, fringed, (*fimbriatus*, separated into shreds or filaments).

**FLEXUOUS**, bending, winding, or tortuous, (*flexus*, a bending).

**FOLLICULATE**, provided with glands, foldings or cavities, (*folliculatus*, a small bag or sac).

**FULGINOUS**, sooty, (*fuligo*, soot or lamp-black).

**FULGID**, glittering, shining.

**FULVOUS**, tawny, reddish yellow, the colour of a lion, (*fulvus*, tawny).

**FURCATE**, forked, (*furca*, a fork).

**FUSCESCENT**, inclining to swarthy.

**FUSCOUS**, swarthy, dusky.

**FUSIFORM**, spindle-shaped; thick in the middle and thinning down at each end, (*fusus*, a spindle).

**GERMINATED**, double; united; used for expressing a pair of coalescing spots or ocelli. See Pl. XVII, f. 64, *Ypthima hyogriwa*, underside, the ocelli of the hindwing are geminated; that on the forewing is bipupilled.

**GENUS**, an aggregate of allied species.

**GLABROUS**, smooth, (*glaber*, without hair).

**GLAUOUS**, silvery, bluish grey or pale bluish green, but always with a sheen, (*γλαυκος*, gleaming, bright, glancing).

**GLOBOSE**, spherical or nearly so, (*globosus*, rounded).

**GRANULATED**, with a rough surface; consisting of or resembling grains, (*granum*, a small particle).

**HATCHED**, closely marked with numerous thin transverse lines.

**HAUSTELLATE**, suctorial, living by suction, furnished with a haustellum or proboscis, (*haustio*, I draw up).

**HAUSTELLUM**, the proboscis. See p. 9 and Pl. I, (*haustio*, I draw up).

**HETEROCERA**, moths. See p. 7.

**HINDER MARGIN**, the outer margin. See p. 11.

**HIRSUTE**, coarsely hairy, (*hirsutus*, rough, shaggy, bristly).

**HYALINE**, glassy, clear like glass, (*υαλος* glass).

**IMAGO**, a butterfly, the perfect or last stage of the insect.

**IMBRICATE**, overlapping, (*imbrex*, a hollow tile) used in connection with the wing-scales.

**INCISED**, cut into, clipped, (*incido*, I cut into).

**INCRASSATE**, thickened, becoming thicker, (*incrassare*, to thicken).

**INNER MARGIN**. See p. 11 and Pl. I.

**INOSCULATE**, to join in mouth to mouth, (*oscular*, to kiss).

**INTERRUPTED**, separated or abruptly broken through.

**INTERSPACE**, the space between any two adjacent nervures or nervules in the wings.

**INTERNAL AREA**, the space between the submedian nervure and inner margin of forewing. See p. 12.

**INTERNAL NERVURE**, a small nervure at base of forewing, wanting in many butterflies. See p. 12.

**INTERNO-MEDIAN AREA**, the space between the median and submedian nervures. See p. 12.

**IRIDES**, plural of iris.

**IRIDESCENT**, reflecting rainbow colours, (*iris*, a rainbow).

**IRIS**, the ring in an ocellus or eye-like spot on the wings, usually bright-coloured, (*iris*, a rainbow).

**IRRORATED**, specked, sprinkled with minute dots or marks, (*irrōrāre*, to bedew).

**JOINT**, used in describing the leg or any jointed appendage to express the parts joined together, such as the "femur," "tibia," &c.

**LABIAL**, at or pertaining to the under lip, (*labium*, a lip).

**LABIAL PALPI**. See p. 9 and Pl. I.

**LABIUM**, the under lip. See p. 9.

**LABRAL**, at or pertaining to the upper lip, (*labrum*, a lip).

**LABRUM**, the upper lip. See p. 9.

**LACINIA**, one of the divisions which form a fringe, (*lacinia*, a lappet or flap).

**LACINIATE**, fringed.

**LAMINÆ**, thin sheets or leaves.

**LAMINATED**, composed of a series of thin sheets one on another.

**LANCEOLATE**, gradually tapering towards one extremity, (*lanceōla*, a little lance).

**LATERAL**, on or along the sides.

**LARVA**, a caterpillar in Lepidoptera, the second stage of development in an insect.

**LEPIDOPTERA**, the order to which both butterflies and moths belong, literally "scale-wings." See p. 7.

**LIMACIFORM**, slug-shaped, (*limax*, a slug).

**LOBE**, a rounded protuberance in form or outline.

**LOBULAR**, consisting of or furnished with lobes.

**LOBULATE**, lobe-shaped.

**LONGITUDINAL**, lengthwise, from head to tail of body, or from base to outer margin of wing.

**LUNULAR**, composed of lunules.

**LUNULE**, a crescent-shaped spot, (*lūna*, the moon).

**LUTEOUS**, yellowish, or saffron-yellow, (*luteus*, dyed with the herb *lūtum*).

**MACULA**, spot, stain, blot, blotch.

**MACULAR**, consisting of spots more or less coalescing. See p. 12.

**MACULATED**, spotted.

**MANDIBULE**, the upper jaws, rudimentary and inconspicuous in butterflies.

**MARGARITACEOUS**, pearly, (*margarita*, a pearl).

**MARGINAL**, when applied to markings on the wings; at the outer edge.

**MAXILLÆ**, the under jaws; in butterflies developed into a long tube.

**MAXILLARY**, pertaining to the under jaws.

**MAXILLARY PALPI**, the palpi of the lower jaws.

**MEDIAN NERVURE**, the central rib of the wing-frame, below the discoidal cell. See p. 11 and Pl. I.

**MEDIAN INTERSPACES**, the spaces between the branches of the median nervure.

**MEMBRANACEOUS**, resembling a membrane, a thin expanded tissue, (*membrāna*, the skin that covers the vital parts of the body).

**MEMBRANOUS**. See "Membranaceous."

**MESOTHORAX**, middle section of the thorax. See p. 10.

**METAMORPHOSIS**, change of form, or outward appearance, transformation, (*μετά*, implying change of condition; *μορφή*, shape).

**METATHORAX**, hindmost section of the thorax. See p. 10.

**MIMETIC**, imitative, apt to imitate, (*μιμεῖσθαι*, to imitate). See p. 2.

**MONOGONEUTIC**, having a single brood each year, (*μονός* alone; *γόρος*, a begetting).

**NERVULE**, a branch rib or veinlet of the framework of the wings. See p. 11.

**NERVURE**, a main rib or vein of the framework of the wings. See p. 11.

**NEURATION**, the arrangement of the nervures and nervules of the wings.

**OBCONIC**, inversely conical, the narrow end downwards.

**OBLIQUE**, with reference to bands of colour on the wing, not perpendicular to the costa or axis of length.

**OBOVATE**, inversely ovate, the narrow end downwards.

**OBSELETE**, almost disappeared, (*ὀβηέτης*, worn out, old, thrown off).

## GLOSSARY OF TECHNICAL TERMS.

**OBTUSE**, blunt at the extremity.

**OCCELLUS**, an eye-like spot on the wing consisting of one or more rings of different colours with a central spot.

**OCHREOUS**, or **OCHRACEOUS**, a pale dull yellow, (*ὀχρῶς*, pale yellow).

**OLIVACEOUS**, olive coloured, or dark brownish green, (*δλίβα*, an olive).

**ORAL**, at or pertaining to the mouth, (*ὄσ, ὄρις*, the mouth).

**OSMETERIA**, scent-glands, (*ὀσμή*, a smell, a scent).

**OVATE**, shaped like an egg, with one end broader than the other, (*ὄνυμ*, an egg).

**OVIPAROUS**, egg bearing, (*ὄνυμ*, an egg, *πρίο*, I bring forth).

**PAGINA**, the surface of a wing, upper or under, (*πάγνη*, a page).

**PALPI**, appendages of the maxillæ and labium; those of the latter or "labial palpi" are largely developed in butterflies. See p. 9 and Pl. I.

**PAPILLÆ**, applied to the minute leaf-like projections at the end of the proboscis, (*πάπιλλα*, a nipple).

**PARENCHYMA**, soft cellular tissue, (*παρά*, beside; *ἐγχεῖν*, to pour in).

**PARONYCHIA**, appendages to the claw found in certain genera of butterflies, more or less triangular in form, membranaceous, hairy, sometimes so broad as almost to conceal the claw, sometimes narrow and almost linear, (*παρά*, beside, *ὄνυξ*, the nail).

**PATAGIA**, shoulder-plates, attached to the thorax just above the base of the forewings, (*πάθιον*, the edging on a Roman lady's tunic). See p. 10.

**PATCH**, a large marking or extent of any colour.

**PECTORAL LEGS**, the forelegs of a caterpillar. See p. 8, (*pectus*, the breast).

**PEDUNCLE**, a stem or stalk, (*πέδυνκός*, diminutive of *πῆς*, a foot).

**PELLUCID**, transparent.

**PICEOUS**, pitchy, pitch-black, (*πίκνός*, made of pitch).

**PILOSE**, hairy, (*πίλος*, a hair).

**PLUMOSE**, softly feathery, (*πλύμα*, a small soft feather, the downy part of a feather).

**POLYGENEUTIC**, having several broods in the course of a year, (*πολύς*, many; *γένεσις*, a begetting).

**PORRECT**, projected forwards, as opposed to erect, (*porrectus*, stretched out, extended).

**POSTERIOR ANGLE**, the hinder angle of the forewing. See p. 11 and Pl. I.

**POSTERIOR MARGIN**, the outer margin of the wing or that furthest from the body. See p. 11.

**PRÆDISCOIDAL CELL**, a small space at base of hindwing, closed by a slender nervule connecting the costal and subcostal nervures. See p. 11.

**PRECOSTAL NERVURE**, a short nervure at the base of the hindwing. See p. 11.

**PRIMARY**, or **PRIMARIES**, a term used by some authors to express the forewing.

**PROBOSCIS**, a trunk or snout. See Pl. I.

**PROCESS**, a protuberance, or projecting part.

**PRODUCED**, lengthened out, elongated.

**PROLEGS**, the fleshy hindlegs of caterpillars. See p. 8.

**PROTHORACIC**, at or pertaining to the prothorax.

**PROTHORAX**, the front segment of the thorax, nearest the head. See p. 10.

**PTERYGODES**. See "Tegula" and p. 10, (*πτέρυξ*, a wing; *εἶδος*, shape).

**PUBESCENT**, downy, finely hairy.

**PULVILLUS**, an appendage to the base of the claws, sometimes elongate and jointed sometimes minute, and often wanting altogether, (*pulvillus*, a little cushion).

**PUPA**, a chrysalis.

**PUPIL**, a spot in the central part of an ocellus.

**PYRIFORM**, pear-shaped, (*pyrum* or *pirum*, a pear).

**QUADRATE**, squared, shaped like a square, (*quadratum*, a square).

**RADIAL**, a term applied to the discoidal nervules. See p. 11 and Pl. I.

**RECUMBENT**, reclining, settled down.



- RECURVED**, bent backwards, turned back, or curved in two directions like an S.
- RETRACTILE**, capable of being drawn back, (*re*, back; *trahere*, to draw).
- RHOPALOCERA**, butterflies or "club-horns." See p. 7.
- SAC**, a small bag or pouch.
- SAGITTATE**, arrow-shaped, (*sagitta*, an arrow).
- SCALLOPED**, having the margin cut out with concave segments of circles.
- SCENT BOUCH**, an organ attached to the wing or other part of the body of the males of some genera, secreting odours.
- SCUTELLUM**, a small triangular portion of the mesothorax, (*scutum*, a shield).
- SEASONAL DIMORPHISM**, having the autumn or summer broods differing from the spring brood. See p. 2.
- SECONDARY** or **SECONDARIES**, a term used by some authors to express the hindwing.
- SEGMENT**, a division of the body, (*seco*, I cut).
- SEMIHYALINE**, somewhat glassy. See "Hyaline."
- SERICEOUS**, silky, (*sericus*, silken).
- SERIES**, a line or row; generally of spots on the wings.
- SERPENTINE**, obscure green, or rich oil-green of various shades; like the mineral serpentine.
- SERRATED**, notched, (*serra*, a saw).
- SETÆ**, bristles, (*seta*, a bristle).
- SETOSE**, bristly.
- SHOT**, glossed with a surface colour visible only in certain lights.
- SINUATE**, wavy, (*sinus*, a curve).
- SINUOUS**, wavy. See "Sinuate."
- SPACE**, the area between two nervures or nervules or a nervure or nervule and the margin.
- SPATULAR**, shaped like a spatule, a roundish end with a narrow linear base, (*spatula*, a spatule).
- SPATULATE**. See "Spatular."
- SPECIES**, a group of individuals presumably descended from the same parental stock.
- SPINOUS**, furnished with spines.
- SPINNERET**, a small perforated organ through which a caterpillar emits its silk.
- SPIRACLE**, an aperture, a round or narrow opening on the surface of the body used for breathing, (*spirāculum*, an air-hole).
- SQUAMOSE**, full of scales, (*squāma*, a scale).
- SQUAMOUS**, scaly.
- STEMMATIC**, a term applied to the simple eyes of an insect, which are placed on the crown of the head, and are scarcely visible, not to be confounded with the compound eyes, which are large and protruding, and which are referred to when the eyes are mentioned, unless the stemmatic eyes are specially indicated, (*stemma*, a wreath; anything to crown with).
- STREAK**, a narrow stripe.
- STRIA**. See "Striga."
- STRIATED**, marked with striæ, or fine very short lines.
- STRIDULATION**, with insects the noise produced in some species by friction of the external organs, (*strideo*, I creak, buzz, rattle).
- STRIGA**, a streak, (*stringere*, to scrape). Generally a very short streak.
- SUB**, as a prefix in composition used to denote near to or approaching to, or somewhat, (implying diminution), but *not* under.
- SUBANAL**, near the anal region; usually applied to that of the hindwing.
- SUBAPICAL**, near the apical region. See "Apical."
- SUBCORIACEOUS**, somewhat leathery. See "Coriaceous."
- SUBCOSTAL AREA**, the space between the costal and subcostal nervures. See p. 12.
- SUBCOSTAL NERVURE**, the rib of the framework of the wing bounding the discoidal cell on the upper side. See p. 11.
- SUBCOSTAL NERVULES**, the branches of the subcostal nervure. See p. 11.
- SUBDIAPHANOUS**, somewhat transparent. See "Diaphanous."
- SUFFUSED**, clouded or obscured, tinged, (*suffundere*, to pour through; to overspread).

- SUBFOLLICULATE**, somewhat glandular. See "Folliculate."
- SUBMARGINAL**, near to the margin, usually the outer margin.
- SUBMEDIAN NERVURE**. See p. 12 and Pl. I.
- SUBULATE**, awl-shaped, narrow, narrowing to a point from a broadish base, (*sūbūla*, an awl).
- SUTURAL AREA**, the posterior or inner-marginal area where the wings overlap, (*sūtūra*, a seam).
- SYNONYM**, a name that has fallen into disuse from any cause.
- TARSUS**, the fourth apparent joint (see **JOINT**) of the leg in the perfect insect. See p. 10 and Pl. I.
- TAIL**, a long projection from the outer margin of the hindwing; also applied to the anal extremity of the body.
- TÉGULÆ**, shoulder-plates on the thorax at the bases of the forewings, (*tēgūla*, a tile). See "Patagia" and p. 10.
- TENTACULA**, a thread-like or filiform appendage.
- TESTACEOUS**, shell-like, (*testa*, a shell).
- TETRAPOD**, four-footed, applied to butterflies having the forelegs imperfect, (*tētrapaes*, four; *πους*, a foot).
- THORAX**, the middle section of the body to which all the limbs are attached. See p. 10.
- TIBIA**, the apparent third joint (see **JOINT**) of the leg in the perfect insect. [See p. 10 and Pl. I.]
- TIFFETS**. See "Tegulæ" and "Patagia"; also p. 10.
- TRACHEÆ**, the respiratory organs or system of tubes for the admission of air to the viscera.
- TRANSVERSE**, as applied to markings on the wing means in the direction of the breadth of the wing. See p. 12.
- TRIARTICULATE**, three-jointed, (*trēs*, three; *articulus*, a little joint).
- TRIFID**, three-cleft, split into three points, (*trēs*, three; *findere*, to cleave).
- TRIFURCATE**, three-forked, branching into three directions, (*trēs*, three; *furca*, a fork).
- TROCHANTER**, the joint between the coxa and the femur. See p. 10.
- TRUNCATE**, cut off, or appearing as if cut off at the top, (*truncus*, maimed, cut short).
- TRUNK**. See "Proboscis."
- TUBERCLE**, a small warty projection or knob, (*tūber*, a hump or knob).
- TUBERCULATE**, furnished with tubercles.
- UNGUES**, claws, (*unguis*, a nail or claw).
- UNDERSIDE**, the surface exposed when the butterfly's wings are closed.
- UNDULATE**, wavy, (*unda*, a wave).
- UNICOLOROUS**, of one uniform colour.
- UPPERSIDE**, the surfaces in contact when the butterfly's wings are closed.
- VEINS**, the main ribs of the frame-work of the wings. See "Nervures."
- VEINLETS**. See "Nervules."
- VILLOSE**, very shaggy with soft hairs, covered with fine hairs, (*villus*, shaggy hair).
- VILLOUS**, hairy.
- VIOLACEOUS**, inclining to violet; pale violet.
- VITTA**, used to signify a short streak, (*vitta*, a ribbon, fillet).
- VITTIFORM**, shaped like a Vitta.



## PREFACE

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INDIA, the land of sunshine, is a land of Butterflies ; for, though in the arid plains of the north insect-life languishes during the dry months, it revives marvellously when the periodic rains set in, and in the moister parts of the country, especially to the east and south, and in the warm valleys of the hilly regions, the amazing numbers of Butterflies and other beautiful insects cannot but strike the most unobservant. In one of his charming essays on tropical nature, Professor A. R. Wallace has remarked that, although in tropical countries individual flowers attain to a size and brilliancy of colouring unknown in temperate climates, it is merely in the individual flower, and not in general effect, that the products of tropical climes excel. There is nothing in tropical landscapes, for instance, that can compare with the heather and gorse of our own country, or with the gorgeous carpeting of the alpine valleys, ever moist with the melting snows. But in insect-life it is otherwise ; both in size and beauty of individuals, and in prolific luxuriance of numbers, the tropics easily bear off the palm ; the largest and most beautiful of European Butterflies sink into insignificance beside the *Ornithoptera*, *Morpho*, and *Thaumantis* of the tropics ; while, perhaps, few sights in nature are more strangely beautiful to the traveller in these Eastern valleys than the patches of damp sand which may be found in torrent-beds in the forests literally carpeted with Butterflies of every hue, closely packed together, busily imbibing the moisture from the sand, and, again, as startled by the approach of an intruder, they rise expanding into a cloud of gorgeous colours of every hue. The difficulty in securing rare species is, in such localities, literally the difficulty of singling them out of a crowd.

