Apriona, Chevrol.—Germari (As.), Hope: Deyrollei (As.) Kaup.

Orsidis, Pascoe—acanthocumoides, Pascoe.
Calloplophora, Thoms.—Solii (As.), Hope.
Gnoma, Fabr.—casnonoides, Thoms.
Agelasta, New.—bifasciana (As.), White.
Coptops, Serv.—leucostictica (As.), White: centurio, Pascoe.
Mispila, Thoms.—curvilinea, Pascoe.
Thysia, Thoms.—Wallichii (Him.), Hope.
Calothyryza, Thoms.—margaritifera (Him.), West.
Ithocritus, Lac.—ruber (As.), Hope.
Rhodopsis, Thoms.—pubera (As.), Thoms.
Olenocamptus, Chevrol.—dominus (As.), Thoms.
Mæchotypa, Thoms.—thoracica (As.), White.
Elara, Thoms.—plagiata (As.), parallela (N. I.), delicatula (As.), cylindraca (As.), White.
Saperda, Fabr.—bicolor (As.), West.
Camptocnema, Thoms.—lateralis (As.), White.
Lychrosis, Pascoe.—zebrina (As.), Pascoe.
Anaches, Pascoe—dorsalis, Pascoe.
Xynenon, Pascoe—Bondii, Pascoe.
Prionetopsis, Thoms.—balteata, Thoms.
Snermus, Lac.—Mniszechii, Lac.
Thermistus, Pascoe.—croceocincta, Saund.
Malloderma, Lac.—Pascoeii, Lac.
Glenea, New.—rubricollis (As.), Hope: sanctæ-mariae, indiana, funerula, capriciosa, obsoletipunctata, obesa (As.), argus, annulata (Him.), chalybeata (As.), maculifera (As.), pulchella (As.), spilota, Diana (As.), Peria, Conidia (Bom.), Thoms.
Stibara, Hope—nigricornis, morbillosa, Fabr.: tetraspilota (As.), trilineata (As.), Hope.
Nupserha, Thoms.—cosmopolita, bicolor, Thoms.
Astathe, New.—violaceipennis (N. I.), Thoms.: divisa, Pascoe.
OF THE NORTH-WESTERN PROVINCES.

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**Westwood.**—Mod. Class. Ins., I., 388. Cab Or. Ent. t. 5, 29.

**Lacordaire.**—Spéc. Gén., IX., 238. 1869-72.


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C.—PHYTOPHAGÆ.

**Family Sagridæ.**

*Sagra,* *Fabr.*—carbunculus (As.), *Hope.*

**Temnaspis,* *Lac.*—speciosus (N. I.), Downessii (N. I.), quinque maculatus (N. I.), nigriceps (Nep.), *Baly.*

**Family Crioceridæ.**

*Lema,* *Fabr.*—Downessii (Bom., Ben.), suturella (Ben.), Psycho (N. I.), glabricollis, *Baly.*

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**References.**

**Westwood.**—Mod. Class. Ins., I., 370.

**Family Hispidæ.**

**Callispa,* *Baly.*—insignis (N. I.), dimidiatiipennis (N. I.), vittata, *Baly.*

**Ambispa,* *Baly.*—lævlgata (Mad., N. I.), *Baly.*

**Botryonopa,* *Blanch.*—sanguinea (N. I.), *Guer.*: Sheppardi (N. I.), *Baly.*

**Estigmema,* *Hope.*—chinensis (Nep., N. I.), *Hope.*: cribricollis (Mad.) *Water.*

**Anisodera,* *Chevrol.*—ferruginea (N. I.), *Guer.*: excavata (N. I.), *Baly.*: cylindrica (Nep., N. I.), *Hope.*

**Downesia,* *Baly.*—insignis (N. I.), *Baly.*

**Javeta,* *Baly.*—pallida (Mad.), *Baly.*

**Gonophora,* *Chevrol.*—Saundersii (As.), *Baly.*

**Hispa,* *Linn.*—erinacea (Nep.), *Fabr.*

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*Baly.*—Catalogue of Hispids in the British Museum, 1858.
Family Classididae—Tortoise-beetles.

Calopepla, Boh.—Leayana (Ben.), Boh. : Reicheana, Guér.

Epistictia, Boh.—selecta (Bom.); viridimaculata (Nep.), Boh.

Hoplonota, Hope—maculipennis, horrida, ochroleuca, Boh.

Prioptera, Hope—Westermannii (As.), Mann. : impastulata (As.), sexmaculata (As.), maculipeunis (As.), decemstillata, decemmaculata (Him.), pallidicornis, decemsignata (As.), Boh.

Aspidomorpha, Hope—miliaris (Mad.), St. Crucis (As.), dorsata, micana, Fabr. : amabilis, Dej. : orientalis, inuncta (Mad.) : fuscoscutata, lobata (N.l.); calligera (Ben.); Egna (Ben.) ; indica (Almora); Boh.

Cassida, Linn.—clathrata, obscura, cruenta, Fabr. : livida, dispar, testacea, tricolor, Herbst : foveolata, 16-maculata, nigrovittata (Cal.) ; Moori, Syrtica, rugulosa, icterica (Almora), obtusata, conspurcata (Mad.), pallida (Mad.), pauxilla, exilis (Mad.), Delesserii, dorsenotata, nigriventris (Tib.), pudibunda, giabella (Nil.), pulvinata (Mad.), costata (Mad.), fuscosparsi (As.), Boh. : trilineata (Nep.), Hope.

Leucoptera, Boh.—14-notata, 26-notata (As.), 19-notata (As.), 18-punctata (As.), nepalensis (Nep.) ; philippinensis (Bom.), Boh.

Coptocyla, Chevrol. —sexnotata (Mad.) Fabr. : sexmaculata (Mad.), Dej. : circumdata, varians, Herbst : ventralis (Nil.), bistrimaculata (Mad.), bistri-notata (Ben.), 11-notata, 17-notata, bipunctipennis (Mad.), promiscua, 7-notata, ornata (Mad.), cribrosa, Boh.

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Westwood.—Mod. Class. Ins., 1., 375. 1820.

OF THE NORTH-WESTERN PROVINCES.

Family Gallerucidae.

Hymenesia, Clark—tranquebarica (Mad.), Fabr.
Sphenoria, Clark—flavicolis (N. I.), nigripennis (N. I.),

Podontia, Dalm.—rufo-castanea, Baly.
Oedicerus, Baly—apicipennis, Baly.
Momæa, Baly.—purpurascens (Nep.), Hope.
Menippus Baly—cervinus (Nep.), Hope.
Xuthes, Baly—orientalis, Baly.
Antipha, Baly—picipes, Brettinghami, Baly: Bennetii (Nep.),

References.

Westwood.—Mod. Class. Ins., I., 381
Clark, H.—On Dejean’s genus Celomera. An. Mag. N. H., 3rd Ser., XVI,

Baly.—On new species of Gallerucidae. Ibid, XVI, 247, 402.

Family Eumolpidae.

Chrysacus, Chevrol.—asiaticus (N. I.), Redt.
Eumolpus, Latr.—pyrophorus, (As.), Parry.
Nerostoma, Motsch.—Dormeri, Bevani, Baly.
Corynodes, Hope—gloriosus (N. I.), Baly: cyaneus (Mad.),

References.


Baly.—J. Linn. Soc., XIV., 246.
Family Chrysomelidae—Golden-beetles.

Chlamys, Knoch—fulvipes, Baly.
Colosposoma, Lap.—Downesii, Baly.
Chrysomela, Linn.—Krishna, Bonvouloirii, Stevensii, Baly:
Vishnu (Nep.) Hope.
Ambrostoma, Motsch.—Mahesa (Nep.), Hope.
Crosita, Motsch.—celestina (N. I.), Baly.
Eumela, Baly—cyanicollis, Hope.

Family Halticidae.

Xanthocycia, Baly—Chapuisii, Baly.
Argopus, Fischer—Haroldi, Baly.
Paradibolia, Baly—indica, Baly.
Chætocnema, Steph.—cognata, squarrosa, Brethinghami, concinnipennis, basalis, Baly.

Reference.
Westwood.—Mod. Class. Ins., I., 335.

Family Erytulidae.

Languria, Latr.—cyanea (Nep.), Hope.

IV.—PSEUDO-TRIMERA.

Family Endomychidae—Fungus-beetles.

Endomychus, Panzer.—bicolor, Gorham.
Engonius, Gerst.—signifer (N. I.), Gorham.
Ancylopus, Costa.—melanoccephalus. Oliv: indicus(N. I.), Gorham.
Mycetina, Gerst.—castanea, Gerst.

Family Coccinellidae—Lady-birds.

Coccinella, Linn.—tricincta, Fabr.: repanda, Muls.: simplex,
Walk.
Epilachna, Chevrol.—28-punctata (Mad.), Fabr.: pubescens
(N. I.), Hope.
Chilocusus, Leach—opponens (Mad.), Walk.

Reference.
Westwood—Mod. Class. Ins., I., 330.
ORTHOPTERA.

The order Orthoptera (straight-winged) comprises the insects commonly known as ear-wigs, cockroaches, crickets, praying-insects, leaf-insects, speckes or stick-insects, locusts and grasshoppers. The body is composed of a head, thorax and abdomen. The head is furnished with a mouth, antennæ and eyes. The mouth consists of a labrum or upper lip, two mandibles, two maxillæ, a labium or under lip and four palpi or feelers. The mandibles are armed with teeth suitable to the food on which the insect lives. In the carnivorous species these teeth resemble the canine teeth of the mammalia, and in the herbivorous species they resemble the incisive and molar teeth of mammals. The maxillæ are furnished with 5-jointed palpi and a membraneous piece vaulted above and covering the extremity of the maxillæ. This piece is called the galea and is either cylindrical in shape or triangular or dilated and forms one of the bases of classification. The labial palpi are 3-jointed. The antennæ are many-jointed and are inserted in front of the eyes, but sometimes below or between them. The true eyes occupy the side of the head and are compound and usually very large. There are also two to three simple eyes or ocelli, either perfect or sub-obsolete. The thorax is composed of three parts, of which the prothorax is the largest and the only one exposed. The wings are four in number, of which the elytra or anterior pair are sub-coraceous, thin and flexible, and the posterior pair or true wings are for the most part membraneous, reticulated and longitudinally folded after the manner of a fan. In some cases the females and even both sexes are apterous, and in the ear-wigs the posterior wings are transversely folded as in the beetles. In many species the elytra of the males are rudimentary and a transparent, hard, neurated membrane covers a portion of the inner margin of the elytra and produces by friction upon each other the stridulating noise remarked in certain families of the order. A similar sound is produced in other families by rubbing the thighs of the posterior legs against the edges of the elytra. The abdomen consists of eight or nine segments furnished at the end with certain appendages. There are six legs provided with feet adapted for running or jumping. The metamorphosis is incomplete: that is, there is no such marked differences in form between the larva, pupa and
imago as obtains in the beetles. The larvae resemble the perfect insects, only they are much smaller and are without wings. After several moltings rudimentary wings appear, and this is supposed to mark the pupa state and again after several moltings the imago with perfect wings appears.

The broad division of the order is into (1) Cursoria, in which the feet are adapted for running; the elytra and wings are placed horizontally to the body and the females are not provided with an ovipositor; and (2) Saltatoria, in which the posterior pair of legs are specially adapted for leaping. In the first division must be included the anomalous family Forficulidae or ear-wigs, which many authors form into a separate order osculant between the beetles and the true Orthoptera. The Indian species of this family have not received much attention at the hands of naturalists. The cockroaches are exceedingly numerous in individuals and are cosmopolitan in their habits, the small Blatta orientalis of Europe being originally a native of India. They have not been thoroughly examined in this country probably owing to a prejudice against them on account of their offensive odour. The Mantidae or praying insects are so called from the position of their fore-legs when lying in wait for their prey. They remain immovable in this attitude until a fly or other insect comes within their reach, when they quickly seize it and devour it. The Phasmidae or spectres resemble dried twigs and attain some of them to a considerable size; many new species have been figured by Mr. Wood-Mason in the Calcutta Journal. Amongst the Saltatoria, the locusts belong to the family Acrididae, and in Scelymena Harpago we have one that takes to the water and dives, the foliolous appendages of the hind legs being well adapted for swimming. This is the first natatorial species of the order recorded and is found both in Bombay and in the upper provinces. The ravages of members of this family in India are too well known to need description. There are two forms of migratory locusts commonly met with. That with pink under-wings and brownish markings on the upper wings is apparently the CE. Edwardsii of Westwood and occurs in swarms sufficient to break down the branches of trees on which they alight. Often for days together they pass over tracts of country in undiminished myriads, leaving whole square miles bare of all vegetation behind them. The colour of the under-
wings in this species varies from a very pale pink to a dark brown or maroon. The second and perhaps more common species in the North-Western Provinces has yellow under-wings and yellowish markings on the upper-wings. The larva of this species has the front of the head orange yellow, whilst the space behind and below the eyes is of a deep maroon and the posterior legs are of a bright yellow colour banded with black. Locusts have been found as far north as the passes leading into Tibet and are not uncommon permanent residents in the Bhabar, where there are also two or three species that occur in groups of many thousands, but are not so formidable as the two first mentioned. The female is not provided with an ovipositor and lays her eggs in some instances on the ground and in others on plants and attaches them by a gummy exudation produced at the same time. In some cases they are further protected by a frothy exudation which hardens by exposure. The eggs hatch in a few days and the larvae are at once ready to satisfy their voracious appetite, which never appears to be satiated. To the Gryllidae belongs the curious mole-cricket Schizodactylus monstro-sus to be found in its burrow in the sands of the banks of any of our great rivers. It is easily recognized by the spiny excrescences on its legs and the net-like wings curled up at the end. It appears to be exclusively carnivorous in its habits and is not very numerous in individuals. The following list is very meagre, considering all that has been written on the Orthoptera, but I must leave to others the task of completing it:—

**ORTHOPTERA.**

I.—Cursoria.

Family *Forficulidae*—Ear-wigs.

_Forficula, Linn._—auricularia (Cal.), Linn.

Blattarioidea.

Family *Polyphagidae.*

_Polyphaga, Brullé_—indica, *Walker.*

Family *Panestidae.*

_Panesthis, Serv._—plagiata, regalis (As.), *Walker_: monstrosa (Mad.), flavipennis (As.), Saussurii (As.), Wood-mason: transversa (As.), Burm.: _ethiops_ (In.); _Stoll_: forceps (Mad.), *Sauss.*
Paranauphæta, Watt.—limbata, Saussure.

Parahormetica, Watt.—bengalensis, Saussure.
Family Planeticæ.

Planetica, Sauss.—phalangium, Saussure.
Family Panchlorideæ.

Panchlora, Burm.—surinamensis (In.), Sulz.: indica (In.), Fabr.; tenebrigera, occipitalis (Bom.), submarginata (Bom.), Walker.
Family Corydilæ.

Family Blattideæ.

Phlebonotum, Sauss.—anomalum, Sauss.: pallens (Mad.), Blanch.

Epilampra, Burm.—auriculata (Bom.), Watt.: cribrata (As.), blattoïdes, melanosa, Sauss.: amplipennis (As.), intacta (Bom.), characterosa, Walker.

Ellipsidium, Sauss.—laterale (As.), Walker.

Blatta, Linn.—bivittata (N. I.), Serv.: parvula, brevipes (Bom.), continua, lycoïdes, telephoroides (Bom.), subreticulata, figurata, annulifera, transversalis, fasciceps, subfasciata, inexacta, subrotundata (all Bombay), ramifiera (Nep.), submarginata (As.), Walker: cognata, ferruginea, Himalayica, Watt.: Luneli, Sauss.

Theganopteryx, Watt.—jucunda, indica (Bom.) Saussure.