The large size, the quaint shapes, and the dazzling brilliancy of the colouring of many of the Indian Butterflies have made them favourite objects of observation and often of collection ; but, though collections are frequently made or purchased, comparatively little has been done here towards investigating the life-history of these beautiful creatures, or towards improving the opportunities offered by such a study of gaining light on the scientific questions and problems of zoology.

The study of Entomology is not merely an interesting recreation for those who can find leisure and opportunity to pursue it, but, even when restricted to Butterflies only, it offers a field for scientific enquiry of the highest importance, in connection especially with the origin of species and other cognate questions. Putting aside the various stages of egg, caterpillar, and chrysalis, through which all Butterflies pass, and in which opportunities for study are ample, the perfect insect, as it emerges from the chrysalis, exhibits variations at least as numerous and important as those of other classes of living organisms, while the short duration of its life, and the quickly succeeding generations, offer facilities for tracing the course of such variations, and thus deducing the causes which govern them, perhaps unrivalled in the whole field of nature. These variations, though possibly traceable ultimately to the same causes, may be grouped under several heads. It must not be forgotten that variety is in a certain sense universal, for no two individuals are really absolutely alike ; but numerous individuals are to be found so closely resembling each other that, to the naked eye, no difference is traceable ; or, if traceable, the differences are so slight as to leave no room for doubt, even if other evidence were wanting, that the individuals are derived from the same parental stock ; or, in other words, belong to the same species. If this close similarity of individuals were constant in each species, there would be no

difficulty in discriminating and identifying insects, though, at the same time, the scientific value of the study would be largely reduced; but it is not so. First we find that in some species the sexes are differentiated—the females differing from the males either in colour or style of markings, and even in form and outline of the wings, these differences being constant in each sex. Again, we find that in different climates Butterflies, apparently the same in general character, present constant differences in colour or style of marking of more or less importance, but frequently sufficient to justify the description of each form under a separate name. Again, in different localities, even where the differences of climate are inappreciable, such as notably the various islands of an archipelago, and in a lesser degree disconnected valleys of a mountain range, the Butterflies of each locality often present constant and well marked differences, particularly in the size and extent of markings thus forming what have been termed “geographical” varieties in contradistinction to “climatic” varieties; and yet, again, we have the most interesting and important variation of all occurring among Butterflies which have two or more broods in the year; and in which the summer and autumn broods differ from the spring brood more or less, sometimes so widely in colour and markings that, until the question was conclusively set at rest by breeding Butterflies of the one type from the eggs of Butterflies of the other, the two forms were described and universally accepted as representing two distinct species.

Thus we have “sexual,” “climatic,” “geographic,” and “seasonal” variations, each of which can be referred more or less confidently to known external causes; but, in addition to these, the study of the subject is complicated by individual variations, which appear to be quite irrespective of external conditions; such variations are exhibited in different species in different degrees, or possibly the tendency to vary may pass through more or less active or dormant stages at different epochs of the history of each group. At the present time some species, notably among the *Junonia*, are wonderfully constant to the type; others, again, differ so universally among themselves that scarcely any two specimens, even from the same locality, are alike. Of such variations the under-surfaces of the wings in *Adiantum lulu* and *M. rusea*, and in the great “oak-leaf” Butterflies of the genus *Kallima*, are noteworthy instances; also the numbers and size of the ocelli in many genera of the *Satyrina*; and, again, instead of a single typical form, with minor differences in each individual, we sometimes find, as in the case of *Papilio polytes* or *P. memnon*, that there are several distinct types, described by the earlier authors as distinct species, but which in reality spring promiscuously from the same stock—a single batch of the eggs laid by a single female having been found to produce two or more of the different forms. And, lastly, we find that specimens aberrant from the type occur singly and casually here and there from time to time, and coexisting in the same localities with specimens of the normal form. It may easily be conceived that among insects with such manifold tendencies to variation and such brief periods of existence, the clue to the laws which govern such developments may most readily be found.

The phenomenon of “mimicry,” too, is deserving of the closest scientific observation. One of the earliest puzzles met with by the observer of Butterflies lies in finding males and females in company, apparently belonging not only to different species, but different genera, and even families; but closer examination reveals that the female in reality belongs to the same species as the male, although its colouration and markings are excellent imitations of a totally different Butterfly, generally of a much commoner Butterfly, and almost always of a Butterfly less subject than its own species to destruction by birds and reptiles. The subject is too extensive to enter on here, but it is one that should never be lost sight of in investigating the life-history of insects.

The field for observation offered by the British Indian Empire is as vast as it is vast. We have every climate, from the eternal snows to the tropics—and all the most interesting

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phenomena of Entomology may here be studied in life—yet little has been done beyond attaching a name to each different form or species; and even in this preliminary ground-work, the greater portion of the labour has been carried on, not by Englishmen, but by foreigners. The larger number of our Indian species have been named by French, German or Russian naturalists, while not one per cent. have been named by English naturalists in this country. The few among our countrymen out here who have taken up the study have worked under difficulties sufficient to dishearten the most ardent student; and the usual result has been that their laboriously collected observations and notes have either been lost altogether, or rendered comparatively useless owing to difficulties in identification of the species observed, or to omission of some detail, the importance of which could only be known to skilled zoologists.

The reason for this state of affairs is obvious. No attempt has hitherto been made to bring the study of the science within the reach of the public in this country. The published information regarding Indian Butterflies is scattered over numerous works, many of which are out of print, and are either not to be bought at all, or else only at prices beyond the means of private individuals. The older books deal with Butterflies from all parts of the world, and the more recent papers regarding the Butterflies of particular localities, such as the "Butterflies of Malacca" by Butler, the "Butterflies of Tenasserim," of the "Andamans and Nicobars," of "Bengal," of the "North-West Himalayas," &c., by Moore, consist of bare and incomplete lists of names, with descriptions of a few new species; and, while amply fulfilling the special object with which they were published, are of no use whatever to the general public, except to the few who, having access to good museums and libraries, have at hand the means of supplementing for themselves the information given.

It has been well nigh impossible under such circumstances for collectors of Butterflies in this country to name their own specimens, and our knowledge of Indian Butterflies has been limited to the contents of such of the more important collections as have been from time to time sent to the Museums of Europe for study and description, but the contents of the smaller collections have, for the most part, been left unrecorded. It is probable that there are, comparatively, few species in this country still unnamed, but that something in this direction still remains to be done is proved by the fact that, since it became known about a year and a half ago that this book was under preparation, nearly fifty new species have been discovered by naturalists in this country—a number far exceeding that of all the species hitherto named by working naturalists in India.

But in the matter of scientific observation of habits and life history we repeat that very little has been done. To get this we must be mainly independent of foreign help—we must depend on our own exertions. No one collector, however zealous, and no single observer, however accurate and persevering, can exhaust the subject even in a single locality. It is by the combined efforts of the many that progress will be secured. The study in this country has hitherto, as we have shown, lacked the stimulus and interest that a knowledge of the nomenclature, and a record of what had previously been discovered, would have supplied; and it is to supply this want, and to secure the co-operation of all those who take an interest in the matter, that a descriptive handbook is required. It has been no small encouragement to us to find that, in the comparatively short time that has elapsed since this work was commenced, we have received hearty sympathy and help from naturalists all over the country, who have not only redoubled their exertions in collecting and observing, but have generously assisted us with specimens, notes, and valuable advice, while several gentlemen, not previously interested in the subject, have undertaken to collect in various localities. Professor J. Wood-Mason, Deputy Superintendent of the Indian Museum, Calcutta, has also in view of this publication thoroughly re-arranged and investigated the

national collection, and published numerous papers and local lists of the greatest value, besides assisting us most kindly in discriminating the species. Owing to his exertions the national collection has been more than doubled since this book was begun.

From Burma we have received specimens of almost every species hitherto recorded; also of numerous species new to the country, and of several new to science, through the kindness of Captains C. T. Bingham and C. H. E. Adamson, and Messrs Eugene Oates and T. C. Hill. To Captain Bingham's exertions the discovery of *Zophoessa dura*, *Neope bhima*, *Penthina binghami*, *Papilio clare*, the male of *Zeuxidia masoni*, the female of *Thaumantis louisa*, and many other new and interesting forms is due. From the Andamans and Nicobars, Colonel T. Cadell, V.C., and Mr. A. R. de Roepstorff have kindly sent numerous specimens, including many species new to science. We have also been aided from Eastern Manipur by Mr. A. O. Hume; from Assam by Mr. C. Donovan and Surgeon-Major G. R. Johnson; from Sikkim by Messrs Otto Möller and W. Davison; from Western Bengal by Messrs W. E. Brooks and C. J. Marshall; from Naini Tal by Mr. E. T. Atkinson; from the North-West Himalayas by Lieutenant-Colonel A. M. Lang, R.E.; Mrs. Deane, General Macintyre, Mr. Robert Ellis in Pangti; Mr. A. Graham Young in Kulu; Major C. H. T. Marshall in Chumbia; the Rev. A. W. Heyde in Ladak; and Major J. Biddulph in Gilgit; from Agra by Mr. C. A. R. Crommelin; from Sind by Major C. Swinhoe; from Bombay by Mr. E. H. Auker; from Poona and Ratnagiri by Mr. G. Vidal; from the Wynad by Mr. Rhodes Morgan, from Travancore by Messrs Ferguson and Bourdillon. To Mr. Ferguson, especially, we owe the discovery of *Mycalasis oculus*, and of that remarkable insect *Parvinterrhexa marshalli*; and from Ceylon we have been assisted by the Hon'ble F. Maclewood;—to all these gentlemen our thanks are due for the welcome aid afforded us in this laborious task, but most of all we are indebted to Captain C. T. Bingham, who not only is a most skilful collector, but most generously has placed at our disposal the whole results of his labours.

This book does not attempt a life-history of each or any of the insects. The time has not arrived for such a work; the details required for a life-history cannot be gathered until a knowledge of the nomenclature is far more widely diffused. It is simply designed as a handbook of reference, as complete as possible in itself, for the convenience of naturalists in the field who have no access to libraries. Where necessary full extracts from other works, not usually available, are given, and where possible and advisable, the description of species are given in the words of the original describers, supplemented by any further details needed to complete them. For the genera the admirable descriptions by Westwood (in the *Genera of Diurnal Lepidoptera*) have been followed as closely as possible.

The book will comprise detailed descriptions of every genus and species known to occur within the limits of India, British Burma and Ceylon; and short descriptions will be added in smaller type of species from neighbouring countries on the border, such as Malacca, Siam, Yunnan, Tibet, South Turkestan, Afghanistan and Beluchistan, which, though not yet recorded from within Indian limits, may very probably subsequently be found to occur within our border.

The absence of coloured illustrations is a great drawback, especially to beginners; but coloured illustrations are expensive; and, as the great object in issuing the book at all is to give it as wide a circulation as possible, it has been thought expedient to confine the illustrations for the most part to uncoloured engravings, and to restrict the number to what will be sufficient to indicate the more typical forms and to supplement the written descriptions. At least one illustration of each genus, and generally of each sub-genus, will be given, as mere description fails to convey to any, except to the practised Entomologist, a sufficiently clear conception of the forms, especially in outline; and a glance at the plates will usually be

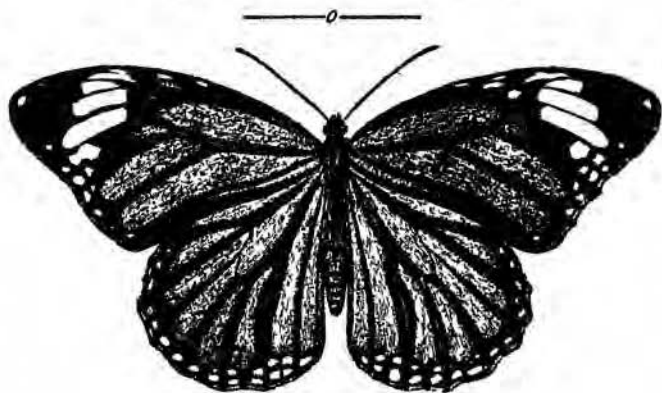
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sufficient to guide the beginner as to the place where the description of any particular species may be found.

After the book is published, and if the circulation it attains appears to warrant it, coloured illustrations will be published in continuation.

No pains have been spared to render this hand-book as complete as possible : and, in judging of the result, we trust that the public will remember the difficulties under which works of this nature are necessarily undertaken in this country : and that the compilation has been carried on, not in the quiet and leisure of a studio, but in the intervals of a busy official life.

# INTRODUCTION.



DANAUS (*Salatura*) GENUTIA, Cramer.

Class—INSECTA.

Order—LEPIDOPTERA.

Sub-order—RHOPALOCERA.

THE insects of this order are distinguished from other insects by their having the wings more or less densely covered with minute scales of various colours, whence the name LEPIDOPTERA, (*λεπίς*, a scale; *πτερόν*, a wing)

The order, which comprises an enormous number of different species, is divided into two sub-orders—HETEROCERA or Moths, and RHOPALOCERA, or Butterflies. The insects of the latter sub-order are alone treated of in this book. The distinction between the sub-orders is primarily based on the structure of the antennæ as expressed in the terms Rhopalocera (*ῥόπαλον*, a club; *κέρας*, a horn), and Heterocera (*ἕτερος*, different; *κέρας*, a horn), the antennæ of Butterflies being more or less uniform in structure and clubbed at the tip, while those of Moths exhibit great variations of structure among different genera and species, and even in the different sexes of the same species.

But there are several other characteristics by which Butterflies can generally be distinguished from Moths. Butterflies are never nocturnal in their habits. Some few species fly at twilight, but with very few exceptions they fly only in the day time, and, as a rule, are active on the wing only during sunshine, the eyes of Butterflies too are larger as a rule and more prominent than those of Moths: again the antennæ of Butterflies, which are straight, filamentous and more or less clubbed at the tip, are always held erect or extended in front of the head, and are never either twisted or folded away by the insect. On the other hand the antennæ of Moths are highly flexible, and during repose are almost invariably folded backwards along the body and concealed under the wings. Again, the division between the thorax and the abdomen is strongly defined in Butterflies, while in most Moths the division is inconspicuous; and, lastly, Butterflies may be distinguished by the position of the wings in repose being, among them, more or less erect over the back and never folded close along the body; or, in other words, Butterflies when in repose usually exhibit the under-surface of the wings; Moths in repose have only the upper surface visible.

None of these distinctive features taken singly will always suffice to distinguish a Butterfly from a Moth; perhaps the surest test of all is the erect posture or otherwise of the antennæ. If



the antennæ are folded under the wings in repose it may be at once safely concluded that the insect is not a Butterfly, even though it may fly by day, or hold its wings partially erect. In some genera of Butterflies the club at the end of the antenna is almost obsolete, but still the antennæ are straight, erect and never folded back or concealed. On the other hand, many of the Moths are day-fliers, many have slender bodies, and in many the shape of the wings and general appearance present great similarities to the appearance of Butterflies, but in such cases the structure of the antennæ will serve to determine the affinities.\*

Butterflies, as well as Moths, are oviparous and pass through four stages of development—the egg, the caterpillar, the chrysalis and the imago, or perfect insect. The usual extreme period of existence extends to one year, during which all four stages are accomplished; but in numerous instances, especially in warm climates, where the winter is short and the summer long, one or more intermediate broods occur, in fact in some cases there is a continuous succession of broods throughout the year, while occasionally, under unfavourable circumstances, the egg or the chrysalis may lie dormant through more than one season.

The EGGS of Butterflies are deposited either singly or in groups, on the leaves or bark of trees as a rule; sometimes on the calyx of a flower, as in some of the *Lycanids*, but always on or near to the food-plant of the caterpillar. In form and pattern the eggs are strangely diversified, far more so than among birds; but for each species the eggs are uniform in shape, colour, and structure, so that the species to which any particular egg belongs can easily be identified: at the same time the eggs of closely allied species often differ widely, so that among Butterflies the eggs afford little or no indication of the affinities of the perfect insect. The laying season varies according to the habits of the species—some kinds passing the winter or “hibernating” in the egg state, some as caterpillars, some as chrysalises, and some, again, in the perfect state.

The CATERPILLARS of Butterflies are usually elongate, and more or less cylindrical in shape, (see Plate II). They consist of thirteen segments, the first of which forms the head and is furnished with twelve microscopic eyes, situated near the mouth, six on each side, and generally arranged in a circle. These eyes are highly convex, only enabling the caterpillar to see objects when close against its mouth; the head varies in shape very much, and is generally furnished with two short, sometimes retractile, antennæ, and two feelers, which usually emerge one on each side from the apex of the underlip, and appear to correspond with the labial palpi of the perfect insect; and occasionally with other protuberances of various kinds. The mouth is furnished with a pair of strong, horny, toothed jaws or *mandibule*, working sideways. And a lower pair of jaws of a softer consistency termed *maxille*; these latter are furnished with a pair of small jointed organs corresponding to the palpi. Near the summit of the labium or under lip, is a small orifice through which issues the silken thread which caterpillars produce. The legs are sixteen in number, arranged in pairs on the second, third, fourth, seventh, eighth, ninth, tenth, and thirteenth segments; the front three pairs, or the true legs, which correspond to the legs in the perfect insect, are horny, jointed and terminate in a strong claw; the last five pairs are very different in structure, being wide, fleshy and broadened at the base, and are termed “prolegs” or “claspers”; the last pair of claspers are termed the “anal” claspers, and the remaining four pairs the “abdominal” claspers. The true legs in front are also sometimes called the “pectoral” legs. Caterpillars are also provided with eighteen “spiracles” or breathing holes arranged in rows along their sides—one row on each side of nine spiracles, one to each segment, except the first, third, fourth, and thirteenth, on which they are wanting. These spiracles are the mouths of air-tubes which constitute the respiratory system. Besides these regular structural features, they are often furnished with remarkable appendages, (see Plate II). The caterpillars of *Athyma* and some other genera are provided with erect processes, more or less spiny towards the tip. Some caterpillars, such as those of *Adolias*, have lengthened procumbent appendages on each side, fringed with long hairs;

\* In some aberrant genera of American Moths the antennæ are clubbed. But no Indian Moths, so far as we know, exhibit this feature.

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those of *Elymnias* and *Melanitis* have two lengthened appendages on the hinder segment and two short ones on the head; those of *Charaxes* have four projections on the head and two short ones on the hinder segment; in the *Hesperide* the head is usually large and the neck narrow, while in the *Pierina* the head is small. The outline, though typically cylindrical, varies from fusiform among the slug-like caterpillars of the *Lycanide*, to an almost uniform lengthened cylinder among the *Pierina*. Caterpillars are often nocturnal feeders, and escape observation by lying concealed during the day-time.