Periplaneta, Burm.—americana (In.), Degeer: thoracica, ethiopica, Serv.: ornata, Watt.: affinis, Sauss. ruficornis (Bom.). curta (Bom.), Walker.

Polyzosteriæ, Burm.—orientalis, Burm.: heterospila (Bom.), sexpustulata, (Bom.), Walker.
Family *Perisphæridæ.*

Perisphæria, *Burm.*—alta (As.), Walker.
Blepharoderæ, *Burm.*—sericea, emortalis, Saussure.

Family *Mantidæ*.—Praying insects.

Mantis, *Linn.*—simulacrum (Ben.), *Fabr.*: concinna, Perty : metallica (As.), West.

Chœradodis, *Serv.*—squilla (In.), *Saussure.*
Fischeria, *Sauss.*—laticeps (Bom. Mad.), *Wood-M.*
Hierodula, *Sauss.*—birivia (Mad.), Stoll.
Æthalochrea, *Wood-M.*—Ashmoliana (Bon.), West.
Campsothepsis, *Sauss.*—anomala (Cal.), *Wood-M.*
Heterocheta, *Sauss.*—tricolor (Cal.), *Wood-M.*
Paradunuria, *Wood-M.*—orientalis (Mad.), *Wood-M.*

Family *Phasmidæ*.—Stick-insects.

Phyllium, *Ill.*—crurifolium, *Serv.*: Robertsonii (Nil.), *Hope.*
Scythe, (As.): West.

Necrosia, *West.*—bimaculata (Mad.), Stoll.: annulata (Mad.), *Fabr.*: affinis, punctata, marginata (Mal.),
Gray: Sipylus (As.), Pholidotus (As.), atricoxis, Casignetus (As.), Sparaxes, hilaris (As.), maculicollis (As.), West.: Menaka (As.), *Wood-M.*

Xeroderus, *Gray.*—manicatus, Licht.
Lopaphus, *West.*—bootanicus (As.), Dancis (As.), West.
Heteropteryx, *Gray.*—dilatata, Parkinson.
Phibalosoma, *West.*—serripipes (Mal.), *Gray.*: Westwoodii (As.), annamahynmmum (Mad.), *Wood-M.*
Anopheles, *West.*—despecta (As.), *West.*

Lonchodes, *Gray.*—luteoviridis [ =lacertinus, *West*], (As.); bicornatus ( ); semiarmatus ( ); virgens [ =sarmanto-us, *West*] (As.); Porus; Stilp-nus (As.); Myrina (Mad.), *West.*: brevipes (Mal.), geniculatus *Gray*: Austeni (As.); Westwoodii (Cal.); insignis (Sik.), *Wood-M.*

Bacteria, *Latr.*—Shiva (In.), *West.*

Menaka, *Wood-M.*—scabriuscula (As.), *Wood-M.*

Bacillus, *Latr.*—indicus, *Gray*: tranquabaricus (Mad.); Beroè; Regulus; cuniculus (As.); Alauna (Mad.); Artemis (As.); Amathia (Mad.), *West*: laevi-gatus (As.); fuscolineatus (Panj); Penthesi-lea (Bhután), furcillatus (Bhutan), *Wood-M.*

II.—Saltatoria.

Family *Gryllidae.*


Acheta, *Fabr*—monstrosa (N. I.), *Drury.*


Gryllus, *Linn*—crythrocephalus (Ben.), melanocephalus 'Ben.', *Serr.*: capensis, *Oliv.*: orientalis (Mad.), *Fabr.*: conscutus (Nep., signifrons (N. I.), facialis (Bom.), humeralis (Bom.), ferri-collis 'Bom', angustulus (Bom.), lineiceps (Bom.), configuratus (Bom., parviceps (Bom.), signipes (Bom.), *Walker.*

Nemobius, *Serr.*—indicus, vagus (Bom.), *Walker.*


Encoptera, *Burm.*—fascipes (N. I.), concolor (Bom.), lateralis, (Bom.), albostra (Bom.), *Walker.*

Melomorpha, *Walker*—ciasticornis (Bom.), *Walker.*

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Cœauthus, Serv.—rufescens (Bom.), Serville.
Prophalangopsis, Walker—obscura, Walker.
Phalangopsis, Serv.—albicornis (N. I.), picticeps, Walker.
Ornebius, Guérin—nigripalpis (Mad.), Guér.
Platyblemus, Serv.—lusitanicus, delectus (Ben.), Serv.

Family Locustidae.

Gryllacris, Serv.—plagiata (As.), contracta, aliena (As.), scita, magniceps, trinotata (Bom.), collaris (As.) gracilis (Ben.), basalis (Bom.), Walker, signifera (Bom. As.), Stoll: amplipennis, (Mal.), gladiator (Mad.), Gerst.
Rhapidophora, Serv.—picea (As.), Serville.
Noia, Walker—testacea, Walker.
Decticus, Serv.—concinnus (Nep.), pallidus (N. I.), Walker.
Xiphidium, Serv.—posticum (As.), Walker.
Letana, Walker—linearis (N. I.), Walker.
Ladnia, Walker—punctipes (N. I.), Walker.
Saga, Charp.—indica, Herbst.

Conocepnnalus, Thaup.—interruptus (N. I.) strenuus (N. I.), varius (As.), Walker.

Megalodon, Brulé—ensifer Brulé.
Phaneroptera, Serv.—punctifera (As.), roseata (N. I.), privata (As.), insignis (As.), notabilis (As.), diversa (As.), nigrosparsa (Bom.), Walker, rufonotata (Bom.), Serv.

Ancylecha, Serv.—lunuligera (As.), Serville.
Steirodon, Serv.—unicolor, Stoll.
Tedla, Walker—sellata (As.), simplex Walker.
Pseudophyllus, Serv.—Titan (As.), White: femoratus, fenestratus, neriiifolia (As.), Stoll: uninotatus (As.), oleifolius (Mad.), Serv.: assimilis (As.), venosus (As.), siccus (As. Mad.), concinnus (As.), signatus, sublituratus, Walker.

Aprion, Serv.—carinatum, porrectum (As.), strictum (Bom.), curviferum (Bom.), Walker.

Cymatomera, *Schau*—rugosa (In.), *Linn.* : viridivitta (Mal.), *Walker*.

Mecopoda, *Serv.*—elongata (As. N. I.), *Linn*.

**Family Acridiidae.**


Mesops, *Serv.*—filatus (N. I.), *Walker*.


Teratodes, *Bruld*—monticollis (In.), *Gray*.


Oxya, *Serv.*—velox (Mal.), *Fabricius* : furcifera (Bom.), *Serv*.


Caloptenus, *Burm*—insignis, glancopsis (N. I.), liturifer (S. I.), erabescens (N. I.), scutifer (S. I.), dominans (As.), ferruginus (N. I.), acaber (Ben.), nepalensis (Nep.), immunis (Bom.), pustulipesnis (Bom.), *Walker*. 
OEديدة, Charp.—flava (In.), Linn.: Edwardsii (In.), Hope; venusta (S. I.), crassa (N. I.), inficita, (N. I.), rotundata (N. I.), granulosa (Biluch.) Walker.

Stenobothrus, Fischer—mundus (Bom.), decius (Bom.), apicalis (Bom.), epacramoides (Bom.), turbatus, (Bom.), luteipes (Bom.), strigulatus (Bom.) simplex (Bom.), Walker.

Epacromia, Fischer—simulatrix (S. I.), aspera (N. I.), turpis, (N. I.), Walker.

Cerarolis, Walker—nigricornis (N. I.), Walker.

Chrotogonus, Serv.—trachypterus (Bom.), liaspis (Bom.), oxypterus (Bom.), pallidus (Bom.), Blanchard.

Phyllochoreia, West—fenestrata (Ben.), Serv.: uniclor (Mal.), West.

Tettix, Fischer—manda (N. I.), umbifrera (Bom.), lineifera, (Bom.), vittifera (Bom.), dorsifera (Bom.), obliquifera (Bom.), nigrilis, (Bom.), lineosa (Bom.), quadriplagista (N. I.), balteata (S. I.), Walker.

Scelymona, Sauss.—Harpago (Bom. In.), uncinata, Serville.: contracta (Mad.), Walker.

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HEMIPTERA.

The order Hemiptera (half-winged) comprises those insects commonly called cicadas, bugs, plant-lice and the lice that prey on animals. With the exception of the males of the gall-insects and a few others, the metamorphosis is incomplete and the change from the larva to the pupa state, and thence to the imago state, is not so well marked as in other orders of insects. The body is composed of a head, thorax and abdomen. The head is furnished with a mouth, eyes and antennae. The oral apparatus is adapted for sucking and consists of three or four delicate pointed setae or threads enclosed in a case which is curved downwards or disposed along the breast between the bases of the legs. The case is tubular and jointed and the threads within represent the mandibles and maxillae of other insects. The labrum is present and in the shape of a ligula of triangular form protects the basal portion of the sucker and the labium is represented by the sheath, but palpi are wanting. The sucker is adapted only for extracting vegetable and animal matter in a fluid state and does not contain a sting, though the result of its application to the human body closely resembles the effect of the sting of other insects. The eyes are large and between them in many species there are 2-3 ocelli or simple eyes. The antennae are very short and small in many families and are usually 4-5 jointed and seldom more than 11-jointed. The thorax consists of three parts, and in some genera the prothorax becomes incorporated with the mesothorax and in others it resembles that of the beetles. The scutellum in some species is very minute and in others covers the entire abdomen. The elytra of a great portion of the insects of this order are for the most part coriaceous with the tips membranous and the under-wings are membranousthroughout. There are six legs and there are never more, though there are often less than three joints in the tarsus or foot. The disagreeable odour so marked insects of this order is caused by a fluid which is expressed from a sac or gland at the will of the insect and escapes through two small apertures on the underside of the metathorax, near the insertion of the third pair of legs.

In figure A (after Westwood), Pentatoma rufipes is shown (1) about twice the natural length with the antennae and legs
truncated, and with the wings on one side extended; a represents the scutellum; b, the coriaceous portion of the elytra; and c, the base of the antenna. In (2) we have the underside of the head and prothorax of the same insect, showing the elongated 4-jointed case or sucker (labium), the basal joint of which is partially covered by the elongated and triangular labrum (4) and at the apex are perceived the tips of the four enclosed setae or hair-like processes representing the maxillae and mandibles. In (8) we have the head of the same insect viewed laterally to show the lobes defending the base of the labium and the manner in which the latter is able to bend, with two of the enclosed setae drawn out at the tip of the second joint and the tips of the other two seen at the end of the case. In (5) we have the dilated base of the four internal setae as seen within the head on removing the clypeus or upper covering, and between the middle pair may be observed the pointed cartilaginous tigula or tongue, behind which is a small oval aperture which is the orifice of the pharynx.

**FIG. A.**

The Hemiptera are primarily distributed into two great suborders: (1) Hemiptera-Heteroptera, in which the elytra are coriaceous at the base and membranous at the apex (hemelytra) and the rostrum is frontal, rising from the anterior part of the head; and (2) Hemiptera-Homoptera, in which the substance of the wings is homogeneous throughout and the beak rises from the inferior part of the head and is inflected beneath the thorax between the bases of the legs.

The Heteroptera are further distributed into some seventy families arranged under two classes, the Gymno-tera. In which the antennae are visible and
the legs are not natatorial and the Cryptocera in which the antennae are hidden and the legs are natatorial. They are all provided with organs adapted for sucking the juices of plants or animals and live either in water or breathe the free air, facts which have also led to their distribution into Hydrocorisae or water-bugs and Geocorisae or land-bugs. The first three families on the list live on plants from which they extract the juices by means of the sucker with which they are furnished. Many of them are of brilliant colours, especially the genus Calliida, and all have the scutellum abnormally developed. They are well represented in India, where some are of a delicate green, others of a navy blue, others red, brown and yellow beautifully varnished. A large red bug, of which the female measures nearly two inches in length, is common on the laksora (Cordia Myxa) in the forests of the submontane tract. Coprotosoma cribrae, procured at Allahabad, is of a deep brown, tubercled or mottled and at first sight has the appearance of a beetle, but its odour soon betrays its real affinity. In the family Pentatomidae the scutellum does not cover the whole of the body. The insects of this family are commonly known as wood-bugs, of which the Indian species are often enriched with brilliant colours. Their larva differ from the perfect insect only in the absence of wings and the pupae in having only rudimentary wings. In all states they live on vegetable juices. The species of the genus Strachia belonging to this family are found on various members of the cabbage tribe and with others are common pests in our gardens. They can never be mistaken for other insects since almost all of them exhale the disagreeable odour common to them with the bed-bug (Cimex lectularius). In the Edessidae the body is very flat with the margins notched, dilated and angular, and in the Coreidae there is no apparent neck and the head is trigonal and sunk in the prothorax. The bugs of the latter family are said to feed on other insects as well as on the juices of plants. Amongst the Lygaeidae mention may be made of L. grandis from Upper India. It is red with two spots on the elytra and with the antennae, tibia and tarsi black. The Reduviidae consist of certain minute species that prey on other insects and even on the bed-bug. The Belostomatidae and Nepidae are water-bugs, but this division requires much more careful examination than it has hitherto had in India.
In the Hemiptera-Homoptera there are three sub-divisions, *Cicadina, Phytophthires* and *Anophura*. To the first belong the families *Stridulanta*, *Cercoidea*, *Jassidae* and *Fulgoridae*: to the second the plant-lice; and to the third the lice that prey on animals. The terminology of the neuration in the Homoptera may be gathered from the following figure representing the fore-wing of a *Ciclochila* belonging to the family *Stridulanta*:

**Fig. B.**

*Explanation.*—1, primitive; 2, front; 3 to 8, first to sixth discoidal cells: 9 to 16, first to eighth marginal areolets: a, b, c, d, e, first to fifth transverse veins.

The cicadas, lantern-flies and wax-insects belonging to the first divisions are amongst the most curious examples of insect life. The stridulation of the cicadas is a familiar sound to all in India and is at times so loud as to be almost deafening. It is produced in the males only and the apparatus is thus described by Wilson:

"When we examine the lateral base of the abdomen of a male cicada, we perceive two large scaly plates of a rounded figure, approaching that of a demi-oval, cut through its smaller axis; so that each plate presents a side which is rectilinear, while the remaining portion exhibits a rounded outline. It is by the straight side that each plate is fixed without articulation on the metathorax of which it forms a portion. When we lift up these plates we discover a cavity on each side of the abdomen divided into two principal chambers by a horny triangular septum. When viewed from the side of the abdomen, each cell presents anteriorly a white and plaited membrane, thin, light and as transparent as glass, called *le miroir* by Beaumur. If we open the mirror from above we perceive on each side of it another plaited membrane moved by a powerful muscle composed
of a great number of straight parallel fibres and arising from the horns of the cetum. This latter membrane is the tympanum or drum on which the muscles act by contraction and relaxation, alternately tightening and restoring it to its original state. This is the true origin of the sound which in fact may be produced even after the death of the insect by jerking the muscle." The cicadas live on shrubs and trees, of which they suck the juices. The female lays her eggs in holes which they form in the branches and which may be recognised by little irregularities formed by a portion of the wood which has been raised. The larvae are white and have six legs and soon escape to the ground and burrow in it to live on the roots of plants. They then undergo the change to the pupa state, and after about a year appear as perfect insects. In the Fulgoridae the antennæ are inserted immediately beneath the eyes and the head is dilated in front into a protuberance which is said, in the living insect, to emit a strong light. The Cercopidae are remarkable for the frothy matter with which some species surround their larvae, called cuckoo-spittle in England. At one time it was thought that in Plata limbata, found in Kumaon, we possessed an equivalent to the wax-yielding insect of China of which Sir G. Staunton and the Abbé Grossier have given an account, but Captain Hutton's researches show that the deposit of the former is of a different character and does not possess the properties of the white-wax of China. Amongst the Phytophthires, the Psyllidae are distinguished by their third pair of legs being formed for leaping. They are nourished by the juices of trees and various plants on which they live. The Aphidina include the plant-lice, which are furnished with two horn-like projections at the posterior extremity that exude a sugary, transparent liquor much affected by ants. These minute insects dwell together in societies and walk slowly and cannot leap, so that they fall an easy prey to the larvae of the Neuroptera genus Hemerobius, to those of several species of Diptera, and especially to the grubs of the lady-birds.