The CHRYSALISES vary much in shape, colour and ornamentation, (see Plate II); the colour usually being adapted to that of the surface to which the chrysalis is attached. The only peculiarities on which it is necessary to touch in this short introductory notice, are in the matter of positions selected for transformation and the methods of securing the chrysalis from disturbance during the state of torpor. There are five typical methods adopted for this purpose: first, the suspension of the chrysalis by the tail only from the underside of a leaf or twig or other object; this is the usual practice with the *Nymphalida*, (see Plate II, *Athyma leucothoe* and *Adolias tubentina*); second, the suspension of the chrysalis in a horizontal position, or with the head inclined upwards, attached by the tail and also by a thread passed round the middle of the body and secured at both ends: this position is adopted by many of the *Lycanide*, (see Plate II, *Amblypodia timoleon*); third, the suspension of the chrysalis by the tail vertically, head downwards, but girt in addition by a thread round the middle of the body: this method is of frequent occurrence among the *Pierina*, (see Plate II, *Hebomora laucippe*); fourth, the attachment of the chrysalis by the tail, but in an erect position with the head upwards, and further secured by threads, either passing round the middle of the body, or attached on either side: this is the usual posture among the *Papilionida*, (see Plate II, *Papilio polytes*); fifth, with the chrysalis free, but enclosed either in the rolled-up edge of a leaf, or between two or more small leaves drawn together by silky threads. This method is typical among the *Hesperide*, (see Plate II, *Ismene adiphodea*). In the genus *Parnassius* (*Papilionide*) the chrysalis is enclosed in a loose silky web on a leaf; the chrysalis of the "Grayling" (*Hipparchia semele*) is described by Newman as being placed beneath the surface of the soil, and there are doubtless many other exceptions; but the five postures and methods described above are typical of the five great divisions of Butterflies.

The IMAGO or perfect state is the most highly developed, and a knowledge of the structure of its various organs is essential to the comprehension of the divisions into families and genera. Plate I shows the principal features\* and explains the names, which have been used to describe the different parts. A careful study of this plate will render the descriptions of the species intelligible to the reader. The perfect insect has always four wings and six legs, the latter sometimes not all fully developed; the body is in three sections—the head, the thorax, and the abdomen; and the head is furnished with antennæ, eyes and oral appendages. Butterflies derive their nourishment from liquid substances, and the structure of the mouth is adapted to this end. The under jaws are developed into a long flexible tube called the "proboscis" or "haustellum," which, when not in use, is curled up closely under the face; the under lip (or *labrum*) is furnished with two processes, called the "labial palpi" or "palpi" (see Plate I) projected forwards, or upwards, one on each side of the mouth, the upper jaws and upper lip (or *labrum*) are rudimentary and scarcely discernible.

The PALPI consist of three joints, the middle one usually the longest, the basal and terminal joints being often very short. They are covered with scales or hairs, varying much in length and texture. The very long hairs of the palpi are distinctive of the family *Satyrina*; they also vary much in size and form, and occasionally, as in *Zephyra*, and in some of the *Lycanida*, are very largely developed; in some cases the palpi are separated throughout their length; in others they meet at the tip, forming a sort of beak in front of the head.

\* The position shown in the figure of the chrysalis of *Papilio polytes* in Plate II, is not typical. The abdominal half of the chrysalis and the stem to which it is attached should be at least vertical, if not leaning slightly over, the upper half of the chrysalis extending outwards nearly horizontally.



The EYES of Butterflies are large, immovable, compound and convex; sometimes smooth, sometimes hairy, and consist of a great number of separate lenses. Butterflies also are said to possess two extremely minute simple or "stigmatic" eyes, placed on the crown of the head and scarcely visible, but the existence of these latter has been disputed.

The ANTENNÆ, which project from the forehead between the eyes, are of moderate length, being from one-half to seven-eighths, usually about two-thirds, the length of the body, and consist of a great number of segments, which increase in diameter more or less gradually towards the tip; the knob thus formed at the tip varies considerably in shape in different families, and affords useful distinctive characters. Typically the antennæ are straight, but in some genera they are hooked at the tip; they are always erect and never concealed during repose.

The THORAX forms the middle part of the body between the head and the abdomen; to it all the wings and legs are united, and it contains the muscles by which all the limbs are actuated. It is shorter than the abdomen, and consists of three segments, so closely united as to appear to form a single piece. The first nearest the head is called the *prothorax*, and bears the fore pair of legs; the middle one, the *mesothorax*, which bears the middle pair of legs and the forewings; and that nearest the abdomen, the *metathorax*, which bears the hindlegs and hindwings.

To the mesothorax, just above the wing joints, are attached a pair of triangular scales, like epaulets, which have been called "*tegulae*" or "*patagia*" or "*pterygodes*:" or "*tippets*." The surface of the thorax is covered with hairs of greater or less density and length.

The ABDOMEN is united to the thorax by a narrow link. It consists of nine segments, and is of a softer consistency than the thorax: the only appendages to the abdomen which require notice at present are the large anal valves, which are found in the males of some species of *Papilionidae*.

The LEGS are six in number, but in a large number of species the fore pair of legs is imperfect, unfitted for walking, and held drawn up close to the sides of the thorax, and partially concealed by its hairs, the Butterfly appearing as if it had only four legs. The characters of the legs are of great importance, and on the extent of development of the forelegs the primary divisions of Butterflies into families usually rests. The perfect leg consists of the following parts:—(1), the *coxa*, which is attached to the body, corresponds with the hip, and is directed vertically downwards; (2), the short joint connecting the femur with the coxa, called the *trochanter*, is counted as the second section of the leg; (3), the *femur*, which is jointed to the coxa, corresponds with the thigh, and is directed upwards; (4), the *tibia* or shank, which is jointed to the femur and directed downwards; the joint between the tibia and femur being the most elevated point of the leg in repose; (5), the *tarsus*, which is jointed to and directed in prolongation of the tibia; the tarsus in all perfect legs consisting of five joints. The coxa and femur are often hairy, and in imperfect forelegs the tibia and tarsus are likewise often more or less densely fringed with hairs; the tibia of the foreleg in *Papilionidae* and *Hesperiidae* has a spur about the middle, which is present in no other family of Butterflies. The tibia of the hindleg has also one pair of movable spines in most of the *Papilionidae*, and two pairs in many of the *Hesperiidae*. The tarsus in the perfect leg is terminated by two claws, which are sometimes entire or simple, and sometimes bifid; at the base of the claws the tarsus is also furnished in some families with other appendages, called *palpomychia* and *pulvilli* (see Glossary of Terms); the development of these appendages when present varies a good deal in the different genera.

The WINGS are larger among Lepidoptera in proportion to the body than in any other order of insects and among Butterflies form the most conspicuous parts of the whole insect. The usual shape of the forewing is triangular, and that of the hindwing roundest, but the outline, though usually similar in allied species and often affording specific and even generic characters, is subject to great variations. These variations often mark sexual distinctions, but occasionally individuals of the same species and sex differ widely in outline, as in the case of the females of

*P. memnon*, some of which have a large spatulate tail to the hindwing, while in others no sign of a tail is visible. The wings consist of a fine translucent membrane, permeated by a number of ribs, like the veins of a leaf or the rays of a fish's fin, and the whole covered more or less densely, both above and beneath, with tiny scales in which the colours of the wing lie. These ribs have been styled by various authors as "nervures" and "nervules," or "veins" and "veinlets," or "rays." In this book the former terms are adopted, the *nervures* signifying the main ribs, and the *nervules*, the branches which they throw off. In describing the wing of a Butterfly (see Pl. I), the junction of the wing with the body is called the *base* (A); the margin nearest the head from the base outwards is called the *costal margin*, or *costa*, or the *anterior margin* (A B); at the end of the costal margin, furthest from the body, is the *apex* (B); the margin furthest from the head from the base outwards is called the *inner or interior margin* (A C), and in the hindwing the *abdominal margin* (A D), at the end of the inner margin furthest from the body is the *hinder or posterior angle* (C), and in the hindwing the *anal angle* (D); and, lastly, the margin between the apex and the hinder angle is called in this book the *outer or exterior margin* (A C and C D); this latter margin has been termed also by some authors the *apical margin*. The term *hinder* (or *posterior*) *margin* has been used by authors with reference both to the outer and inner margins. In accordance with these terms the adjacent parts of the wing are referred to severally as the basal or sub-basal, costal or sub-costal, apical or sub-apical, anal or sub-anal, &c.—the prefix "sub" being used to denote "near to," as basal, at the base—sub-basal, near the base. When the *margin* alone is mentioned, as in describing marginal lines or rows of spots, the outer margin alone is signified. The wings are said to be *entire* when the margin is not serrated or incised in any way.

The *neurulation*, or arrangement of the nervures and nervules, follows the same general plan in all Butterflies, though the diversities in detail are numerous and of great value in discriminating families and genera (see Pl. I); the *costal nervure* (*a*) starts from the base nearest the head and extends just below the costal margin, ending in that margin usually at some distance short of the apex. The costal nervure of the forewing is always simple, but in some of the *Morphina* it appears to throw off one or more branches towards the costal margin; in the hindwing there is also usually a small nervure called the *precostal nervure* (*j*), close to the base and between the costal nervure and the costal margin, it is short, recurved and sometimes bifid; immediately below the costal nervure is found the *subcostal nervure* (*b*), which is continued to the outer margin a little below the apex; this nervure throws off two branches or nervules in the hindwing and three, four or five in the forewing (*b*<sub>1</sub>, *b*<sub>2</sub>, *b*<sub>3</sub>). All the branches of this nervure are invariably thrown off on the upper side towards the costa, and either end in the margin near the apex, or coalesce with the costal nervure. They are numbered in order as thrown off from the base—that nearest the base being the *first subcostal nervule*, the next the second, and so on. In the *Elymnina* and some others there is a short slender nervule connecting the subcostal with the costal nervure near the base; the space thus enclosed is called the *praediscoidal cell*. Below the subcostal nervure is a wide space (*h*) owing to the discoidal nervure which should follow, being either wholly or partially wanting. This space, which is usually closed by short transverse nervules, is called the *cell or discoidal cell*; the short transverse nervules (*g*, *g*<sub>1</sub>) closing the cell are termed the *disco-cellular nervules*, and are three in number (upper, middle, and lower) in the forewing, and two in number (upper and lower) in the hindwing, the "upper" being the one nearest to the subcostal nervure. From the points of junction of these disco-cellular nervules with each other, the *discoidal nervules* (*c*<sub>1</sub>, *c*<sub>2</sub>), two in the forewing and one in the hindwing, extend to the outer margin, these discoidal nervules being considered as branches of a discoidal nervure, which, as noted above, is either partially or wholly wanting; the discoidal cell on its lower edge is bounded by a strong nervure (*d*), termed the *median nervure*. This nervure has three branches, both in the fore and hindwings (*d*<sub>1</sub>, *d*<sub>2</sub>, *d*<sub>3</sub>), called the *median nervules*, which in this case are all invariably thrown off on the underside towards the outer margin, and being numbered in order as they are thrown off from the base, they reach the outer margin in inverse order, the first ending nearest the hinder angle, and the third nearest the apex. The lower disco-cellular nervule (when present) closes the cell by junction with the median nervure. Below the median

nervure is another nervure extending from the base of the wing to near the hinder angle, and without branches, called the *submedian nervure* (c). This nervure is occasionally (especially in the *Papilionida* and *Morphina*) joined to the median nervure near the base, by a short connecting nervule, termed the *interno-median nervule* (not shown in the plate). Lastly, between the submedian nervure and the inner margin is occasionally found a short nervure from the base, often not extending to the inner margin, and called the *internal nervure* (f).

This net-work of branches greatly facilitates exact description of the distribution of the colours and position of the markings, and of the various sexual appendages which are found on the wings of Butterflies, the latter chiefly in the males. When the names attached to the various margins, nervures, and nervules are impressed on the memory, the terms denoting the various areas will be readily understood. Broadly speaking the wing is divided, for purposes of description, into the following areas:—(1), the *costal area*, between the costal nervure and costal margin; (2), the *subcostal area* between the subcostal and costal nervures; (3), the *discoidal cell*; (4), the *interno-median area*, between the median and submedian nervules; (5), the *internal area* between the submedian nervule and the inner margin; (6), the *basal area* comprising the portion of all the above areas nearest to the base; (7) the *apical area* near the apex; and (8), the marginal area along the outer margin. The remaining portion of the wing between the discoidal cell and the marginal area is often loosely called the *disc* or *diskal area*; but for greater accuracy it is usual to define the interspaces between each pair of nervules. Thus, the space between the first and second median nervules is termed the *first median interspace*; that between the second and third, the *second median interspace*; that between the third median and lower discoidal nervules, the *third median interspace*; that between the lower and upper discoidal nervules, the *lower discoidal interspace*; and that between the upper discoidal and last subcostal nervules, the *upper discoidal interspace*, and so on.

The following expressions used in describing also require some explanation. When the term *both wings* is used it refers to the fore and hindwings of one side, not both forewings or both hindwings. The *length* of a wing is measured from the base to the apex; the *breadth* from the hinder angle to the costa; the *expanse* is usually taken as twice the length of the forewing plus the breadth of the body. A band or stripe of colour is said to be *longitudinal* when it is in the direction of the length of the wing, and *transverse* when it is in the direction of the breadth of the wing, whether fore or hind: thus a transverse band on the hindwing can be nearly parallel sometimes to a longitudinal band on the forewing. A *macular* band is a band evidently composed of coalescing spots, and a *lunular* band is one evidently composed of coalescing lunules.

The classification of Butterflies is not of course based on the features of the perfect insect only. The egg, as has been noted above, affords no indication of the affinities of the perfect insect, though, judging from analogy it is possible that further investigation may remove this apparent anomaly; but the other stages of caterpillar and chrysalis furnish important, and perhaps even more critical, tests of actual affinity than the last or final stage does. In a handbook of this sort the distinctive characters of the perfect insect are more prominently put forward in any case, on account of the perfect insect being more accessible to beginners in the study; and in this particular instance the characters of the earlier stages of Indian Butterflies, being so little known comparatively, it would be premature to attempt to give them the first place but it is essential to note that the classification, though based nominally on the perfect insect, must be considered as open to revision, when it is found that it entails anomalous grouping of the earlier stages. Generally speaking it will be found that this is not the case, and that the genera, as now defined, group together caterpillars and chrysalises of the same general types and habits.

The sexes of Butterflies differ frequently in colouring, and almost always in outline of wings and size; the female being usually the larger, and having the wings, especially the forewing broader and more rounded than in the males. But independently of colouring and outline, and also of internal structure, which can only be investigated by dissection under a microscope, there are in most instances external structural features by which the sexes can, with certainty and

without much difficulty, be discriminated. Throughout the families in which the forelegs are more or less imperfectly developed, including the *Danaïnae*, *Satyrinae*, *Elymninae*, *Morphinae*, *Acraeinae*, *Nymphalinae*, *Libytheinae*, *Nemobiinae*, and *Lycenidae*, the structure of the tarsus of the imperfect foreleg differs in the male and female. These differences vary in the different genera, (see Pl. I, dissections of *Junonia asterie*, *Elymnias undularis* and *Melanitis leda*, figs. *r.* and *f.*) and are detailed in the generic descriptions. In addition to the "foreleg" test the sexes of many species belonging to the above families may be recognised by marks on the wings, which occur in the male sex only. Such are the pouches on the hindwing of many species of *Danais*, the patches of silky appressed scales on the forewing of many species of *Euplaea*, the erectile tufts of hair on the hindwings of *Mycalesis* and of the *Morphinae*, the raised stripes along the median nervules of the forewing in some species of *Argynnis*. In the *Pierinae* the sexes almost invariably differ in colour, and the outer margin is more rounded in the females than in the males; but, with few exceptions, as for instance, the erectile tufts on the hindwings of *Catopsilia*, there are few prominent external features to distinguish the sexes. In the *Papilioninae* the sexual distinctions, irrespective of colour and outline, are very various. *P. polyctor*, and some of its allies, have raised stripes along the median nervules of the males, as in *Argynnis*; in *Leptorectus* and in many species of *Papilio*, such as *P. salicis*, *P. nox*, and its allies, the abdominal margin of the hindwing is broadly folded back on to the upper surface in the males. In *Ornithoptera*, and in some *Papilio* males have a pair of conspicuous corneous valves on the last segment of the abdomen; while in *Parnassius* the females are furnished with a corneous pouch on this segment. In *Teinopalpus* the male has one tail on the hindwing and the female has three. Among the *Hesperidae*, the only remaining family, the discrimination of the sexes is often a difficult matter. According to Westwood in some groups\* the fore-margin (costa) of the forewing is recurved in the males, the enclosed space being thickly clothed with pale coloured down; in others the males have a large velvety patch near the base of the forewing; in others the males have a thickened oblique ridge in the middle of the forewing; and in others the form of the club of the antennæ differs in the sexes. In life the females are as a rule less active than the males, and less frequently seen on the wing. It often happens that, when males are common in collections, females are rare or even unknown, as from their more sedentary habits they are more likely to escape observation.

The powers and style of flight vary much in the different genera, so much so that a practised observer will generally readily distinguish the different genera on the wing.

The genera in many cases contain a large number of species which can be grouped under several types. Some of the largest of these genera, such as *Danais*, *Euplaea*, *Lethe*, and *Mycalesis* have in recent years been divided up into numerous groups, based chiefly, if not entirely, on the characters of the male insect. The generic value of these sub-divisions is doubtful, but their usefulness as aids to correct arrangement and identification of the species is unquestionable. In order to retain the names of these sub-divisions, many of which will probably be adopted as generic divisions in future works but which at present we do not feel justified in using to the exclusion of the name of the larger and more completely defined group, of which they form sections, we have usually added in brackets after the generic name, the name of the minor group where it has been separately characterised.

With regard to species and varieties, we have found it convenient to describe, where there is any room for doubt, under its own distinctive name, every form that has been separately characterised. The question whether any particular form represents a species or a variety of a species can, at present be decided in most instances in this country only as a matter of conjecture, for a knowledge of the life-history in all its stages is essential to the authoritative settlement of such questions; at the same time the evidently, or apparently allied species, are carefully grouped together, and the nature of the variety is indicated as closely as our present knowledge will allow.

\* Exclusively American.



Thus a species, say *marginata* of *Euplexa*, belonging to the group which has been discriminated as *Salpinx*, is entered as *Euplexa (Salpinx) marginata*, and such species as *exprompta*, *nicobarica*, and *vulgaris*, which are all conjectured on very fair grounds to be merely local or geographical varieties of *Danaus similis* (of China) are entered as *Danaus exprompta*, *Danaus nicobarica*, &c., but grouped together in consecutive order with their apparent affinities indicated.