In the third family or Coccidae there is at least one or two local species that deserve some further notice. Geoffroy attributed to a species of kermes the faculty of producing a sugary substance of a white colour resembling manna, and Captain Frederick gave an
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account of a manna-like substance called gaz found in Persia, but was doubtful whether it was of vegetable or insect origin. Subsequently General Hardwicke described an insect under the name Chermia mannifer, obtained on a Celtis at Pachmarhi in the Central Provinces, and which yielded a similar manna of a waxy nature. He described the insect as of about the size of the common bed-bug, of a flattened ovate form and with a rounded tail. The snout is longer than the thorax, inflected and pressed down between the legs: the antennae are 3-jointed and as long as the thorax; first joint minute, second clavate and much the largest, and third setaceous: legs long, formed for walking, tarsi 3-jointed, wings rudimentary: colour light brown. The substance produced by these insects appeared to project from the abdomen in the form of a tail or bunch of feathers like snow which gradually lengthened and fell on the leaves, where it caked and hardened like wax. The same insect has been recorded from Kumaon, where it is found on the Elodendron Roxburghii, the debari of the outer range and Siwalik tract. Mr. Thompson writes:—“It will be known by its clustering around the stem in large numbers conspicuous for the white downy appearance which the long filamentary processes issuing from its body give it. Some of these pretty creatures will remind one of a porcupine with all its quills bristling. They excrete a white substance of a sweet taste and which cakes on the leaves of the plant they affect.” A similar phenomenon is observed in the lac-insect (Coccus lacca, Kerr), which yields the resin and lac-dye of commerce. We have its life-history in a series of observations made by Mr. Carter in Bombay in 1860 on certain specimens procured by him on the custard-apple tree (Anona squamosa). This insect is also found in the forests along the foot of the Kumaon hills and in the Duns, chiefly on the dhak (Butea frondosa), pipal (Ficus religiosa) and other fig-trees. The first thing that struck Mr. Carter on looking at the surface of the resin in crustation within which the insects were alive was the presence of a white kind of powder like that observed around the cochineal insects. This is concentrated here and there in little spots, and on being more closely examined will be seen to be chiefly confined to three bunches of curly, hair-like filaments which radiate from three

2 Ann. Ben. XIV., 184; see also J. Linn. Soc., 1, 188. (cont.) III., 179.
small holes in each spot in the incrustation and are continuous with corresponding apertures in the insects from which the white filaments originally proceed. These filaments are shown to be the attenuated extremities of the tracheae or breathing arrangements of the insect, covered with a white powder which after impregnation increases so as to cover the whole of the branch occupied by the insects. This description shows that the so-called manna is produced by a Coccus closely allied to the lac-insect whose history we shall now record.

The young are oví-viviparous and issue from the body of their parent about the beginning of July as an elliptical grub of a red colour, one-fortieth of an inch long and possessed of six legs, two antennæ and two ocelli.\(^1\) The mouth is placed on the ventral surface at some distance from the anterior extremity and is in time furnished with setæ or hairs and a proboscis by which it attaches itself to the bark of the tree on which it lives. It at once commences to grow in size and to secrete the resinous substance with which its entire body, except the anal orifice, is ultimately enveloped. By the middle of August, the distinction of the sexes is completed and the male becomes more highly developed and leaves an opening for exit, whilst the female remains enclosed in the resin. The males of the summer brood are possessed of antennæ, of which the scopus is 2-jointed and the flagellum has seven joints; they have also four eyes and a caudal apparatus for impregnation: in the winter brood they are also furnished with wings. Impregnation takes place in the first week of September and the young brood appear swarming out of the anal orifice of the female at the end of the first week in December, when, again the same changes occur, resulting in a second brood in the first week of the following July. The red colouring matter appears first in the ovary of the female after impregnation in the shape of a large number of spherical globules, and then in the young Coccus itself, and therefore the time when both colouring matter and resin will be at its maximum will be for the summer brood during June and for the winter brood during November. Propagation can be effected by transferring a stick encrusted with the resin just before the time of evaporation and tying it to the tree on which it is desired to rear the brood.

\(^1\) Mac. Mag., N. S., vol. II., p. 345 (plata).
In the following list I have added the locality 'Bur.' (Burma) to those species recently recorded from that country by Mr. Distant to show the wide geographical distribution of some species:

I.—HEMIPTERA—HETEROPTERA.

Family Plataspida.

Brachyplatys, Boisd.—silphoides (As.), Vahlili (As.), Fabr.: subgenae (N. I.), Hope: radians (As.), Voll.: Burmeisteri (As.), Dist.: bistriga (Mad.), Walker.

Coptosoma, Lap.—cribrarium (N. I.), Fabr.: 12-punctatum, circumscriptum (N. I.), sphærulum (N. I.), Germ.: nepalesis, parvulum, cicatricosum (N. I.), Dallas: xanthochlorum, integrum, Walker.

Plataspis, West.—nitens (N. I.), Dallas: nitida, hemisphierica, Hope.

Family Cydnida.

Aethus, Dall.—foveolus (N. I.), maurus (In.), pygmaeus, apicalis (N. I.), Dallas: indicus (N. I.), Hope: transversus, Burm.: brevipennis, Fabr.: Badius, Walker.

Stibaropus, Dall.—brunneus (N. I.), Dallas: testaceus, Walker.

Family Pachycoelida.

Cantao, Serv.—occultus (As.), Them.

Scutellera, Lam.—nobilis (In.), Fabr.: fasciata (Nep., As.), Panzer.

Sophola, Walker.—spinigera, (As.), Dallas.

Brachysaulax, Dist.—oblonga (N. I., As.), Hope.

Paezilocoris, Dall.—interruptus (Nep.), purpureascens (Nep.), Hardwickii (Nep., As.), Hope: Drusaei (N. I., As.) Linn.: Childrenii (Nep.), White: ocreus (N. I., As.), rufigenis (As.), obsoletus (N. I.), ornatus (N. I.), pulcher (Mad.), Dall: anisocelius (As.), Walker.

17. A. S. Bus, XLIV., II., 27.
Chrysocoris, Hubn.—patricius (As.), Fabr.: grandis (As., Bur.), Thumb.: purpureus (As.), Hope.

Lamprocoris, Stål.—Roylei (Nep., As.), Hope: spiniger (As.), Dall.

Callidea, Dall.—Baro (As.), purpurea (Ben., Bom.), Fabr.: Stollii (As., N. I.), Wolff: marginella (Bom.), bengalensis, Roylei, Hope: pulchella (As.), Dall.: Stockerus, Linn.: fascialis (As.), White: lateralis (As.), dilaticollis, Guérin.
histeroides (As.), scripta (As.), gibbula (Panj.), contraria porphyricola, Walker.

Hotesa, Serv.—curculionoides (As., Burm.), H.-S. nigrorufa, diffusa, Walker.

Elvisura, Spinola—spinola, Signoret.

Sphærocoris, Burm.—lateritius, Hope: rusticus (Mad.), Stoll.
Coeloglossa, Germ.—rubro-punctata, Guér.
Alphocoris, Germ.—lxioides (N. I.), Germ.

Family Asopidae.

Cazira, Serv.—verrucosa (In.), ulcerata, (Mad.), West.
Cecyrina, Walk.—platyrhinoides (As.), Walk.
Canthecona, Serv.—furcillata (Bom., N. I.), Wolff: grisea (N. I.), Dall.: tibialis (As.), binotata (As.), nigrivitta (As.), Dist.

Picromerus, Serv.—spinidens (As.), Fabr.: obtusus (As.), nigrivitta, (As.), Walk.: robustus (As.), Distant.

Family Podopidae.

Podops, Lap.—niger, Dall.: spinifer, Hope: limosus, Walker.
Sootinophora, Voll.—lurida (As.), Burm.: obscura (As.), Dall.: tarsalis (As.), Voll.

Amphilophus, Stål.—mortii (As.), Stål.

Family Stictocorida.

Stictocoris, Fall.—indicus (N. I.), Dall.: gastricus, Thumb.: ruficornis, Fabr.: lateralis, Fleb.

Laparia, Dist.—variatissima (N. I., As.), Dall.
Mecidea, *Dall.*—indica (Bem.), *Dall.*
Ædrus, *Dall.*—ventralis (As.), *Dall.*

**Family Halydidae.**

Œstopsis, *Dist.*—terra (As.), *Dist.*
Erthesina, *Spin.*—acuminata (N. I.), *Dall.*: Fullo (As.), *Thumb.*
Dalpada, *Serv.*—oculata (As., Burm.), clavata (N. I., As.), *Fabr.*: nigricollis, varia (As., Burm.), affinis (N. I.), *Dall.*: versicolor (N. I., As.), *Sch.*: confusa (Marri), *Dist.*: bulbifera, tecta (As.), brevivitta (As.), *Walker.*
Ageus, *Dall.*—tessellatus, *Dall.*
Halys, *Fabr.*—dentata (Bom., N. I.), *Fabr.*

**Family Pentatomidae.**

Belopis, *Dist.*—unicolor (As.), *Dist.*
ÆElia, *Fabr.*—glandulosa (N. I.), *Burm.*
Cratonotus, *Dist.*—coloratus (As.), *Dist.*
Hoplistodera, *Hope.*—virosoens (N. I.), *Hope.*
Æschrus, *Dallas.*—obscurus (N. I.), *Dall.*
Axiatagus, *Dall.*—Rosmarus (As.), *Dall.*
Stollia, *Dist.*—guttigera (As.), *Thumb.*
Apines, *Dall.*—concinna (N. I.), *Dall.*
Palomena, *Dist.*—Reuteri (Marri), spinosa (N. I.), *Distant.*
Tolumnia, *Ellen.*—latipes (As.), *Dall.*
Halyomorpha, *Dist.*—picta (As.), *Fabr.*: scutellata (As., Bom.), *Dist.*
Cappara, *Ellen.*—taprobaneensis (As.), *Walk.*

Bathyocelia, Serv.—indica (N. I.), Dall.

Catacanthus, Spin.—incarnatus (In., Burm.), Drury.

Plautia, Stål.—fimbriata (As.), Fabr.

Antestia, Stål.—anchora (As., Burm.), Thumb.: apicalis (N. I.), Dallas.

Nezara, Serv.—viridula (As.), Linn.: subsericeus (N. I.), Hope: humeralis (As.), Walk.

Prionochilus, Dist.—8-punctatus (As.), Dall.

Rhapsigaster, Serv.—macracanthus (N. I.), humeralis (As.) Dall.: flavolineatus (N. I.), Mayr.: strachioides, rubriplaga, bisignatus, patulus (N. I.), Walker.

Cuspicona, Dall.—plagiata (N. I.), Walker.

Menida, Dist.—flavovaria (As.), Dall.: distincta (N. I.), Dist.

Prionaca, Dall.—lata (As., Burm.), Dall.: exempta (As.), Walk.

Microdeuterus, Dall.—megacephalus (N. I.), Sch.

Diplostira, Dall.—valida (As.), Dall.

Rhynchocoris, West.—humeralis (As.), Thumb.: serratus (Mad.), Don.

Sastragala, Serv.—uniguttata (As.), Don.

Acanthosoma, Serv.—punctatum (N. I.), distinctum (N. I.), for- fex (N. I.), elongatum (N. I.), recurvum (N. I.), cornutum (N. I.), Dall.: hetero- pila (Panji.), binotata, aspera (N. I.), truncatula, immunda, alisticorns, nigricornis, Walker.

Asyla, Walker—indicata, Walker.

Family Urostylidae.

Urochela, Dall.—bimaculata (N. I.), obscura, quadripunctata, Dall.: discrepans, Walker.

Urolabida, *West.*—tenera (As.), *Hope:* Grayii (As., Nep.), *White:* binotata (As.), *Walker.*

Family *Edessidae.*


Eusthenes, *Lap.*—cupreus (In.), *Hope:* robustus (As.), *Serv.: Polyphemus* (N. I.), *Stdl.*

Eurostus, *Dall.*—gossipes (As.), *Dall.*


Pycanum, *Serv.*—rubens (As.), amethystinum, *Fabr.: jaspideum,
*Schaum:* ampicolle ponderosum (As.), *Stdl.*: stabile, pallipes (N. I.), *Walker.*

Dalcantha, *Serv.*—dilatata (As.), *Serv.: inermipes* (Panj.), *Stdl.*: regia, *Walker.*

Cyclopelta, *Serv.*—obscura (As., Burm.), *Serv.*: tartana (As.),
*Stdl.*: siccifolia (N. I.), *Dall.*

Aspongopus, *Lap.*—Janus (In.), obscurus (In.), *Fabr.: ochreus*
(As.), nigriventris, nepalensis (As., Nep.), sanguinolentus, *Hope:* marginalis (As.),
*Dall.*: circumcinctus, *Walker.*

Muscarda, *Walker*—testacea (As.), *Walker.*

Family *Phyllocephalidae.*

Placosternum, *Serv.*—Taurus (As.), *Fabr.*

Dulsira, *Serv.*—glandulosa (As.), *Wolff.*

Tetroda, *Serv.*—histeroides (As.), *Fabr.: transversalis* (N. I.),
*West.*: divaricata (Nep.), atomaria (N. I.), nigricipennis (N. I.), obtusa (N. I.), *Dall.*: bilineata, *Walker.*

Cressona, *Dall.*—*Valida,* *Dall.*

Atelides, *Dall.*—*centolinensis* (As.), *Dall.*

Macrina, *Serv.*—*coecina* (As.), *Walk.*: dilatata (As.), *Dist.*
Megarhynchus, Lap.—limatus (As.), Sch.: hastatus, Fabr.: testaceus, Serv.: truncatus, Hope: diversus, Walker.

Family Megynidae.

Megynumen, Guér.—inerme (As., N. I.), Sch.

Family Mictidae.

Brachytes, West.—bicolor (Bom., N. I.), West.

Dalader, Serv.—acuticoosta (As., N. L., Bur.), Serv.: planiventris (As.), Hope.

Trematocoris, Mayr.—grosa (As.), calcar, Dall: dentipes, Serv.: notatipes, patulicollis subvittala, Walker.

Derepteryx, White—Hardwickii (Nep., As.), Grayii (Nep., As.), White.

Helcomeria, Sign.—spinosa (As.), Sign.

Prionolomia, Sign.—fulvicornis (As.), Fabr.: biplagiata (As.), Walk.: gigas (As.), Dist.

Anoplocnemis, Sign.—phasiana (As.), Fabr.: compressa (N. I., As.), Dall.

Mictis, Leach.—nigricornis (As.), gallina (As., Bur.), Dall.: fasciata, albiditarsis (Nep.), Hope: dentipes. Serv.: umbilicata (As.), Sch.: nigrorufa (As.), ferrifera, amplectens, Walk.: tenebrosa (As., Bur.), heros (As.), pictor (As.), Fabr.: protracta, Schaum.

Notobitus, Stal.—Meleagris (As.), Fabr.: marginalis (As.), Hope: seripes (As.), Dall.: excellens (As.), Dist.

Cloresmus, Stal.—nepalensis (Nep., As.), Hope: brevicornis (As.), Sch.

Physomerus, Burm.—calcar (As., Bur.), grossipes, Fabr.: parvulus (N. I.), Dall.

Family Homocorididae.

Homocerus, Burm.—angulatus (Mad.), 2-guttatus (N. I., As.), Dall., Hope: albiventris, macula, Dall.: fasciatus (As.), Stal.: unipunctatus (As.), Thumb.: graminis abbreviatus, Fabr.: anticus, minor, Walker: prominulus (A.L.), Dall.

Orzytus, Dall.—brevicornis (N. I.), Dall.
Family Anisocelidae.

Serinetha, Spin.—augur (Bom., Ben., Bur.), abdominalis (Bom., Ben., Bur.), Fabr.: corniculata, Stål.

Lybas, Dall.—obscurus (As.), Dall.

Leptoglossus, Sign.—membranaceus (As.), Fabr.

Family Alydidae.

Euthetus, Dall.—pulchellus (N. I.), Dall.

Camtopus, Serv.—linearis (Bom.), pedestris (As., Bur.), Fabr.: ventralis (Bom.), Hope.

Family Stenocephalidae.

Leptocoris, Latr.—varicornis (In.), angustatus, Fabr.

Family Coreidae.

Metacanthus, Costa—pulchellus (N. I.), Dall.

Cletus, Stål.—calumniator (As.), hastatus (Mad.), Fabr.: punctulatus (As., N. I.), bipunctatus (N. I.), Hope: signatus (N. I.), pallescens inconstans conspicus, Walker.

Ceratopachys, West.—vicinus (N. I.), variabilis (N. I.), Dall.

Cletomorpha, Stål.—denticulata (As.), Stål.

Clavigralla, Spin.—gibbosa (Bom.), Spin.

Acanthocoris, Serv.—scabrator (As., Bur.), Fabr.

Petalocnemis, Stål.—obscurus (As.), Dall.

Family Rhopalidae.

Rhopalus, Schill.—bengalensis, Dall.

Family Lygaidae.

Bochrus, Stål.—foveatus (As.), Dist.

Lygaeus, Fabr.—nigriceps (As.), maculatus (N. I.), bipunctatus, guttiger (N. I.), Dall.: militaris (N. I.), familiaris (As., Bom.), mendicus, Fabr.: pacificus, Boisd.: grandis, Gray: argentatus (As.), Stål: inaequalis (As.), semiruber, Walker.

Graptostethus, Sign.—servus (As.), Fabr.: 3-signatus (As.), 4-signatus (As.), Dist.
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Arocatus, Spin.—pusillus, Dall.: pilosulus (Marri), Dist.
Beosus, Serv.—uniguttatus (As.), Thumb.
Lethusus, Dall.—sindicus (N. I.), Dall.
Aphanus, Lap.—indicus (N. I.), Dall.
Pachymerus, Serv.—sordidus (As., N. I.) Fabr.: antiquus (As.), Walker.

Bhuparochromus, Curtis.—pallens (N. I.), bengalensis, assimilis (Bom.), pallicornis, gutta (N. I.), Dall.: leucospilus (As.), semiluces (N. I.), antiquus, Walker.
Ischnodemus, Fieb.—punctatus (N. I.), Walker.

Family Pyrrhocoridae.

Lohita, Serv.—grandis (As., Bur.), Gray: longissima (As.), Stål.
Physopelta, Serv.—gutta (As., Bur.), Burm.: Shlanbuschii (As.), Fabr.: cincticollis, Stål.: apicalis, plana, bimaculata, Walker.
Iphita, Stål.—limbata (As., Bur.), Stål.
Antilochus, Stål.—russus (As., Bur.), Stål.: Coquebertii (As., Bur.), Fabr.
Odontopus, Latr.—sanguinolens, Serv.: nigricornis (As., Bur.), russus, Stål.: varicornis (As.). Fabr.: scutellaris (N. I.), Walker.
Ectatops, Serv.—limbatis (As.), Serv.: lateralis (As.), distinctus (As.), de Vuill.
Melamphus, Serv.—faber (As.), Fabr.: rubrocinctus (As.), Stål.: femoratus (N. I.), Walker.
Dindymus, Serv.—rubigineus (As., Bur.), sanguineus, Fabr.: ovalis, Ianus (As.), Stål.
Pyrrhocoris, Fall.—vittiventris (As.), Walk.: grandis, Gray.
Dysdercus, Serv.—cingulatus (As., Bur.), Fabr.

Family Phymatae.

Amblythyreus, West.—angustus (As.), quadratus, West.
Tingis, Fieb.—exes, Walker.
Family Brachyrhynchida.

Brachyrhynchus, Lap.—membranaceus (As.), Fabr.: orientalis (In.), de Lap.

Crimia, Serv.—rubescens, Walker.

Family Holoptilidae.

Maotys, Serv.—viverra, Westwood.

Family Capsida.

Phytocoris, Fall.—Stoliczkanus (Marri), Dist.

Calocoris, Stål.—Stoliczkanus (Marri), Dist.

Capsus, Fabr.—partitus (N. I.), stramineus (N. I.), patulus (N. I.); Walker.

Family Reduvidae.

Icyndus, Stål.—heros (As.), Fabr.

Endochus, Stål.—famulus (As.), Stål.

Euagoras, Burm.—plagiatus (As., Bur.), Burm.

Sycanus, Serv.—collaris (As.), Fabr.

Velinus, Stål.—annulatus (As.), Dist.

Cosmolestes, Dist.—annulipes (As.), Dist.

Reduvius, Fabr.—marginellus (As.), Fabr.: nigricollis (As.), Dall.: mendicus (As., Bur.), costalis (As.), pulchriventris (As.), Stål.: Reuteri (Stål.), Dist.: rivulosus (As.), perpusillus (N. I.), singularis, Walker.

Petalochirus, Burm.—malayus, Stål.: singularis, Walker.

Lophocephala, Lap.—Guerini (Bom.), Lap.

Opistoplatys, West.—indicus, Walker.

Family Ectiuchodida.

Vilics, Serv.—melanopterus (As.), Stål.

Ectiuchidia, Lap.—tuberculatus (As.), maculiventris, Stål.: discrepans (In.), insignis, umbifera, Walker: crudemis (N. I.), nigripennis, Fabr.

Ectiuchotes, Sch.—pilicornis (As., Mad.), Fabr.
Family Piraetidae.


Lestomerus, Serv.—affinis (As.), Serv: flavipes (N. I.), diffinis, Walker: sanctus, Stoll.

Catamarius, Serv.—brevipennis (In.), Serv.

Androclus, Stdl.—granulatus (As.), Serv.

Family Acanthaspideae.

Sminthus, Stdl.—fuscipennis (As.), marginellus, Dist.

Acanthuspis, Serv.—5-spinosa (As.), 6-guttata Fabr.: helluo (As.), cincticrus (As.), pedestris (Mad.), concinna (Dec.), biguttula, bistillata, (As.), rugulosa (N. I.), ornata, Stdl.: fulvipes (As.), Dall.: tergmina, Stoll.: unifasciata, Wolff: quadrinotata, luteipes (N. I.), megaspilus, dubius, micrographa (N. I.), Walker.

Pachythemus, Klug.—bigruttatus, Stdl.

Prostemma, deLap.—carduolis, Dohrn: placens, Walker.

Family Stenopodidae.

Oncocephalus, Klug.—annulipes (As.), Stdl.: naboides (Mad.), Walker.

Stenopoda, deLap.—lunata (N. I.), Walker.

Pygolampid, German.—unicolor (N. I.), concolor, Walker.

Family Apiomeridae.

Syconus, Serv.—collaria (In.), Stoll: versicolor (Bcn.), croceovittatus, Dohrm: indagator, depressus, Stdl.: pyrophumata, semimarginatus (As.), Walker.
Harpactor, *de Lap.*—pulchriventris (N. I.), costalis, (Bens.),
Stål: obscursus (As.), nigricollis (As.), *Dall.*:
fuscipes, Stoll.

Euagoras, *Burm.*—famulus, atrispinus, dichrous (As.), cons-
persus *Stål*.
Family *Emenidae*.

Family *Gerridae*.

Ptliomera, *Serv.*—laticauda (As., Bur.), *Hard.*
Family *Belostomatidae*.

Belostoma, *Latr.*—indica (As.; Bur.), *Serv.*
Family *Nepidae*.

Ranatra, *Fabr.*—elongata, filiformis, *Fabr.*: macrophthalmalma,
Walker.

Lacotrephees, *Stål.*—rubra (As.), *Linn.*: japonensis (As.), *Scott.*:
robustus (As.), *Stål*.
References,

Dallas.—List of specimens of Hemipterous insects in the British Museum.
Pt. I., 1851: Pt. II., 1852.
Dohrn.—Catalogue of the Hemiptera, 1859.
Saunders.—
Trans. Ent. Soc., 1873, p. 117, 245:
1876, 513.

II.—HEMIPTERA-HOMOPTERA.

I.—Cicadina.
Family—*STRIDULANTIA*—Cicadas.

Polyneura, *West.*—ducalis (Nep.), *West.*

Platypleura, *Serv.*—phalaeonoides (In.), Sphinx (N. I.), cervina
(N. I.), straminea (N. I.), interna, *Walk.*,
andamana, *Dist.*

Tacca, **Serv.**—speciosa, **Ill.**

Tosena, **Serv.**—melanoptera (As., N. I.), **White**: Mearesiana (Him.),

**West.**: splendidila (As.), albata (N. I.), **Dist.**

Huechys, **Serv.**—phalemata (As., N. I., Bur.), splendidula (As., N. I.), **Fabr.**: 8-notata (A.), **West.**

transversa, **Walk.**

Geana, **Serv.**—sulphurea [= pulchella, **West.**], (N. I.), **Hope**:
dives (As.), **West.**

Mogannia, **Serv.**—illustrata (N. I.), **Serv.**: recta, obliqua, Locus-
ta, lacteipennis (N. I.), quadrimaculata (N. I.), Terpsichore, **Walk.**

Dundubia, **Serv.**—obecta (N. I.), **Fabr.**: vaginata (As.), **Serv.**:
cinotilanus (As.), ramifera (As.), vibrans (As.), microdon (N. I.), lateralis (As.), Ura-
nia, Nicomache (N. I.), tigrina (Mad.), mac-
culipes (N. I.), Samia (N. I.), varians (As.),
saturata (As.), singularis, linearis (As.);
**Walk.**: Radha (Mad.), Tripurasura (As.),
**Distant.**

Cosmopsaltria, **Distant**—Pomponia, Tibicen, Stål: Sita (Bom.),

Durga (As.), Kama (Darj.), Madhava (As.),

Aurungzebe (Bom.), **Distant.**

Cicada, **Linn.**—subintata (As.), **Area** (N. I.), acorata (N. I.), sub-
vitta (N. I.), xantex (N. I.), **Walk.**: apica-
lis (N. I.), **Germ.**: hemiptera, maculicollis
(Ben.), **Guér.**: imperatoria (Nep.), **West.**

Fidicina, **Serv.**—vicina (As.), **Sign.**: recta (As.), corvus (As.),

immaculata (Ben.), **Walk.**

Family Cercopidae.

Cercopis, **Serv.**—nigripennis (As., N. I.), **Fabr.**: signifera (As.),
duces (As.), pallida, dorsalis (N. I.), dor-
simaculata (N. Ben.), undata (As.), dorsivit-
ta (N. I.), humeralis (As.), costalis (Mad.),
hilaris (Mad.), basilava (N. I.), egens
(As.), pudens (N. I.), dubitabilis (N. I.),
rotundata (N. I.), amplicollis (N. I.), deci-
sa (Darj.), **Walk.**: bispecularis (N. I.),
**White**; **Strongil., West.**
Cosmoscarta, Stdl—borealis (As.), andamana, Moorei (As.), 
Distant.

Phymatostheta, Stdl—binotata (Sadiya), Distant.

Tomaspis, Serv.—(Moneophora) trimacula, (Sphenorhina) 
contigua (N. I.), intermedia (N. I.), 
proxima (N. I.), approximans (N. I.), 
Walk.

Ptyelus, Serv.—nebulosus, Fabr.: costalis (N. I.), conifer, quad-
ridens (N. I.), guttifer (N. B.), sexvittatu-
tus (N. I.), punctus (N. B.), subsfasciatus 
(N. I.), Walk.

Aphrophora, Germ.—sigillifera (N. I.), Walk.

Family Jassidae.

Oxyrhachis, Germ.—tarandus (N. I.), subjecta, unicolor, rudis 
(N. B.), Walk.

Hypsauchenia, Germ.—Hardwickii (N. B.), Fairm.

Centrotus, Fabr.—flexuosus scutellaris, Fabr.: Dama, Germ.: 
Gazella, Hoff.: assamensis, Fairm.: 
reponens (N. B.), substitutus (N. B.), 
pilosus (N. I.), Walk.: Paria (N. B.), 
Lef.

Penthimia, Germ.—orientalis (N. I.), compacta (N. I.), 
Walk.

Ledra, Fabr.—aurita, Fabr.: dorsalis (As.), dilatata, plana, scut-
tellata, fornicata (N. I.), carinata (N. B.), 
punctata (Mad.), chlorocephalus (N. I.), 
culobata, lineata (N. I.), punctifera (Darj.), 
obligens (N. I.), Walk.

Epiclines, Serv.—planata, Serv.

Tettigonia, Germ.—opponens (N. I.), extrema (N. I.), bella 
(N. I.), jactans (N. I.) Walk.: ferruginea 
(As.), Fabr.: rubromaculata (Nep.), Pavo 
(Ben.), quadrilineata (Nîl.), semicircularis 
(Mad.), unimaculata (Cal.), Siga.

Jassus, Fabr.—(Calidina) indica (N. I.), Walk.
Family Fulgoridae.

Laternaria, Linn.—Curtiprora (As.), cardinalis (Nep.), Butler.
Fulgora, Linn.—(Hotinus) candelaria (As.), Linn.: maculata, 
Oliv.: guttulata (In.), virescens (As.), 
viridirostris (As.), Spinolaæ (Mad., As.), 
clavata (As. N.I.), geminata (Him.), West.: 
Delessertii (Mad.), subocellata [var. occlusus, West], (Mad.), Guér.: pyrorhincha, 
(Nep.) Donov.: ponderosa (As.), Stål.: 
brevirostris (As.) Butler: andamaenensis, 
Distant.

Pyrops, Serv.—punctata (As. Nep.), Spin.: guttulata (As.), vive-
sens (As.), West.: perpusilla (N.B.), Walk.

Cyrene, West.—fusiformis (As.), Walk.

Aphana, Guér.—festiva, Fabr.: atomaria (N. I.), Burm.: ama-
bilis (As.), Hope: Saundersii, imperialis 
(As.), White: Caja (As.), submaculata (As.), 
basirufa (As.), Io (N. I.), albiflos (Mad.), 
dives (Mad.), delectabilis (N. I.), lectis-
sima (N. I.), placabilis, verisamor (As.), 
Walk.: sanguinipes (As.), Stål.

Episcius, Spin.—Guerinii, Spin.

Polydictya, Guér.—basalis (As.), Guér.: tricolor (Mad., N. I.), 
Walk.

Lystra, Fabr.—dimidiata (As.), punicea (As.), Hope: West-
woodii (As.), Parry.

Eurybrachys, Guér.—Lepelleteri (Ben.), Guér.: spinosa, Burm.: 
insignis (Mad.), West.: seruginosa (N. I.), 
pulverosa (As.), reversa (As.), Hope.: de-
cora (As.), punctifera (Mad.), tricolor (N. 
I.), subfasciata (N. I.), Walk.

Dichoptera, Spin.—hyalinata (Ben.), Fabr.