The great importance of a correct record of exact localities cannot be too strongly insisted on. The vague localities used by the earlier writers, such as "East Indies," which may mean any portion of India, Malaya or the Malay Archipelago; or "North-India," which may mean anything from the snows of Kashmir to the hot, moist, forests of Assam and Eastern Bengal, are useless for scientific purposes, and should be scrupulously avoided. Such localities have necessarily often been quoted in this book, for in some cases the Butterflies have not been captured since the original description was published, so that the exact localities of capture are still unknown. It is difficult to record on labels any full details, but in addition to the actual locality, the name of the province, and, if in a mountainous district, the approximate elevation above the sea, should invariably be noted. The date of capture too is a most valuable record, not only for information of future collectors in quest of the insect, but as a clue to whether the insect belongs to a spring, summer, or autumn brood. Doubtful localities, such as "Darjeeling," for a butterfly purchased at Darjeeling should be always carefully distinguished from the accurate records of places of capture. The necessity for care in this matter will be understood when it is considered how the Indian Empire is situated. There is a fairly typical "Indian" fauna, as represented by the central portions of Continental India and the Peninsula, but on the West Coast, stragglers from the African and South Palearctic fauna may be found. In the North West, and also in the higher ranges of the Himalayas, the Eastern Palearctic forms occur; on the east the Indo-Malayan fauna is largely represented, and many of the typical Malayan forms occur; and it is of great importance to ascertain, as accurately as possible, the extreme ranges to which the various types extend.

## COLLECTING AND PRESERVING.

To start with, a net is the first essential required. In England apparatus for collecting is to be obtained at any of the established Naturalist's shops; in India one has to depend a good deal on one's own ingenuity to supply one's wants in this respect. The main point to aim at is lightness, so far as is compatible with rigidity, of the frame and handle, on which the handiness of the net largely depends. Probably the simplest form of net is somewhat oval in shape, and made of three joints, which can be rivetted together or not at the discretion of the user. For this kind of net all that is required is to have made by any bazar blacksmith a brass Y and two ferules. The Y should be made of three tubes, the lower one somewhat larger and longer than the other two that form the branches. In the lower one a strong rigid stick is fitted, and for general collecting the stick should not be less than five or six feet in length, though for collecting small "Blues," &c., a shorter stick will be found much more handy. Again, for taking insects that fly high and settle on the upper branches of trees, a pole, 20 or 30 feet in length, may be required. The framework of the net should be in three pieces; the two side pieces (fitting at their bottom ends into the two upper branches of the Y) should be of very tough rigid wood. On their further ends the two ferules are fixed, one end of each being fastened with a rivet, so precluding any chance of the ferule falling off and getting lost. The top of the net may be made of a piece of rattan cane. The circumference of the net when fitted together should again depend upon circumstances. One fifty inches round is a good sized general net, but will be found much too small, unless very skilfully used, to catch the large, fast flying *Papilio*s, &c. Probably a net 70 to 80 inches round will be found the most generally useful, particularly in rich localities, where the larger insects abound. Nothing is more annoying than to lose a large, fine insect, which may be very rare, because one's net is an inch or so too narrow! For a small pocket net one made with the joints folding like the old fashioned parasol, the handle of which doubles up in the middle, will be found very useful.

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The framework should be made of four pieces of rattan cane, each piece bent by steaming into a quarter circle, the two end ones fitting, as in the larger net, into a Y-piece. This is a capital net for small insects, and has the great advantage of being easily put together and being "carriable" in an inside pocket. The net itself is a simple bag; a broad hem made of very coarse cotton cloth is made for the framework to run in, the bag being made of any length thought advisable. For the larger net four feet is not too long; about three feet will suffice for the smaller net, the framework of which should not exceed a yard in circumference. Common mosquito netting is a good material for the net; green gauze is better, but is more difficult to obtain; the flimsier the material used, the less is the risk incurred of injuring the insects.

A collecting box is the next essential. It should be made of zinc, and have pieces of sheet cork fixed to the lid and bottom inside by clamps. The box should be made to fit an outside pocket. When starting on a day's collecting, the cork should be well wetted, so that the specimens pinned into it remain limp till they are ready to be set. If the cork is not damped, specimens will get as dry as a chip in an hour or two under the hot sun of India, and require to be relaxed to be set. During a journey, when specimens cannot be set the same day, or when specimens are required to be sent long distances, either for custody or exchange, it is best to put them at once into paper cases. For this purpose a supply of paper should be kept ready, cut into oblongs of various sizes, a little longer than they are broad. Thin Serampore paper, or the thinnest printing paper, answers best; each paper should be folded diagonally once, with the two ends projecting, so that by folding over the right hand edge to the right, and the left hand edge to the left, a closed triangular pocket is formed, in which the Butterfly can be placed. Great care should be taken that the ends fold over the reverse ways, for then the pocket can be easily opened without damage to the Butterfly inside. Only one Butterfly should be put in each paper, and when putting it in the wings should be folded together over the back, and the antennæ put back carefully against the wings. Care should always be taken to prevent injury to the legs and antennæ if the species are to be of any value for scientific purposes. On each paper should be roughly noted the date and place of capture. Specimens thus packed can be safely kept and transported, and can be relaxed at any time. For relaxing two methods are available—first, a zinc box lined with cork well damped inside; second, an unglazed earthen *ghurra* fitted with a top, and containing about two inches of well damped sand. The mouth of the *ghurra* should be wide. The insects to be relaxed should be laid on the damp cork or sand and then closed up, the *ghurra*, if one is used, being wrapped with damp cloths. In a few hours the specimens will be found ready for setting.

Pins are next required. By sending a Post Office Money Order to Messrs D. F. Taylor & Co., New Hall Works, Birmingham, England, for a sovereign, and specifying the sizes of pins required, a supply will be sent by overland parcel post which will last an ordinary collector for five years. Nos. 11, (large, for *Papilio*, &c.), 12 (medium sized, the pin most wanted), and 6 (small size for "Blues," &c.) will be found a good selection.

Setting boards are required to spread out the insects on when caught and before placing in the collection. They can be easily made out of *Semul* or other soft wood, and should have a groove for the body, regulated in size according to the size of the bodies of the Butterflies intended to be set on them, and a smaller groove in the centre of the larger one for the reception of the pin. In making these boards great care should be exercised in making the pin groove in all the boards of equal depth, which should be one-third of an inch from the bottom of the body-groove. If this is not attended to, it will be found that, when the insects are taken off the boards and placed side by side in the store-box or cabinet, being at different heights on the pin, they present a very irregular appearance, all up and down, no two insects at the same level. Uniformity in setting adds greatly to the beauty of a collection. Boards should be made of all sizes—from half-an-inch broad for the tiniest "Blues" to eight inches for the gigantic *Ornithopteras*. The boards should also gently slope downwards on each side from the centre groove, not too much, say about 10°, and the slope in all the boards should be the same.

Lastly, places in which to store the insects, when caught and set, are required. The best are English-made mahogany cabinets, the drawers eighteen inches square, and about two inches deep, with a glass cover to each drawer, and a camphor cell round each. Such cabinets cost from £1 to £1.5 a drawer in England, so are very expensive; but there is nothing like them for preserving the specimens. The next best things are cork-lined store boxes with a single camphor cell, and fitting very closely. Any good native carpenter can turn out such boxes, and instead of cork, *sola* pith can be used; cut into strips and pasted on the top and bottom of the box with a double layer of moderately thick paper over it, it answers all purposes. The most useful size for store boxes is eighteen inches long, twelve broad, and three deep. If the boxes are all made of the same size, they can be packed very easily into a larger outer box, which is an additional security against mites and mould, the two great enemies to the collector in India. Such store boxes do not require glass covers. The supply of camphor in each box should be kept up most carefully, or else mites will destroy in a very short time the results of one's labors, and as an additional protection, if the insides of the boxes are occasionally painted over with a few drops of oil of aniseed, lemon grass oil or any "essential" oil to be obtained at a chemist's, mites will never shew themselves. Should they do so, a few drops of benzine or benzine collas dropped on the specimens affected, will destroy every mite without injuring the specimens in the least if the benzine is pure, but the benzine should first be tried on a *common specimen* to ascertain its purity, or rare specimens may be injured. Very often an insect will go greasy. To remedy this one has only to immerse the specimen bodily, pin and all, in a bath of benzine; take it out after a few minutes and leave the benzine to evaporate, and it will be found that, not only has the specimen not been injured at all, but that the grease has entirely disappeared, and the specimen is restored to all its original beauty. While the benzine is evaporating, and until the colours return, the specimen should be kept in a separate box in which the air can circulate.

Each specimen, when caught, should have a small label with the exact locality where caught, and date when captured placed, face downwards, on the pin beneath it. A collection should be arranged in rows, one specimen behind another; the males at the head of each row, the females following, and the name of the specimen ending each row. When a collection embraces specimens from various localities, it is an advantage to place a label at the side of and below each specimen, shewing where it was taken. This does away with the necessity of taking up each specimen to read the label beneath it, when its place of capture is required to be known, but under no circumstances should the label beneath the specimen be dispensed with, since from every point of view, a collection of insects with the specimens all properly 'localized' is worth far more than one in which the localities of the specimens have not been retained.

For further useful information on these, and on all other matters connected with the collection of insects, including the collecting and management of eggs, caterpillars and chrysalises for breeding, we would recommend collectors to obtain Dr. H. Guard Knaggs' "Lepidopterists' Guide for the use of the young collector," published by John Van Voorst, 1, Paternoster Row, London, E.C., the new illustrated edition of which can be bought for one shilling.

## SYNOPSIS OF THE FAMILIES AND SUBFAMILIES.

# RHOPALOCERA.

## FAMILIES.

**I.—NTMPHALIDÆ**, with the FORELEGS very feebly developed in both sexes, short, imperfect, and unfitted for walking. FOREWING with the subcostal nervure emitting four branches exclusive of terminal portion.

**I—DANAINÆ** Body, long, slender ANTENNÆ not half the length of forewing gradually clavate, PALPI, *short divergent, erect, very slightly compressed, clothed with dense short porrect hairs*. WINGS, entire, rather lengthened, never dentate or caudate CELL, closed in both wings FOREWING, nervures never dilated at base, upper disco cellular minute or wanting internal nervure slender, running into the submedian near its base HINDWING, discoidal nervure appearing as a third subcostal nervure, no prædiscoidal cell

**II—SATYRINÆ** Body, short, weak ANTENNÆ, short, slender, club usually slender but variable in shape PALPI, *moderately long, divergent, erect, very much compressed and clothed in front with long porrect hairs*, WINGS, broad, sometimes rounded, often dentate, occasionally falcate in forewing and slightly caudate in hindwing CELL, closed in both wings, FOREWING, with the nervures generally dilated at base HINDWING, with no prædiscoidal cell

**III—ELYMNINÆ** Body, rather robust ANTENNÆ short, slender with long, slender, gradually formed club PALPI *long, divergent, porrect, nearly straight only slightly compressed, clothed with short appressed hairs longer on the back edge*, WINGS dentate, or angled CELL, broad, generally closed in both wings by long, slender, much curved nervures FOREWING, with the costal nervure only slightly dilated at base HINDWING, furnished with a prædiscoidal cell

**IV—MORPHINÆ** Body, robust, seldom elongate ANTENNÆ long, slender, with a slender club, PALPI, *small, wide apart, erect, (elongate and porrect in Amathusia and Zenxiphi), front edge narrowed and sharp, clothed with scales or scaly appressed hairs, the back edge often hairy*, WINGS large, broad ample, sometimes rounded, sometimes with a short broad tail CELL, in forewing broad, closed—in hindwing open, FOREWING, with the nervures not dilated at base (except in *Cleome*), the costal nervure sometimes appearing as if branched HINDWING, with no prædiscoidal cell

**V.—ACRÆINÆ** Body, long rather stout ANTENNÆ short, abruptly clavate, the club obtuse at tip, PALPI, *long, divergent erect, hairy, the second joint somewhat swollen*, WINGS, long, narrow, entire, never dentate or caudate CELL, closed in both wings FOREWING, nervures not dilated at base, HINDWING, with no prædiscoidal cell, *not channelled* to receive abdomen NEURATION as in *Danaus*.

**VI—NYMPHALINÆ** Body, robust ANTENNÆ long, with a broad elongate distinct club PALPI, *large protruding, wide apart, scaly, the front edge broadly dilated*, WINGS, large, triangular, but varying much in outline CELL sometimes closed in both wings, often open in hindwing, and sometimes open in forewing also, FOREWING, nervures not dilated at base, (except in a few genera, *Ergolis*, *Eurytela*, &c., in which the costal nervure only is dilated), the second subcostal nervure emitted before end of cell, HINDWING, *channelled* to receive abdomen, *no* prædiscoidal cell.



**II.—LEMONIDÆ**, with the **FORELEGS** small, slender, imperfect, but more developed than in the *Nymphalidæ*; those of the *males* brush-like and clothed with long hairs, the tarsus without joints or claws; of the *females*, longer, slender, scaly, tarsus with the joints longer and more distinct than in the *Nymphalidæ*. **FOREWING**, subcostal nervure generally with only three branches, the disco-cellulars very slender. All of small size.

I.—**LIBYTHÆINÆ**: **BODY**, robust; **ANTENNÆ**, short, stout, incrassate, or gradually clavate; **PALPI**, very long, protruding, united at tip, forming a long conical beak; **CELL**, in both wings, closed; **FOREWING**, very falcate, upper disco-cellular minute.

II.—**NEMEOBIINÆ**: **BODY**, slender, or somewhat robust; **ANTENNÆ**, moderately long, slender, and abruptly clubbed; **PALPI**, very small and slender, scarcely advanced in front of the face, the last joint nearly naked; **CELL**, in both wings, closed; **FOREWING**, with the upper disco-cellular obliterated; **HINDWING**, very variable in shape, slightly channelled to receive the abdomen.

**III.—LYCÆNIDÆ**, with the **FORELEGS** slender and evidently smaller than the rest, but nearly alike in the sexes, used for walking, scaly; tarsus of the *male* long, exarticulate, that of the *female* jointed like in the hindlegs. **FOREWING**, with the subcostal nervure emitting only two, or three, branches; the discoidal cell generally narrow owing to the distance between the costal and subcostal nervures. All but one or two of small size. **BODY**, rather slender; **ANTENNÆ**, short, often ringed with white, with an elongate distinct club; **PALPI**, elongate, terminal joint, slender, horizontal and nearly naked. **HINDWING**, scarcely channelled to receive the abdomen, often with one or more slender tails; precostal nervure apparently wanting.

**IV.—PAPILIONIDÆ**, with **ALL SIX LEGS** perfect. **WINGS**, with the discoidal cells always completely closed; some of the subcostal nervules of the forewing emitted beyond the end of the cell.

I.—**PIERINÆ**: **BODY**, slender, or moderately robust; **ANTENNÆ**, elongate, with an ovate club, or short, incrassate and truncate; **PALPI**, rather long, perfect, often hairy. **FOREWING**, with lower discoidal nervule manifestly distinct from the median nervure; **HINDWING**, channelled to receive the abdomen; **TIBIA** of foreleg without any spur in the middle.

II.—**PAPILIONINÆ**: **BODY**, short, somewhat robust; **ANTENNÆ**, gradually clavate, club elongate, sometimes tapering; **PALPI**, short (except in *Tetralopis*), pressed close to the face, densely clothed with scales and hairs; **FOREWING**, with the lower discoidal nervule united to the third median, and appearing like a fourth median nervule; **HINDWING**, never channelled to receive the abdomen; **TIBIA** of foreleg, with a stout spur about the middle.

**V.—HESPERIDÆ**, with **ALL SIX LEGS** perfect. **WINGS**, with the discoidal cell of hindwing slenderly, and often incompletely closed, subcostal nervure of forewing always with four branches, all four emitted before end of cell. Of small size, very robust build and rapid flight. **BODY** of all but a few very robust; **ANTENNÆ**, wide apart at base, with a thick club, or strong curved hook at tip; **PALPI**, short, very broad, closely pressed against the face, densely squamose. **HINDLEGS**, generally with a pair of movable spines at the tip of the tibiae, and another pair in the middle; **MIDDLE LEGS** with a pair of movable spines at the tip of the tibiae.

The foregoing table is drawn up in accordance with the arrangement adopted in Kirby's "Synonymic Catalogue of Diurnal Lepidoptera," that being the only complete catalogue of the suborder yet published; but there are many points on which the arrangement is open to revision, and possibly improvement, when the life-history of exotic Butterflies becomes more fully known. The position of a few genera has already been altered.

The primary divisions into families are based, as regards the perfect insect, mainly on the structure of the legs, and especially on the extent of development of the forelegs.

The secondary divisions into subfamilies are far less clearly marked, and it is difficult to find distinctive characters of sufficient importance to maintain some of these divisions. The characters given in the table are merely a few of the more important, the remaining characters being detailed in the body of the work.

In the subfamilies of the *Nymphalidae* the most important test is the structure and clothing of the labial palpi, but even the palpi are not uniform throughout the genera of each subfamily; each division naturally may be expected to embrace, in addition to the more typical genera, aberrant forms showing approaches to other types, and with these there is sometimes considerable difficulty in determining their affinities. The characters given in the table, taken as a whole, will usually be sufficient for identification.

The *Danae* form a well-marked group, and as far as the Indian genera are concerned, no doubt has ever been raised as to the propriety of retaining each and all of them in their present places, their nearest allies are the American subfamily *Heliconinae*, which latter have no representatives in Asia.

The *Satyrinae*, too, form a well marked group, mainly distinguished structurally by the long hairs of the palpi. This character is not fully developed in all the genera, but no genera are included among the Indian *Satyrinae*, the position of which in the present subfamily has been considered doubtful. One or more of the nervi of the forewing are often, if not always, much dilated at the base, the dilation of the costal nerve occurs also in *Elymninae* and in some genera of *Nymphalinae*, but the dilation of the subcostal and median nervi is, where it occurs, characteristic of the *Satyrinae*. The *Satyrinae* are found in all parts of the world, but are most numerous proportionally in temperate climates.

The *Elymninae* in this arrangement are restricted to two very closely allied genera, which, with the exception of a very few east African species, are entirely Asiatic, and the bulk inhabit the Malay Archipelago. They are very closely allied to the *Satyrinae*, but differ in the clothing of the palpi, and in the presence of a prædiscoidal cell in the hindwing. Westwood included them with *Euryteta*, *Frigolia* and *Ulysses*, (which also have the costal nerve dilated at base) as a separate subfamily under the name of *Eurytelidae*, and there is a good deal to be said in support of this arrangement; the latter genera are now included among the *Nymphalinae*, and they form a link between that subfamily and the *Satyrinae* and *Elymninae*.