Dictyophora, Germ.—gramineus, Fabr.: lineata (Ben.), pallida 
(Ben.), Donov.: indiana, despecta (Mad.), 
nigrimaëcula (N. I.), albivitta (N. B.), pal-
lider (N. I.), leptorhina, Walk.

Cixius, Latr.—flavolinea (N. I.), Mittendorf, Walk.
Helicoptera, **Serv.**—indica (Mad.), simbra (As.), ferrugines, *Walk*.
Derbe, **Fabr.**—maestra (N. I.), carnosa (N. I.), *West*.
*Elasmoscelis, Spin.*—fuscofasciata (As.), *Stål*.
Issus, **Fabr.**—pectinipennis (Ben.), *Guér.*: apicalis (N. I.), *Walk*.
Flata, **Fabr.**—limbata (N. I.), *Fabr.*: marginella (As.), *Oliv.*: bombycoides (Mad.), *Guér.*: intacta (As.), completa (As.), tenella, *Walk*.
*Pochazia, Serv.*—obscura, *Guér.*: guttifera (As.), interrupta (Mad.), simulans (N. I.), *Walk*.
*Flatoidea, Guér.*—orientis, truncatus (N. I.), *Walk*.
*Colobesthes, Serv.*—coromandelica, *Spia.*: conspersa (As.), *Walk*.
*Pscoptoptera, Latr.*—truncata (N. B.), *Linn.*: ferrugata, *Fabr.*: dentifrons, *Guér.*: comma (As.), lactifera (N. I.), ocellata (Mad.), *Antica*; intracta (Panj.), lutescens (N. I.), *Walk.*: Maria (As.), tricolor (As.), *White*; vidua (As.), *Stål*.

II.—PHYTOPHTHRES.
Family *Psyllidae*.

*Psyilla, Först.*—basalis (N. I.), *Walk*.
Family.—*Aphidina* : plant-lice, apparently not examined.
Family *Coccidae*.

*Coccus, Linn.*—Laaca (In.), *Kerr* : cacti (In.), *Linn*.
*Ceroplastes, Gray.*—ceriferus (Mad.), *Fabr*.
*Monophlebus, Leach.*—stripennis, *Klug* : Leachii (Mad.), Saundersonii (S. In.), *West*.

III.—ANOPLURA—Lice.

References.
Westwood.—*Mod. Class. Ins. II.*; 414, 1839 : *Ann. Ent. t. 6. 24, 25, 51, 57*.
*Cab. Or. Ent. t. 8, 98. Trans. Linn. Soc. XVIII. 123 (Fulgora), XIX., 1 (Derbe)*
*An. Mag. N. H. t. 2, IX., 118*.
*Angot (C. J.) et Seréllis (Aud.)—Histoire Naturelle des Insectes Hyméto*.
*Paris, 1849*.
*Davis.—Anoplura Britannica, 1841*.
*Butler.—Z. Z. S. 1874, p. 97.*
The order Neuroptera [nerve-winged] includes those insects commonly known as white-ants, May-flies, dragon-flies, scorpion-flies, and ant-lions. "Of all the Linnaean orders," writes Mr. Kirby, "this appears to consist of the most discordant tribes: so that it seems next to impossible to construct a definition that will include them all, unless indeed that a varied metamorphosis is its essential character: or, to speak more largely, variety itself seems the characteristic of the insects composing it in every state, and there is scarcely a common distinctive character in their perfect state upon detecting which in any individual you may exclaim—this is a neuropterous insect." The insects of this order may, however, be distinguished from the Orthoptera and Hemiptera by the homogeneous texture of their wings; from the Hymenoptera by their oral arrangements; from the Lepidoptera by the absence of scales on the wings, and from the Diptera by the possession of four wings. The wings are membranous and transparent and are marked with nervures so arranged as to resemble fine network. The mouth is formed for bruising the food on which the insects live and is never adapted for sucking the juices of plants or animals. The abdomen does not possess a sting and is rarely furnished with an ovipositor. The antennæ are many-jointed and hair-like, and the eyes are simple. The thorax is composed of three segments closely united together and the abdomen is attached to the thorax by its whole breadth. The insects of this order are usually divided into four classes—(1) Pseudo-neuroptera; (2) Odonata; (3) Planipennis; and (4) Phryganina, the last of which forms in some systems a separate order under the name Trichoptera. To the first class belong the Termittina or white-ants, of which no description is necessary to residents in India. They comprise males, females, and neuters, and live in societies and are omnivorous eaters in all states. In the Ephemera or May-flies the mouth is entirely membranous or very short, and the posterior wings are sometimes wanting. They live in the perfect state seldom more than twenty-four hours. The Odonata include the great family of dragon-flies of which the larvae and nymphs are aquatic. The Planipennis include the scorpion-flies in which the head is prolonged or narrowed in the form of a proboscis; the ant-lions in which the
head is not so prolonged and the aphid-lions somewhat similar to the preceding. Though the ant-lions in their perfect state approach in form the dragon-flies, they differ much in the character of their metamorphosis. The Myrmeleonides undergo a complete metamorphosis and their larvae are terrestrial in their habits and of a short stout and thick form. They usually construct a cocoon when about to undergo the change to the pupa state in which they are for the most part quiescent. In the perfect insects, the wings have fewer nervures than the dragon-flies, their eyes also are smaller and the antennæ are many-jointed. The mandibles are sharp and the maxillæ and lower lips have palpi attached to them. The female dragon-fly lays her eggs on the water in which the young larvae are hatched and also undergo the change to the pupa state. In both states they are very active and breathe through the intestine which admits water and with it air mechanically suspended which is taken up by the tracheæ of the intestines. Although they can only walk slowly, they manage to elude their enemies by expelling the water in their intestine with such violence as to carry them a considerable distance. The genus Hemerobius are miniature ant-lions and prey on the Aphides in the same manner that the Myrmeleonides prey on ants and other insects. The scorpion-flies have a long proboscis and are in the habit of erecting the last segments of the abdomen somewhat in the manner of a scorpion. The caddis-flies in the larval state form tubes of all sorts of substances within which they move about. Some of the sections of this order have been fairly worked, but very much more remains to be done.

NEUROPTERA.

I.—PSEUDO-NEUROPTERA.

Family Termitina—Whitie-ants.

Termes, Linn.—obesus (In.), Mauricianus, Ramb.: taprobanes,
Walk.: ferruginosus, Latr.: brunneus,
fatalis, Hogen.

Family Embidina.

Embisia, Latr.—Latreillei (Bom.), Ramb.
Oligotoma, West.—Saundersii (Ben.), West.
Family Perlina.
Perlæ, Geoff.—suffusa (Nep.), Walk.: D. vauceli, Pictet.
Isagonus, New.—infuscatus (N. L.), New.

Family Ephemerina.—May-flies.
Polymitarcys, Eaton—indicus (N. L., Bom.), Pictet.
Palingenia, West.—lata (As.), Walk.
Ephemeræ, Linn.—immaculata, Eaton: exspectans, Walker:
Bætis, Leach: debilis, Walker.

II.—ODONATA.

Agrionina.—Water nymphs.
Calopteryx, Leach.—gracilis (Bom.), Ramb.: smaragdina, basi-
laris, De Selys: sinensis, Linn.: ciliata
(As.), Fabr.
Eupheæ, De Selys.—dispar, Ramb.: lestoides, indica, De Selys:
plendens Hagen.
Rhinocyphe, Ramb.—trimaculata, unimaculata, trifacilas, quadrina-
maculata De Selys: bispinata, Hagen:
fenestrella, Ramb.: lineatus, Burm.
Lestes, Leach.—viridula (Bom.), platystyla, Ramb.
Argia, Ramb.—quadrinaculata (Bom.), gomphoides (Mad.),
Ramb.
Agrion, Fabr.—decorum (Bom.), microcephalum (Bom.), ceri-
um (Bom.), Ramb.

Gomphina.
Diostatomma, Charp.—repax (Bom.), Ramb.

Æschnina.
Anax, Leach.—immaculifrons, Ramb.

Libellulina.—Dragon-flies.
Zycoxoma, Ramb.—petiolatum (Bom.), Ramb.
Neurothemis, Brower.—Sophronia (Mal.), fulvia (Mal.), Drury:
pallida, Ramb.
Aedesma, Ramb.—geminipennis (Bom.), Ramb.
OF THE NORTH-WESTERN PROVINCES.

Libellula, *Linn.*—stylata (Bom.), geminata (Bom.), intermedia, (Bom.), festiva (Bom.), Caesia (Bom.), truncata (Bom.), trivialis (Bom.), obscura, *Ramb.*: Tikarga (Mad.), equestris (Bom.), lineata, Braminea, contaminata (Mal.), *Fabr.*: variegata, *Linn.*: Sabina (Bom.)

**Drury.**

III.—**PLANIPENNIA.**

Family *Sialina.*

*Hermes, Gray.*—maculipennis (Mad.), *Gray.*


*Neuromus, Ramb.*—infectus (Darj.), montanus (Sik.), fenestratus (Darj.), latatus (Aes.), intimus, *M'Lach.*: testaceus (Aes.); albipennis (Nop.), *Walk.*

Family *Hemerobina*—Ant-lions, aphis-lions.

*Rapesma, M'Lach.*—viridipennis, *Walk.*

*Mantispa, Ill.*—nodosa (Aes.), quadruberculata (N. I.) linoelata (Nop.), indica (Nep.), *West.*: rufescens (Mad.), *Latr.*: Cora (Mad.), *New.*

*Osmylus, Latr.*—conspersus, tuberculatus, *Walk.*

*Chrysopsa, Leach.*—infecta (Mad.), *New.*: candida, *Fabr.*

*Palpares, Hagen.*—patiens (N. I.), infimus (N. I.), *Walker.*: parvus (N. I.); zobratus (N. I.);

*Macronemurus, Hagen.*—nafandus (N. I.), *Walker.*

*Stinares, Hagen.*—improbus (N. I.), *Walker.*

*Formicaleo, Hagen.*—andax (Nep.), verenda (N. I.), vossanus (N. I.), minax (N. I.), pugnax (N. I.), dirus (N. I.), truculentus (N. I.), *Tappa* (Nep.), *Walker.*

*Acantholisi, Hagen.*—incluse (N. I.), *Walker.*

*Creagris, Hagen.*—perfidus (N. I.), *Walker.*

*Gleburus, Hagen.*—infactus (N. I.), tacitus, *Walker.*

*Myrmecolurus, Hagen.*—acerbus (N. I.), impexus (N. I.), *Walker.*
Tomateros, *Hagen.*—pardalis (Mad.), *Fabr.*: astutus (N. I.), *Walker.*
Helicoomitus, *M'Lach.*—insimulans (N. I.), immotus (N. I.),
diex (N. I.), verbo sus (N. Ben.), profanus
(N. I.), *Walker.*
Ogcogaster, *West.*—tessellata, segmentator (N. I.), *West.*
Acheron, *Lef.*—longus (Ben.), *Walker.*
Hybris, *Lef.*—angulata (As.), *Westwood.*
Glyptobasis, *M'Lach.*—dentifera (Bom., N. I.), *West.*

Family *Panorpina*—Scorpion-flies.
Panorpa, *Linn.*—Charpentieri (In.), *Burm.*: appendiculata
(Mad.), *West.*: furcata (Nep.), *Hard.*

Family *Nematopterina.*
Nematoptera, *Burm.*—filipennis (Cen. In.), *West.*

IV. — PHRYGANINA.

Family *Hydropsychina*—Caddis-flies.

Family *Leptocerina.*
Leptocerus, *Lecch.*—indicus (N. Ben.), *Walk.*

References:

H. M. 8. VIII. 102, 276.*
Pt. II., *Syphocrypta*) *Genere, 1841-2.*
*De Selys Longchamps, E.*—*Monographie des Libellulidés d'Europe.* Paris,
1849.
OF THE NORTH-WESTERN PROVINCES.


LEPIDOPTERA.

The order Lepidoptera (scale-winged) comprises those insects so well known under the names butterflies and moths. In this order the metamorphosis is complete and the change to the pupa and imago states is well marked. The body comprises the head, thorax and abdomen. The head is furnished with a suckorial apparatus, eyes and antennae. The mouth consists of filaments or threads united together to form a trunk or tube representing the maxillae of other insects and adapted for sucking the juices on which the perfect insect lives. The base of the trunk is protected by two palpi corresponding to the labial palpi of other insects and the maxillary palpi are small and sub-obscure in many species. The labrum also is small, conical or subulate, and the labium is composed of a single piece, flat and triangular. The mandibles are very small and rudimentary and are in some species sub-obscure. The true eyes are compound, but occasionally there are two ocelli between them. The antennae vary much in form in different groups. In the diurnal tribes they terminate in a knob, hence the name Rhopalocera (knob-horned): in the crepuscular groups they are usually fusiform, and in the nocturnal they are thread-like or hair-like and assume various forms, hence the name Heterocera. In the last group some are pectinated like the teeth of a comb; others are plumose like a tuft of feathers; and others again are branched. The three segments of the thorax are in appearance one and carry on the upper side the organs of flight and on the under side the legs. The abdomen is attached to the thorax by only a portion of its breadth and is not furnished with either a sting or an ovipositor. The scales which bear the colouring matter are attached to the framework of the wings by a stalk or pedical and are laid on somewhat like the tiles on a roof. In form the scales are usually
rounded towards the pedicel and truncated at the outer edge with a toothed border. Amongst the diurnal Lepidoptera, the wings in repose are usually folded perpendicularly, and amongst the crepuscular and nocturnal groups the wings are folded horizontally. The legs are six in number and the tarsi are five-jointed and have a pair of hooks at the end. The first pair of legs are in many species rudimentary and of no apparent use, except perhaps to clean the front of the head and the trunk. The caterpillars or larvae possess twelve segments or articulations which are furnished beneath on the anterior segments with three short scaly legs, terminating in a cushion surrounded by hooks and on the posterior segments with from four to ten false legs. These larvae feed on vegetable substances and before the transformation into the imago state change to a pupa or chrysalis, in which the limbs, thorax and abdomen of the imago may be seen. The corneous envelope of the chrysalis varies much in form. In Danais chrysippus it is of a grass-green or pink colour adorned with small spots of gold and is attached by a pedicel to its food plant. Other species form cocoons and others again bury themselves in the earth. The senses of touch, sight, hearing and smell are strongly developed, and the squeak of Acherontia when captured, though produced only by the air escaping from two cavities in the abdomen, may be likened to the fifth sense.

It is not so necessary to discuss the basis of classification, as the different families are sufficiently distinguished in the works quoted in the 'References' at foot. The great families of which representatives are found in the Kamaon Himalaya are the Nymphalidae, Lemoniidae, Lycaenidae, Papilionidae and Hesperidae. The Nymphalidae are numerous both in genera and species and many are distinguished by the strength of their wings and their steady, swift flight. The Purple Emperor and the Fritillaries of British collectors belong to this family. For the most part, the insect in the pupa state is attached by a pedicel and has not the support of the slight chain of thread passed round the body which is noticed in other families. The fore-legs also are imperfect and unfit for walking. In the Lemoniidae the chrysalis is attached by a slender thread across the body. They are chiefly natives of tropical America, and in these hills but four genera have been captured by me,
of which, moreover, there are few species. The Lycaenidae are numerous in genera and species and include the Blues, Coppers and Hair-streaks of the British collectors. In this family the chrysalis is attached by the tail and girt by a silk thread across the body. The Papilionidae include the true Papilionidae or swallow-tails and the Pieridae or whites. The former are always known by the apparently four-branch nervule and the spur on the anterior tibis. The pupa is braced or sub-solliculate and varies much in form. It never has the head pointed as in the Pieridae. In India the latter family hardly bears out its English name: some, like P. Nabellica, are nearly black; others are blue, or are adorned with red, crimson, chrome, yellow or orange colours. The Hesperidae or skippers are very numerous in species and individuals. The pupa is attached by the tail and is supported by a skein of thread around the body. This family is also marked by the possession of a pair of spurs on the middle of the hind tibias, and in India many species are adorned with bright colours.

The differentiation of the genera is chiefly based on the form of the legs and the form and neuration of the wings. A clear appreciation of the position and nomenclature of the neuration of the wings is essential to the understanding of any description of the diurnal Lepidoptera. It would, however, lead us too far away to enter into this subject here or to discuss the interesting anatomy and transformations of this order. We have not the materials for estimating exactly the number of species of Lepidoptera found in India, but in a large collection from Bengal examined in 1865, the Rhopalocera numbered 409 species and the Heterocera 1,207 species. The single collection of the late Mr. W. S. Atkinson, examined in 1880, added 650 new species of Heterocera; and if we take the numerous additions made by other collectors and the species recorded by others, we have about 900 species of Rhopalocera and about 2,500 species of Heterocera, chiefly from the Bengal Presidency. The Heterocera of the north-west Himalaya have hardly been worked and no good list yet exists for this group. In the following lists the Rhopalocera represent, with few exceptions, actual captures in the tract between the Tons and the Harda, the Duna and Bhilaw by

1 Heesom's description of the terminology of the Lepidoptera in Smithsonius Contributions to Knowledge, iv., M. C., 1868, is accurate and complete.
myself or others. The list of Heterocera contains also a number of typical species captured in Darjiling, Calcutta and western Assam, and sent me by the late Mr. W. S. Atkinson as an aid in determining species. It is to be regretted that my notes do not enable me to separate these from the species actually recorded from Upper India. This list can therefore only be taken as a record of species that may or may not occur in the tract for which the Rhopalocera list shows actual captures.

The Heterocera include both the crepuscular and nocturnal groups, and the list gives the families recorded as occurring in the Bengal Presidency. At the foot of the list of each family the genera are noticed which, though found in India, have not yet, with few exceptions, been identified as occurring in Upper India. The tribe Sphinges or Hawk-moths affords numerous examples. They are easily recognized by their prismatic or fusiform antennae, which are usually thickest in the middle and are terminated by a little flake of scales. They fly with great force and swiftness, so that it is most difficult to capture them uninjured, and are named from a supposed resemblance in the position usually assumed by the caterpillar to the attitude of the phinx. They pass their pupa stage in the ground. The tribe Bombyces is also very well represented in India, but the space at our disposal will not allow us to note the very interesting families comprised in it, except the Bombycida, which from its economic value and the efforts now being made to localise sericulture in the Dehra Dun demands and deserves considerable attention. We shall first reproduce the late Captain Hutton's valuable note on the family which is but little known, and coming from a practical naturalist such as he was should have wider circulation. We shall then describe the different experiments that have been undertaken to ascertain whether silk culture can be made a profitable practical industry like indigo and tea.

Notes on the Bombycida, as at present known to us, by Captain Thomas Hutton.

Bombycidae: Mori, Liriarcus.—The insect of the domesticated Chinese Bombyces, originally from China, about north latitude 36° to 34°. Also in Japan.

* Dated 26th July, 1871. As far as I am aware nothing has been discovered to invalidate the accounts here given, and these "Notes" may still be taken as a summary of our scanty knowledge of the silk-producing moths of India.
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This has been cultivated in Europe, especially in France and Italy, as well as in Syria, Egypt, Persia, Bokhara, Afghanistan, Cashmir, in one or two localities of the Northern Punjab, near the hills, and thrives well at Mussoorie, everywhere feeding upon various species of mulberry and everywhere an annual, only except at Mussoorie, where I can obtain two crops. This is the worm that lately failed in France after centuries of domestication. It occurs nowhere in the lowland Gangetic provinces, but its name is assigned, in ignorance, to all the under-mentioned species. This species has been introduced into Australia, where it is said to thrive well, although Dr. Wallace of Cochester has lately informed me that Australian eggs do not hatch so kindly and regularly in England as English-bred eggs; instead of coming forth in a swarm, they appear daily in small quantities only. This I attribute to the high temperature of Australia having acted injuriously upon the constitution, which is debilitated. The best silk of all is produced by this species, and readily sells, with good reeling, at 25 shillings per pound. Mr. Cope sold some at that rate which he produced in the Punjab; and that reeled at Mussoorie fetched the same price. A splendid silk is produced by crossing this species upon the smaller monthly worm known in Bengal as the dori, but the crossing requires great attention, and the out-turn after all may not be worth the trouble, for, unless very closely watched and attended to, the worms will invariably revert to annuas. Silk—golden yellow when in health.

2. Bombyx tussor, Hutton.—This species is cultivated sparingly in several parts of India, but its constitution is thoroughly worn-out, and it ought to be sent to a hill climate. At Mussoorie it thrives well, and although, like the last, an annual everywhere else, here it yields a second or autumnal crop also. It was originally brought from China, near Nankins, in north latitude 41°, but is fast fading away from Bengal. It is cultivated in France and Italy and in China, as well as in Bengal, and in those countries generally produces a pure white silk; in Italy there are more white than yellow cocoons, but in France more yellow than white; this is dependent upon climate, as is well shown at Mussoorie, where worms introduced from Bengal produce white cocoons for the first crop, but almost all yellow in the second crop. The worms being northern in constitution is impatient of heat and suffers accordingly in constitution; the silk in consequence becoming white, which, as I have elsewhere pointed out, is generally a sign of loss of constitution, not only among silkworms, but among animals still higher in the scale of nature; the natural colour of the worm of B. Mori is nearly black-brindle, whereas the worms under domestication are of a sickly creamy white. So, then, the climate of France, being more temperate than that of Italy, produces more yellow than white cocoons. This species is often termed the Hindoo or Indian stock, and in Bengal is known as the Kore jale, because its cocoon is larger than those of the so-called dori worms or polyvinctus. It is cultivated in Assam and, according to Dr. Ray, in Bihar and elsewhere called "Pet major," although it is invariably confounded with B. Mori, than which it is at least an inch smaller, though in other respects closely resembling it. The cocoons are of a different texture with more flaws. The silk varies in price from 20 to 25 shillings per pound. Unless it be very soon transferred to the hills, this species will certainly die out, here I could hardly find it this winter without difficulty.
3. *Bombyx Crasi*, Hutton.—This is the largest of the monthly worms, and in Bengal passes under the native name of the Madras or Nistri, and is as usual confounded by Europeans with *B. Mori*, although the one passes as an annual, and the other as a monthly worm. The silk is good, of a golden yellow, and the worms thrive best in a temperate climate; in Asam (sppt. Boyce) it is known as "Fat minor." This species is cultivated in several parts of India, and thrives well at Mysorees. It is to be particularly remarked, however, that none of the Chinese species, whether annual or monthly, have hitherto succeeded in the North-Western Provinces; Dr Boyce long since remarking that all the Old Company's instances did not extend higher up the country than about 2° of north latitude, owing to the dry hot nature of the North-Western climates.

4. *Bombyx formosus*, Hutton.—Known to the Bengalis as the dest worm and, like the others, digested by Europeans with the name of *B. Mori*. Silk—golden yellow, distributed over Bengal and other parts of Southern India; but people know so little of the distinguishing characters of species, that it becomes very difficult to say what species is alluded to in magistrates' reports, unless the native name is mentioned. This also is one of the polyvoltines. A sure mark of distinction between the worm of this species and that of any of the others exists in the fact that when near maturity it becomes of a dull leaden blue color. This species thrives best in the cold weather. It is very small, but yields a good cocoon, although the returns of silk are said to be uncertain; there are no dark worms observable among them. The worm is figured in the second part of my paper "On the Reversion and Restoration of the Silkworm."

5. *Bombyx sinalo* Hutton.—This is known as the "Sins" of Bengal, but, like the others, it originally came from China; it is very prolific, and even at Mysorees goes on yielding crop after crop up to the middle of December. The cocoons vary in colour, some being white and others yellow, while others even have a beautiful faint greenish hue. These changes clearly show that the health of the worm is becoming impaired. There is a peculiarity about these also which may enable the tyro to distinguish them from any of the others; while all the other species hatch slowly during the morning, from six to twelve o'clock, the Sins worms come forth all in a batch, and continue hatching all day and all night.

6. *Bombyx annamensis*, Hutton.—This I have only once been able to procure and the worms died off soon after hatching. The cocoon is said to be larger than those of the Bengal monthlies, but very little beyond the fact of its existence appears to be known. As the species is supposed to have been introduced from Burma, it may probably turn out to be the same as that which was lately reported to exist in Burma.

7. *Bombyx*—I have heard of a species which in Central India is said to yield three crops of silk in the year, and that as soon as they are hatched the worms are placed out upon mulberry trees and left there until they spin the cocoons. Some of the cocoons were kindly sent to me, but were so crushed in transit that they were destroyed; the cocoons were small, but the silk was good, of a pale goldenish yellow, like that of *B. formosus*. The following, with the
exception of B. Huttesi, are little known. Mr. F. Moore wishes to place them in a separate genus under the name of "Thephila," one of his chief characters being the rows of spines on the larva; I object, however, to the establishment of this genus, because, in truth, we know little or nothing about them, and as to the spines, two species only are as yet known to possess them; nevertheless, they certainly do not stand properly under the genus Bombyx, but we must wait yet awhile in order to ascertain whether all can be included in the same genus. (B. Heresfeldi (Moore) is a native of Java.)

9. Thephila Huttesi, Westwood. Cab. Or. Ent. t. 13 f. 4. —This is a wild mountain species, feeding on the indigenous mulberry of Simla, Muscosore and Almora. I first discovered it at Simla in 1857, and afterwards in great abundance at Muscosore. In some years they swarm to such an extent that by the end of May, the worms of the first, or spring brood, have thoroughly denuded even large forest trees, not leaving a single leaf. In this predicament they quit the tree in search of another, which they generally find near at hand, and which is then soon thickly covered with cocoons spun in the leaves; but if, unfortunately, they fail to find a tree at hand, the whole brood perishes, the most forward worms spinning cocoons among shrubs and grass. The trees thus denuded, instead of dying, are in another month once more in full leaf, as if nothing had happened. T. Huttesi is a strong and hardy species, yielding a beautiful soft, whitish silk; and although the worm is too intractable and wandering to be treated in the usual manner in the house, yet I am by no means sure that it cannot be turned to good account by collecting the cocoons from the trees, as was evidently done in the outset by the Chinese with respect to B. Mori.

9. Thephila bengalensis, Hutton.—If the species discovered some years ago in Bengal by my friend Mr. A. Grote is correctly figured in my paper No. 2, just alluded to, then that sent to me from Chota Nagpur in 1869, by Mr. King, must be distinct, for it is in all respects as to shape, colouring, markings, &c., a perfect miniature of B. Huttesi; that it is distinct, however, is shown in the smaller size both of larva and image, as well as in its being a polyvolute instead of a bivoltine like B. Huttesi. In Chota Nagpur the food was the leaf of Arctocarpus Lohok, upon which tree likewise Mr. Grote found his specimens; but as the latter gentleman was in the habit of employing an accurate native delineator of insects, I much doubt any error occurring in the figure kindly supplied by him to me, and therefore am inclined to regard Mr. King's species as distinct from Mr. Grote's, and would term the Chota Nagpur insect Bombyx (Thephila) affinis, (nou.) in reference to the remarkable affinity to B. Huttesi, in all its stages.

10. B. affinis, Hutton.—When the young worms hatched at Muscosore from eggs and cocoons were sent from Chota Nagpur, I had an armful of Arctocarpus within some pincers and was sadly pressed to feed the worms; I tried, without success, the leaves of wild fig trees, Ficus venes, Morus nigra, Morus sinensis, M. multicaulis, M. indica, M. serrata (wild), but all to no purpose, and I had almost made up my mind to lose the species, when it suddenly occurred to me to try the leaves of M. indica. With these I succeeded, the young worms riddling the hard, dense leaf into a perfect sieve in a few minutes.
Huttoni, in the two first stages they were dreadfully troublesome, wandering down from the branches and spreading all over the table, but as they grew larger, they became more tractable and remained tolerably quiet, eventually spinning their cocoons in the leaf like B. Huttoni.

When the moths appeared, there was equal difficulty in getting them to pair, and then even many of them laid no eggs; those that did so deposited them in batches and then covered them over thickly with the brush or tuft of hair at the end of the abdomen; thus the eggs of B. Huttoni are pale straw colour, glued to the trunk or branches of the tree, and quite naked, whereas those of B. affinis are of an orange colour and covered with dark hair. This renders it difficult to detect them on the bark, and the covering is probably used as a non-conductor of heat. The eggs of B. Huttoni are scattered along the under side of the small branches or over the bark of the trunk, whereas those of B. affinis are placed in patches or groups, and none of the eggs that remain without a coating of hair ever produce worms. I obtained four broods, the last being reared on the trees of M. nigra in the open air. I am sorry to add that none survived the winter, although the cocoons were kept in a room with a fire; thus, after all my trouble, I lost the species. The silk resembles that of B. Huttoni, and is equally good, although from the smaller size of the cocoons there is less of it. Mr. Grote kindly sent me a specimen of his moth which, so far as I can remember, was whitish and very much smaller than that of B. affinis.

11. Thaëphila subsutata, Walker, Proc. Lin. Soc. III., 186 (1859).—Nothing more is known of this species than is contained in Mr. Walker's description of the moth, and that it was procured from Singapore by Mr. R. A. Wallace; neither the larva nor its food is mentioned. Whether this be a true Thaëphila or not we cannot tell. (T. mandarina, Moore, is a native of Chekiang, China.)

12. Thaëphila Sherwilli, Moore.—This is closely allied to B. Huttoni, but the larva is unknown; all that has been ascertained is that the specimen was obtained from a collection made by the late Major J. L. Sherwill, but whether captured in the plains or at Darjiling no one knows. People who have often collected at Darjiling assure me they never saw the species there; hence I incline to regard it as a lowlander, feeding on Acanthopus perhaps. All that Moore says of it is that it is "allied to B. Huttoni and differs from it in being somewhat larger, and of a grayer colour, the fore-wing having the apical patch, fuliginous instead of black, and it has only a single transverse discal streak (instead of the two as in B. Huttoni). A most prominent character is that the abdomen is tipped with black, as well as having the dark waistband."

13. Oecophora religiosa, Halter, J. A. S. Beul., VI., 4.—Although this stands as a Basileia, the entire description as given by Dr. Halter applies rather to a species of Oecophora. It is called the Jori silk-worm by Halter, and the Des-muga silk-worm by Mr. Hagen. It is said to occur in Assur and Bilaspur, but I have failed to obtain information from those localities. Bombyces are far less curious than the allied genera of Thaëphila and Oecophora, and if indigenous in any district, either they will remain year after year, sometimes in greater, sometimes in lesser numbers; but Thaëphila and Oecophora are both important; plentiful one year, absent altogether the next, and, with the latter especially, for two or three
yam. Hendo Grote for four or five years lost sight of *Theopilius bengalensis*, and no one seems to have seen Heftor's *B. religiosa* since the time of its discovery.

14. *Ocina* *Lida* Moore. (O. Moore, Hutton) Cat. Lep., E. I. C. Mus., II., 301.—This species is found at Mussoorie, where it feeds upon the leaves of *Ficus venosa*, the larva being very like that of a *Geometra*, and spinning a small white cocoon on the leaf or against a stone beneath the tree. It is too small to be serviceable. I named it after Mr. F. Moore, but he tells me it is the same as the Javaese *O. Lida*. It is a multivoltine. It feeds on the wild fig also. (*O. diaphana*, Moore, also occurs in the Khasiya hills.)