The *Morphinae* include several genera (*Amathusia*, *Zeuxidia*, *Enispe*, and *Discophora*) which were included by Westwood among the *Nymphalinae*, and also one genus, *Xanthoterna*, which Kirby even now includes among the *Nymphalinae*. The genera which should compose this subfamily, and even the right of this to the rank of a subfamily at all, have been frequently disputed. Horstfeld and Swainson grouped it with the *Satyrinae*, some of the American group have a prædiscoidal cell, showing affinity for the *Elymninae*, and some American genera have the discoidal cell in the hindwing closed. These American forms are included in a separate subfamily, *Brassolinae*, which has no representatives in India. But the characters given in the table will define the Indian genera, and, though numerous divergencies in structural detail exist even among these, the group is clearly a natural one.

The *Aercinae* contain only two Indian species, which were formerly considered to represent different genera, but now are included in a single genus. About fifty species are found in Africa, one in the Malay Archipelago, one in Australia, and between twenty and thirty in America. So far as the Indian species are concerned, this group is abundantly distinct. The American *Heliconinae* are closely related to this group.

The *Nymphalinae* embrace the widest differences of form, outline and even structure, the long and distinctly clubbed antennae and the protruding dilated palpi being the most

constant features. As arranged in this work they exclude, as stated above, certain genera now included among the *Morphinæ*, and they include other genera which are equally closely allied to the *Elymninæ*. The minor structural differences to be found within this group will be detailed further on.

The remaining groups, *Libytheinæ*, *Nemeviniæ* (or *Erycininæ* of Westwood), *Lycanidæ*, *Purinæ*, *Papilioninæ* and *Heperidæ* need no remark; the characters are well defined, and the allocation of the genera composing the groups is undisputed.

## FAMILY 1.—NYMPHALIDÆ.

This family includes the whole of the great division of Butterflies in which the forelegs of the perfect insect are undeveloped, having the tarsus rudimentary in *both* sexes. As thus defined it includes all genera in which the chrysalis is simply suspended by the tail and not girt about the body by a thread, (see Plate II, *Athyma leucothoe* and *Adolias lubentina*), with the single exception of the genus *Libythea*, which forms the link between the *Nymphalidæ* and the next family, *Lemoniidæ*. *Libythea* is a very distinct form; it was placed as a separate family by Westwood, and is still retained as a separate subfamily by Kirby; it is classed with *Lemoniidæ* rather than with *Nymphalidæ*, on account of the structure of the forelegs.

It also includes two distinct types of caterpillar:—the “Scolopendriform” (see Plate II, *Athyma leucothoe*), and the “Thysanuriform” (see Plate II, *Adolias garuda*), sections of Horsfield’s classification of 1857.

In the aspect of the perfect insect, the *Nymphalidæ* vary greatly; in shape from the long wing of *Hestia* to the short deep wing of *Kallima*; in colour from the sombre *Satyrina* to the brilliant *Euplexa* and *Apatura*; in size from the tiny *Ypthima* to the gigantic *Thaumas*; in structure from the weak *Erebus* and the delicately formed *Cyrestis* to the strong and rapid *Charaxes*; in habit too there is an equally wide divergence, from the shade-loving, sometimes crepuscular *Melanitis* to the *Vanessa*, which basks in the hottest sunshine; but throughout the family the small undeveloped foreleg folded closely against the thorax is a constant and well-marked feature.

### SUBFAMILY I.—DANAINÆ,\* Bates. (PLATES III TO IX INCLUSIVE.)

*Danaina*, Bates, Journ. Ent. vol. ii, p. 176 (1864); *Danaidæ*, Kelder, Wien. Ent. Mon., vol. vi, p. 74 (1862); *Danaidæ*, Doubl., Gen. D. L., p. 84 (1847).

**HEAD**, round. **Eyes**, oval, prominent. **Labial palpi**, divergent, ascending, scarcely rising above the forehead, distinctly triarticulate; the basal joint short, stout, curved; second double the length of the first, subcylindric, slightly curved, rounded at each extremity; third minute, about one-fifth the length of the second, obovate, slightly pointed. **Antenna**, gradually clavate. **Thorax**, moderately stout. **FOREWING**, elongate, the cell closed; the subcostal nervule always with four branches exclusive of the terminal portion; the first nervule thrown off before the end of the cell, generally distant, at its origin, about one-fourth the length of the cell from the disco-cellular nervule, the second thrown off at the end of the cell or very little before it, the third rather more distant from the second than from the fourth, the fourth about midway between the third and the apex. **Upper discal-cellular nervule** very short, or altogether wanting; **middle and lower**, about equal in length; **internal nervule** slender, running into the submedian, causing the latter to appear as if double at its

\* In his recently published “Lepidoptera of Ceylon,” Mr. F. Moore alters the name of this subfamily to *Euplexina* with the following remark:—“Linnaeus’s name of *Danaus* having been adopted in a generic sense by Esper in 1777, and also by Panzer in 1801, for species of *Pierina*, its use—as applied by Latreille in 1809, cannot be retained in this group of butterflies.” Possibly this may be strictly correct; but as the name of *Danaus* has been in general, if not universal, use in connection with the present subfamily for upwards of seventy years, and as its use in this sense cannot possibly be misunderstood, we have deemed it advisable to retain it here. It is so interwoven with this sense in all entomological literature that it seems a pity to have disturbed its claim to acceptance on account of an objection founded solely on works which are practically obsolete.

base. HINDWING obovate, the cell closed; the *discoidal nervure* always appearing to be a third subcostal nervule; *abdominal fold* mostly ample. LEGS, (except the forelegs) rather stout and long; *forelegs* imperfect, varying in the sexes: *middle* and *hindlegs* with the *tibiae* spiny; the *spines* not strikingly developed; the *tarsi* with the basal joint long; second, third, and fourth progressively shorter; fifth longer than the second; all spiny at the sides below; *claws* simple. ABDOMEN, rather slender, nearly as long as the abdominal margin of the hindwing.

CATERPILLAR — Stout, cylindrical, smaller towards the head, furnished on one or more of the anterior segments with a pair of long, slender, flexible, fleshy *tentacula*, not retractile; and with a similar, but often shorter, pair on the penultimate segment (*Westwood*). The anterior pair of these processes in all *Danaus*, and almost certainly in all *Hestia*, are a ticated and freely movable at the base and function as *antennæ* (*J. Wood-Mason*).

CHRYSLIS — Suspended, short, smooth, somewhat ovate, contracted near the middle (*Doubleday*), often with brilliant metallic colouring.

The *Danainæ* are insects of large or moderate size, of slow flapping flight when undisturbed, and of fearless demeanour. They include some of the very commonest of Indian Butterflies, and the commoner species are not only wide spread, but they occur in most parts in very great numbers. Their fearlessness is evidently the result of the freedom that they enjoy from the attacks of insectivorous birds and reptiles, which they owe to the presence of a pungent semi-aromatic odour pervading the juices of their bodies; these juices, when exuded by pressure, stain the skin yellow and leave a distinct odour; their bodies are moreover very tough and leathery, and they have great tenacity of life, so that any individual which might be accidentally seized and afterwards dropped by a bird, has a good chance of escaping with immunity when more delicately framed insects would be killed or hopelessly maimed. The males often bear curious sexual marks on the wings, and have besides the power of extruding and expanding two long brushes of yellow hairs from their anal extremity which have been thought to disseminate the odour with which the insects are furnished. In connection with the immunity from persecution which these insects enjoy, it is worthy of note that many species belonging to widely different genera, such as *Elymnias*, *Hypolymnias*, some of the *Pierina*, *Papilionina*, &c., which altogether lack this kind of protection, are found to closely resemble in outward appearance and style of colouration certain species of *Danainæ* which frequent the same localities at the same periods; such genera are termed "mimetic," with reference to this habit of mimicry, which is a subject of great interest and importance for investigation. Regarding the gregarious habits of these insects, Dr. Thwaites\* writes from Ceylon: "On a fine sunny day, when calm or nearly so, amazing numbers of one or more species of *Euplexa* may often be observed wending their way in one direction, as if floating upon the air a few feet from the ground, with an apparently sluggish movement of their wings, though really making rapid progress." Captain C. H. E. Adamson also writes that, on one occasion near Moulmein, on the 12th June, he found hundreds of *Euplexa* of numerous species, all congregated round a single flowering tree in the jungle, at a time when scarcely a single *Euplexa* was to be found elsewhere in the neighbourhood. Mr. Harold Ferguson has observed much the same habit in *Hestia lynceus*, and every one who has paid attention to the subject in this country must have observed the swarms of the common *Danaus chrysippus*, *D. genethia*, and *Euplexa core* to be found from time to time in various localities. All the *Danainæ* have the costal and subcostal nervures of the forewing rather widely separated; also the peculiar structure of the internal nervure noted above. They are found in all the four continents and in Australia, though as a rule confined to tropical and sub-tropical regions. The Indo-Malayan region, where the species are very numerous, appears to be the head-quarters of the subfamily. The distinctive characters of the Indian genera are shown in the following table:—

\* "Lepidoptera of Ceylon," by F. Moore, F.Z.S.

## Key to the Genera of DANAINÆ.

A. Antennæ almost filiform, scarcely perceptibly clavate. Of large size, wings elongate, diaphanous, white with black or blackish spots and marks, no sexual pouch on hindwing of male. *Claws furnished with paronychus and pulvilli.*

## I.—HESTIA.

B. Antennæ distinctly clavate.

a. Claws without paronychus or pulvilli

a<sup>1</sup>. With no sexual spot on hindwing of male. Smaller than *Hestia*, but similar in form and colouration.

## II.—JEROPSIS.

a<sup>2</sup>. Generally with sexual spot or pouch on hindwing of male. Wings yellowish brown, or bluish or greenish white, bordered and more or less streaked with black.

## III.—DANAIUS.

b. Claws furnished with paronychus and pulvilli. The sexual marks, usually on forewing of male, wings various shades of velvety brown or black often brilliantly glossed and spotted with blue, and often with white spots near the outer margin.

## IV.—EUPLEA.

The genera of *Danaius* and *Euplea* have been further subdivided into minor groups, based mainly on the form and position of the sexual marks in the males; these subdivisions are indicated under each generic head, but the generic names, as defined above, are retained, as they alone appear to have full generic value.

## Genus I.—HESTIA, Hübner. (PLATES III &amp; IV).

*Hestia*, Hübner, Verz. bek. Schmett., p. 14 (1816), Doubl. Gen. D. L., p. 94 (1847), Butler, Trans. Ent. Soc. Lond., series iii, vol. v, p. 467 (1867) *Monograph*, *Idea*, Fabricius, Ill. Mag., vol. vi, p. 283 (1808), Larr., Enc. Méth., vol. ix, p. 10 (1819), *Nom. Spec.* Horsfield, Cat. Lep. E. I. C., pl. iii, n. 28 a, b, c, d (1828).

ANTENNÆ, more than half the length of the body, slender, almost filiform, scarcely thickened at the apex. FOREWING, ample, elongate, somewhat oval; the outer margin sometimes sinuate, especially in the males. *Costal nervure* and first subcostal nervule anastomosing; *upper disco-cellular nervule* short but distinct. HINDWING, elongate, obovate; the abdominal fold almost wanting in the MALES, distinct in the FEMALES. FORELEGS, clothed with scales; the *femur* and *tibia* of about equal length; the *tarsus* of the MALES about one-third the length of the *ulna*, cylindrical, tapering towards the apex, sometimes showing indications of being four jointed, sometimes constricted near the base, without any signs of articulations. *Tarsus* of the FEMALES clavate, four-jointed each joint, except the fourth, aimed at the apex with a spine on each side. MIDLE and HINDLEGS, of moderate length; *tarsus*, long, with the last joint dilated. CLAWS, curved, rather short. PARONYCHIA with the outer lacinia strap-shaped, longer than the claw; inner lanceolate, more than half as long as the claw. PULVILLUS jointed, nearly as long as the claw, the second joint broad and corneous.

CATERPILLAR.—Unknown. CHRYSALIS.—Typical as in the subfamily. A chrysalis of *Hestia beta*, Westwood, is figured in Horsfield and Moore's Cat. Lep. E. I. C., vol. I, pl. iv, fig. 12 (1857), from Java.

The *Hestias* are remarkable Butterflies, of large size and with elongate wings; they are essentially tropical insects. About fifteen species are known, all from the Indian or Indo-Malayan regions. Within our limits they seem to be confined to Ceylon, the south of the peninsula and along the western Ghâts to the south Concan, reappearing on the east in Burma and the Andaman Islands. The texture of the wings is delicate, and the colour throughout the group is semi-transparent white or greyish white, sometimes pure, sometimes powdered with blackish scales, with the nervures and numerous spots and marks black. They fly slowly over the tops of bushes and trees, often at considerable height from the ground, but when within reach are not difficult to capture. They are essentially forest-loving insects, and frequent the neighbourhood of pools and streams. Locally they are known by various trivial names, often very appropriate, such as "floater," or "silver paper fly," or "Sylph" in Ceylon; "spectre" or "ghost" in south India; "widow" in Province Wellesley, &c.

The Ceylon species, *H. jasonia*, has been placed by Moore in his recent work on the Lepidoptera of that island under the genus *Nectarina* of Dalmann, which embraces a section



of the genus *Hesia* of Hübner. The characters of this genus, as extracted below from Moore's work,\* accord well with those of the Indian species, except that these latter have the disco-cellulars of the hindwing bent inwards, not outwards, but the two form an outward angle at their junction.

### Key to the Indian species of *HESIA*.

- A. With the white ground colour reaching the margin of the wings between the marginal spots and markings.
  - a. With the black band across the forewing consisting of a patch above and a distinct patch in the cell, the subapical spots small and separate.
    - a<sup>1</sup>. Of large size (Exp. 5.5 to 6.5 inches), ground colour typically grey.
      - 1. *H. LYNCUS*, Travancore to Mysore
      - H. IDRA*, Malaya
    - b<sup>1</sup>. Of smaller size (Exp. 4.5 to 5.5 inches), ground colour pure diaphanous white.
      - 2. *H. MALABARICA*, Western Ghâts, Concan
      - H. LINEATA*, Malacca
  - b. With the patch in the cell large and confluent with the black costal patch above, the subapical spots elongate and coalescing.
    - a<sup>2</sup>. With the inner margin white below the submedian nervure.
      - 3. *H. JASONIA*, Ceylon
    - b<sup>2</sup>. With the inner margin entirely black below the submedian nervure.
      - 4. *H. AGAMARSCHANA*, Andamans, Mergui
- B. With the black marginal spots coalescing on the border, the white ground colour especially on the hindwing not reaching the margin.
  - a. With the border spots only partially coalesced, the ground-colour white irrorated with black scales.
    - 5. *H. CADELLI*, South Andamans
  - b. The border spots all completely coalesced, the ground colour pure fleckless white.
    - 6. *H. HADENI*, Bassein, British Burma

Many of the species are very closely allied, and the specific differences require further study, especially with regard to geographical distribution. The Mergui specimens of *H. agamarschana* approximate to *H. jasonia* in the presence of the second interno-median spot on the hindwing. The coalescing of the spots on the apical half of the forewing and along the margin of both wings in *H. cadelli* show an approach to *H. hadeni* of Burma rather than to *H. jasonia* of Ceylon. *H. jasonia*, too, appears to be distinct; but between *H. lynceus* and *H. malabarica* there appears to be no constant difference except size, unless the white specimens from Travancore, as large as *H. lynceus*, are really *H. malabarica*, in which case the sole difference is in tone of ground-colour, as the markings are absolutely identical. Out of a large series of *Hesias* from the south Concan sent by Mr. G. Vidal, C.S., there is not a single large or grey specimen, all belonged to the small and white type; and again out of six or seven specimens sent by Mr. Harold Fergusson from the Ashambop range in Travancore, there were none of the small kind, all were very large; but while none were as grey as the typical *H. lynceus* some were almost as white as typical *H. malabarica*.<sup>†</sup> The most typical specimens of

\* *Nes-taria*, Dalm., in Billb. Enum. Ins., p. 76 (1820). "Wings semi-diaphanous, large, forewing lengthened, triangular costa slightly arched, apex quite convex, exterior margin very oblique, waved, posterior margin short, slightly concave in middle, costal nervure extending to half the length of the wing, subcostal with first branch emitted at some distance before end of the cell, and anastomosed to the costal near its end; second branch from near end of the cell, third and fourth at equal distances beyond, the fourth terminating above and the fifth below the apex, cell long, upper disco-cellular inwardly oblique and slightly angled near subcostal, lower outwardly convex, first radial from angle of the upper, and second from near upper end of lower disco-cellular, three median branches wide apart, submedian very recurved. Hindwing lengthened, oval, costal margin curved, apex convex and more or less prolonged, exterior margin slightly waved, anal angle convex; costal nervure short, with a basal forked spur, subcostal branches wide apart, first very short; disco-cellulars bent outward at their middle, the radial emitted from the angle, median branches wide apart; submedian and internal nervures slightly recurved. Body long, slender, palpi perfect, pilose above and beneath, tip pointed, legs long, slender, antennae slender" (Moore, l. c.).

*H. lynceus* are from the Wynnad, from whence they were sent by Mr Rhodes Morgan, although numerous specimens in the Indian Museum, Calcutta, from the Kadur District, Mysore, are equally typical as regards the dark-grey ground-colour, though somewhat smaller in expanse. The large Travancore race has been retained for the present as *H. lynceus*, but the point requires further investigation. *H. hadens* with its very broad pure black border is the most distinct of all the species.

1. *Hestia lynceus*, Drury.

*Papilio lynceus*, Drury, Ins., vol. ii, p. 12, pl. vii, fig. 1 (1773). *Hestia lynceus*, Doubt and Hew., Gen. D. L., p. 95 (1847). Horsfield and Moore, Cat. Lep. E. I. C., vol. 1, p. 134 (1857).

HABITAT : South-west peninsular India ; and Malaya.

EXPANSE : 5.3 to 6.3 inches.

DESCRIPTION : "UPPERSIDE, all the wings appear almost transparent and of a glassy hue, having a great number of black spots like velvet on them, of different shapes and sizes, some being round, some oblong, and others like streaks, there being on each forewing twenty-eight distinct ones, besides those placed near the anterior edges, which are not easily ascertained from their running into one another, the hindwing has thirty-three distinct spots like those on the forewing, whereof some appear double. UNDERSIDE, exactly similar to the upperside. The edges of both wings plain and even" (Drury, l. c.)

The above somewhat quaint description is taken from the original by Drury, it is not very definite, but an examination of the plate, though the colouring is overdone, leaves no doubt that the large *Hestias* from the Wynaad are identical with *H. lynceus*, Drury, the expanse of which is 6.3 inches.

The following is a detailed description of the Wynaad species. Forewing, with the space between the costal nervure and the margin black for about one-third the length of the wing from the base, then merging into a black spot extending from the margin to the subcostal nervure, beyond this the costal margin is alternately striped white and black. In the cell are three black streaks, the upper one starting from the subcostal nervure, the two lower united towards the base which they do not quite reach, beyond the middle of them is an irregular black patch usually not reaching the nervure on either side, at the end of the cell the disco-cellular nervules are broadly defined with black, a discal series of seven black spots, of which the three nearest the costa are parallel to the end of the cell, and the next four parallel to the outer margin; within this row is an irregular black patch on a black stripe between the median and submedian nervures, and a round black spot between the first and second median nervules; beyond the discal series is a submarginal row consisting of pairs of conical spots placed by the nervules, one on each side of each, and coalescing, and a marginal series, consisting of a conical spot on each nervule with the base outwards and the apex coalescing with the submarginal row, and between each pair of nervules an elongated spot; a narrow black marginal line extends completely round both wings. On the hindwing, the markings correspond with those on the forewing; the marginal, submarginal and discal series are similar in style and arrangement, but within the cell there are only two black streaks, the upper one with a short branch near the end. The ground-colour of both wings is semi-transparent white, covered with minute black irrorations giving it a greyish tone. The FEMALE differs from the male in being somewhat larger, the forewing broader and less emarginate. The Travancore specimens correspond entirely with the above in markings, but the ground-colour is purer and more opaque white, the black irrorations being confined to the outer half of the wing, or in some cases entirely wanting.

*Hestia lynceus* appears to be fairly common in the hilly districts of Travancore, but is rather local. Mr. Harold Fergusson writes : "On one occasion, on the 16th February, in a patch of heavy forest at about 3,500 feet elevation, I saw numbers of this *Hestia*. There must have been at least a hundred floating about the trees some twenty feet from the ground. I had seen none before this in any of the other forests, so I should think that they must



be local." \* \* \* "Later on during April they were not uncommon, but seldom numerous, \* \* \* and throughout May they were common in the hills in suitable localities." They seem to occur only on the hills, not lower than 1,000 feet elevation, and to frequent forests. In the Kadur District, Mysore, at about 2,500 feet elevation, it has been found common in August, October, and November, by Mr. G. H. Kearney, a correspondent of the Indian Museum.

In Malacca, and possibly extending up into Tenasserim, is found a variety of this species figured by Doubleday in the Gen. D. L. (plate xiii, fig. i) as *H. lynceus* var. *idea*; it is smaller than the typical specimens, of equally grey ground-colour, the wings narrower and more elongated, and all the markings smaller, and with no tendency to confluence at the apex of the forewing. - Expanse, 5·6 inches.

### 2. *Hestia malabarica*, Moore.

*H. malabarica*, Moore, Ann. and Mag. Nat. Hist., fourth series, vol. xx, p. 46 (1877).

HABITAT: South Concan, Malabar, South India.

EXPANSE: 5 to 5·5 inches (Moore); 4·3 to 5·0 inches (Marshall).

DESCRIPTION: "Allied to *H. belia*," [from Java] "but differs on the forewing in the costa being black-streaked, the cell-spot more compact, there being also a contiguous but distinct spot situated outside the cell nearer the base, and between the costal and subcostal nervures; the discal series of spots turns to the costa more abruptly and nearer to the end of the cell; these spots are more conical, and have no contiguous patches on the veins. The marginal series of vein-marks are on long peduncles. On the hindwing the spots are somewhat smaller. Abdomen above with a broad dorsal black band." (Moore, l.c.) The FEMALE differs from the male in being rather larger, the forewing less emarginate outwardly, broader and more rounded; the hindwing is also rounder. All the markings are larger and a deeper black, and the ground-colour not quite such a pure clear white. As the markings of this species are precisely similar in every detail to those of *H. lynceus*, there is no occasion to repeat them.

"Found in woody places on the western coast, especially on the thick-wooded mountain passes up the western Ghâts and Nilgiris." (Moore, l.c.) The *Hestia* found in the northern portions of the western Ghâts in the south Concan, and on the Goanese frontier, is much smaller than the dimensions given by Moore. Of nine specimens captured by Mr. G. Vidal, none reached 5 inches in expanse, and the smallest was only 4·3 inches; but there can be no doubt that they belong to the species described by Moore. Whether or not it is distinct from *H. lynceus* appears still open to doubt; but if the two species are distinct, the name *H. malabarica* would apply to the smaller northern race. It appears to be common towards the end of March on the wooded passes in the south Concan; a number of them were found on the Onomed and Coessi passes at about 1,600 to 1,700 feet above the sea, in that month.

Another species of this group, *Hestia lineata*,† Butler, has been recorded from Malacca.

\* *Hestia belia*, Westwood, Cab. Or. Ent., p. 75, pl. xxxvii, fig. 2 (1848). Habitat: Java. Expanse: 5·5 inches. Description: "Wings oval, snow white, with the veins and spots black; the rather small spot of the discoidal cell scarcely extending into the subcostal area, and with a row of black oval spots beyond the middle of the wings, parallel with the apical margin, which is alternately marked with oblong oval spots between the nervules, and clavate ones placed on the nervules, the inner false vein in the discoidal cell of the hindwing is marked in the middle of its outer edge with a black spot, the apical margin of the wings is rather irregular." (Westwood, l.c.)

† *H. belia* differs from all the Indian species by the purer and more opaque ground-colour of the wings, the more rounded outline, the neatly, sharply-defined and rounded character of the spots, and lastly by the discal series on the forewing being parallel to the outer margin throughout its length, giving a neater and more regular appearance to the style of the markings. The chrysalis is suspended freely by the tail from the back of a leaf as figured in Horsfield and Moore's Cat. Lep. E. I. C., vol. i, pl. iv, fig. 12 (1857).

‡ *Hestia lineata*, Butler, Trans. Linn. Soc. Lond., second series, vol. i, Zoology, p. 536, pl. lxxix, fig. 6. Habitat: Malacca. Expanse: 5·5 to 6·7 inches. Description: "Nearly allied to *H. belia*, Westwood, but much larger, the veins less broadly black-bordered; spots larger, excepting towards the costa of the forewing at apex, discoidal spot of hindwing very large; clavate markings terminating the nervules much longer, more slender in the middle." (Butler, l.c.)

This species seems to be the Continental representative of *H. belia*, which as yet has only been recorded from Java.

3. *Hestia jasonia*, Westwood. (PLATE III, FIG. 1 & 2).

*H. jasonia*, Westwood, Cab. Or. Ent., p. 27, pl. xlii, fig. 1, (1848), male; Butler, Trans. Ent. Soc. Lond., third series, vol. v, p. 470 (1867); *Nectarina jasonia*, Moore, Lep. Cey., p. 3, pl. i, fig. 1 (1880).

HABITAT: Ceylon.

EXPANSE: 4.75 to 6 inches.

DESCRIPTION: "MALE and FEMALE.—Wings semi-hyaline, fuliginous-white; nervures black. **UPPERSIDE**.—Forewing with a black basal costal border, an oblique irregular broad band across the middle of the cell, a short streak on the middle of the costa, a streak through the disco-cellular nervures, a large spot between the base of the two lower median nervures, a crutch-shaped mark extending to the base above the submedian nervure, a discal series of seven angulated-oval spots, a submarginal series of duplex spots terminating in a thickened streak at the end of each nervule, and a marginal row of spots. Hindwing with a black, round spot in the middle of the cell, two small spots below it, a discal series of eight angulated-oval spots, two of which are between the costal and subcostal nervures, a submarginal series of duplex spots terminating in a thickened streak at end of each nervule, and a marginal row of spots. Head and thorax spotted with white; thorax above, palpi and femora beneath, streaked with white. Abdomen black above, white beneath. **UNDERSIDE** of both fore and hindwings marked as above. Some specimens are darker coloured than that above described, being blackish fuliginous; others, again, have a slight ferruginous tint pervading the wings." (Moore, l. c.)

Horsfield and Moore, in the Catalogue of the Lepidoptera in the India Museum, p. 135 (1857), record a specimen of this species from Canara (south India), but all the *Hestias* we have yet seen from peninsular India belong either to *H. lynceus* or to *H. malabarica*, and with the solitary exception noted above the present species appears to be confined to Ceylon. A variety, also from Ceylon, has been discriminated by Butler, as having "the wings smaller, fuscous, especially towards the apex, with the spots more approximating to the external margin." "*Hestia jasonia* affects the glades of woods, and is notable for its graceful flight, rising and descending almost like a gossamer in the air, and well deserving the name of 'the Sylph' which is commonly given to it." (*Dr. Thwaites*). "It is found only in the deep shade of the damp forest, usually frequenting the vicinity of pools of water and cascades, about which it sails heedless of the spray, the moisture of which may even be beneficial in preserving the elasticity of its thin and delicate wings that bend and undulate in the act of flight." (*Tenent*). "In the forests, and especially about waterfalls in the western, central, and southern provinces, this Butterfly may be found all the year. It has a very slow floating flight, often poising nearly motionless, and is very easily caught." (*Hutchinson*).

The plate is taken from a male specimen from Ceylon, in the Indian Museum, Calcutta; the upperside only is shown; the underside is similar to the upper. In the FEMALE the wings are broader in proportion to their length, but the markings are similar.

4. *Hestia agamarschana*,\* Felder.

*H. agamarschana*, Felder, Reise Nov., Lep., p. 351, pl. xliii, fig. 7 (1867); Wood-Mason and de Nicéville, Journ. A. S. B. vol. i, pl. ii, p. 244, (1881); *H. jasonia*, var. 2, Kirby, Syn. Cat. D. L., p. 2, n. 9 (1871).

HABITAT: Andaman islands, Mergui.

EXPANSE: 4.6 to 5.1 inches.

DESCRIPTION: "MALE.—Wings pellucid white, with the nervures black, the cellular folds, coniform spots on the nervures along the margin, with two confluent spots above and oval ones between, an interrupted costal band on the forewing, a large confluent spot in the cell, three large spots below the cell, a small subapical band, a disco-cellular series of spots elongated and confluent towards the costa forming an irregular black band, and the internal margin, also on the hindwing the cellular spot and eight other round ones besides the marginal series, dusky black; on the UNDERSIDE the spots are paler and smaller." (Felder, l. c.)

\* "1. 'Agamarsena' from ἄγαμος 'unmarried,' and ἄρσεν, ἄρσενος 'male,' in allusion to the fact that the describer was ignorant of the opposite (female) sex."

According to Dr. Felder's figure the markings on this species are very similar in style to those of the south Indian *Hestia*, but far more boldly developed. The discal series of spots are much elongated towards the costa, where they are almost completely confluent, forming a wide subapical black band. It has been considered by some authors as a small local variety of *H. jasonia*, but "it obviously differs from *H. jasonia*, Westwood, by the wings being shorter in the inner and longer in the outer margin, by the more concave outer margin of the forewing, and by the longer and narrower discoidal cells." (Felder, l. c.). It is further distinguished from that and from all the other Continental types by the conspicuous subapical black band, and the wide black inner margin to the forewing. Quite recently (December, 1881, and January, 1882) three males and a female, which evidently belong to this species, have been taken for the Indian Museum in the Mergui-archipelago; these differ from the type in being a little larger, and in having the black spot near the middle of the streak in the intercosto-median area of the hindwing. The FEMALE differs from the male in the forewing being wider and less emarginate externally; and in all the black markings of both wings being smaller, leaving a greater extent of the pure white ground-colour. See remarks on the following species, *H. cadelli*.

5. *Hestia cadelli*, W.-M. & de N. (PLATE IV, FIG. 2 ♂).

*Hestia cadelli*, Wood-Mason and de Nicéville, Journ. A. S. B., vol. xlix, part ii, p. 225, pl. xlii, fig. 1 (1880), male; Id., vol. l, part ii, p. 244 (1882), female.

HABITAT: Port Blair, South Andamans.

EXPANSE: 5 inches; length of forewing, 2.45 inches.

DESCRIPTION: "MALE: Allied to *H. agamarschana*, Felder. Wings above pure subpellucid white, clouded, especially on the outer halves, with minute black scales, and marked and veined with intense black; all the markings larger, more or less coalescent, and blurred or paler at the margins; the nervures more broadly black-bordered, and the marginal spots completely run together, so that the wings are all, especially the hindwings, distinctly bordered externally with black. Forewing relatively narrower and longer, being more than twice as long as broad, with the discoidal cell equal in length to the submedian nervure, that is to say, to the inner margin, and all but as long as the outer margin measured in a straight line from the extremity of the submedian nervure to that of the subcostal; with the anterior discal spots more elongated and more completely coalesced, the spot between the first and second median nervures alone constantly free, and the large rounded one internal to it in the same interspace coalescent with the enlarged extremity of the cellular mark (which fills the cell nearly to the level of the origin of the second median nervure, and is divided at the base of the wing by three indistinct longitudinal clouded white streaks), and the large mark in front of the submedian nervure larger, triangular, and united by a black streak to the discal black spot beyond it. Hindwing shorter and broader, with the outer margin more broadly rounded off, the cell and the interspaces beyond it broader, the spot in it larger, and all those around it free, though exhibiting a tendency to coalesce with the black margins of the nervures. UNDERSIDE dirty-white, of a dull opalescent tinge, with fuscous-black markings and nervures. FEMALE: Both wings broader, with the markings of the same shape, situation, size, and shade as in the male, from which, in fact, the female differs in the proportions of the organs of flight just in the same manner as does *H. hadeni*, ♀ from *H. cadelli*, ♂" (vide Pl. IV).

In describing this species Professor Wood-Mason and Mr. de Nicéville recorded the following note: "This specimen does not agree with Felder's figure and description of *H. agamarschana*, the only species of the genus hitherto recorded from these islands, either in the extent and relations of the black markings or in the shape and proportions of the wings; the former being larger, more or less coalescent generally, and completely run together at the outer margin so as to form a distinct black border to each wing, the hindwing being broadly rounded off at the extremity, and consequently not presenting the peculiar egg-shaped outline so characteristic of these organs in all the hitherto described Indian *Hestia*, e.g., *H. lynceus*, *H. jasonia*, &c., with the latter of which Felder compares his species; the specimen apparently also differs from *H. agamarschana* in having the white of both wings everywhere more or less clouded

with minute black scales. *H. agamarschana*, it is true, to judge from Felder's figure of it, has the hindwing a little less pointed, the anterior discal spots on the forewing obviously more elongated, with more black in the cell and behind it, and the markings generally larger than in *H. jasonia*, and it is, as might have been expected, more closely related to the present specimen than to any other species; but, large series of specimens having shown us how extremely constant the different species or local races of *Hestia* are, we cannot unite the two, and we think that the differences they present are in all probability due to a difference of station, and that Helfer may have obtained the specimen that formed the type of Felder's species on a different island. All the Lepidoptera received of late years from the Andamans have been obtained in the immediate vicinity of the settlement at Port Blair, in an area therefore which is a very small fractional part indeed of the Andaman group of Islands, which extends through nearly four degrees of latitude. \* \* \* The specimens of *Hestia* which Hewitson, in his list of Butterflies from the Andamans (Ann. and Mag. Nat. Hist., fourth series, vol. xiv, 1874, p. 356) considers to be specimens of *H. agamarschana* remarkable for their dark colour, doubtless belong to the species now described."

The type specimen, which was obtained by Colonel T. Cadell, V. C., is in the Indian Museum, Calcutta. Another specimen, taken subsequently by Mr. A. R. de Roepstorff, also in the vicinity of Port Blair, on the 16th April, is in Major Marshall's collection. There are also a large series of both sexes of this species, collected by Mr. de Roepstorff, in the Indian Museum; they shew no variation whatever from the type, except in one or two specimens having an additional spot on the black streak in the interno-median area of the hindwing. The plate shews the upperside only of a male specimen in the Indian Museum, Calcutta.

6. *Hestia hadeni*, W. M. & de N. (PLATE IV, FIG. 3 ♀).

*H. hadeni*, Wood-Mason and de Nicéville, Journ. A. S. B., vol. xlix, part ii, p. 249, pl. xlii, fig. 3 (1880), female.

HABITAT: Bassein, British Burma.

EXPANSE: 5.18 inches, length of forewing, 2.54.

DESCRIPTION: "FEMALE. Closely allied to *H. cadelli*. Wings, above pure fleckless white, marked and veined with black of a fuscous tint, with the marginal, submarginal, and all but the two posterior (which are subcoalescent with the marginal band) of the discal series of spots in the forewing, but with the marginal and submarginal series only in the hindwing completely run together, so that only the inner portions of the outlines of the innermost series of the coalesced spots are in either case still discernible, and so as to form a very broad outer border of black to both the wings. Forewing, broader and shorter, being less than twice as long as broad, the extreme length of the cell bearing the same relation to the submedian nervure and to the less deeply emarginate outer margin; with the spot at the base of the second median nervule smaller and free of the nervules, as also is the discoidal cellular spot at its posterior extremity; the curved club-shaped mark in the interno-median area much as in *H. agamarschana*, but not connected by a black streak with the subcoalescent marginal spot beyond it, the outer black border with a clouded white spot in the first median interspace more or less distinctly separating the second discal black spot off from the band; and the black inner marginal space longitudinally streaked with clouded white. Hindwing broader, with its undulated outer margin still more broadly rounded; the spot in the discoidal cell smaller, and the spots around it also rather smaller and free of the black outer border, though exhibiting a tendency to coalesce with it in front of the second median nervule. UNDERSIDE of a less pure white than above, marked and veined with fuscous. Thorax more conspicuously marked with greyish-white than in *H. cadelli*, in which these marks are almost effaced, but this character, as also the differences in the proportions, and the less obvious emargination of the outer margin of the wings, may be sexual." The MALE is as yet unknown.

Two specimens, both females, agreeing in every respect with one another, were obtained by Mr. Algernon Haden at Bassein; no other instance of its capture is on record. The type specimen is in the Indian Museum at Calcutta, the figure of it shews the upperside only. For the use of this well executed plate, on which the two preceding species are represented, we



are indebted to Mr. J. Wood-Mason, Natural History Secretary of the Asiatic Society of Bengal, in whose Journal it first appeared.

### Genus 2.—IDEOPSIS, Horsfield. (PLATE V).

*Ideopsis*, Horsfield and Moore, Cat. Lep. E. I. C., vol. i, p. 133 (1857); *Danaüs*, sect. 4, Doubl., Gen. D. L., p. 90 (1847.)