15. *Ocina* *lactea*, Hutton.—This also occurs at Mussoorie, feeding on *Ficus venosa* and spins a curious little cocoon of a yellow colour within the leaf; over the cocoon is laid a net-work of yellow silk, too small to be of use. It has several broods during the summer. The larva is smooth, whereas that of the preceding is hairy. (*O. diflecta*, Walker, is a native of Java.)

16. *Ocina* *Comma*, Hutton.—The moth of this is white, with a dark comma-shaped mark on the disc of the upper wings; hence the name. It occurs both in the Dha and at about 5,600 feet of elevation below Mussoorie.

17. *Triana* *variegata*, Moore. Cat. Lep. E. I. C. Mus., II., 302.—Is a small species found in Kansa; and again by Mr. Grote in Calcutta. As a silk-yielder it is of no value. For further remarks on these species, consult the second part of my paper "On the Reverence and Restoration of the Silkworm." (J. Agri. Hort. Cal., 1864, Trans. Ent. Soc.).

18. *Cricula* *trifasciata*, Heft. —This handsome and curious in India, sometimes in such numbers in the larva state as to become a perfectly destructive pest; it destroys the mango trees of every leaf, destroys the foliage of the cashew-nut, and is even said to attack the tea plants. It occurs in Burma, Assam, Moulmain, and Chota Nagpur in Central India. The cocoons are formed in clusters, so closely interwoven that they cannot be separated for reeling, which, indeed, their very texture prohibits; they are therefore carded, but are not much used; the cocoons are very irritating, from a number of minute bristly hairs from the caterpillars. I am inclined to think there are two species now standing under this name; as some cocoons are very much reticulated, while those from other localities are far more closely-woven and scarcely reticulated at all. This will never prove productive as a silk-yielder, unless the cocoons can be reduced to a gummy pulp and used for some other purposes (*C. drepanoides*, Moore, occurs in Sikkim.)

19. *Automera* *Myllara* Drury.—This handsome species is distributed all over India from Burma to Bombay; but it has to be observed that there are in this wide range several distinct species included under the name. To separate these efficiently must be the work of time, and until it is done, there can be no really good Tenasserim silk produced. That several of these species are capable of producing a very valuable article of commerce is an undoubted fact, and from its cheapness and durability it would be useful to these classes of the British population which cannot afford to indulge in expensive silks. At present the native method is this: At the season when the cocoons
have been formed, the jungles swarm with them, and men sally forth to pluck them from the trees. These jungles, however, contain several distinct species, a thing of which the natives are profoundly ignorant; these cocoons are all promiscuously hedged together placed in hackeries, and carted off to the dealers. They are then sorted according to size, thickness, colour, &c., and named accordingly as a kind of trade mark, but without any reference to species. The cocoons selected for reeling are treated in the roughest manner and all kinds spun off together; those that are kept for breeding are allowed to eat out of the cocoon, as it is termed, and to interbreed, still without reference to species; and as this has been going on from time immemorial, of course the species have become blended into a most confusing cross-breed. Hence it results that if a dozen cocoons are taken at random, no two moths will resemble each other.

This system of crossing is not confined to the Tusche group. I have detected it more than once in what were termed Japan worms imported direct from that island; indeed, I have not only detected the cross, but I have succeeded in separating the species which composed it; in one instance, I found B. Mori crossed with B. sinensis, and on another occasion B. testor and B. sinensis. In the case of domesticated species there is no great difficulty to contend with, but with regard to the wild species the thing is very different, and, in short, I can scarcely yet say that I see my way at all clearly. In the Dehra Dún and extending up the hill side to about 4,500 feet, perhaps more, we have two species of Tusche, one of which is also found in Central India; what the other is I am not yet prepared to say. Here, however, we have no artificial crossing, so that our species may be regarded as types. The difficulty is to get the sexes of two moths showing marks of relationship to come forth at the same time, so as to obtain a breed and compare the larvae with others. To trust to the reports of the unscientific would only add to the confusion. A gentleman residing in one of these districts kindly furnished me with cocoons of what he declared to be distinct species, and furnished me with voluminous notes, but neither the one nor the other furnish the slightest data upon which I can work or depend; that a cross exists I can see, but my correspondent is not able to enter into my views and wishes.

20. Antherea nobilis, Hutton.—This is one of the species that has been crossed upon A. Puphis, and it seems to be not uncommon throughout Central India. It is a well-marked species, and as specimens have been sent to England. The silk would probably rival that of A. Puphis.

21. Antherea:—I refrain from naming this until I can obtain more specimens; it is found in Central India and in the Dehra Dún. It is quite distinct from either of the foregoing.

22. Antherea Purpu, Gau’ Mín.—This species was discovered in Munsoree, in the north of China, where it feeds on the oak. According to Mr. Athamath, he has captured two specimens of what he declares to be this species at Darjeeling; those flew to a light placed out in the evening, but nothing further was ascertained. The great difference between the climates of Darjeeling and Munsoree calls especial attention to this discovery, and makes one to wonder when the species has not been introduced by man. Munsoree and Manipur, both further to the north.
22. _Antheraea Yamamai_, Guz. Mén.—This is a Japan species and is well thought of both in England and in France, where great efforts have been made to introduce it, but as yet with very indifferent success. Last year I received an ounce of these eggs direct from Japan, and found them to thrive admirably on our hill oak; unfortunately my means were not adequate to the undertaking, as gauze covers were found to be indispensable in order to ward off the attacks of insects, such as bugs, the larva of _Coccinella_, spiders, &c. However, the experiment was suddenly cut short in one night when the worms were in the fourth stage, by the incursion from below of a swarm of large black ants which carried off every one. The species however is well worth another trial.

21. _Antheraea assamica_, Heller.—This is the _Muga_ or _Munga_ worm of Assam which produces a very excellent silk, which, if well reeled by skilful hands, instead of being carded, would be extremely valuable. I have found this species in the _Dehra Dün_ feeding upon a tree known to the natives as "_Kiri_," but I only procured one male and have not since seen another.

22. _Antheraea Perrottetii_, Guz Mén.—Said to occur at Pondicherry, but although I long ago applied to the late M. Perrottet, he could not procure a specimen of it, although he sent _Antheraea Paphia_ (vern) and _Actias Selene_. I am half inclined to regard it as a mere variety of _A. Paphia_.

23. _Antheraea Helleri_, Moore.—Is found at Darjiling, the cocoon resembling that of the common _Tussah_.

24. _Antheraea Frithi_, Moore.—Is another Darjiling species, of which we know no more than of the last.

25. _Antheraea Roylei_, Moore.—Is common at Simla, Mussooree, Almora, and, I think, Darjiling. It feeds upon the common hill oak, spinning a large but thin cocoon between three or four leaves. I found it at Simla in the winter of 1836 by following a flock of tomtits, one of which, after a time, began tappi so loudly that I hastened to the spot and found the little fellows hard at work on the outer cocoon, from which I drew him off and pocketed the prize. The outer coating is very strong, and I do not think it could be reeled; but within this case is the true cocoon, of an oval form and yielding a good silk. The worms are easily reared, and sometimes give two or three crops, but this is when treated in the house. The males will couple with _Antheraea Paphia_, but the produce never comes to anything.

26. _Anthera_—This is a species occurring near Bombay and discovered by the Messrs. Robertson of the Civil Service, who regard it as allied to _A. Yamamai_ of Japan. From the rough sketch of the cocoon sent me it certainly appears to differ from _A. Paphia_, though I do not think it can possibly be _A. Yamamai_. (Mr. Messrs. Moore, occurs in Assam and _A. assamica_, Moore, in the Andamans).

27. _Anthera_—Nothing is known of this species, except that I possess a well-formed (probably male) cocoon of about the size of one of the _B. Mori_; the peculiarity exists in there being no vestige of a pedicel or safety rope, the cocoon being equally perfect at both ends. Unfortunately the label has been lost, and I have not the least recollection of where it came from or who
sent it, although I incline to think it came from Madras. I am particularly anxious to obtain living specimens of this, which is not only an undescribed species, but promises to be a valuable silk-yielder. These remarks will serve to show how much scientific work yet remains to be done in this single genus of Antecea.

29. *Attacus Atlas*, Linnaeus.—This is the largest of the real silk-spinners. It is common at 6,500 feet at Mussoorie and in the Dehra Dun; it is found also in some of the deep warm gims of the outer hills. It is also common at Hawalibagh near Almora, where the larva feeds almost exclusively upon the "Kilmor" bush or *Berberis asiatica*; while at Mussorie it will not touch that plant, but feeds exclusively upon the large milky leaves of *Exocaria insignis*. The worm is perhaps more easily reared than any other of the wild Bombycidae, producing a very large and well-stuffed cocoon of a grey colour and somewhat difficult to unwind; a strong ley of potash appears to be the best solvent. The species is also abundant in Cachar, Sylhet, and is found also at Akyab, in Annakhan, as well as in China.

30. *Attacus Edwardi*, White (P. Z. S., 1855).—This species was discovered at Darjiling and is much darker in colour than the other, and rather smaller in size, but nothing seems to be known of its food and silk.

31. *Attacus Cynthia*, Drury (Ma. II, t. 6 f 2).—Abundant at Mussoorie, feeding on various wild plants; common in China, where it feeds on *Ailanthus glandulosa*; found in Assam, Cachar, Sagar. Although it is commonly reported to be under cultivation in different places (*vide* Col. Agnew's Assam Report), yet such is not the case, the *Attacus ricini* in India invariably mistaken for it. Indeed until a few years ago, when I pointed out the fact, *Attacus Cynthia* was not known to occur in India, the other species passing under that name, as the silk-worms did under that of B. Mori. *Attacus Cynthia* has been imported into France and England and reared out in the open air on trees of *Ailanthus glandulosa*; it has likewise succeeded to some extent in Australia, and I believe they have it also at the Cape of Good Hope. There are difficulties attending the rearing of the silk as there is with all the *Attaci*, but nevertheless the French have succeeded in turning out some very good silk places. In England it is not quite as highly thought of as it once was. In Australia Mr. C. Brady has produced silk from it.

32. *Attacus ricini*, Jones (Trans. Linn. Soc., 1864, p. 48).—This is the worm that produces the silk known to the natives as the Arinli-silk (from arinli, the vernacular name of the castor-oil plant); it is easily reared and feeds on the castor-oil plant, *Ricinus communis*. The silk is obtained by boiling. The chief places of cultivation are Assam, Bengal, and Dinajpur, in Eastern Bengal, not at Dinajpur, as stated in one of Dr. Bennett's reports. It is also cultivated in smaller quantities in other places. The Mekirai to the eastward possess a very fine kind with white silk. *Attacus ricini* thrives well at Mussoorie, and has been introduced into France, Algeria, Malta, and other places.

33. *Attacus Cyrialis*, Moore. —Is known only from a few specimens of the moth in some museum in England, and I am inclined to regard it as no more than an ill-got specimen of *A. ricini*. It has failed to procure it from any part of the
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country, though I have seen an approach to it in ill-fed specimens of the former in my own trays. This underfeeding or semi-starvation is well exemplified in some very Lilliputian specimens of *Actias Seleusa*, received from a gentleman who reared it at Serampur, near Calcutta, where he only supplied the worms with food twice a day; the moths are only a quarter of the natural size. (*Attacus silhelmica*, Hefter, occurs in Silhet: *A. cunningi*, Hutton, in the N.-W. Himalaya: *A. insulara*, Walker, in Silhet: *A. obscura*, Butler, in Cachar).

33. *Actias Seleusa*, Hübner.—Very common in a wild state at Mussooree, where it feeds on the wild cherry, wild pear, walnut, *Cedrella paniculata*, (†) *Coriaria sappalina*, and several other forest trees and shrubs. It occurs also at Aimura, Darjiling, Assam, Cachar, Sagar, and at Serampur, near Calcutta. Mr. C. Turner failed to reel silk from the cocoons sent down from this, but it has been reeled, though there is not much of it.

34. *Actias Manasa*, Doubleday.—Occurs at Darjiling and is a very large species, but nothing has been recorded of its habits, food, or produce.

35. *Actias Leila*, Doubleday.—Is another Darjiling species, the economy of which has yet to be ascertained. (*Actias sinaesis*, Walker, occurs in N. China, and *A. ignescens*, Moore, in the Andamans).

36. *Satania pyretorum*, Boladoval.—Occurs at Darjiling and in Cachar, but nothing more is known of it.

37. *Satania Grotes*, Moore (P. Z. S., 1859).—Has been found at Darjiling and one or two specimens have been captured at Mussooree; but collectors of moths make no inquiries as to economy, and for all practical purposes the species might as well remain unknown. I am inclined to think that the larvae feed on the wild-pear tree (*Pyrus cariocca*).

38. *Satania Lunda*, Moore.—Of this nothing more is known than that it occurred in a collection made by the late Captain J. L. Sherwill, and is supposed to be from Darjiling or its neighbourhood. It is allied to *Satania Grotes*.

39. *Satania Cidos*, Moore.—From Captain J. L. Sherwill's collection also, and from North-Eastern India, but we have no information regarding it. From its being closely allied to *Satania pyretorum*, I should be inclined to suppose it an inhabitant of Darjiling or Cachar.

40. *Norus Huttoni*, Moore.—Found by myself at Mussooree at about 6,600 feet of elevation, feeding on the wild-pear tree. The larvae are to be found in April. The cocoon is an open net-work, and would produce no silk.

41. *Calliga Sinea*, Westwood.—Occurs at Sine, Mussooree, and in Kumaun, feeding on the walnut, *Sata babylonia*, wild pear tree, etc. But the cocoon is a mere mass of open net-work, through which the pupa is visible, and yields no silk.

42. *Rinaca Thilota*, Westwood.—Occurs at Mussooree, where I have taken it as *Androna annulata*, wild pear, and common peltophorum. It occurs also in Kumaun, but the specific name is a mistake, the insect never approaching
Tibet. Specimens were taken out of a collection made in Kumaon, and because the collector travelled into Tibet it was ridiculously enough called a Tibetan collection, and the species named accordingly. The cocoon is a coarse open net-work, through which the larva is visible, but there is no available silk.

43. *Lopa Katiska*, Westwood.—A very beautiful yellow moth discovered originally in Assam, occurring also, according to my ideas, at Mussoorie. Mr. Moore, however, considers mine as distinct. I am not quite satisfied that the cocoon will not yield silk, but there is very little of it.

44. *Lopa sivalica*, Hutton.—Closely allied to the last, and found at Mussoorie at about 5,500 feet and lower. It will probably yield a small quantity of silk.

45. *Lopa Miranda*, Atkinson.—Found by him at Darjiling; a good and handsome species, but nothing more is recorded of it.

46. *Lopa sikkimensis*, Atkinson.—A very beautiful species found by Mr. Atkinson at Darjiling. It may be known from the others by the smaller size, and by the wings being clouded with maroon. Of its economy nothing is known. Three or four other species of this family occur in Darjiling and Silhet, but beyond their existence nothing is recorded.

(The following silk-producing species also occur:—*Riona Zalikha*, Hope, in Sikkim; *Satasya Lala*, Westwood, in Sikkim; *Rhodia swara*, Moore, in Nepal; *Caligula caphara*, Moore, in Cashmir; *Noria Shadrika*, Moore, in Yarkand; *Noria Stolienkupper*, Felder, in Ladak; *Satura Assa*, Moore, in Sikkim.