"Closely resembles *Hestia* in form, colouring, and texture of the wings, and to which it has another resemblance in the absence of the sexual spot on the hindwing. Like some species of *Danaüs*, and like the genus *Hestia*, it has the first subcostal nervule anastomosing with the costal nervule. Like most species of *Hestia*, the genus *Ideopsis* has the wings somewhat diaphanous, white; the outer margin, nervures, nervules, two or more vittæ in the cell, and a series of dots between the nervules, sometimes coalescing, all fuscous; but notwithstanding these points of resemblance, it may always be known from *Hestia* at first sight by its distinctly clavate antennæ, and on closer examination by its claws devoid of peronychia and pulvilli." (*Doubleday*, l. c.)

The Butterflies belonging to this genus were for a long time included under *Danaüs*, and form section iv of that genus in Westwood's Genera of Diurnal Lepidoptera. They are a fairly well-marked group, and are distinguished from all species of *Danaüs* by the *Hestia*-like style of their markings and colouring, and from all except the first group *Radema* by the absence in the males of the sexual spot or pouch on the hindwing. Six species are known, all from the Indo-Malayan region, only one species extending into the Indian limits in Tenasserim; the same species occurs also in China, the other five are insular and local.

### 7. *Ideopsis daos*, Boisduval. (PLATE V, FIG. 4 ♂).

*Idea daos*, Boisd., Sp. Gén., vol. i, pl. xxiv, fig. 3 (1836); *Hestia eudora*, Gray, Lep. Ins. of Nepal, p. 10, pl. ix, fig. 3 (1846); *Idea diards*, Voll., Tyd. Ent., vol. iii, p. 44, pl. ii, fig. 4 (1860); *Hestia daos*, Doubl., Last. Lep. Brit. Mus., pt. i, p. 52; *Ideopsis daos*, Horsfield and Moore, Cat. Lep. E. I. C., vol. i, p. 134 (1857).

HABITAT: Tenasserim, Malay Peninsula, China.

EXPANSE: 4'0 to 4'4 inches.

DESCRIPTION: MALE: Both wings white, thickly irrorated with grey scales, semi-transparent, markings black, and also the nervures, which are more or less broadly bordered with the same colour. A narrow black line extends round both wings; *cilia* very short, black, white at the interspaces. *Forewing* with the whole of the costa black, and containing a basal streak about one-third the length of the wing, and three spots gradually decreasing towards the apex and equidistant from each other, white. Three black streaks in the discoidal cell, the anterior one immediately behind the subcostal nervure; the other two in the middle of the cell, joined about midway and not quite reaching the base of the cell. A large irregularly shaped spot occupies the outer end of the cell and extends a little beyond it. A discal series of six spots parallel with the outer margin between the nervules, the apical three small and conical, the point inwards, the lower three larger and circular. A marginal series of large spots placed on the nervules, between each pair of which on the folds are a pair of small marginal spots. A streak between the median and submedian nervures. *Hindwing* with a large spot occupying the outer extremity of the cell, from which issue two streaks united towards the base of the cell and which they do not reach. A discal series of six oval spots, the third and sixth from the apex the smallest, placed between the nervules. A marginal series of spots on the nervules, and between them a series of more or less pear-shaped spots, their points resting on the margin. The submedian nervure is widely bordered with black; between it and the first median nervule is a black streak (Penang specimen). The FEMALE differs from the male in the wings being shorter and broader, and the *forewing* not being emarginate. The ground-colour is also pure diaphanous white, all the markings smaller and clearer. It has also an additional spot on the *forewing* between the discoidal nervules (Singapore specimen). UNDERSIDE in both sexes, as above.

The caterpillar and chrysalis of *Ideopsis daos* were discovered by Captain Hamilton on the Tenasserim coast; and are figured by Horsfield and Moore (Cat. Lep., E. I. C., vol. i, plate iv, figs. 11, 12 a). The CATERPILLAR is about two inches in length, furnished with four pairs of

long fleshy tentacula<sup>4</sup> upwards of half an inch in length, the first pair on the second segment projected horizontally forward over the head, the other three on the third, fifth, and twelfth segments projected upwards and backwards. It is dark ringed between the segments, and has a row of six large oval red spots in the spiracular region on the fifth to tenth segments, both inclusive. The CHRYSALIS is 1·1 inch in length; it is simply suspended by the tail. In general outline it closely resembles the chrysalis of *Heslia delia*, but the tail is more pointed.

The figure is taken from a specimen from Penang in the Indian Museum, Calcutta; the upperside only is shown, the underside being similar in markings to the upperside.

• **Genus 3.—DANAIS**, Latreille. (PLATES V to VII).

*Danais*, Latreille, Enc. Méth., vol. ix, p. 10 (1819); Boisd. and Lec. Lép. Am. Sept., p. 133 (1833); Doubl., Gen. D. L., p. 89 (1847); Butl., Proc. Zool Soc Lond., 1866, pp. 43, 171, *Monograph*; *Danaida*, Latr., Hist. Nat. Crust. Ins., vol. xiv, p. 108 (1805); *Danaus*, Latr., Gen. Crust. Ins., vol. iv, p. 201 (1809).

"ANTENNÆ, about one-half the length of the body, gradually but distinctly clavate. FORELEGS, with the femora and tibiae about equal in length; the tarsi shorter. Tarsi of the MALES sometimes obscurely two-jointed, the basal joint subcylindric, rather stoutest at the apex; the second joint about one-fourth the length of the first, more or less pointed; sometimes without any indication of joints, subcylindric, tapering towards the base and apex. Tarsi of the FEMALES four-jointed, the last joint often indistinct, all, except the last, with a stout spine on each side at the apex. MIDDLE and HINDLEGS with the tarsi very spiny; the claws long, slightly curved; the pulvilli and paronychial obsolete."

"CATERPILLAR.—Subcylindrical, tapering towards the head; furnished with a few long fleshy tentacula, not retractile, placed in pairs, usually on the third and last segments. They are mostly white, tinged with green or purple, marked with transverse bands or narrow rings of black, the space between them often marked with yellow dots. They feed chiefly on ASCLEPIADEÆ."

"CHRYSALIS.—Suspended by the tail, ovate, contracted about the middle; the abdomen very short. They are commonly of a beautiful transparent green, spotted with black, and banded and spotted with gold, sometimes altogether of the most brilliant golden colour." (*Westwood*.)

*Danais* is distinguished from *Euphaea* by the want of paronychial and pulvilli, as well as by the style of the sexual mark in the males, when present. This genus comprises several well-marked groups, and has a very wide range; some species are to be found in the warm latitudes of every part of the globe. The perfect insects generally appear within fifteen days after the<sup>4</sup> chrysalis form has been assumed. They are of slow flapping flight, but often sailing high in the air with their wings expanded; most of the species are numerous and abundant where found.

The Indian species of *Danais* come under the following groups:—

- A. The males having the anterior tibiae and tarsi covered with short scales and fringed with thinly scattered long hairs, colours fuscous, with whitish or hyaline markings.
  - a. Males with no scent-pouch on the hindwing
    - I. RADENA, Moore.
  - b. Males with two scent-pouches on the hindwing, marked on the underside by dilatation of the first median nervule, and submedian nervure
    - II. PARANTILA, Moore.
  - c. Males with two scent-pouches on the hindwing, marked on the underside by dilatation of the submedian and internal nervures.
    - III. CHITTIRA,\* Moore.
  - d. Males with one scent-pouch between the first median nervule and submedian nervure protruding on the underside as a prominent sac.
    - IV. TIRUMALA, Moore.
- B. The males having the anterior tibiae and tarsi covered with long, hair-like, not appressed scales, colours tawny brown with black and white markings.
  - a. Males with one scent-pouch placed as in *Tirumala*, but with the sac not nearly so prominent.
    - V. SALATURA, Moore.

\* This group contains two types, very distinct in form and style of markings, the first has the wings elongate narrow, and with the hyaline markings greatly predominating (type, *D. tytia*). This is probably the type separated as *CADUGA* by Moore, but we have been unable to obtain any diagnosis of *Caduga*, and therefore cannot assign the name with certainty; the second has the wings shorter and broader, and the hyaline markings much reduced and narrow. This latter is the true *Chittira* of Moore (type, *D. saprobiana*).



**First Group**—RADENA. "*Forewing* moderately long, triangular; first subcostal nervule emitted at about one-third before end of the cell, and anastomosed to the costal in the middle; second nervule emitted before end of the cell. *Hindwing* broad, somewhat triangular; costal margin long, nearly straight; abdominal margin long; costal nervure very convex from the base, and then extending straight along the edge of the margin; cell broad, long; subcostal and median nervules very wide apart. No scent-pouch in the male. *Antennæ* longer than in allied genera, and with a more gradually thickened and blunt club. *Larva* (*R. juvenis*) with two pairs of fleshy filaments. Type, *R. similis*, Linnæus, from China." (Moore, Lep. Ceylon, p. 3, 1880).

Only three species of this group occur within Indian limits; another occurs in Siam (*D. persimilis*), and another in Java (*D. juvenis*), and it is possible that these may one and all be merely fixed geographical varieties of the type *D. similis*. The absence of the sexual spot in the male is a very distinctive feature found in no other group of Indian *Danaus*, and linking this group with the foregoing genera. In the absence of the sexual spot the males can be distinguished by the pointed tip of the tarsus of the imperfect foreleg, which in the females terminates in a brush; and by the narrower and less rounded wings.

### Key to the Indian species of Radena.

- A α Males with no scent pouch on the hindwing both wings blackish with subhyaline markings.
- a<sup>1</sup>. The white streaks from the base narrow, no defined black border to the wings
    8. *D. (Radena) VULGARIS*, Burma
  - β<sup>1</sup> The whitish spaces on the basal area greatly predominating, leaving a well-defined dark border beyond
    - a<sup>2</sup> The cell in the hindwing with two broad black streaks.
      9. *D. (Radena) RAPIDATA*, Ceylon
      - D. (Radena) PERSIMILIS*, Siam
    - b<sup>2</sup> The cell in the hindwing almost entirely hyaline
      10. *D. (Radena) NICOBARICA*, Nicobars.

### 8. *Danaus vulgaris*, Butler

*D. melissa*, Doubleday (nec Cramer), List Lep. Brit. Mus., vol. 1, p. 49 (1844). Gen. D. L., p. 92, n. 28 (1847). *D. vulgaris*, Butler, Ent. Month. Mag., vol. xi, p. 164 (1874). Moore, Proc. Zool. Soc. Lond., 1878, p. 822.

**HABITAT.** Burma, Mergui, Singapore, Borneo.

**EXPANSE:** 3.3 to 3.7 inches.



**DESCRIPTION:** "Allied to *D. similis*, altogether smaller, with all the spots paler and smaller, and all the streaks narrower; the second and third spots of the postcellular series smaller." (Butler, L.c.)

This is the original description, but in the absence of description of specimens of *D. similis*, which does not occur in India, and which has been but lately correctly discriminated, somewhat more is necessary to render it intelligible.

**MALE.** *Forewing* black; a streak in the discoidal cell from the base, followed by an irregular outwardly indented blotch near the end; a subcostal streak, followed by three decreasing subcostal spots, one between each pair of the nervules; an inwardly pointed streak above the first discoidal nervule; an oval spot touching the cell and an outwardly dentate spot some way beyond it between the first and second discoidal nervules; a similar pair of spots, but closer together between the second discoidal and third median nervules; a single large spot in each of the median interspaces near the base; two lengthened streaks starting from the base between the median and submedian nervules; a submarginal row of seven increasing spots, one between each pair of nervules, the apical one minute; an incomplete marginal row from the hinder angle of minute spots, two between each pair of nervules, and a short streak from the base below the submedian nervule—all subhyaline bluish-white. *Hindwing* brown, darker towards the apex, a spot at the base, a short streak above the costal nervule, and a longer one below it; two lengthened streaks in the cell joined at the base, with a short streak between them from the end; five streaks outside the cell, one in each interspace; two lengthened streaks from the base below the cell, (the inner one tinged ochreous), and one on each side of the internal nervule (also tinged ochreous); an irregular submarginal row of small elongate spots, coalescing with the streaks at the anal angle; and an incomplete marginal row of minute round spots evanescent at the apex—subhyaline bluish-white. **UNDERSIDE:** *Forewing* cupreous brown, blacker on the middle of the wing. *Hindwing* of a paler and uniform tint; all the subhyaline markings in both wings as on upperside.

*Danaus vulgaris* is recorded by Butler from Nepal, Assam, Bengal, Moulemein, Singapore, Borneo, and Java; but if it really does occur anywhere west of Burma it is extremely rare. Limborg met with it at Ahsown, Moulemein to Meetan, and the Hounduran sounce in Upper Tenasserim; Mr. A. Haden has taken it at Bassein; Captain C. H. E. Adamson has taken specimens in the neighbourhood of Moulemein in March, June, October and December; Captain Bingham took it in the Thoungyen forests in May. It is common at Rangoon; Dr J. Anderson has taken it at Mergui in December; and there are two specimens in the Indian Museum, Calcutta—one from Malacca, the other from Borneo. It is apparently not uncommon in Upper Tenasserim throughout the year, and is probably frequently overlooked; but we know of no instance of its occurrence as yet even in Pegu or Arakan. The true *D. similis*, which is a native of Formosa and China, only really differs from *D. vulgaris* in being somewhat larger. The figure is taken from a male specimen from Malacca, in the Indian Museum, Calcutta, and shews the upper and underside.

#### 9. *Danaus exprompta*, Butler.

*D. exprompta*, Butler, Ent. Month. Mag., vol. xi, p. 164 (1874). *Radena exprompta*, Moore, Lep. Ceylon, p. 4, pl. ii, fig. 1 (1880), Female.

**HABITAT:** Ceylon.

**EXPANSE:** 3.25 inches (Butler); 2.75 to 3 inches (Moore).

**DESCRIPTION:** "Allied to *D. similis*, much smaller, the pale spots and streaks broader at base of wings, and in the series bounding the cell of *hindwing*, the second and third spots of the postcellular series in *forewing* considerably smaller; the long cuneiform spot of the outer discal series nearer to apical margin. **UNDERSIDE**, altogether paler and less coppery in tint." (Butler, l. c.)

The above is the original description; the following more detailed description is taken from Moore's "Lepidoptera of Ceylon":—

**"MALE and FEMALE:** **UPPERSIDE** blackish-brown; abdominal margin pale brown. *Forewing* with a pale blue narrow discoidal streak, and a large sinuous quadrate spot beyond it; a slender costal streak; two streaks below the cell, and a slender basal streak on inner margin; two large discal spots, three small upper spots, and five subapical spots, the upper three of which are slender; a submarginal regular series of seven small spots, and a marginal row of minute spots. *Hindwing* with pale blue, broad, basal streaks, large discal spots, an

irregular submarginal and marginal row of small spots. *Head*, *thorax*, and *palpi* white spotted. *Femora* beneath streaked with white. *Abdomen*, brown above, paler beneath. **UNDERSIDE:** *Forewing* dark brown; *hindwing* umber-brown; markings as above, but paler.\*

"Common in Kottawa forest, but have not seen it elsewhere" (*Wade*). It appears to be confined to the island of Ceylon; no record of its occurrence elsewhere has been made.

A closely allied species belonging to this group has lately been described from Siam under the name of *D. persimilis*†

10. *Danais nicobarica*, W-M & de N.

*D. similis*, var. *nicobarica*, Wood Mason and de Nèveville, Journ. A. S. B., vol. I, pt. 14, p. 225 (1882).

**HABITAT.** Great Nicobar.

**EXpanse:** *Male*, 3·1 inches; *female*, 3·2 inches.



**DESCRIPTION.**—"MALE and FEMALE. Nearest to *D. exprompta*, Butler, from Ceylon, from the figure† of which species (probably that of a female, though the sex is not stated) it differs, in the *forewing* in having the streak in the base of the interno-median area broader, occupying all but the entire breadth of the space, shorter, and marked along the middle by a linear streak (instead of being divided into two long and narrow streaks connected at the base only), and, in the *hindwing*, in having the cell entirely subdiaphanous greenish or bluish white, except for two excessively fine and faint longitudinal and apically-divergent dusky lines much as in *D. juvena* (instead of being divided by two very broad and black ones into two streaks, the posterior of which is strongly recurved at its free end); the discal series of bluish streaks immediately beyond the cell much narrower and shorter, and the ground-colour around them consequently of greater extent and giving to this portion of the wing a much darker appearance, again much as in *D. juvena*. The MALE differs from the female in the bluish markings of both wings being of a much deeper shade, and, with the exceptions to be stated, larger, in the *forewing* being narrower and externally slightly emarginate (instead of well rounded), with its outer submarginal series of spots reduced to small specks, and the three posterior ones of its inner series externally distinctly tridentate; and in the *hindwing* being also apparently somewhat narrower and less rounded externally, with both series of submarginal spots much smaller,—with its two posterior veins margined on both sides with fuscous of a far lighter and duller tint than the rest of the ground,—and with the submedian one of them more prominent, with the wing membrane on each side of it raised into a slight fold, and the two light streaks that bound it dirty whitey-brown: the male of this species is, in fact, provided with a distinct, though little-specialized, sexual mark or scent-gland."

\* *Danais persimilis*, Moore, Proc. Zool. Soc. Lond., 1879, p. 136. **HABITAT.** Petchaburree, Bankok District, Siam (April 12th, 1875). **EXpanse.** 2·37 inches. **DESCRIPTION.** "Nearest allied to *D. exprompta*, Butler (the Ceylon form of *D. juvena*), but is much smaller in size. The markings are similar; but those from the base of the wings are very much more attenuated and shorter, and the discal spots also smaller, the markings on the *hindwing* being more attenuated than those in *D. grammica* (Moore, l. c.). *D. agestodes* is probably referred to here.

† Moore, 'Lep. Ceylon,' pl. 11, fig. 2, 1880, female.

"One male and three females, the latter agreeing exactly with one another, from Great Nicobar." No notice of its occurrence elsewhere has been recorded. The figure shews the upper and underside of a female in the Indian Museum, Calcutta.

*Second Group.*—*PARANTICA*. "Forewing long, narrow; inner margin lengthened; first subcostal nervule emitted at one-fourth before end of the cell and touching the costal nervure near its end; the second emitted immediately before the end of the cell; cell long, narrow. Hindwing somewhat elongated; exterior margin very convex; abdominal margin short; costal nervure arched from base and thence extending along edge of the margin; cell very long and narrow. MALE with two spatular-shaped scent-pouches, one (the largest) being on the first median nervule, the other (about one-fourth its size) on the submedian nervure, near their end, each being visible on the underside by the slender swelling of these nervures at that part. Antennæ with lengthened slender tip Larva with two pair of fleshy filaments. Type, *D. aglea*, Cramer." (Moore, 'Lep. Ceylon,' p. 7)

This group is further divisible into two sections, the first of which has for its type *D. cleona*, Cramer; the Butterflies of this section comprise the smallest species of the genus, and are distinguished from all other species of *Danais* by having beautiful pure yellow tints on the hyaline markings of the wings; they are Malayan Butterflies, and within Indian limits are extremely rare. Four species are included in the Indian list, but the claims of two of them for inclusion rest on somewhat obscure data, especially those of *D. aspasia*, which is recorded from south India. The Butterflies of the second section, type *D. aglea*, are rather larger in size, and have no trace of the pure yellow tints; their head-quarters too are in Malayan, but they extend over the greater part of India, and some of the species are common where they occur. Of the five Indian species, one is found in Ceylon only, another, which is doubtfully distinct from the Ceylon species, occurs throughout peninsular India; another in north India extending into Burma; another in Burma extending to the Nicobars; and the last is confined to the Andaman Islands. They are all comparatively delicately-formed Butterflies, with rather elongate wings, and having the hyaline markings usually preponderating over the blackish ground-colour.

### Key to the Indian species of Parantica

- A. *♂*. Males with two scent-pouches on the hindwing, visible on the underside by dilatation of the first median nervule and submedian nervure. Wings blackish, with hyaline markings.
  - a<sup>1</sup>. Of small size, some of the hyaline markings tinged with pure yellow.
    - a<sup>2</sup>. With yellowish tints on both wings
      - a<sup>3</sup>. With only one, or two, very small dorsal spots between the third and second median nervules.
        11. *D. (Parantica) CLEONA*, N India (?), Java
      - a<sup>4</sup>. With two spots, the inner one filling the base of the interspace
        - a<sup>5</sup>. Outer margin of forewing convex and markedly emarginate, the streaks between the discoidal nervules short and broad.
          12. *D. (Parantica) IMBOMBIA*, Nepal (?), Java
        - a<sup>6</sup>. Outer margin of forewing highly emarginate the streaks between the discoidal nervules long and narrow.
          13. *D. (Parantica) CROCEA*, Burma, Java
      - a<sup>7</sup>. With yellowish tints on hindwing only
        14. *D. (Parantica) ASPASIA*, Tranquebar (?).
    - a<sup>8</sup>. Of rather larger size, no pure yellow tints.
      - a<sup>9</sup>. Deep black, with pure hyaline white markings, hindwing with the black streaks very fine and white spaces wide.
        15. *D. (Parantica) MELANOLEUCA*, Andamans.
      - a<sup>10</sup>. Fuscous, with dull hyaline bluish white markings.
        - a<sup>11</sup>. Forewing with the hyaline streak between the discoidal nervules almost touching the discocellular nervule.
          16. *D. (Parantica) AGLEA*, N India, Burma
        - a<sup>12</sup>. Forewing with the streak between the discoidal nervules not nearly reaching the discocellular nervule
          - a<sup>13</sup>. Forewing lengthened and emarginate on outer margin hyaline markings large, prominent.
            17. *D. (Parantica) CEYLANICA*, Ceylon
          - a<sup>14</sup>. Wings comparatively short and rounded, all the hyaline spots small, and the streaks narrow.
            18. *D. (Parantica) GRAMMICA*, S India.
        - a<sup>15</sup>. Wings comparatively short and rounded, all the hyaline spots small, and the streaks narrow.
          19. *D. (Parantica) NOLIOIDES*, Burma, Nicobars.

*D. ceylanica* is precisely similar to *D. grammica*, except that its tone of colouration is somewhat darker, and the hyaline markings are rather less prominent; they are very doubtfully distinct as species.

#### 11. *Danais cleona*, Cramer.

*Papilio cleona*, Cramer, Pap. Ex., vol. iv, pl. cclxxvii, fig. F (1781); Herbat, Pap., pl. cxxvi, fig. i (1793); *Danais cleona*, Godt., Enc. Méth., vol. ix, p. 190, n. 47 (1819); Blanc, Voy. au Pôle Sud, vol. iv, p. 386, pl. ii, fig. 3 (1853); *Danais lutescens*, Butler, Proc. Zool. Soc. Lond., 1866, p. 172, n. 5, p. 173, fig. 3, female.

HABITAT: North India (apud Westwood and Butler), Java, Borneo.

EXPANSE: 3.0 to 3.5 inches.

DESCRIPTION: The following description is taken from Cramer's plate:—**MALE: UPPER-SIDE:** Forewing black, with a short basal streak and beyond it an oval spot, both in the cell; three submarginal spots along the costa, below which are a short and broad streak below the subcostal nervure, a longer one between the discoidal nervules; a large spot above and a small one below the third median nervule; two spots below the second median nervule, the inner one large and completely filling the base of the interspace; and the space between the median and submedian nervules from the base to rather more than half the length of the wing—all hyaline tinted with pure yellow. A submarginal series of spots one between each pair of nervules, and a marginal row of smaller spots not reaching the apex, two between each pair of nervules—both series white. Hindwing also black; the entire discoidal cell, a series of spots round it between the nervules, a double streak joined at the base below the median nervure, a single streak below the submedian (and probably another near the abdominal margin) hyaline, tinted with pure yellow. A submarginal and marginal row of white spots as on forewing, except that in the hindwing there are two spots between each pair of nervules in both series. The usual black sexual marks. The FEMALE from Ceram and Borneo has been described by Butler as a separate species under the name of *D. lutescens*, and is stated to be "closely allied to *D. cleona* of Cramer, from which it differs chiefly in its pale colouring, more rounded and shorter wings, and larger spots." (Butler, l. c.). His figure agrees exactly with Cramer's, except in the outline of the wings being more rounded, and in the discoidal cell of the forewing being entirely hyaline. Blanchard's figure of a female (apparently) from Ceram in the "Voyage au Pôle Sud" shows a second very small spot inwardly between the third and second median nervules, which is absent from both Cramer's figure of a ♂, and Butler's of a ♀, thus showing an approach to *D. philomela* and *D. cloaca*.

Atkinson (Ent. Month. Mag., vol. iv, p. 60, 1867) records having taken *D. cleona* at Jounpur, North-Western Provinces, in July. This record at any rate goes to prove that at least one species of this group of *Danais* still occurs in Continental India, but as far as we know there is no specimen of *D. cleona* now in any collection in this country.

#### 12. *Danais philomela*, Zinken-Sommer.

*Euplexa philomela*, Zinken-Sommer, Nova Acta Ac. Nat. Cur., vol. xv, p. 184, pl. xvi, fig. 17 (1831).

HABITAT: Nepal (apud Butler and Kirby), Java.

EXPANSE: ♂, 2.5; ♀, 2.9 inches.

DESCRIPTION: **MALE: UPSIDE:** Forewing black: with the discoidal cell; two spots between the third and second median nervules; two larger spots between the second and first, the inner one of each pair entirely filling the base of the interspace; the entire space between the median nervure, first median nervule and the submedian nervure to within a fourth of the length of the wing from the outer margin—pure hyaline yellow. Three subcostal oval spots, one between each pair of the subcostal nervules; two streaks below these, the lower the longest; an outwardly indented spot between the second discoidal and third median nervules; a submarginal series of increasing spots, one between each pair of nervules; a very incomplete series of smaller marginal spots, two between each pair of nervules—white. The discoidal cell has near its middle a dusky streak, and the median nervure is widely bordered on both sides with black. Hindwing also black; with two small spots at the base; a very short streak above the costal nervure; a long one below it; the entire cell; a streak



below the first subcostal nervule ; a longer and broader one below this ; a spot between the discoidal and the third median nervules ; another between the third and second, with a small round spot beyond it ; a broad streak between the second and first, filling the base of the interspace, also with a small round spot beyond it ; two broad streaks connected at the base, between the median and submedian nervules ; a streak between the submedian and internal nervules—pure hyaline yellow. A small spot at the end of the streak below the costal nervule ; a spot beyond the streak between the first and second subcostal nervules ; an irregular submarginal row of small spots interrupted at the black sexual mark ; a regular marginal series ; both series with two spots between each pair of nervules—white. The streak between the internal nervule and the abdominal margin almost white, but faintly tinged with yellow. **UNDERSIDE** as above. Described from a Javan specimen in the Indian Museum, Calcutta. The figure of a FEMALE given in the "Nova Acta" differs from the male in the *forewing* being broader, rounder, and but slightly emarginate ; in having only the broad space below the median nervule tinged with yellow ; and the submarginal series of spots on the *hindwing* complete from the absence necessarily of the male sexual spot.

Butler writes (Proc. Zool. Soc. Lond., 1866, p. 456) :—" *Euplaea philomela* of Zinken-Sommer, hitherto placed as a synonym of *D. cleona* of Cramer, must be kept separate from it. This species, excepting in form, bears a more general appearance to my *D. crocea* ; it is intermediate between the two species ; and the male, two specimens of which I have discovered in the [British] Museum collection, is of the same form as my *D. gloriosa*, ♂. It may be easily distinguished from *D. crocea*, not only by its different form, but by the male having the entire basal portion of the *forewing* yellow, and the subapical streaks much broader and shorter. **HABITAT** : Java, Nepal." It is included in the Indian list on the strength of the above quotation. If it does really occur in North India, it is rare ; it was not met with in Tenasserim either by Limboig or Captain Bingham.

### 13. *Danais crocea*, Butler. (PLATE V, FIG. 6 ♂.)

*D. crocea*, Butler, Proc. Zool. Soc. Lond., 1866, p. 57, pl. iv, figs. 5, 6.

**HABITAT** : Nepal?, Assam?, Burma, Penang, Malacca, Singapur, Java, Borneo.

**EXPANSE** : ♂, 2.5 to 3.12 ; ♀, 2.62 to 3.19 inches.

**DESCRIPTION** : " Allied to *D. cleona*, Cramer, from which it differs in having the cell of *fore-* and the costa of *hindwings* unclouded, the subapical and submarginal spots more numerous, and white, not yellow ; an additional yellow spot below the base of the third median nervule, the nervules not so broadly margined with brown, and the wings more transparent. **UNDERSIDE** the same as above. *Note*.—In some specimens the whole transparent portion of the *forewing* is clear white, with a slight tinge of yellow at the base." (Butler, l. c.)

" Occurs at Penang in August and September." (W. L. Distant.)

The figure is taken from a male specimen in the Indian Museum, Calcutta, from Kyouk Phyoou, Burma, and shows both upper and underside. This specimen differs from Butler's description as given above, in that the cell of the *forewing* is decidedly clouded, but it corresponds exactly with his figure No. 5—the real point of difference between this species and *D. cleona* being the absence, in the latter, or very minute size if present, of the inner spot between the second and third median nervules of the *forewing*. Dr. Anderson took two male specimens of this species at Mergui in December, and one in March.

### 14. *Danais aspasia*, Fabricius.

*Papilio aspasius*, Fabricius, Mant. Ins., vol. ii, p. 15, n. 145 (1787).

**HABITAT** : Trinquebar.

**EXPANSE** : (not given)

**DESCRIPTION** : " Wings oblong, entire, black with hyaline streaks and spots. *Hindwing* yellow at the base, head and thorax black, spotted with white ; abdomen fuscous. *Forewing*,



black, the base streaked and the apex spotted with hyaline. *Hindwing*, yellow at the base, with the veins black, the margin black, with hyaline spots."

The above is the original description by Fabricius; there does not appear to be any recent record of the occurrence of this species, but the description is sufficient to admit of identification if the Butterfly should again be found.

15. *Danais melanoleuca*, Moore.

*D. melanoleuca*, Moore, Pro. Zool. Soc. Lond., 1877, p. 381, pl. lviii, fig. 3.

HABITAT: South Andamans (Port Blair).

EXPANSE: ♂, 2·3 to 2·8; ♀, 2·6 to 3·3 inches.

DESCRIPTION: "MALE and FEMALE: Black. *Forewing*, with white space within the cell, two-thirds of space between first median nervule and submedian nervure; four discal spots, an indistinct costal basal streak, three costal spots before the apex, two lower elongated streaks, followed by a dentate spot, and three smaller rounded submarginal spots; some marginal white dots near the posterior angle, and a small spot below the apex, the space within the cell with short, narrow, dusky streaks from its end, and a median dusky line within the space below the median nervure. [In the numerous specimens in the Indian Museum, Calcutta, the submarginal spots are five to seven in number]. *Hindwing*, with white space within the cell and between the nervures to one-third from the outer margin, the upper spaces concave, and the lower conical externally; an indistinct dusky lunule crossing the end of the two lower median spaces, a prominent black bifid streak within the cell, and a line between first median nervule and submedian nervure; a submarginal series of small white spots, two between each pair of nervules (two being obsolete in the male on the sexual mark), and a marginal series of seven smaller spots from anal angle. *Head and thorax* with white spots and streaks. *Abdomen*, cinereous brown above, white beneath. *Femora and tibiae*, white streaked." (Moore, l. c.) On the *UNDERSIDE* the markings are similar, but the marginal and submarginal series of spots are larger and complete on both wings. In the *forewing* the white space in the cell is sullied; and the two streaks beyond the cell and the spots below them are extended towards the submarginal spots, and very concave externally. In the *hindwing* the lower median white spaces, and the subcostal space are shortened, while the discal white spaces are lengthened, making the black border much more irregular in width than on the upperside.

*D. melanoleuca* is only as yet known from the Andamans, and is probably a local, insular, though very well marked, species nearly allied to *D. vittina*, Felder. It appears to be common at Port Blair, where it is on the wing throughout the year.

16. *Danais aglea*, Cramer. (PLATE VI, FIG. 7 ♂ ♀).

*Pupilio aglea*, Cramer, Pap. Ex., vol. iv, pl. cccxxvii, fig. E (1781), male: Herbst, Pap., pl. cxxv, fig. 5 (1793); *Danais similis*, Godart, Enc. Méth., vol. ix, p. 190, n. 46 (1819); *Danais aglea*, Moore, Pro Zool. Soc. Lond., 1878, p. 822.

HABITAT: Sub-Himalayas, Assam, Burma, Tenasserim.

EXPANSE: 3·0 to 3·8 inches.

DESCRIPTION: MALE: *Forewing*, swarthy black; the discoidal cell, a narrow subcostal streak from the base nearly to the first subcostal branch, beyond this three decreasing spots between the subcostal branches, behind these spots a streak in front of the first discoidal nervule, and a longer one between the discoidal nervules; one spot above the third median nervule outwardly concave; two between the third and second, and two between the second and first, the inner of each of these pairs filling the base of the interspace; the entire space between the median and submedian nervures to within one-fourth of the length of the wing from the outer margin; a submarginal row of seven increasing spots, one between each pair of nervules; and a marginal row of two smaller spots between each pair of nervules disappearing towards

the apex—bluish subhyaline white; two dusky streaks from the end of the cell uniting towards the middle and not reaching the base, and a dusky streak in the middle of the hyaline space below the median nervure. *Hindwing* also swarthy black; the discoidal cell subhyaline, with a bifid blackish streak not reaching the base; two spots at the base; a streak above the costal nervure; an elongated streak below the costal nervure; five broad streaks round the end of the cell completely filling the interspaces at the base; the two in the median interspaces crossed near the end by a black bar not always complete; two broad streaks connected at the base, between the median and submedian nervures; and a single broad streak on each side of the internal nervure; a marginal and a submarginal row of spots two between each pair of nervures in each row—hyaline bluish white. The submarginal row interrupted at the sexual mark. *UNDERSIDE* lighter, the bluish white markings similar but more prominent; none of the submarginal or marginal series of spots obsolete. The sexual spot on the first median nervule of the *hindwing* is deep intense black, and divided by a very narrow white streak on each side of the black nervule, which is slenderly dilated. The submedian nervule also is white and slenderly dilated in that portion adjoining the sexual spot. On the *forewing* the lower white streak between the discoidal nervules and the discal spot below it are extended in a crescent shape, half encircling the submarginal spots beyond. On the *hindwing* the white interspaces on either side of the discoidal nervule extend to and coalesce with the submarginal spots beyond, forming a prominent white patch on the border. *FEMALE*: Similar to the male, except that the wings are somewhat broader and the *forewing* less falcate. The sexual mark on the *hindwing* is of course absent, so the submarginal row of spots on that wing is complete and uninterrupted. *Cilia* black, spotted with white at the interspaces. *Head* and *thorax* spotted and streaked with white. *Abdomen* swarthy above, chalky white beneath.

*D. aglea* inhabits the region of heavy rainfall in north-east India, extending along the submontane ranges to the Sutlej, but common only towards the east. There is only one record of its occurrence so far west as Simla. A single specimen was taken by Mr. de Nicéville in a garden about 1,000 feet below Simla in July. Three specimens were taken in November 1880, at Nanaishahr in the Saharanpore district by Mrs. Deane; and there is a specimen from Mussoorie in the Indian Museum, Calcutta, but in the north-west Himalayas it is decidedly a rare insect. In Kumaon there is no record as yet of its occurrence; in Sikkim it was taken in November by Mr. Otto Möller in the Great Rünjt Valley at 1,200 to 3,500 feet elevation, and in the Darjeeling tarai and up to 6,000 feet elevation in the hills Mr. de Nicéville found it plentiful in October. In the Khasi hills it occurs in November; in Tenasserim Limborg took it in the winter at 3,000 to 6,000 feet elevation; and Captain C. T. Bingham found it there commonly in February up to 1,500 feet elevation, and again in August to November. Dr. J. Anderson took it at Mergui in December.

The figure shows the upperside of male and female from specimens from Sibsagar, Assam, in the Indian Museum, Calcutta.

### 17. *Danais ceylanica*, Felder.

*D. ceylanica*, Felder, Verh. zool.-bot. Gesellsch. Wien, vol. xli, p. 479, n. 90 (1862); *Parantica ceylonica*, Moore, Lep. Cey., p. 8, pl. 11, figs 2, 2a, larva and pupa (1880).

*HABITAT*: Ceylon.

*EXPANSE*: 3 to 3.25 inches.

*DESCRIPTION*: " *MALE and FEMALE*. *UPPERSIDE*, dark fuliginous-brown. *Forewing* with a bluish-white narrow discoidal streak, above which are two parallel contiguous slender lines, two lengthened streaks below the cell, five discal spots, two upper slender streaks, and three costal spots, a submarginal row of small mostly cordate spots, and a marginal row of more or less indistinct smaller spots. *Hindwing* with broad bluish-white basal streaks, regular series of discal quadrate spots, the two lower of which have a contiguous or continuous outer spot, an irregular submarginal and marginal row of small spots. The two scent-pouches [as usual] in the male. *Head*, *thorax*, and *palpi*, white-spotted, a dorsal streak on the thorax, and the femora beneath, white. *Abdomen* brown above, white beneath. *UNDERSIDE* brown, markings clearer. *Forewing* with the discoidal streaks more distinct; above the cell is a