These species which, like *Aricia Salana* and *Aetherana Paphia*, weave strong compact cocoons, perfectly closed at both ends, are furnished on each shoulder with a hard wing spar for the purpose of separating the fibres when the moth is ready to come forth; it may be heard grating against the silk and the point may often be seen protruding. It is common to the genera *Aricia* and *Aetherana* and was discovered by myself. In *Aricia*, *Noria*, and *Lopa* the upper end of the cocoon is left open, the fibres pointing forward, closely arranged, like the fine wires of a mouse-trap. No spine is needed in these genera. In *Bombyx* and others, although the cocoons are entire, the silk is loosely woven, and the fibres, being moistened by an acid from the mouth, are then easily separated by the claws on the fore-feet of the moth.

This is about the state and extent of our knowledge of the Bombuids of India; that there are many other species yet to be discovered no naturalist will think of doubting. Nature in the work through which the Almighty teaches man to look from earth to heaven, and up. His works and knowledge are boundless, so has this beautifully illustrated book no end.

'The author has two valuable papers published in the *J. Agric. Horst. Sec. Cal.* by Captain Haines in 1864: (1) "On the Reformation and Improvement of the Silk-worms, *Bombyx*; and (2) "On the Insecticide Properties of Silk-producing Moth cocoons." Both these are admirably reproduced here.
The following communication regarding certain experiments made by Captain Hutton with the Japan silk-worm also deserve reproduction here.

Experiments with the Japan silk-worm.

He writes that he received the eggs in the beginning of March, when they were just beginning to hatch. This process went on very irregularly for many days, showing that the worms were not in a healthy state. He goes on to say:

"When first hatched the worms had the head and prolegs shining jet black, the anterior segment ashy white, and the rest of the body as usual covered with small tufts of short hair of a pale brown. After the second moult the worm had a good deal of the appearance of the little China monthly worm (B. sinensis) known in Bengal as the 'Sino or China,' the markings and smallness of the worm being in some instances quite those of that species, while others of the same age appeared much larger and very much resembled the worms of B. Mori or B. textor, being of a sickly white with the usual semilunar spots on the back. Like the worms of B. sinensis, however, they grew very slowly until the last stage, when the increase in size was rapid and the worms bore all the appearance of a bara pata or a dwarf, B. Mori being at maturity about 2 inches long, which is the size to which B. textor attains at Musseorkee. For a long time I was sorely puzzled to make out what the worm could be, for the variety in the marking of different individuals was so great and so often changing at the time of moulting that I began to think the worm must be distinct from any known species, until suddenly the mists of doubt were entirely dispelled by the appearance of a black worm in all respects identical with those of my reverted B. Mori. From that moment I began to see my way, and when at length on the 2nd of May, just 36 days after hatching, the worms began to spin their cocoons it was perfectly evident that the worm, about which the French have gone mad, and the silk-cultivating world has made such a fuss, is nothing more than a hybrid or cross between the true sickly B. Mori and the little monthly B. sinensis or 'Sino.'

According to the labels attached to the wooden tubes in which the eggs arrived one hatch should have produced 'white' cocoons, and the other 'green'; yet both have spun them of the same size and shape, and all are of a pale sulphur yellow, except that of the solitary black worm, which is decidedly as to size and colour an undersized specimen of B. Mori of Kashmir and China. The moths, which came out on the 19th May, are minatures of the pale unhealthy specimens of B. Mori, being ashy white with a faint transverse brown line on the upper wing. I have preserved some of the eggs where with to carry on my observations, and ascertain whether eventually the cross will wear out as in other instances, and the worms revert to the annual B. Mori. Further than this I do not consider the worm worth cultivating as the increased race from which it is derived can to the full as good or even better in every respect, for the B. Mori can only be deteriorated by such a cross. I have long known these cocoons, having received specimens both from Mr. Moore of the E. I. Museum and from M. Guibert-Montville with a request to mention to what species they belonged. I decided that they were the product of B. sinensis, but without any idea then that the worm had keep
crossed. In the colour and size of these cocoons we recognize the influence of the small polyvoltine *B. siamensis*, and in the shape and texture the influence of *Bombyx Mori*. As to the univoltine-polyvoltine character of the worms, all will depend upon climate, and the degree of influence exercised over individual worms or moths by the species from which they spring, and no purchaser of eggs in Japan, China or elsewhere can ever be certain that he has secured a batch of either univoltine, bivoltine or polyvoltine worms, because all experiments hitherto tried in the crossing of the various species of silkworms have invariably shown that there is always a strong tendency to revert to the strongest and healthiest species. I found this to be the case in my own experiments in crossing *B. Mori* of Kashmir with *B. Crusi*, the *Nisii* of Bengal. A cross between a univoltine and a polyvoltine species will produce eggs some of which will be polyvoltine for a time, others will be bi- or tri-voltine, but the majority (unless in a hot climate) will revert at once to univoltines or annuals. Climate or temperature, as I long since remarked, will influence the colour of the cocoons, and this is shown in the fact that instead of 'white' and 'green' cocoons my Japanese worms have all produced sulphur yellow cocoons."

**SERICULTURE.**

In 1856, Captain Hutton brought to the notice of Government the existence of several species of silk-producing moths in Mussoorie and the Dehra Dun, and suggested that steps should be taken to ascertain whether they would submit to domestication like the silk-moth (*Bombyx Mori*) of China. His proposals were accepted, and in 1858 a grant was made to carry them out. In 1859, Captain Hutton reported that the wild mulberry tree was unfitted by slowness of growth for extended operations and that the quick-growing Chinese plant was not attractive to the *Bombyx Huttoni*, the subject of his experiment. Further, that the worms of this species, were irreclaimably wild even when crossed with other species and therefore that the experiment had failed both as regards the insect and the tree. He showed, however, that the climate was admirably adapted for sericulture and advocated further attempts with other silk-producing moths and other trees. The grant was, however, withdrawn and sericultural experiments were left to individual effort for some time. In 1850, the Chinese mulberry (*Morus chinensis*) was introduced by Dr. Jamieson, and subsequently propagated in the Dehradun, where it thrived luxuriantly, as well as a variety known as *M. multiflorus*, both of which are eminently suited for silk-worm breeding. The latter is said to be a variety of *M. nil* though,
according to Mr. Duthie, it now varies much from the great shrub described under that name.

In 1867, Captain Murray commenced a series of experiments with seed imported from Bengal and obtained good returns in quality and quantity. In the meantime the Government gardens had distributed cuttings and plants of the better kinds of mulberries to all who desired to propagate them, but nothing of importance was undertaken and sericulture remained in the purely experimental stage in the hands of private individuals until 1874, when Mr. H. Ross commenced a plantation of mulberries on a large scale at Ambiwala in the Dün.

By the end of 1875 Mr. Ross had twenty acres of young trees not old enough to produce any leaf and 100 old trees fully grown. He procured silkworm seed from Japan and Kashmir, but during his absence the trees were allowed to die, and the seed was neglected. None of that procured from Kashmir hatched and not much of the Japan seed and altogether only about 48lb. of cocoons were produced and about five to six ounces of seed, a good deal of which died from want of care. The proceedings of the year 1876-77 were equally unsatisfactory, and but little progress was made. The report for 1877-78 is another record of failure, but the carelessness and neglect which were marked features in the operations of the previous year are wanting on the present occasion. The experiment was throughout the year under the personal management of Mr. Ross, whose

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1 Mr. Duthie writes:—"The plant (M. multifida) according to Bureau (De Candolle’s Prodromus, Pt. XVII., p. 246) is given as one of the numerous varieties of M. alba. He mentions that it is cultivated in S. China, where it is considered to be the best kind for rearing silkworms. I suspect, however, that the M. multifida of N. India, whatever may have been its origin, is a very different plant now to the one known under this name both in Europe and China. M. Bureau describes the leaves of the Chinese plant as being very large, and gives, as a synonym, M. chinensis, a variety which was introduced by Dr. Jameson from China many years ago. The leaves of the latter are certainly very different in appearance from those of the variety known in the Dün as M. multifida, which has small thin leaves. It also differs in its behaviour under cultivation. The M. multifida of the Dün will grow easily in any kind of soil, whereas the M. chinensis requires a great deal of care. The effect of cultivation and climate on the many varieties of mulberry which have been grown, either for the production of fruit or for the supply of leaves as silkworm food, have added very greatly to the difficulties of botanical discrimination. This is more, or less the case with all such plants whose cultivation has extended from very early periods. The characters of the original became in time obliterated or mingled with those of the several varieties which have been produced from the indigenous species. M. multifida was in leaf on the 17th January (1869), just a fortnight before any other kind in the garden."
attention to the conduct of the experiment and interest in its success was undoubted. Nevertheless, both worms and eggs failed in an unaccountable manner, the final outturn was very small, and a few villagers to whom worms were given succeeded in rearing much larger cocoons than any that were produced on the Government plantations. The records of the experiment had not been kept in sufficient detail and no data were available from which any lessons that could be relied upon for future guidance could be drawn. The eggs had been kept in Mussooriee from May to January each year to prevent their hatching during the hot-weather and rains, when the climatic influences were unfavourable, and much was expected from the operations of 1878-79 to settle many of the questions of detail. The season was, however, an exceptionally unfavourable one. Mild weather, at the commencement of February caused the mulberry to shoot somewhat earlier than was customary and induced the growers to bring down the seed from Mussooriee for hatching at an earlier date than usual. No sooner had the young caterpillars appeared than a succession of cold frosty days cut the mulberry shoots back and left the grubs with insufficient nourishment, resulting in small cocoons of inferior quality. The worm was not killed at once when the cocoon was fully formed, but was allowed to partly cut its way through before being destroyed; and even then no precautions were taken to dry the cocoons and the worm was allowed to decompose within and stain the fibre. Notwithstanding all these drawbacks, the report on the small quantity of silk produced was that it was superior to Bengal qualities and a valuable addition to the local supplies. The representative of a Bradford firm of silk merchants interested himself very much in these experiments, and in 1879-80 took over their supervision, the financial responsibility remaining with Government. The results were encouraging; over fourteen mounds of cocoons were brought in by private rearers, and though the quality was not first class, they gave promise of ultimate success. During 1880-81, the entire responsibility for the supervision remained in the same hands and arrangements were made for handing over the Government agricultural establishment and a considerable area for mulberry plantations. A scheme was also under consideration.
for the establishment of mulberry plantations at intervals along the slopes of the Himalaya for the purpose of cottage-rearing. The great difficulty to be encountered is in the matter of seed, and this can only be overcome by prohibiting the rearing of seed by villagers, as the worms raised from this seed are invariably diseased and the silk suffers accordingly. It would appear that this precaution is necessary in other countries also. An expert writes (1880):

"In every country without exception the disease has crept in where cottagers have been allowed to rear seed. The industry has been ruined by it in Asia Minor first, then in Europe (Italy, then France); and as each country's stock became infected and diseased, it had to import seed at great expense, and commenced a drain from another country, which in turn gave the fatal impulse to seed production in the new country with the usual result, that, in hastening to become rich rapidly, the people took to breeding from inferior cocoons, instead of following their old habits of careful selection, with the consequence of deterioration and then disease amongst their stock. Thus Italy commenced a drain from Japan long ago, and as Japan stock required renewing yearly in Italy (as it would not acclimatise, i.e., deteriorate yearly till it was of little or no use after the third year in Italy), this proved a constant drain and great source of revenue to Japan. Then came the failure in France, and once disease creeps in where the cottagers are allowed to breed and sell seed amongst themselves, it only takes about five years to ruin a country. Thus France became ruined so far as stock goes, and the industry is in a ruinous condition, as I saw last year when visiting the silk districts in the south of France. An increased drain came on Japan; the Japanese found greater profit in breeding seed—faults in which are so difficult to discover—to growing and reeling silk, which latter can be so much better judged on its merits. They got careless and greedy, and the usual result followed; they have now had the disease amongst them in Japan for I believe about six years, and the old confidence in Japanese seed is gone. Thus virtually all the seed markets are spoilt, as we know to our cost, as all our imported seed this past season was more or less diseased, and we have lost over Rs. 7,000 in bad seed, besides losing the season. To bring the importance of the question nearer home, the old indigenous Panjáb cocoon is excellent. Mr. Halsey, as an experiment, imported a few Italian eggs into the Panjáb some six or seven years ago, till when the disease was unknown. These Italian eggs brought the disease, and now the indigenous race is ruined, and has failed four years running. We have over Rs. 5,000 out in advance this year to rearers in the Panjáb unworked off owing to the failure again this year. There is more in this still, as the natives will not throw away their old seeds, and if we give them new good seed, they will keep the two together and spread the disease amongst our new stock, and ruin us with yearly importing expenses, did we not keep a special rearing establishment out here, or else have plantations of the race in the Panjáb, on which we could keep some stock on the seed used."
The only measures for preventing the rearing and distribution of cottage-reared seed that have yet been proposed are that clauses should be entered in the contract with therearers that they should, under a penalty, bring in all the green seed-cocoons to the central stations to be destroyed there, and that they should rear no other seed than that distributed to them. The future of the silk industry is now in good hands, and so far as skill, experience and capital can conduce to arriving at success, the conditions exist. There can be no doubt that it would not repay a European to conduct the rearing process himself, but it will give the weaker members of the agricultural classes full and remunerative employment, and the European will find his place in supervising the cottage operations, supplying seed, collecting, sorting and disposing of the produce and increasing and tending the mulberry plantations.

The tribes Noctua, Pseudo-deltoides, Deltoides, Pyrales, Geometra, Crambices, Tortrices and Tineines are all represented in the Himalaya. The last three tribes have been but imperfectly worked and the microlepidoptera of India may be said to be almost unknown to science. For beauty of colouring and for economic study the Tineines yield to none. As observed by a distinguished naturalist, "the wings frequently combine with extreme beauty of colouring the most brilliant little stripes and masses of shining silver and burnished gold which under the microscope exhibit a most radiant richness. This lustrous aspect of many species is but a poor recompense for the injury which we receive from many more while in the larva state. These clothe themselves at our expense in the warmest woollen garments which they traverse in all directions, leaving behind a gnawed and well-worn path so thin and bare as to yield to the slightest pressure. They also destroy furs, hair, feathers and many other articles of domestic economy and are the exterminating pests of zoological musetums." The sugar-cane is attacked by a bore in the Mauritius and West Indies identified as the caterpillar of Phalana saccharalis, Fabr. (= Diatraea sacchari, Guignard) and the same or an allied species occurs in Bohilkhand. Our grain is also liable to great damages from moths; and in the Bombay Presidency the cotton suffers from the ravages of a small species (Empressaria georgiella) which deposits its eggs in the germen at the time of flowering and the larva feeds on the cotton seeds until the pod is
ready to burst, a little previous to which it opens a round hole in
the side of the pod through which it descends to the ground, and
burrows into it about an inch, and there assumes the pupa state.
The perfect insect is dark fuscous brown, the head and thorax
somewhat lighter in colour: fore-wings with an undefined round
blackish spot on the disk a little above the centre of a fascia of the
same colour, crossing the wings a little above the apex, which itself
is black: under-wings silvery grey, darker towards the hinder
margin. The only way to arrest its ravages is to dig the soil
slightly around the roots of the plant and either collect it to the
depth of an inch and burn it or collect the pupae and burn them or
apply a caustic solution of lime. Space and time do not allow us
to note the many species useful to man or destructive of man's
labours, and we hope that the day is not far distant when some of
the many labourers in this field of Natural History will give us a
series of manuals fitted for the systematist and the economical ob-
server. Every county in England has an almost complete list, but
there is not even an attempt at one yet for any order of the insect
fauna of India.

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LEPIDOPTERA

Rhopalocera.

A—submontane tract including Taíl, Bhábar, and Déná.

B—outer Himalaya.

C—upper valleys towards and beyond the snows.

Family Nymphalidae.


Hadern, Moore—similis, Linn., B.

Tirumala, Moore—Limnias, Linn. A: septentrionalis, Butler, A.